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PORTUGAL

NATIONAL ENERGY PLAN AND CLIMATE 2021-2030 (NECP 2030)

Update/Review

(as defined in Article 14 of Regulation (EU) 2018/1999 of 11 December)

Portugal, 1 October 2024

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1.1.1. Political, economic, environmental and social contexts of the plan

The Paris Agreement (PA) reached in 2015 set as long-term objectives to contain the increase in the global average temperature well below 2 °C above pre-industrial levels, with the commitment of the international community to pursue all efforts to limit this increase to 1.5 °C, values that science sets as the maximum to ensure a continuation of life on the planet without overly disruptive changes. It also set objectives to increase the capacity to adapt to the adverse impacts of climate change and to mobilise financial flows consistent with low-emission pathways and resilient development.

This agreement, which entered into force on 4 November 2016, thus represented a paradigm shift in the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), with the explicit recognition that only with the contribution of everyone can the challenge of climate change be overcome.

The main commitments of the PA are to achieve a global balance between anthropogenic emissions and removals in the second half of the century, to prepare and report successively on the " *Nationally Determined Contribution*" (NDC) to the overall emission reduction effort, which should be successively more ambitious and prepare and report "Long-term strategies for emission reduction".

In 2016, at the UNFCCC Conference of the Parties (COP), Portugal set itself the goal of achieving Carbon Neutrality by 2050 and developed the Carbon Neutrality Roadmap 2050 (RNC2050) which set out the vision, trajectories and orientations for policies and measures to be achieved within that time horizon. RNC2050, published by Council of Ministers Resolution No 107/2019 of 1 July, thus constituted the long-term low greenhouse gas (GHG) development strategy submitted to the UNFCCC on 20 September 2019.

In line with the findings of the *Intergovernmental Panel on Climate Change* (IPC1) Special Report, it was also concluded in RNC2050 that the biggest GHG emission reduction efforts should be concentrated in the 2021-2030's, which is the key decade for aligning the national economy with a carbon-neutral pathway.

Thus, in conjunction with the objectives of RNC2050, ambitious but achievable targets have been set for 2030, which are reflected in the National Energy and Climate Plan 2030 (NECP 2030), approved by Council of Ministers Resolution No 53/2020 of 10 July, and which is the main national energy and climate policy instrument for the decade 2021-2030 towards a carbon-neutral future.

The challenges call for concerted action between energy and climate policies that will make it possible to set a workable path towards a carbon-neutral economy and society, while at the same time promoting economic growth and improving the quality of life. In this sense, the NECP is key to ensuring the achievement of the 2030 energy and climate targets and is future-oriented and Portugal's long-term objectives.

At international level, the Glasgow Climate Pact was adopted on 13 November 2021 at the UNFCCC COP26, which recognised that limiting the increase in the global average temperature to 1.5 °C above pre-industrial levels would significantly reduce the risks and impacts of climate change and the various signatories committed to strengthen their 2030 targets in order to close the remaining ambition gap.

More recently, at COP28 in Dubai at the end of 2023, the urgency of aligning decarbonisation pathways with the Paris Agreement objective was also recognised. The first stocktake of the Paris Agreement reinforced the sign that the temperature increase needs to be contained at 1.5 °C, with reference for the first time to the start of the transition

1Intergovernmental Panel on Climate Change

to the end of all fossil fuels, but also to the agreement reached on the need to triple global renewable energy capacity and double the overall average annual rate of energy efficiency improvements by 2030; the recognition of the need to achieve neutrality by 2050, including the respective intermediate GHG emission reduction targets of 43 % by 2030 and 60 % by 2035 compared to 2019, or the need for peak emissions to occur by 2025.

This agreement also saw the need for the next round of NDC to include ambitious economy-wide and greenhouse gas emission reduction targets aligned with the 1.5 °C objective and informed by science and the results of the Global Stocktake.

At Community level, the presentation of the European Green Deal (COM (2019) 640 final) in December 2019 is a new growth strategy based on a green transition aligned with the long-term decarbonisation objectives of the European Union (EU), ensuring that economic growth is decoupled from resource use and that the transition is fair and inclusive for all.

The subsequent adoption of the European Climate Law (Regulation (EU) 2021/1119 of 30 June 2021)shaped the2objectives set out in the Green Deal, thus setting a binding EU 2030 net GHG emission reduction target of at least 55 % compared to 1990 levels, as well as the objective of achieving climate neutrality by 2 050 in Europe.

It is against this background that some of the policy initiatives included in the Fit-for-55 package (COM (2021) 550 final), presented in 2021, have emerged to ensure that all EU climate and energy legislation is aligned with the new 2030 GHG emission reduction target.

In addition, in response to the difficulties and disruptions in the global energy market arising from the changed geopolitical landscape with the start of Russia's invasion of Ukraine, the REPowerEU Plan (COM (2022) 230 final) was also presented in May 2022 as the EU's plan to accelerate the energy transition and end dependence on fossil fuels.

Considering the importance of industry as an accelerator and enabler of change, innovation and economic growth, the Green Deal Industrial Plan (COM (2023) 62 final) was presented in February 2023. With this plan, the EU aims to strengthen the competitiveness of European industry and support the rapid transition to a climate neutrality scenario, complementing ongoing efforts under the European Green Deal and REPowerEU, and aligning with the principles set out in the European Industrial Strategy (COM (2020) 102 final), presented in March 2020.

With a view to ensuring the achievement of the climate-neutrality target set out in the European Climate Law, and responding to the provision in the Climate Law, the European Commission presented its assessment on the 2040 climate target (COM (2024) 63 final) in February 2024, recommending a 90 % reduction in GHG emissions by 2040 compared to 1990 levels, based on an impact assessment, the results of the related public consultation and the scientific opinion of the European Climate Change Advisory Board.

In order to achieve this ambition, in addition to the full implementation of the 2030 climate and energy framework, it will also be necessary to enhance the contribution of carbon capture, utilisation and geological storage technologies. It was in this follow-up that the European Commission presented its Communication (COM (2024) 62 final), also in February 2024, on the Industrial Carbon Management Strategy, with a view to promoting the development of carbon dioxide technologies, coupled with the creation of transport infrastructure, at EU level. Reference should also be made to the Net Zero Industry Act (Regulation 2024/1735 of 13 June), which identifies zero emission technologies and which includes technologies for the capture and geological storage of carbon dioxide.

These new developments, which entail major changes in energy and climate policy, with significant impacts on the three pillars of sustainability at national level, trigger the need to revise the NECP 2030 to ensure the alignment of previously established policies, objectives and targets with the new international and Community context. This complex review exercise includes an increased ambition presented previously to ensure that the climate and energy targets set are met.

At national level, the new post-COVID-19 pandemic context, and reforms and investments to boost digitalisation and

2Establishes the framework for achieving climate neutrality and amends Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')

green industrialisation, are also important elements to be considered in this review process. In particular, the development of the renewable hydrogen value chain will play a very important role in the country, going beyond the expectation set out in the National Hydrogen Strategy approved by Resolution of the Council of Ministers No 63/2020 of 14 August. The recent Biometano Action Plan 2024-2040, approved by Council of Ministers Resolution No 41/2024, is also a new focus on the accelerated reduction of greenhouse gas emissions due to the use of natural gas.

In the light of this international, EU and national context, Portugal has approved its first Climate Bill (LBC)3, which consolidates objectives, principles and obligations for the different levels of governance for climate action through public policies and sets out new provisions on climate policy, including:

- Stipulates climate rights and obligations, strengthening the right to citizen participation;
- Defines the governance framework for climate policy, creating new structures, including a Climate Action Council;
- Establishes new requirements and timetables for climate policy planning and assessment tools, including the development of regional and local climate action plans, five-year sectoral plans for mitigation and adaptation;
- a green industrial strategy aimed at supporting the industrial sector in the climate transition process, as well as carbon budgeting for 5-year periods;
- It sets out new principles and rules on economic and financial instruments, with a particular focus on the budgetary process, green taxation and sustainable finance.

The objectives, principles and obligations set out in the CLL, which further revises with increased ambition the GHG emission reduction targets set out in RNC2050, are also reflected in the revision of the 2030 NECP, given their impact on the current national climate and energy strategy, such as limiting the marketing of new light-duty vehicles running exclusively on fossil fuels by 2035 or banning the use of fossil natural gas for electricity production from 2040, provided that security of supply is ensured.

In addition to the ambition of climate neutrality, in December 2022, through Decree-Law No 84/2022 of 9 December, in its current wording, Portugal updated its national targets for renewable energy in final energy consumption in the transport sector and set new targets for maritime, air and rail transport.

In response to the CLL, which envisaged studying the frontloading of the 2050 climate neutrality target, Portugal, aware of the challenges and opportunities associated with this transition, made a commitment at COP28 to frontload the 2045 climate neutrality target.

Portugal thus strengthened its prominent position in the international context, not only on the medium- to long-term commitments, but also on the path it has been following in recent years, in particular in relation to GHG emission reductions and the commitment to renewable energy sources, where very positive results have been achieved. In 2022, GHG emissions, without accounting for emissions from land use, land use change and forestry (LULUCF) and no indirect emissions, were estimated to be around 56.25 Mt CO_2eq, representing a decrease of 4.4 % compared to 1990, and 34.5 % compared to 2005. Despite the exceptional conditions of 2020, driven by the impact of the measures in response to the COVID-19 pandemic, which translated into significant emission reductions, the recovery of the economy led to an almost zero increase in emissions between 2021 and 2022 (0.3 %), demonstrating the consolidation of the decarbonisation path of the national economy, aligned with the 2030 GHG emission reduction target.

Portugal has made progress towards increasingly high levels of renewable energy incorporation across sectors, in line with the targets set by the Climate Law, having achieved a total share of renewables in gross final energy consumption well above the European average and on an increasing trajectory in recent years (+ 15,2 pps compared to 2005). In the electricity sector, in 2022 Portugal was the fourth EU country with the highest level of renewables incorporation (+ 33 pps compared to 2005).

As a result, Portugal reduced its external energy dependency (-17,6 pps compared to 2005), increasing domestic

3Law No 98/2021 of 31 December 2007

energy production and reducing primary energy consumption (-21.3 % compared to 2005), thus ensuring higher levels of security of supply.

It is worth highlighting the contribution of the energy sector to the Portuguese economy by creating a new industrial and business sector generating jobs, promoting regional development, boosting exports of goods and services, boosting scientific research and innovation, capable of attracting international investment and stimulating the internationalisation of national businesses.

Table 1 – Evolution of key energy and climate indicators in Portugal [Source: APA, DGEG]

INDICATOR	2005		2022	VARIATION
TOTAL EMISSIONS OF CO2eq (no indirect emissions, no LULUCF)	85,86 MTON	4	56,25 MTON	— 34.5 %
PRIMARY ENERGY CONSUMPTION	27,1 Mtoe	4	21,3 Mtoe	— 21.3 %
RENEWABLES IN FINAL CONSUMPTION	19.5 %	+	34.7 %	+ 15,2 pps
RENEWABLES IN ELECTRICITY	28.3 %	+	61.0 %	+ 32,7 pps
ENERGY DEPENDENCE	88.8 %	4	71,2% 4	— 17,6 pps

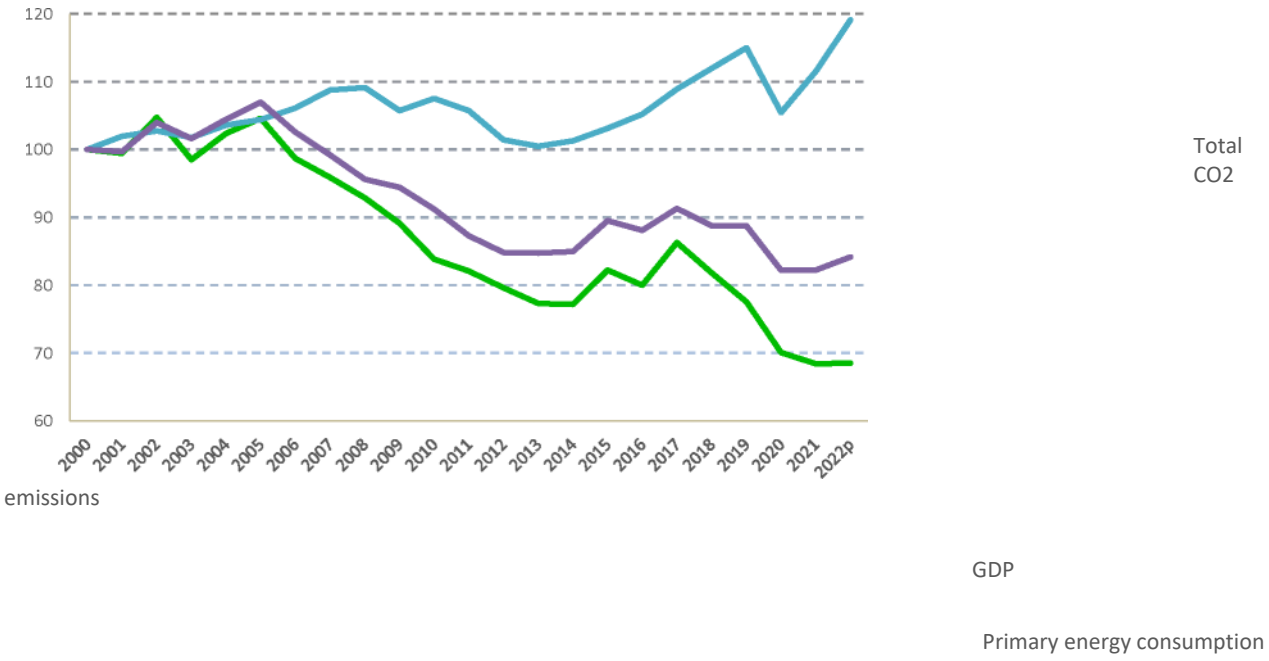
It is also important to highlight Portugal's energy and climate pathway in recent years and how it has been possible to uncouple Gross Domestic Product from CO_2 emissions and Primary

4Including the contribution of heat pumps

Energy Consumption, a trajectory that continues in 2022. This means that Portugal has been able to generate wealth with lower emissions and lower energy consumption, with clear benefits for the economy and society. This pathway of reducing total CO_2 emissions is expected to continue in the coming decades, as Portugal is committed to an increasingly carbon-intensive economy, with particular emphasis on renewable electricity generation and the use of renewable gases. This transformation should cut across all sectors of activity, energy and non-energy, taking into account their decarbonisation potential, and should be assisted by improvements in energy efficiency, optimisation and integration of production processes.

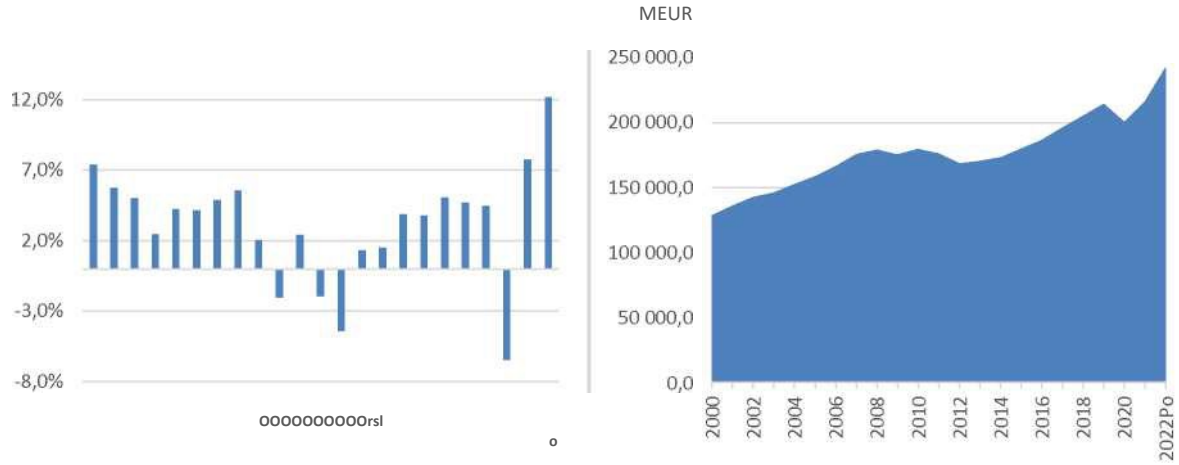
However, the trajectory of primary energy consumption should rise again at least until 2030 as a result of much greater use of renewable primary energy for the production of renewable fuels, which could lead to a decarbonisation of all energy end-uses where the electricity option is not technically and/or economically favourable.

Figure 1 – Evolution of Gross Domestic Product, Total CO_2 emissions (no LULUCF; no indirect emissions) and Primary Energy Consumption (2000 = 100) (Source: INE, APA, DGEG]



Portugal's economic recovery since 2013 was interrupted in 2020 as a result of the COVID-19 pandemic. In 2022, GDP growth is estimated at 12.2 %, representing the highest rate since 1992, after growth of 7.7 % in 2021, reaching a value of EUR 242.3 billion.

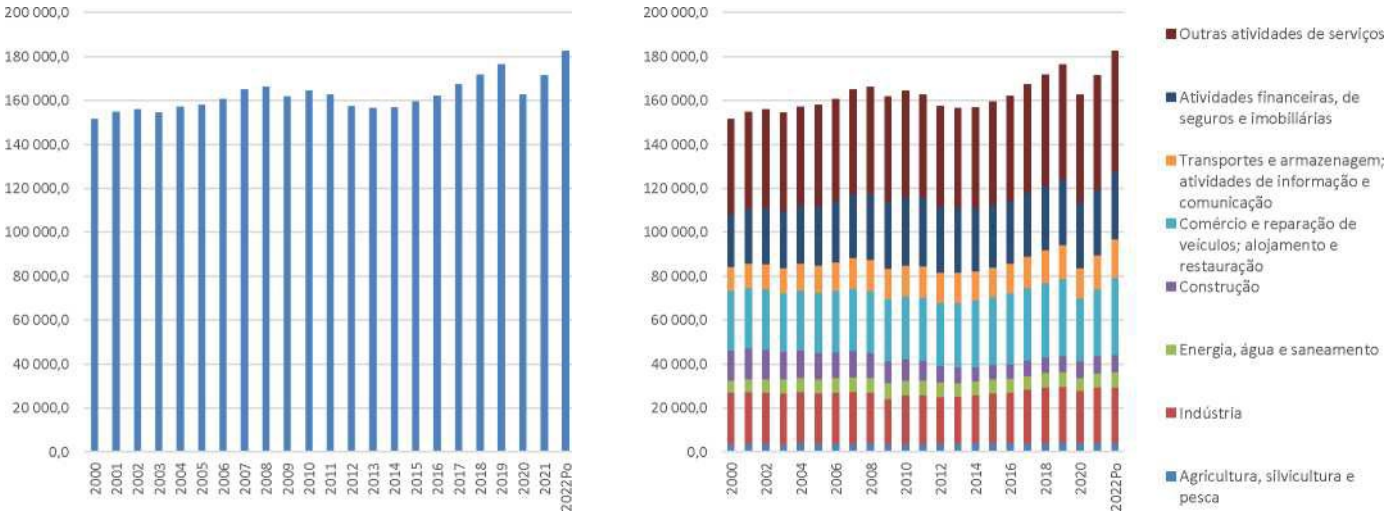
Figure 2 – Change in GDP (base 2016) in Portugal [Source: NSA]



According to more recent projections, the growth path is expected to remain in the coming years.

In the production approach, in 2022, Gross Value Added (GVA) increased by 6.5 % compared to 2021, covering almost all sectors of activity: Transport and Storage, Information and Communication Activities 15.1 %; Industry 1.3 %; Trade and Repair of Vehicles and Housing and Restoration 15.1 %; Construction 1.5 %; Other Service Activities 6.1 %; Energy, water and sanitation 4.2 %; Financial, Insurance and Real Estate Activities 1.6 %. Only in Agriculture, Forestry and Fisheries there was a 5.3 % decrease in GVA. It should be noted that in terms of turnover, the industry and energy sector remained the one with the highest contribution between 2021 and 2022 (+ 8,4 pps), followed by the trade sector (+ 6,2 pps).

Figure 3 – Evolution of GVA (base 2016) in Portugal (EUR million, chain-linked volume; annual) [Source: NSA]



To be added to the decarbonisation trajectory of the national economy, with the corresponding reduction in GHG emissions, which have made it possible to consolidate Portugal's energy and climate pathway, the synergy between decarbonisation measures and options to adapt to the effects of climate change should also be noted as relevant. As climate change is a very complex process with high risks for humans, ecosystems and material assets, it is vital to promote adaptation in a structured way by implementing effective measures that reduce vulnerability and increase system resilience (EEA, 2017; IPCC, 2022b).

In the current context of uncertainty in global climate policy, with changes in political leadership, conflicts of interest between different economic sectors and a lack of consensus between countries, the need to implement effective and coordinated measures to mitigate and adapt the negative impacts of climate change is all the more important.

This is even more important when looking at the latest results of the National Adaptation Roadmap 2100 (RNA2100). The census of regional climate projections for mainland Portugal makes it clear that the intensity of warming up to the end of the century (2100) is highly dependent on the greenhouse gas emissions scenario considered. For example, for the mitigation scenario RCP2.6, an increase of 1 to 2 °C in the average daily temperature over the summer is expected, compared to an increase of 4 to 7 °C for the PCR8.5 scenario. In addition to average and maximum temperature increases, heat waves and very hot days will be more frequent, more intense and more durable, and by the end of the century, the maximum number of very hot consecutive days can reach 3 months (90 days) in the south-east region of Portugal, in a scenario of RCP8.5emissions. Precipitation projections already show a significant increase in the maximum number of consecutive dry days throughout the 21st century in all emission scenarios.

The implementation of an adaptation policy is therefore essential, but the effort should be coordinated with mitigation measures in order to limit the magnitude of climate impacts.

Aligned with an integrative vision, the NECP 2030 was developed in conjunction with RNC2050 and taking into account the results of RNA2100, as part of the obligations under Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, this version of the update foreseen under Article 14 of that Regulation.

The NECP 2030, as the main energy and climate policy instrument for the decade 2021-2030, is organised in accordance with the structure set out in Part 1 of Annex I to the above-mentioned Regulation. Thus, the 2030 NECP addresses the aspects listed in that structure: it includes a characterisation of the current energy and climate situation in Portugal, covering the **five dimensions** of the Regulation – **decarbonisation, energy efficiency, security of supply, internal energy market, and research, innovation and competitiveness** – as well as the definition of national contributions, and planned policies and measures to meet the different overall Union commitments, including in terms of greenhouse gas emission reductions, renewable energy, energy efficiency and interconnections.

The integration of adaptation to climate change in the NECP 2030 is consolidated with the climate vulnerability and risk assessment of the planned measures. This process took into account the main findings of RNA2100, namely climate projections and the modelling of sectoral impacts, and identified how these factors could interfere with the implementation of the plan's measures.

1.1.2. Strategy relating to the five dimensions of the Energy Union

In 2016, at the Conference of the Parties to the United Nations Framework Convention on Climate Change, Portugal set itself the objective of achieving Carbon Neutrality by 2050 and developed and endorsed the Carbon Neutrality Roadmap 2050, which set out the vision, trajectories and orientations for policies and measures to be achieved within that time horizon. RNC2050 was the long-term low GHG emission development strategy submitted to the UNFCCC on 20 September 2019, which is under review to reflect the important energy and climate developments that have taken place since its adoption, in conjunction with the revision of the NECP 2030.

In line with the findings of the IPCC Special Report on limiting global average temperature increase to^{1,5}°C above pre-industrial levels, RNC2050 concluded that the largest GHG emission reduction efforts should be concentrated in the decade 2021-2030. This reduction, which is expected to be highlighted during this decade, is essential for the alignment of the national economy with a climate neutrality path. Thus, in conjunction with the objectives of RNC2050, and following the developments at international, Community and national level already listed, the targets for 2030 have been revised with a view to raising ambition. The new targets are reflected in this update of the NECP 2030, which is the main national energy and climate policy instrument for the decade 2021-2030, towards a carbon-neutral future.

Achieving climate neutrality in 2045, in view of the latest commitment at national level on this issue, means the phasing out of a linear economic model based on fossil fuels, and a commitment to an economy that is based on

renewable resources, used efficiently, pursuing circular economy models, valuing the potential of land and sea territory and promoting territorial cohesion.

National efforts to reduce GHG emissions, as part of a broader framework for global action, will help to reduce the costs of adaptation to climate change significantly, with clear economic savings.

Addressing this challenge involves transforming life into society, in particular production and consumption patterns, and the relationship between energy production and use; how cities and places for housing, work and leisure are thought, how we move and how mobility needs are seen. In addition to a technological challenge, this is also a social organisational challenge, which depends on the support and buy-in of society.

This global climate emergency context underlines the importance of the energy transition and economic paradigm shift, in particular with regard to fossil fuels. Portugal has made a commitment to the energy transition, leveraging the country's economic competitiveness, with the aim of reducing its GHG emissions, aligned with the EU's objective of becoming the first climate-neutral continent by 2050. In 2021, Portugal stopped coal-fired electricity production, anticipating its initial commitment (2023) and thus consolidating the pathway away from fossil fuel use. One example of this was the closure of the Matosinhos Refinery in 2021.

In addition to the energy sector, the remaining sectors of the economy should contribute to achieving urgent emission reductions through the guidelines and measures set out in this plan as well as in RNC2050.

For the 2030 horizon, it is important to define the national objectives and strategy, consistent with a competitive, resilient and carbon-neutral economy, and with the new developments and renewed ambition required by the climate emergency.

Portugal's strategic vision for 2030

PROMOTING THE DECARBONISATION OF THE ECONOMY AND THE ENERGY TRANSITION CARBON NEUTRALITY, AS AN OPPORTUNITY FOR THE COUNTRY, BASED ON A DEMOCRATIC AND FAIR MODEL OF TERRITORIAL COHESION THAT BOOSTS THE GENERATION OF WEALTH AND EFFICIENT USE OF RESOURCES

While all sectors of activity contribute to emission reductions, it is the energy sector that will make the greatest contribution in the current decade, with the energy transition playing a particularly important role in the context of decarbonisation. Portugal's 2030 strategy is based on a mix of policy and policy options, as well as technological options, seeking synergies between the various options. The path towards a carbon-neutral economy requires joint action in the different policy areas, with energy efficiency first and the scaling up of renewable energy carriers, not only electricity, but also biofuels such as biomethane, renewable hydrogen (also called green hydrogen) and other renewable fuels of non-biological origin. Electrification should be increased; the strengthening and modernisation of equipment and infrastructure enabling it; increasing the interrelation between electricity, heating and cooling, and transport*(sector coupling*), developing energy interconnections; the reconfiguration and digitalisation of energy markets, while preserving the conditions for stability, capacity and investment opportunity; encouraging research and innovation; the promotion of low-carbon processes, products and services, better energy services, and informed consumer choice.

Despite Portugal's positive climate trajectory, the severe impacts of the pandemic have created new challenges to the climate transition. In this context, it is important to ensure that the economic and social recovery model is based on green transition objectives. Thus, under the Recovery and Resilience Facility, Portugal allocated around 38 % of available funds to the climate transition, promoting measures with a higher multiplier effect on the economy, such as energy efficiency and decarbonisation measures linked to innovation.

The European Council established *Next Generation EU*, a recovery instrument, from which the Recovery and Resilience Facility is developed, which is part **of the Recovery and Resilience Plan (RRP) for Portugal**, approved on 16 June by the European Commission, which was translated into the Implementing Decision of the European Council and the Parliament on 13 July 2021.

The RRP is a nationwide programme, with an implementation period until 2026, which aims to implement a set of reforms and investments aimed at boosting the country on its path to recovery and sustained economic growth, accelerating convergence with the EU, ensuring a greener, more digital and competitive economy, a less unequal society with more and better jobs.

The set of reforms and investments are organised into **20 components, grouped around three structuring dimensions, Resilience, Climate Transition and Digital Transition**.

The **Climate Transition dimension** is the result of Portugal's commitment and contribution to the climate targets that will achieve carbon neutrality. Decarbonising the economy and society offers important opportunities and prepares the country for realities that will shape competitiveness factors in the near future.

In the Climate Transition dimension, 6 components were considered with intervention in strategic areas: the sea (C10), the decarbonisation of industry (C11), the sustainable bioeconomy (C12), energy efficiency in buildings (C13), hydrogen and renewable energy (C14) and sustainable mobility (C15). In parallel, the Forest (C8) and Water Resilience Dimension (C9) components also incorporate investments directly linked to the climate transition.

It should be noted that investments financed by the RRP have to ensure that a number of criteria are met to demonstrate that they are environmentally sustainable, including the 'Do No Significant Harm (DNSH) principle'5. Following the approval of the initial plan, Portugal submitted on 26 May 2023 the update of the RRP, through a single request covering in addition to that update, an additional amount of EUR 3.2 billion in loans, to increase the ambition of the approved RRP in 2021 and to address the increased costs in the already planned measures, as well as the REPowerEU grants, and was approved in October 2023, and currently being implemented, with this request for additional funds bringing the total allocation of the RRP to EUR 22.2 billion.

Energy efficiency is crucial for the decarbonisation of society and as a response to the need for a competitive economy and a resilient, secure and self-sufficient energy system. In this context, Portugal commits to the 'Energy Efficiency First' principle in decisions on investment projects in the energy sector, in a spirit of sustainability and cost-effectiveness. This logic has also been reflected in the incentives made available to households, services and industry through the Environmental Fund or the Recovery and Resilience Plan. The energy renovation of the national stock of existing buildings and the decarbonisation of their energy consumption, including through electrification, are key measures for meeting national energy and climate objectives, as well as for meeting other policy objectives, such as tackling energy poverty and supporting vulnerable consumers, in line with the objective of ensuring a just and cohesive transition.

Experience shows that the challenge of energy efficiency is equal to or greater than that of renewables. Nevertheless, energy efficiency targets and renewable energy targets will have to be achieved in parallel with other strategic priorities, such as interlinkages between different energy carriers or in physical cross-border terms, with a view to a genuine integration of the country into the Energy Union and the need to achieve climate neutrality, always ensuring security of supply in the country.

The energy transition in Portugal will undoubtedly go through the strengthening of renewable energy by increasing electrification and developing a system based on renewable fuels, in particular renewable gases (whether hydrogen or biomethane). Portugal has enormous potential for the development of a renewable-based power generation sector, heavily decarbonised, on the one hand, by the high availability of indigenous resources in particular hydro, solar, wind (*onshore* and *offshore*), alongside sustainably produced and used biomass, marine waves, and geothermal energy, and on the other hand, by having developed, and further developing, a reliable,

5As laid down in Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 (RRP Regulation), it is mandatory to respect the principle of DNSH which means not supporting or carrying out economic activities that cause significant damage to any environmental objective within the meaning of Article 17 of Regulation (EU) 2020/852 of the European Parliament and of the Council (EU Taxonomy Regulation).

robust and safe electricity system that is able to cope with idiosynfosies associated with the variability of renewable generation and which will evolve significantly in this decade. The fact that it has been possible to bring forward the closure of coal-fired power plants from 2023 to 2021 is in itself a demonstration and validation that Portugal is in a position to achieve its ambitious targets.

By 2030, developments in the electro-producer sector will observe considerable developments in the incorporation of solar PV. Production costs, and the abundance of the solar resource, make this technology more competitive with fossil or renewable alternatives. However, environmental impacts need to be addressed, so distributed production, the use of unconventional areas (e.g. water plans, berms), and combination with other activities (e.g. agrovoltaic) should be promoted. *Onshore* wind production will also grow consistently though less than before. In *onshore* wind, growth opportunities by exploiting new locations are already limited, so the focus will be on hybridisation, overpowering and repowering, three ways to increase renewable electricity generation while minimising environmental impacts, as already realised grid investments are optimised.

Offshore wind will have an increasingly important weight, seeking to exploit the existing resource in the national coastal zone, which is more constant and higher than on land. While it is necessary to align the installation of *offshore* wind with other interests (e.g. environment, defence) and other economic activities (e.g. fishing, tourism, shipping), as well as dealing with large sea depths, it is possible to develop renewable energy projects that are sustainable and beneficial to all parties involved, and the development of offshore wind technology, in particular floating systems, should lead to increases in conversion efficiency and reduced installation and operation costs.

The aim of a renewable electricity generation system is to promote and enhance the use of electricity in the various sectors of activity of the economy, with a particular focus on the transport, industrial and residential sectors, and electrification in the services sector is already high.

In order to strengthen installed capacity of renewable origin, in particular for solar photovoltaic, Portugal decided to pursue the auction of reception capacity on the grid with three main objectives: (I) greater clarity and predictability of permitting procedures for energy generation; (II) establish a capacity allocation mechanism that adequately addresses the fact that there is a scarce public resource that has to be managed as such; (III) ensure that, for each network point by auction, the winners are the projects that contribute most to lowering the electricity tariff paid by consumers.

Portugal conducted the first auction in 2019, specific to solar PV, with a total of 1 400 MW divided into 24 lots. The results of the first auction in Portugal, which guaranteed the lowest prices in Europe and the lowest prices in the world, with direct translation into real gains for consumers, pave the way for the results achieved to anticipate the multiplier potential of this mechanism in future bids and its considerable and necessary contribution to achieving the national renewable energy targets. The same happened in 2020 and 2 021 in similar procedures for solar technology. In the short term, Portugal's strategy will be to launch auctions for solar and *offshore* wind power generation that result in the allocation of new renewable capacity, including technologies with potential for dispatchability, building on the success and experience of auctions already carried out.

It should also be highlighted that hydrogen will play an increasingly important role in the national energy system in multiple contexts. As an energy carrier connecting heat and electricity; decarbonisation of energy end-use niches where electrification presents technical and/or economic difficulties (e.g. very high temperatures in industry); seasonal and even interannual energy storage, ensuring security of supply; and even, in non-energy uses, such as the production of fossil-based industrial chemicals (e.g. fertilisers, solvents, plastics). It should be noted that Portugal only considers the production of renewable hydrogen, favouring the electrolysis of water using solar and/or wind electricity (including in the short to medium term, in refineries).

It is also worth mentioning here the approach to decarbonising gas, given its importance for the transmission and distribution of energy in order to take account of many types of end use; to operate in close coordination with the electrical system; and to provide resilience to the energy sector, including through energy storage (in the short and medium term). The path towards gas decarbonisation involves three approaches: promoting the discontinuation of LPG and natural gas in buildings, transport and industry in favour of electricity; promote the replacement of natural gas with biomethane; incorporation of increasing amounts of hydrogen into the national

gas system; replacing, especially in industry, the consumption of fossil gases by renewable gases, either in the logic of distributed production of renewable gases close to their consumption, or of local hydrogen and/or biomethane distribution networks.

A special mention should be made of the use of natural gas for the production of electricity, since the Climate Law provides for a ban on natural gas from 2040, provided that security of supply is ensured.

The energy transition and the decarbonisation of the economy and society go beyond technological change. The active involvement of citizens and communities, as energy producers/consumers and actors for behavioural change, will also play an important role in this path.

A better informed citizen represents better, more efficient and sustainable choices. On the other hand, a citizen at the heart of decision-making represents a more active consumer in the transition to a carbon-neutral society, and more willing to participate in the structural changes that are needed to achieve this challenge. Technological developments itself can provide the practical tools needed for this involvement. With the citizen as an informed and active player in the market, and with the most vulnerable consumer protection tools, and a strong commitment to physical and digital one-stop-shops to support decision-making geared towards the climate transition, another of the 2030 policy priorities will be addressed by tackling energy poverty and consumer vulnerability.

In order to promote distributed generation and self-consumption of energy from renewable energy sources, a new legal framework was developed, Decree-Law No 15/2022 of 14 January 2012, repealing Decree-Law No 162/2019 of 25 October 2010, which: (I) enables and encourages individual self-consumption; (II) enables and encourages collective self-consumption; (III) makes it possible to build up renewable energy communities. The legal establishment of these figures allows citizens, businesses and other public and private entities to produce, consume, share, store and sell energy produced from renewable energy sources, thereby actively participating in the energy transition.

The aim of this new scheme is to complement each other by combining centralised clean energy promotion instruments with decentralised processes which, by their very nature, strengthen social and territorial cohesion, contributing to the reduction of existing inequalities, in particular by creating jobs, improving the competitiveness of companies distributed on national territory and combating energy poverty; it also leads to a very significant reduction in costs for transmission and distribution networks, reduction of losses and optimisation of energy production solutions.

Given the obvious advantages, but also the challenges it presents, the promotion of self-consumption of renewable energy – either individually, collectively or through a renewable energy community – will, in the short term, be accompanied by a programme to disseminate information and support the implementation of self-consumption projects in order to reduce information asymmetries and support businesses, municipalities and citizens in their development. Among the initiatives to be implemented, a programme of technical support and funding for establishing self-consumption in partnership with municipalities is of particular relevance.

The vision of a considerably decarbonised electricity system, with a significant level of decentralisation and associated with high levels of digitalisation, will allow traditional consumers to become also electricity producers, becoming active participants in the system, also contributing to ensuring the quality of service and security of supply of the electricity system.

Smart grids, management support systems, producer and/or consumer aggregators, bi-directional smart meters, storage systems, equipment progressively free from SF6 (sulphur hexafluoride) (aligned with Regulation (EU) 2024/573 of 7 February 2024 on fluorinated greenhouse gases), local energy production, active consumers, flexibility supply/demand, electric vehicle, among others, are the variables to be taken into account in building the grid model of the future. To ensure a true integration of all variables, and regardless of the configuration that will be adopted, it is important to form a strategic vision of the national electricity system, which contributes to the achievement of national objectives and targets for 2030.

In the residential sector, the aim is to enhance the thermal comfort of homes by focusing on passive insulation, sun protection and ventilation solutions, and by continuing the trend of electrification of the sector and the use of renewable energy sources for heating and cooling, such as solar thermal energy and superficial geothermal systems. At the same time, a resilient building stock with high resource efficiency performance is promoted. A

continued commitment to urban regeneration will provide the opportunity to incorporate energy and water efficiency improvements, the incorporation of low-carbon materials and renewable energy sources, and will also contribute to the fight against energy poverty.

In the services sector, the remaining potential to increase the electrification of consumption should be explored and increased energy efficiency of installed equipment and the use of renewable energy sources should be paramount.

At industry level, priority should also be given to decarbonising heating and cooling needs, focusing on the characterisation of installations and needs, including through audits, prioritising technical advice for the transition to renewable sources and harnessing excess heat that can be identified as technically and economically feasible.

At infrastructure level, energy interconnections are essential for the development of the internal energy market, ensuring security of supply, improving the functioning of energy systems, increasing competition and stability in energy markets, promoting market integration, greater fairness and balance in the definition of energy costs and prices, and contributing to the achievement of energy, climate and competitive targets at EU level. In addition, regional cooperation should be strengthened with a view to closer rapprochement between Member States (MS) with a particular focus on Spain and France, with the aim of monitoring and evaluating interconnection projects addressing the interconnection needs of energy markets and systems.

Decarbonisation of the gas sector is achieved at all times by ensuring the incorporation of renewable gases into the system, respecting the technical and physical constraints of the National Gas System (SNG). In a transition perspective of the energy sector, current gas reception, storage, transmission and distribution infrastructure will play an important role in enabling the introduction, distribution and consumption of renewable gases, in particular biomethane and hydrogen, in the various sectors of the economy, enabling higher levels of incorporation of renewable energy sources into final energy consumption to be achieved. Biomethane obtained, for example, from anaerobic digestion of waste could be injected into the natural gas network without limitations, given its chemical affinity with natural gas, or in Autonomous Gas Units (UAG´s) and used for mobility, particularly heavy road freight transport.

Hydrogen of renewable origin may be injected into the natural gas network up to the volume set out in the legislation (this is a measure for the initiation of the renewable hydrogen market in Portugal), or used in closed distribution networks. In addition, it is expected that it will boost the development of the green industry by being used as a raw material. The use of the gas sector, in symbiosis with the increase in renewable electricity capacity, is of utmost importance as it will allow energy storage in the form of renewable gases. With this in mind, particular emphasis should be placed on the production and incorporation of renewable gases such as hydrogen and biomethane, which promotes a more intensive substitution of fossil fuels and reduces the country's energy dependency. The growing recognition of the importance of renewable gases, in particular hydrogen, is based on the fact that it allows for energy storage and the preparation of other renewable fuels, helping to maximise the achievement of national targets for the incorporation of renewable energy sources into final energy consumption and for the decarbonisation of consumption, with a particular focus on industry and mobility.

With this framework, the government is promoting an industrial policy around renewable hydrogen and renewable gases, such as biomethane, which is based on the definition of a set of public policies that guide, coordinate and mobilise public and private investment in projects in the areas of production, storage, transmission, distribution and consumption of renewable gases in Portugal. There is a desire to grow new industrial sectors that will consume renewable hydrogen as the main energy carrier (*Enabler*). This is due to the fact that Portugal has very favourable conditions for installing a green hydrogen production industry with potential exporter, the main advantage being the low costs of producing renewable electricity. Renewable gases therefore have the potential to promote the reversal of the Portuguese importing energy paradigm. The development of a green hydrogen production industry in Portugal thus has the potential to boost a new economy, combined with the huge potential for reducing GHG emissions associated with hard-to-decarbonise industrial activities.

Renewable gases, in particular hydrogen and biomethane, have the potential to play an important role in decarbonising sectors of the national economy that currently have few alternative technological options and where electrification in the short to medium term could translate into significant costs. Renewable gases have the potential to replace fossil fuels in industry (e.g. in combustion processes, as a raw material, and in mainly freight transport. This will allow Portugal to focus on solutions of varying scale, with different technologies and with territorial dispersion that create value and decarbonise energy consumption.

The Portuguese Government will continue to work on developing the conditions and mechanisms for recognising and valuing renewable gases on the national market, promoting dialogue with investors and market operators with a view to finding the cost-effective solution (s) for the emergence of a genuine renewable gas economy. The development of a green hydrogen industry in Portugal has the potential to boost a new economy, combined with the huge potential for decarbonisation.

The injection of renewable gases into the national gas grid**has already been regulated and the implementation of a system of guarantees of origin for renewable gases will be finalised in 2024.** Alongside Guarantees of Origin, the Proof of Sustainability (PoS) will be evaluated as a means of valorising gases and contributing to enabling renewable gas production projects. **The aim is to continue to concentrate the available financial resources on national and European funds to support energy production on the production of renewable gases, in particular renewable hydrogen and biomethane.**

In particular, a number **of installations of industrial units in Portugal are proposed, including the Sines Industrial and Logistics Zone (ZILS) for the production of renewable hydrogen (for use in the green steel industry and for the production of ammonia and renewable methanol, among others)**, powered by solar, wind and electricity grid energy with guarantees of origin and based on strategic, national partnerships and with other EU Member States, which will give the project a European dimension as a way to ensure Community funding and find partners for the consortium.

This industrial-scale ZILS project for the production of green H_2 is focused on leveraging solar energy as a factor of competitiveness (the cost of electricity represents the largest share of the cost of production and Portugal has a huge competitive advantage over other countries because it has lower electricity production costs), industrial transformation and the opportunity to increase exports (of renewable hydrogen and derived products). Portugal has very favourable conditions for the installation of such an industry, particularly in Sines in view of its multiple advantages – strategic location on the Portuguese Atlantic coast, the availability of a deep water port, transport infrastructure, storage and connection to the gas transmission network, as well as an industrial area with current and future hydrogen consumers, and the availability of land.

The industrial sector will play an extremely important role, as it is one of the main poles of need for innovation. While decarbonisation is expected at a lower pace, this sector is highly aware of resource efficiency, energy efficiency, competitiveness and innovation. Several sectoral roadmaps for a more decarbonised industry are under way, where the commitment to the circular economy and the bioeconomy, through, inter alia, industrial symbioses and resource reutilisation, as well as new business models determined by the provision of services to the detriment of the sale of goods, is an asset by 2030.

This sector will also be strongly influenced by robotisation and digitalisation, with increased electrification expected, with increased use of biomass and combined with other forms of renewable energy such as solar thermal and geothermal (classical or surface).

Decarbonising mobility and transport is another sector that by 2030 plays a special role, as it is one of the most important sectors in terms of primary energy consumption and one of the main sources of GHG emissions at national level. This decade will be a paradigm shift in this sector, largely leveraged by the measures promoted at European level under the*FIT for 55*package, which includes the introduction of progressive emission reduction targets for passenger cars and vans, the promotion of the use of sustainable aviation fuels, the promotion of the use of renewable and low-carbon fuels in maritime transport, and the commitment to a network of infrastructure for recharging or refuelling alternative fuels vehicles and vessels (electricity and other renewable fuels).

Profound changes are expected, towards the decarbonisation of the sector, with traditional fossil fuels being progressively replaced by electricity, advanced biofuels, renewable synthetic fuels, green hydrogen and biomethane, with significant environmental and efficiency gains. The future of mobility will be sustainable, autonomous and shared. It will be a future in which users will have greater power to manage their own mobility as a result of increasing digitalisation. However, the paradigm shift is not exhausted by technological innovation. A continued commitment to public transport and active mobility, changing Portuguese mobility patterns and

reversing historical trends, is one of the most important decarbonisation and energy efficiency measures to be pursued.

It is therefore important to promote investment that contributes to the strengthening and increasing use of public transport, boosting its competitiveness vis-à-vis individual transport, to decarbonisation and the energy transition in the transport sector, with a strong impact on the quality of the service of this sector, promoting economic activity by increasing people's accessibility levels.

The increase in demand for passenger mobility should be ensured with more public transport and with the use of zero-emission vehicles, and with the generalisation of shared transport, as well as increasing the expression of active and soft mobility over the short distance. In the period up to 2030, electric mobility and advanced biofuels will be the most significant in this sector, as well as the introduction of hydrogen-powered vehicles and the use o*e-fuels*.

The decarbonisation of mobility is also intrinsically linked to the models of territorial organisation of cities, economic and leisure activities, and their implications in terms of mobility needs, as well as in terms of collective *versus* individual mobility. Cities have been active actors in decarbonising the economy and it is crucial to harness this momentum for the creation of carbon-neutral cities.

In freight transport, logistics management, including reverse logistics and fleet management and optimisation, will be of great importance, with a strong focus by 2030 on electric light goods vehicles, biofuels, biomethane and renewable hydrogen for heavy-duty vehicles. Rail will play an important role in decarbonising freight transport over the medium and long distances, therefore investment in this infrastructure, its decarbonisation through electrification and its modernisation and expansion will be stepped up. At the same time, the aim is to decarbonise air transport, by promoting the use of sustainable aviation fuels (SAF), and maritime transport, by focusing on the development and adoption of measures to adapt ships flying the Portuguese flag, in particular measures to increase the efficiency of ships and new forms of propulsion, electrically energise ships from shore at berth, use of cleaner fuels available in the geographical area of operation and, at the same time, boost the connection and interoperability of rail freight transport with commercial ports.

Changing behaviour in the face of mobility is still not overlooked when it comes to mobility decisions and more efficient behaviour, by promoting eco-driving and the use of new technologies to induce sustainable mobility behaviour.

Finally, the waste and waste water sector, with relative expression in the general breakdown of emissions, is a sector with very special characteristics and in which sector-specific public policies and measures play a decisive role.

For their relative importance, emissions associated with landfilling and urban wastewater treatment deserve priority analysis and accounted for more than 95 % of the sector's emissions in 2020, respectively, 73 % and 23 %.

In view of the specific characteristics of emissions relating to landfilling, the consequent reduction effort depends above all on the speed with which the quantities of bio-waste landfilled are reduced. According to theLandfill Directive6, only 10 % of municipal waste generated may be landfilled in 2035.

The objective of reducing landfilling of bio-waste will also be achieved by adopting strategies for the implementation of specific separate collection circuits for organic waste and by putting in place new bio-waste treatment infrastructure. Where possible, these systems will contribute to the energy use of biogas generated, in the implementation of policies to promote the use of biometano7.

The GHG emissions associated with biological waste treatment are almost marginal compared to landfill emissions, so all efforts to redirect bio-waste from landfilling to composting or anaerobic digestion systems will

6Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste.

7Biometano Action Plan 2024-2040, approved by Council of Ministers Resolution No 41/2024 of 15 March 2024.

be highly effective from the point of view of the effort to decarbonise the activity. They will be all the more rapid to produce effects, as soon as the use of landfills as the final destination of mixed waste can be severely restricted.

Finally, the use of municipal waste incineration, with its energy recovery through electricity generation, will always be a complementary means in the municipal waste management system, tending to marginally increase the respective CO2 emissions as the fraction of organic carbon in the waste to be incinerated is reduced, in accordance with the policy of separate collection of bio-waste and consequent biological treatment.

This will lead to a paradigm shift, embracing the need for greater prevention, avoiding the generation of waste and its hazardousness, and, where this is not possible, the focus on recycling and recovery of waste, in a more circular and less wasted economy.

With regard to the waste water sector, the requirement for secondary/tertiary treatment for all centralised systems will tend to increase GHG emissions in this way if the operation of the treatment processes is not optimised. This is an example where environmental policies on water quality may, in theory, conflict with policies to reduce GHG emissions.

In view of the inherent difficulty of significantly reducing the organic and nitrogen loads in urban waste water over time, the effort to reduce emissions in this sector focuses on increasing both the physical accessibility of public sanitation systems, through the planned investments to extend the coverage of urban wastewater collectors networks, and the take-up of the sewerage service by fixed network in baixa8. The reduction in the use of individual systems of the septic pit type will reflect not only the improvement of the quality of the local environment, but also a containment of national GHG emissions. In the medium term (post-2030), consideration of N_2O emission control systems in aerobic systems, together with the use of more reliable methods of monitoring their emissions, could be a pathway to further emission reduction.

The movement towards the production and use of reclaimed water (RSAs) from urban wastewater treated for irrigation, in addition to the potential to reduce water consumption in an environment of increasing scarcity, also shows potential in terms of reducing GHG emissions, avoiding indirect emissions by discharges into natural water.

On the other hand, since energy costs are one of the most important components of the operating and operating costs of water supply and wastewater services, with direct implications for tariffs, energy management is today one of the main challenges for the operators of these services.

It is in this spirit of recognising the advantages of an integrated, multidisciplinary view of system management (hydraulic aspects, water quality, reliability, energy management and operation and maintenance) that the Government is driving action to: (I) increase the resilience of public water supply systems by improving their performance, in particular with regard to reducing water losses; (II) increase the resilience of wastewater sanitation systems by eliminating undue connections, adapting sewage treatment plants to extreme climatic events and producing RSAs; (III) increase the resilience of rainwater drainage systems by eliminating undue infiltration, damping flows in periods of heavy rainfall and reusing rainwater; (IV) decrease the energy consumed in water services by improving energy and water efficiency and increasing the level of energy self-sufficiency of sewage treatment plants and other installations.

The agricultural sector is also expected to make an essential contribution to the decarbonisation of the Portuguese economy, with a number of drivers for the future evolution of national crop and animal production systems, in particular:

- The expected increasing and significant impact of climate change in particular on water resources.
- The greater or lesser openness of EU agriculture to world agricultural markets with particularly significant implications for animal products.
- The evolution of demand for diets in Portugal depends on the quantitative and age evolution of the

8Strategic Plan for Water Supply and Waste Water Management 2030 (PENSAARP 2030), approved by Council of Ministers Resolution N. o23/2024 of 5 February

Portuguese population, subject to increasing health and environmental pressures on future diets.

- The future changes envisaged in the context of the Common Agricultural Policy (CAP) and their impact on the evolution of the system of direct income support for farmers and the social and environmental constraints on future production and technological options, on which economic competitiveness, environmental sustainability and territorial cohesion of national agriculture will depend to a large extent.
- The evolution of farm structures and the greater or lesser pace and comprehensiveness of the technological innovation process already under way, on which the greater or lesser economic and environmental efficiency in the use of natural resources and agricultural inputs depends, which is essential for agriculture's contribution to the climate neutrality of the Portuguese economy.

Although at a lower pace than in other sectors, changes to reduce emissions are expected to occur in the current decade, with a focus on more sustainable agriculture, through a wider spread of integrated production practices, along with the expansion of organic, conservation, regenerative and precision farming, reducing emissions associated with livestock effluents and the use of synthetic fertilisers, and boosting carbon sequestration resulting from increases in organic matter content in soils, including through the promotion of biodiverse pastures. This type of agriculture will improve the efficiency of water use, allowing productivity gains and water savings, which is a scarce and essential asset to be preserved.

It will also be necessary to promote new forms of animal diet with a view to achieving improvements in the digestibility of animal feed with a consequent positive impact on emission reductions.

It will also be important to rethink the food chain – choices that integrate diet, reduction of food waste, how plants and animals are produced for food, pressure on soil, water and biodiversity, including on marine resources and fisheries. It is also important to highlight and replicate the good examples of marketing in short agri-food circuits, which reduce energy consumption and pollutant emissions due to lower packaging, transport and cooling needs.

In the case of forests and other land uses, appropriate agroforestry management will be essential in order to progressively reduce the burnt area, increasing productivity and strengthening the commitment to ecosystem services that enable and contribute to the fight against desertification and the enhancement of the territory, as one of the foundations for territorial cohesion. The potential for sinks, in particular in the forest area, needs to be strengthened by taking over the management of spatial planning aspects, and by investing in management practices and models that enhance the role of forest sinks and increase their resilience to climate change, which have the potential to worsen the conditions for forest fires and land degradation.

The Landscape Transformation Programme (PTP), approved by Resolution of the Council of Ministers No 49/2020 of 24 June 2012, sets out a strategy for vulnerable forest territories with high fire hazard. The Landscape Planning and Management Programmes (PRGP) are one of the measures of the TPP and are intended to plan and programme the transformation of the landscape into vulnerable forest territories, targeting a multifunctional and resilient landscape, new economic activities and the remuneration of ecosystem services. PRGPs design the desirable landscape, define a medium-to-long term transition matrix supported by a funding model that ensures its implementation.

Another measure of the PTP is the Integrated Landscape Management Areas (AIGP), which aim at an integrated territorial approach to address the need for landscape planning and management and for increasing managed forest area on a scale that promotes fire resilience, natural capital enhancement and the promotion of the rural economy.

In these areas, the necessary conditions will be created for the development of Integrated Landscape Management Operations (OIGP) to be implemented in a management model under the responsibility of a managing body and supported by a long-term multi-fund programme providing support for initial investment, maintenance and management over time and remuneration for ecosystem services.

The implementation of this Landscape Transformation Programme aims to ensure the resilience of vulnerable territories by ensuring their potential as sinks, while ensuring more economic activity and protection of biodiversity.

In this context, it is important to mention the potential that the Voluntary Carbon Market, created by Decree-Law No 4/2024 of 5 January 2009, could play in this sector. This market aims to support efforts to mitigate GHG

emissions, with a particular focus on strengthening the capacity for natural carbon sequestration, and to promote the reduction of the vulnerability of the national territory to fire risk, among other environmental and socio-economic externalities that may arise, directly or indirectly, such as the preservation of biodiversity and existing natural capital, the creation of jobs and new business models, the economic return of areas with low production potential but high conservation potential, and innovation and the development of new technologies.

The path towards carbon neutrality is also the path of innovation and knowledge, skills and training. Technology-driven research and innovation will play a key and cross-cutting role in addressing the challenges of decarbonisation and energy transition.

The development of new technologies and the improvement of existing low-carbon technologies requires a significant effort in research and innovation, which will be boosted through the adoption of an ambitious and broad-based agenda that includes all stages of the technology development cycle up to their commercialisation. To this end, national support frameworks focused on research and technological development according to the country's priorities, such as renewable hydrogen, storage, smart grids, advanced biofuels, deep and surface geothermal, concentrated thermal solar, ocean energy, energy integration, energy conversion and storage, low-carbon processes, circular economy relevant areas, forests, precision farming, etc. will contribute.

Achieving this requires changes in the economy, the territorial model and society. It is therefore crucial that this transition is planned, involving the different sectors of our society and the different regions. It is also important to consider the economic and social impacts of this transition and ensure that it is a just transition. The different analyses carried out at international level show that policies for deep decarbonisation of society have positive impacts on the economy, employment and society. In particular, reducing emissions of particulate matter, ozone precursors and oxides of nitrogen and sulphur has a positive impact on air quality and improving public health, especially in dense urban areas.

Investment linked to the decarbonisation of the economy is a driver of innovation and skilled employment, especially in green sectors. It is crucial to take into account the specificities of the different sectors and to design measures to support the transition towards the most energy-intensive sectors, with regard to the retraining of activities and workers, in particular in those regions that may be most affected by the transition. The creation of skills geared to the jobs of the future is therefore of particular importance.

On the other hand, internalising the environmental impacts associated with fossil fuels and phasing out the tax exemptions from which they benefit entail differentiated impacts on society. It is therefore crucial that the associated tax revenues can be redirected to society by supporting decarbonisation projects, including projects promoting energy efficiency, reducing the burden on work or minimising the associated social impacts.

This transition should contribute to the reduction of energy poverty and the inclusion of the most vulnerable regions and populations, so that it is a just transition. Situations of energy poverty and vulnerability should be identified and addressed through measures aimed at urban regeneration, promoting energy efficiency in buildings, in particular through insulation measures, and reducing dependence on fossil fuels. In this context, the ongoing commitment to decentralised production of electricity based on renewable energy communities and the valorisation of collective systems that mitigate maintenance costs can reduce energy costs and dishoness households.

Financing the transition will require the effort of all sectors of the economy. Aligning public and private financial flows and tax policy with decarbonisation and energy transition objectives is therefore key for a just transition.

This transition involves encouraging investment in the various sectors of activity. In this context, the current Multiannual Financial Framework 2021-2027, the InvestEU programme and the Recovery and Resilience Facility, as the main sources of funding for the decarbonisation of the economy in the coming years, deserve particular relevance. The current funding framework for the period 2021-2027 translates the objectives set out in the European Green Deal and the European Climate Law as regards the axes of sustainable mobility, decarbonisation of industry, renewable energy, energy efficiency, smart and sustainable cities, carbon sequestration, sustainable agriculture, bio-economy, etc.

In parallel, in the Recovery and Resilience Facility, where Portugal's Recovery and Resilience Plan (RRP) is framed, and in the Multiannual Financial Framework 2021-2027, it is established that the expenditure incurred should be compatible with the objective of EU climate neutrality by 2050, with the 2030 climate targets and consequently with the objectives of the Paris Agreement. In addition, 30 % of this expenditure has to be dedicated to climate-related projects. For the Recovery and Resilience Facility, this share increases to 37 %.

In this context, together with the Multiannual Financial Framework 2021-2027, the Recovery and Resilience Plan contributes to the Portugal 2030 Strategy, which builds on strategic axes for the country's economic and social development during this decade, embodied in the vision of restoring the economy and protecting employment, and promoting Portugal's convergence with the EU to ensure greater external resilience and social and territorial cohesion.

This strategy is structured around four key thematic agendas for the development of Portugal's economy, society and territory by 2030: (I) the persons first: a better demographic balance, more inclusion, less inequality; (II) digitalisation, innovation and qualifications as drivers of development; (III) climate transition and sustainability of resources; and (iv) an externally competitive and internally cohesive country. This new energy model towards carbon neutrality is a unique opportunity for Portugal. As part of the country's economic recovery in recent years, the challenge of the energy and climate transition is seen as an opportunity to leverage the national economy in a spirit of sustainable development, based on a democratic and fair model that promotes civilizational progress, technological advancement, job and wealth creation, and territorial cohesion, as well as the preservation of natural resources. In this sense, decarbonising the economy is at the same time an opportunity for economic growth.

A carbon-neutral society based on a circular economy, which retains resources at its highest economic value, also creates more skilled jobs, more sustained wealth and more shared well-being.

1.1.3.overview of the main objectives, policies and measures of the plan

Portugal puts forward strong arguments to remain at the forefront of the energy transition and to aim for a carbon-neutral economy, which is why it has advocated, at national and European level, more ambition for 2 030 in reducing GHG emissions, incorporating renewable energy sources in the various sectors, energy efficiency and promoting interconnections, which materialise in the following targets:

Figure 4 – Evolution of total emissions of CO_2 by 2030 (Mton CO_2)

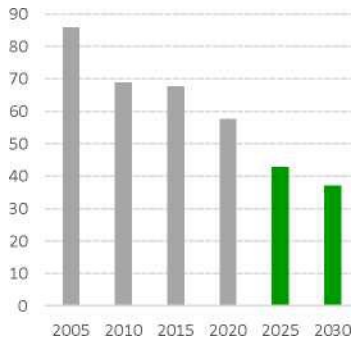


Figure 5 – Evolution of Primary Energy Consumption – EE target

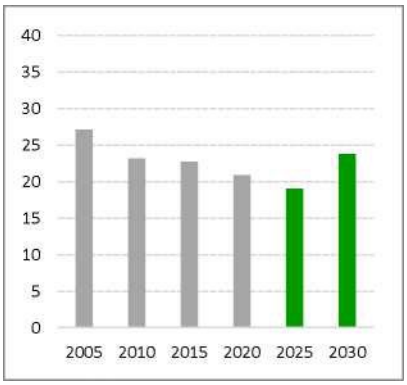


Figure 6 – Evolution of the contribution of

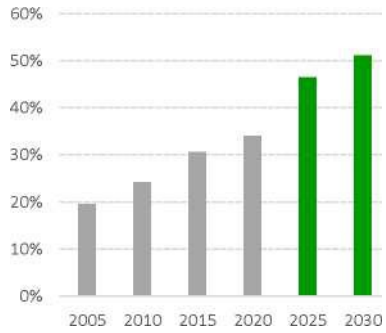


Table 2 – Portugal's national targets for 2030

TARGETS NATIONALS	EMISSIONS (no LULUCF; for 2005)	Energy Efficiency (primary energy reduction and consumption target)	EFFICIENCY Energy (Final Energy Consumption Target) 9	RENEWABLE (gross final energy consumption)	RENEWABLE IN TRANSPORT	ELECTRICITY INTERCONNECTIONS
NECP 2030	— 45 % to -55 %	35 %	— —	47 %	20 %	15 %
Review	— 55 %	16 711 KTE p10	14 371 ktoe	51 %	29 %	15 %

9According to the revised Energy Efficiency Directive (EED) (Directive (EU) 2023/1791), an indicative target for final energy consumption in 2030 was set to contribute to the Union's binding target (Union final energy consumption should not exceed 763 Mtoe in 2030).

10According to the EED review, the energy efficiency target is expressed in terms of a limit on primary energy consumption in 2030, which in the case of the Union shall not exceed 992,5 Mtoe.

Figure 7 – Evolution of Final Energy Consumption (Mtoe)

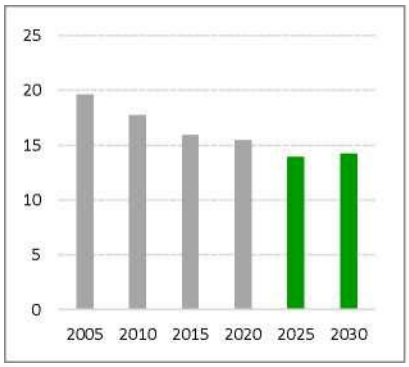


Figure 8 – Evolution of the contribution of renewables in

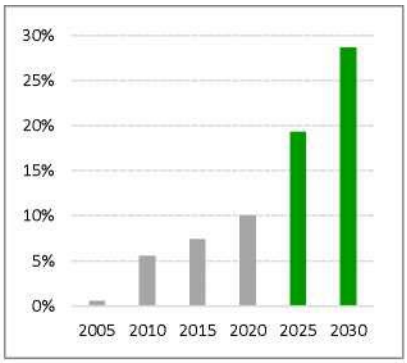
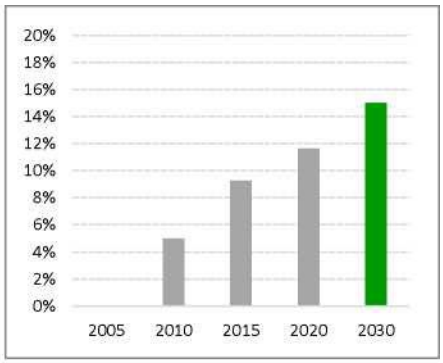


Figure 9 – Evolution of PT-ES interconnection capacity



Gross inland energy consumption excluding international marine bunkers and heat pumps

The path to climate neutrality is a unique opportunity for Portugal. As such, the 2030 NECP has a strong participatory component of society, whose contribution to a strategic vision towards 2030 is key. In the framework of economic recovery, the challenge of decarbonisation and energy transition is an opportunity to leverage the national economy in a spirit of sustainable development and based on a just and cohesive transition, which promotes civilizational progress, technological advancement, job creation and prosperity, while preserving natural resources. In this sense, the path towards the decarbonisation of the economy is an opportunity for economic growth and the valorisation of the territory.

In line with the strategic vision set out for the five dimensions of the Energy Union and Climate Action, the figure below illustrates the national targets and contribution set for 2030 under the NECP.

Table 3 – Targets and national contribution to Union targets

TARGETS 2030	**NATIONAL CONTRIBUTION TO UNION TARGETS**	
	NECP 2030	**PNEC Revision 2030**
Reduction of CO2eq emissions (no LULUCF) (Mt CO2eq) compared to 2005	— 17 %	— 28.7 %
Boosting the share of renewable energy	47 %	51 %
Energy Efficiency (Primary Energy Consumption)	35% **11**	16 711 KTE p12
Energy Efficiency (Final Energy Consumption)	— —	14 371 KTE p13
Electrical Interconnections	15 %	15 %

In order to implement Portugal's strategic vision and ensure that the targets and objectives set for the 2030 horizon are met, eight national strategic objectives have been defined in a logic of

11Percentage of reduction in primary energy consumption

12 According to the EED review, the energy efficiency target is expressed in terms of a limit on primary energy consumption in 2030, which in the case of the Union shall not exceed 992,5 toe.

13Target for final energy consumption in 2030, calculated according to the revised EED (Directive (EU) 2023/1791), to contribute to the Union's final energy consumption not exceeding 763 Mtoe in 2030

energy and climate mainstreaming. Pursuing these strategic objectives, which are interlinked, will contribute to carbon neutrality.

Figure 10 – National targets for 2030

These eight national strategic objectives set for 2030 positively contribute to the achievement of the strategy of the five dimensions of the NECP, with each objective contributing to more than one dimension, according to the matrix below.

Figure 11 – Link between national strategic objectives and the dimensions of the NECP

—A) DUUfMS-FS *PWC* / *O8JfT > VDS*	DESCARBONIZACE	EFFICIENCY CLASS	SAFETY CLASS	INTERNAL MARKET	RESEARCH, INNOVATION AND COMPETITIVENESS
&D; 1. DECARBONISING THE ECONOMY NA' NATIONAL					
G > 2. EFFICIENCY FIRST = > **ENERGY**					
* 3. STRENGTHENING THE COMMITMENT TO m ENERGIAS RENOVABLE **AND** REDUZED A ENERGY DEPENDENCE OF THE COUNTRY					
g \ 4. ENSURING THE SAFETY OF DV/ABASTECTION					

5. PROMOTING MOBILITY <co ‘‘o) sustainable					
6. Promoting an AGRICULTURE AND SUSTAINABLE FLORESTA and leveraging 0 CARBON SEQUESTRATION					
7. DEVELOPING AN INNOVATIVE ANDCOMPETITIVE ® INDUSTRY					
X 8- ENSURING A JUST, FAIR, DEMOCRATIC AND COHESIVE TRANSITION					

1.2. Overview of current policy situation

1.2.1. National and EU energy system and policy context of the national plan

The Paris Agreement reached in 2015 set long-term objectives to contain the global temperature increase well below 2 °C above[pre-industrial]levels, with the international community's commitment to pursue all efforts to limit that increase to 1.5 °C·values that science sets as the maximum to ensure a continuation of life on the planet without overly disruptive changes. It also set objectives to increase the capacity to adapt to the adverse impacts of climate change and to mobilise financial flows consistent with low-emission pathways and resilient development.

This Agreement thus represents a paradigm shift in the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), with the explicit recognition that only with the contribution of all can the challenge of climate change be overcome, and that the main commitments are to achieve a global balance between anthropogenic emissions and removals in the second half of the century, to prepare and report successively on nationally determined contributions to the global emission reduction effort, which should be successively more ambitious, and to prepare and communicate Long-Term Emission Reduction Strategies.

In this context, the European Commission has launched several policy packages to address this global challenge in the different areas. These include the 2030 Climate Energy Package, the Europe on the Move Package and the Clean Energy for All Europeans package, which sets the regulatory preconditions for the clean energy transition, putting the EU on the path to delivering on its commitments under the Paris Agreement.

To this end, the European Union has adopted, in the framework of Regulation (EU) 2018/1999 of 11 December on the Governance of the Energy Union and Climate Action, an ambitious set of 2030 targets for increasing renewable energy, reducing energy consumption, reducing GHG emissions and electricity interconnections.

Reference should also be made to the 2030 Agenda for Sustainable Development – Transforming our World – adopted at the United Nations General Assembly on 25 September 2015, which addresses various dimensions of sustainable development (social, economic, environmental) and promotes peace, justice and effective institutions. The 2030 Agenda is a universal agenda, based on 17 Sustainable Development Goals (SDGs) and 169 targets to be implemented by all countries. Their fulfilment presupposes the integration of these objectives and targets into the policies, processes and actions developed at national, regional and global level.

Following the publication of the IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels, which reinforces the urgency of action to combat climate change, the European Commission presented on 28 November 2018 a proposal for a long-term strategy for a prosperous, modern, competitive and carbon-neutral economy – 'A Clean Planet for all' – setting out the Commission's vision for a climate-neutral and prosperous Europe by 2050.

In 2019, the European Green Deal (COM (2019) 640 final) was presented by the European Commission, with the aim of making EU climate, energy, transport and taxation policies fit for reducing net GHG emissions by at least 55 % by 2030 compared to 1990 levels, alongside climate neutrality by 2050.

The package of legislative proposals "*Fit-for-55*" (COM (2021) 550 final), presented in 2021, comes as part of the European Green Deal and follows the adoption of the European Climate Law and aims to update the 2030 climate and energy regulatory framework to fit it with the new emission reduction target. It should be noted at the outset that:

- Revision of the European Emissions Trading System (EU ETS) Directive to include maritime transport, as well as the creation of a dedicated scheme for buildings and road transport;
- Revision of the Effort Sharing Regulation (ESR) and the Regulation on the inclusion of GHG emissions and removals from land use, land use change and forestry (LULUCF);
- Establishing a Carbon Border Adjustment Mechanism (CBAM);
- Creation of a Social Climate Fund (FSAC);
- Revision of the Regulation setting CO2 emission performance standards for new passenger cars and light commercial vehicles;
- Revision of the Alternative Fuels Infrastructure Directive (AFIR), which led to its repeal and the creation of a Regulation;
- Approval of the FuelEU Maritime and ReFuel Aviation Regulations to promote sustainable fuels;
- Reviewfrom Directiverelative renewable Energy (RED);
- Reviewfrom Directiverelative energy Efficiency (EED);
- Reviewfrom Directiverelative the Energy Performance of Buildings (EPBD);
- Reviewfrom Directiverelative energy Taxation (ETD)

Other European energy and climate strategies have also been adopted in order to achieve this increased Union aspiration, such as:

- Strategy for a system integration (COM (2020) 2999 final)[14];
- Strategy for o hydrogen (COM (2020) 301 final)[15];
- Strategy for a offshore renewable energy (COM (2020)) 741final)[16];
- Strategy for a solar renewable energy (COM (2022) 221 final)[17];
- Strategy for a adaptation to climate change (COM (2021) 82) final)[18];
- Sustainable Carbon Cycles Strategy (COM (2021) 800 final)[19];
- EU action plan for the digitalisation of the energy system (COM (2022) 552 final)[20];
- Wind energy action plan (COM (2023) 669 final);
- European Parliament resolution of 18 January 2024 on geothermal energy (2023/2111 (INI)).

In the meantime and since the publication of the Fit for 55 package, the European Commission has put forward new legislative proposals to accelerate the reduction of GHG emissions, including the proposal to revise Regulation (EU) 2019/1242 setting CO $2_{emission}$ standards for heavy-duty vehicles, or Regulation (EU) 2024/1787 amending Regulation (EU) 2019/942 on reducing methane emissions in the energy sector to improve the accuracy of information on the main sources of methane emissions associated with energy produced and consumed in the EU, ensure a more effective reduction of methane emissions across the energy supply chain in the EU and improve the availability of information to incentivise the reduction of methane emissions related to fossil energy imported into the EU.

More recently, and in addition to the assessment on the 2040 climate target (COM (2024) 63 final), recommending a 90 % reduction in GHG emissions by 2040, the European Commission published a communication (COM (2024) 62 final), also in February 2024, on an industrial carbon management strategy to promote the development of a carbon market through

[14] Powering a climate-neutral economy: An EU Strategy for Energy System Integration COM (2020) 2999 final

[15] A Hydrogen Strategy for a climate-neutral Europe COM (2020) 301 final

[16] An EU strategy to harness the potential of offshore renewable energy for a climate-neutral future COM (2020) 741 final.

[17] EU Solar Energy Strategy COM (2022) 221 final.

[18] Building a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change COM (2021) 82 final.

[19] Sustainable Carbon Cycles COM (2021) 800 final.

[20] Digitalising the energy system – EU action plan – COM (2022) 552 final.

carbon capture, utilisation and geological storage (CCUS) and the establishment of carbon dioxide transport infrastructure at EU level.

The economic recovery from the COVID-19 pandemic, followed by Russia's military aggression against Ukraine in 2022, brought new challenges to energy systems around the world, increased energy prices and energy security concerns, highlighting the EU's dependence on fossil fuel imports from Russia.

The EU adopted an emergency response in the REPowerEU Plan (COM (2022) 230 final) to address the energy crisis triggered by geopolitical developments, which promotes measures to reduce dependence on Russian fossil fuels by reorienting and accelerating the clean energy transition to achieve a more resilient energy system and a genuine Energy Union.
In order to avoid disruptions to the supply of natural gas and to enhance security of supply at Union level, in particular supplies to protected customers, Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022, drawn up the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions entitled 'Save gas for a safe winter' (COM (2022) 360 final), and proposed a solidarity regulation to improve the coordination of gas purchases, cross-border exchanges of gas and reliable price benchmarks (COM (2022) 549 final).

High prices on electricity markets since September 2021, mainly due to the high price of gas used as feedstock to produce electricity, led to the adoption of Council Regulation (EU) 2022/1854 of 6 October 2022, which calls for an emergency intervention to address high energy prices.

It should also be noted that due to the impacts of the COVID-19 pandemic on the EU economy, national measures have been adopted for the economic recovery and for increasing the resilience of economies to negative shocks. The European Council established Next Generation EU, a tool to mitigate the economic and social impact of the crisis, contributing to ensuring long-term sustainable growth and addressing the challenges of the climate and digital transition. This instrument contains the Recovery and Resilience Facility, which is part of the Recovery and Resilience Plan (RRP) prepared by Portugal, in accordance with Article 18(1) of Regulation (EU) 2021/241, and where measures are expected to be in line with the information included in the NECP 2030, developed at national level.

With the aim of leveraging EU industry as an accelerator and enabler of change, innovation and growth, the European Industrial Strategy (COM (2020) 102 final) was presented in March 2020, laying the foundations for an industrial policy that supports the twin transition, increases the global competitiveness of EU industry and strengthens Europe's strategic autonomy. Also in the industrial sector, reference should be made to the Green Deal Industrial Plan (COM (2023) 62 final), presented in February 2023, to complement the efforts listed under the European Green Deal and the EU Industrial Strategy, notably the Circular Economy Action Plan. The Green Deal Industrial Plan strengthens the competitiveness of European industry and supports the rapid transition to a climate neutrality scenario, with the practical objectives of promoting a predictable and simplified regulatory framework, accelerating access to finance, enhancing skills and opening up trade to resilient supply chains. With the start of the Russia-Ukraine conflict in February 2022, the European Commission also assumed the need for (reindustrialisation of the EU, so that it becomes increasingly self-sufficient and less dependent on the outside world, and this has been reflected among other initiatives in REPowerEU (more detail on this topic in chapter 2.3 of this plan).

It was in this follow-up that the European Commission's initiatives to boost carbon-neutral technologies were launched, in particular through the recently adopted Net-zero Industry Act and the European Critical Raw Materials Act, published on 11 April, establishing a framework for ensuring a secure and sustainable supply of critical raw materials (Critical Raw Materials Act), as well as Regulation (EU) 2024/795 establishing the Strategic Technologies for Europe Platform (STEP) to support critical and emerging strategic technologies in 3 sectors. and their value chains (i.e. deep tech digital and innovation technologies, clean and efficient technologies, and biotechnologies).

The European Critical Raw Materials Act, combined with the European policies mentioned above, is key to ensuring the energy and digital transition and is also essential for the defence and aerospace sectors. This European Act aims to strengthen the EU's capacities on critical raw materials along all stages of the value chain and increase the EU's resilience by reducing dependencies, increasing readiness and promoting the sustainability and circularity of the supply chain.

However, it is recognised that it is also crucial to safeguard the specificities of the defence sector in order to guarantee, on the one hand, the critical raw materials and energy needs on which this sector depends and, on the other hand, an energy transition compatible with the lifecycles of weapons systems, the size and geographical spread of military facilities and the financial and budgetary resources available.

Also under the REPowerEU plan, in 2022 the EU took on the need to scale up biomethane production, doubling the ambition for 2030 (ambition to produce 35 bcm of sustainable biomethane) and identifying this alternative gas as one of the pillars for more secure and sustainable energy in Europe. To achieve these objectives, the EU has taken forward a series of actions to expand sustainable biogas production from waste with a view to its transformation into biomethane. One of the main actions proposed was the establishment of an industrial partnership on biogas and biomethane to develop their sustainable production and use. This proposal isaccompaniedby others such as speeding up the granting of permits for renewable energy projects, encouraging new investments in biogas and biomethane, and assessing existing infrastructure challenges and barriers that may hinder the exploitation of the potential of renewable gases in Europe.

Given the evolving policies and geopolitical circumstances in the field of energy and climate since the development of the NECP, the current revision focuses on the need for more ambitious climate action and a more resilient and sustainable Energy Union. Accelerating the transition to renewable energy, ensuring greater energy security, including by reducing dependence on fossil fuels, aligning action in key areas, investing in cost-effective and carbon-neutral technological solutions, promoting the active participation of citizens and ensuring a just and fair transition, is key to shaping the strategy to achieve the short-, medium- and long-term objectives. Also relevant in the context of this revision of the NECP are the framework set for the Common Agricultural Policy (CAP) and the Multiannual Financial Framework (MFF) for 2021-2027. The CAP Strategic Plan (PEPAC) should be properly aligned with the policy guidelines, lines of action and action measures provided for in this revision of the NECP.

Portugal is a proven climate policy country that has gone beyond the targets set under the Kyoto Protocol and the 2020 targets for GHG emission reduction, energy efficiency and the promotion of renewable energy sources, and is in line with the 2030 targets.

At national level, the first step towards achieving the targets set in the European Climate and Energy Package for 2030 was taken in 2015, with the approval of the Climate Policy Strategic Framework (CSPF), aiming at the decarbonisation of the economy and putting the country in a better position to face the challenges created by the Paris Agreement. The QEPiC establishedanintegrated, complementary and articulated framework for climate policy instruments for 2020/2030, in conjunction with air policies, and approved the National Climate Change Programme (PNAC 2020-2030), which identifies the guidelines for policies and measures to ensure compliance with the 2020 and 2030 emission reduction targets, and the National Strategy on Adaptation to Climate Change (ENAAC 2020), which sets out objectives and the model for implementing solutions for adapting different sectors to the effects of climate change. It was established that Portugal should reduce its GHG emissions to between -18 % and -23 % in 2020 and from -30 % to -40 % in 2030, compared to 2005 values, contingent on the results of the European negotiations, and sectoral GHG emission reduction targets were set.

The setting of these targets was underpinned by the previous National Low-Carbon Roadmap 2050 (RNBC), which was the first long-term national emission modelling exercise carried out at national level. As early as that date, national emission reductions of between 50 % and 60 % could be achieved compared to 1990, corresponding to a reduction of 60 % to 70 % in the energy sector compared to 1990.

However, it has been found that the emission reduction potential that has been modelled at the time is outdated today, in particular as a result of faster than anticipated developments in technologies, leading to the revision of these targets as part of the work of the current RNC2050 towards greater ambition in reducing GHG emissions in the medium and long term.

The current Climate Action Commission (CCS) was set up in 2015 and formed the National System of Policies and Measures (SPeM), which integrates policies and measures aimed at the decarbonisation of the various sectors involved. The work carried out in the context of the SPeM and under the umbrella of CCS has resulted in the identification of a set of sectoral measures for the decarbonisation of the economy, which were the starting point for identifying the lines of action and action set out in this Plan.

As regards renewables and energy efficiency, and in an integration logic, Portugal relied on the National Renewable Energy Action Plan (PNAER 2020) and the National Action Plan for Energy Efficiency (PNAEE 2020) with a view to promoting renewable energy and energy efficiency as energy policy priorities.

In the context of the 2030 Agenda for Sustainable Development, Portugal identified SDG 13 – Climate Action – as one of its priority objectives, alongside SDG 7 – Sustainable and Secure Energy for All, SDG 4 – Quality Education, SDG 5 – Gender Equality, SDG 9 – Industry, Innovation and Infrastructure, and SDG 10 – Reduction of Inequalities.

At national level, the Portuguese Government committed in 2016 to ensure that its emissions are neutral by the end of 2050, setting out a clear vision for the deep decarbonisation of the national economy, as a contribution to the Paris Agreement and in line with ongoing international efforts. In order to achieve this goal, the Carbon Neutrality Roadmap 2050 (CNR2050), which was the long-term low greenhouse gas emissions development strategy submitted to the UNFCCC on 20 September 2019, was developed and approved. RNC2050 identifies the main drivers of decarbonisation and lines of action to be pursued towards a carbon-neutral society in 2050.

According to RCN 2050, achieving climate neutrality in 2050 requires reducing GHG emissions by 90 % compared to 2005 and achieving carbon sequestration levels between 9 and 13 million tonnes of CO_2 in 2050. Achieving climate neutrality in 2050 implies the full decarbonisation of the electro-generating system and urban mobility, profound changes in the way we use energy and resources, the commitment to circular models and the leveraging of carbon sequestration capacity by forests and other land uses.

In line with the IPCC Special Report on 1.5 °C and the objectives of the Paris Agreement, it is also concluded in the context of RNC 2050 that significant emission reductions are expected in the 2021-2030's.

In this framework, and taking into account the revision of the AML targets, an emission reduction level of 55 % compared to 2030 should be achieved by 2005. In 2040, the emission reduction shall be 65 % to 75 % and in 2050 to 90 %.

Meanwhile, Portugal's new commitment to bringing forward climate neutrality to 2045 may also require a revision of the medium-term emission reduction targets to ensure that the reduction effort associated with this frontloading does not only fall between 2040 and 2045. This effort will also be translated into their respective policies and measures, with a view to ensuring that the conditions for this are in place, including in the context of the just transition with a particular focus on the most vulnerable.

The Regulation on the Governance of the Energy Union and Climate Action requires all MS to prepare and submit to the European Commission an integrated National Energy and Climate Plan for 2021-2030. This Plan aims at setting targets, objectives, and policies and measures on decarbonisation, GHG emissions, renewable energy, energy efficiency, energy security, internal market and research, innovation and competitiveness, as well as a clear approach to achieving those objectives and targets. The NECP, approved by Resolution of the Council of Ministers No 53/2020 of 10 July, is currently the main instrument for energy and climate policy for the decade 2021-2030.

Following developments at national and European level, which have prompted the adoption of new targets and the energy and climate policy framework, it appears that the targets set in the NECP 2030 are outdated today. This update is underpinned by a new modelling exercise that was carried out in parallel with the revision of NMR 2050 to ensure alignment of policies, objectives and targets set between short and long times.This document is the final version of the update of the NECP, replacing the *draft* version submitted in June 2023 to the European Commission, revising the document submitted in December 2019 to the European Commission, and this update is prepared under Article 14 of Regulation (EU) 2018/1999.

1.2.2.Current energy and climate policies and measures relating to the five dimensions of the Energy Union

Portugal has a wide range of sectoral instruments in the area of climate action and energy, which have made it possible to effectively implement Community and international commitments.

This includes the National Energy and Climate Plan 2030, approved by Council of Ministers Resolution No 53/2020 of 10 July, the Roadmap for Carbon Neutrality 2050 (RNC2050), approved by Resolution of the Council of Ministers No 107/2019

of 1 July, and the Basic Climate Law, approved by Law No 98/2021 of 31 December. In addition to these, reference should be made to the National Programme for Spatial Planning Policy (PNPOT) and the Circular Economy Action Plan (CEAP). The articulation and interconnection of these three axes (decarbonisation, territory and circular economy) and the energy transition are essential elements to be taken into account in the NECP.

In addition, the main sectoral policy instruments at national level that are currently in place or in the final stages of implementation and that contribute to the achievement of the energy and climate targets and objectives of the NECP 2030, while contributing to the Energy Union dimensions of decarbonisation, energy efficiency, energy security, internal energy market and research, innovation and competitiveness, are identified below.

Current TRANSVERSAIS policies and measures:

- Roadmap for Carbon Neutrality (RNC2050), approved by Council of Ministers Resolution No 107/2019 of 1 July;
- National Strategy for Adaptation to Climate Change (ENAAC 2020), approved by Resolution of the Council of Ministers No 56/2015 of 30 July, which also established the National System of Policies and Measures subsequently governed by Resolution of the Council of Ministers No 45/2016 of 26 August;
- Action Programme on Adaptation to Climate Change (P-3AC), approved by Council of Ministers Resolution No 130/2019 of 2 August;
- National Air Strategy (ENAR 2020), approved by Council of Ministers Resolution No 46/2016 on 26 August;
- Circular Economy Action Plan (CEAP), approved by Resolution of the Council of Ministers No 190-A/2017;
- The National Programme for Spatial Planning Policy (PNPOT), approved by Law No 99/2019 of 5 September 2009;
- National Programme for Territorial Cohesion (PNCT), approved by Resolution of the Council of Ministers No 72/2016 of 24 November 2008;
- National Action Programme to Combat Desertification 2014-2024 (PANCD), approved by Resolution of the Council of Ministers No 78/2014 of 24 December;
- National Strategy for Sustainable Cities 2020, approved by Resolution of the Council of Ministers No 61/2015 of 11 August;
- National Strategy for Green Public Purchasing (ENCPE 2020), approved by Resolution of the Council of Ministers No 38/2016 of 29 July;
- National Strategy for Conservation of Nature and Biodiversity 2030 (ENCNB 2030), approved by Resolution of the Council of Ministers No 55/2018, 7 May;
- National Strategy for Environmental Education (ENEA 2020) for the period 2017-2020, approved by Resolution of the Council of Ministers No 100/2017 of 11 July;
- European Emissions Trading (ETS), Decree-Law No 38/2013 of 15 March 2009 and Decree-Law No 93/2010 of 27 July 2009.
- National Maritime Spatial Planning Situation Plan, approved by Resolution of the Council of Ministers No 203-A/2019 of 30 December.

New TRANSVERSAIS Policies and Measures:

- Climate Bill approved by Law No 98/2021 of 31 December 2009;
- Resource Efficiency Programme in Public Administration for the period up to 2030 (ECO.AP 2030), approved by Resolution of the Council of Ministers No 104/2020 of 24 November;
- National Strategy for Green Public Purchasing 2030 – ECO360, approved through the Council of Ministers Resolution No 13/2023 of 10 February 2015;
- Horizon 2025 Sustainable Bioeconomy Action Plan (PABS) approved through the Council of Ministers Resolution No 183/2021;
- National Strategy for the Sea 2021-2030, approved by Council of Ministers Resolution No 68/2021 of June 04;
- Action Plan of the National Strategy for the Sea 2021-2030, approved by Resolution of the Council of Ministers No 120/2021 of September 01;

- Green Skills/Green Skills Work Programme, vocational training programme in the field of energy (Ministerial Implementing Order No 21/2023, of 6 January);
- Strategic guidelines on exploiting the potential of lithium minerals in Portugal, approved through MCR No 11/2018 of 31 January;
- Reform and simplification of environmental licensing, approved by Decree-Law No 11/2023 of 10 February.
- Voluntary Carbono Market (Decree-Law No 4/2024 of 5 January 2007);
- Biometano Action Plan 2024-2040, approved byCouncil of Ministers Resolution No 41/2024 of 15 March 2024.

Current ENERGY policies and measures:

- National Programme for Dams of High Hydroelectric Potential (PNBEPH);
- National Plan for the Promotion of Biorrefineries, approved by Resolution of the Council of Ministers No 163/2017, of 31 October;
- Industrial Strategy and Action Plan for Ocean Renewable Energy, approved by Resolution of the Council of Ministers No 174/2017 of 24 November;
- Development and Investment Plan of the National Transmission Network, storage infrastructure and liquefied natural gas terminals for the period 2018-2027 (last approved);
- Natural Gas Distribution Network Development and Investment Plans for the period 2019-2023 (last approved).

New ENERGY Policies and Measures:

- Energy certification system for buildings, regulated by Decree-Law No o101-D/2020 of 7 December 2009, as amended
- The Long Term Strategy for the Renovation of Buildings (ELPRE), approved by Resolution of the Council of Ministers No 8-A/2021 of 3 February;
- National Hydrogen Strategy (EN-H2), approved by Resolution of the Council of Ministers No 63/2020 of 14 August;
- Emergency Plan for the National Gas System (2022-2027), March 2023;
- Preventive Action Plan for the National Gas System, March 2023
- Electricity Risk Preparedness Plan (PPR), January 2023;
- Intervention Plan and Use of Safety Reserves (of Petroleum and Derivatives) of 2020 (latest update);
- Mechanism for the decoupling of the price of natural gas from MIBEL, Decree-Law No 33/2022 of 14 May 2006, as amended;
- Energy saving plan approved by Resolution of the Council of Ministers No 82/2022 of 27 September;
- Organisation and functioning of the National Electricity System (SEN), established by Decree-Law No 15/2022 of 14 January 2012 and related regulatory legislation;
- Organisation and functioning of the National Gas System (SNG), established by Decree-Law No 62/2020 of 28 August 2012;
- Manual of Procedures of the Authorising Authority of Guarantees of Origin, Directive ERSE No 17/2023, of 31 August;
- National Long-term Strategy for Combating Energy Poverty 2023-2050 (ELPPE), approved by Resolution of the Council of Ministers No 11/2024 of 8 January;
- National Energy Poverty Observatory, set up by RCM No 4 No 11/2024 and its composition and functioning as determined by Order No 1335/2024 of 2 February 2006;
- Development and Investment Plan of the National Electricity Transmission Network for the period 2022-2031 (last approved);
- Electricity Distribution Network Development and Investment Plan for the period 2023-2025 (last approved);
- 2040 national Electricity System Security Monitoring Report (period 2024-2023), National Gas System Security Monitoring Report 2022 (period 2023-2040) and Market and Supply Safety Monitoring Report of the National

Petroleum System 2020 (latest approved);

- Decree-Law No 70/2022 of 14 October 2022 setting out a strategic natural gas reserve, belonging to the Portuguese State, while further establishing extraordinary and temporary measures for the reporting of information and ensuring gas supply security;
- Council of Ministers Resolution No 82/2022 of 27 September 2006 defining preventive measures for possible disruptions, always with a view to ensuring security of energy supply;
- Ministerial Implementing Order No 59/2022 of 28 January 2009, which sets a minimum global quantity of gas security stocks and provides for the establishment of an additional reserve in the SNG;
- Decree-Law No 30-A/2022 of 18 April 2009 approving exceptional measures to ensure the simplification of procedures for the production of energy from renewable sources.
- Decree-Law No 72/2022 of 19 October 2009 amending exceptional measures, implementation of projects and initiatives for the production and storage of energy from renewable sources.
- Decree-Law No 84/2022 of 9 December 2013 setting targets for the consumption of energy from renewable sources
- Ministerial Implementing Order No 15/2023 of 4 January 2009 establishing a centralised purchasing system for biomethane and hydrogen produced by electrolysis from water using electricity from renewable energy sources
- Order No 5971-A/2024 of 27 May, opening a competitive procedure, in the form of an electronic auction, for the centralised purchase of biomethane and hydrogen produced by electrolysis from water, using electricity from renewable energy sources.Resolution of the Council of Ministers No 50/2024, 14 March, establishes the Mission Structure for the Licensing of Renewable Energy Projects 2030 (EMER 2030)
- Order No 6757-A/2024 of 17 June 2008 sets up the Working Party on the transposition of Directive (EU) 2023/2413 (GT-RED III).
- Order No 8023/2024 of 19 July establishes the Working Party for the transposition of Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 into Portuguese law (WG – EPBD).
- Order No 10559/2024 of the Office of the Minister for Infrastructure and Housing and the Office of the Minister for the Environment and Energy on the establishment of the AFIR Working Group on the deployment of alternative fuels infrastructure under Regulation (EU) 2023/1804

<u>Current policies and measures in the field of RESIDURES and RESIDUAL WATES:</u>

- Circular Economy Action Plan in Portugal, approved by Resolution of the Council of Ministers No 190-A/2017 of 11 December.
- Strategic Plan for Urban Waste (PERSU 2030), approved by Resolution of the Council of Ministers No 30/2023 of 24 March;
- The National Water Plan, approved by Decree-Law No 76/2016 of 9 November 2008;
- River Region Management Plans (RBMPs) of the 3th cycle (2022-2027), approved by Resolution of the Council of Ministers No 62/2024 of 3 April;
- Legal regime for the production and use of reclaimed water obtained from waste water treatment, approved by Decree-Law No 119/2019 of 21 August 2006;
- National Strategy for Combating Food Waste (ENCDA), approved by Resolution of Council of Ministers No 46/2018 of 27 April;
- Strategic Plan for Water Supply and Waste Water Management 2030 (PENSAARP 2030), adopted in February 2024 by Resolution of the Council of Ministers No 23/2024 of 5 February);
- National Strategy for Agro-Livestock and Agri-Industrial Efluents (ENEAPAI 2030), approved by Resolution of the Council of Ministers No 6/2022 of 25 January.

<u>New policies and measures in the sector of RESIDUAL AND RESIDUAL WATES:</u>

- National Waste Management Plan 2030 (PNGR), approved by Resolution of the Council of Ministers No 31/2023

of 24 March;

- Strategic Plan for Non-Urban Waste (PERNU), approved by Council of Ministers Resolution No. 127/2023 of 18 October.

Current AGRICULTURE AND FLORTED sector policies and measures:

The Rural Development Programme 2014-2020 (RDP 2020), approved by Commission Implementing Decision C (2014) 9896 of 12 December 2014;

- National Strategy for Agri-Livestock and Agri-Industrial Efluents (ENEAPAI) 2018-2025, under review;
- National strategy for sludge management, currently being finalised;
- Code of Good Agricultural Practice (CBPA), approved by Order No 1230/2018 of 5 February 2008;
- National Forest Strategy (NFE), update approved by Resolution of the Council of Ministers No 6-B/2015 of 4 February;
- National Strategy for the Promotion of Cereal Production, approved by Resolution of the Council of Ministers No 101/2018 of 26 July 2008;
- National Strategy for Organic Farming (ENAB), approved by Council Resolution of Ministers No 110/2017, 27 July;
- National Programme of Regadios, approved by Resolution of the Council of Ministers No. 133/2018 of 12 October 2012.

New AGRICULTURE AND FOLLOW-UP policies and measures:
T HE Landscape Transformation Programme, approved by Resolution of the Council of Ministers No 49/2020, 24 June 2020
T HE National Strategy for Agri-Livestock and Agri-Industrial Efluents 2030, approved by Resolution of the Council of Ministers No 6/2022 of 25 January;
T Common Agricultural Policy Strategic Plan (PEPAC 2021-2027)
T HE Innovation Agenda for Agriculture 2020-2030, approved by Resolution of the Council of Ministers No 86/2020 of 13 October 2020

Current MOBILITY AND TRANSPORT sector policies and measures:

- Transport and Infrastructure Strategic Plan (PETi3 +) for 2014-2020, approved by Council of Ministers Resolution No 61-A/2015 of 20 August;
- Sustainable Mobility Programme for Public Administration – ECO.mob 2015-2020, approved by Council of Ministers Resolution No 54/2015 of 28 July;
- National Strategy for Cycle Active Mobility (EMNAC) 2020-2030, approved by Resolution of the Council of Ministers No 131/2019 of 2 August.

New policies and measures in the field of MOBILITY AND TRANSPORT:

- National Railway Plan (NFP), under development;
- National Strategy for Active Pedonal Mobility 2030, approved by Council of Ministers Resolution No 67/2023 of 7 July;
- Strategy for increasing the competitiveness of the Continent Commercial Ports Network – Horizon 2026, approved by Resolution of the Council of Ministers No 175/2017 of 24 November, and subsequently amended by Resolution of the Council of Ministers No 182/2021 of 24 December;
- National Investment Programme 2030 (PNI 2030).

Current policies and measures in the field of research and research:

The Research and InnovationStrategy for a Smart Specialisation EI & I, 2014-2020, adopted on 23 December 2014;

- Thematic Research and Innovation Agendas 2030, following Council of Ministers Resolution No 32/2016 of 3 June;
- Research and Innovation Thematic Agenda | Circular Economy, FCT, Lisbon – FCT (2019).

Current FINANCIAL policies and measures:

- National Investment Programme (PNI 2030), approved by Resolution of the Assembly of the Republic No 154/2019 of 23 August 2019;
- Carbon tax, Law No 82-D/2014 of 31 December 2009 approving the Green Tax Reform;
- Financial support for electric mobility and the purchase of low-emission vehicles in fleets public transport;
- Tariff Reduction Support Programme (PART), approved by Order No 1234-A/2019 of 4 February 2008;
- Programme for the Remuneration of Ecosystem Services in Rural Spaces (2019-2038), approved by Resolution of the Council of Ministers No 121/2019 of 30 July;
- Phasing out of coal tax exemptions until 2030, State Budget Law 2018.

New FINANCIAL policies and measures:

- Portugal 2030 strategy, approved by Resolution of the Council of Ministers No 98/2020 of 13 November 2020;
- Portugal 2030 programmes (Compete 2030, Climate Action and Sustainability Programme, Sea 2030, Regional Operational Programmes);
- National Recovery and Resilience Plan (RRP), approved on 16 June 2021 (to be updated with a dedicated REPowerEU chapter).

Regional framework (Autonomous Regions)

The Autonomous Region of the Azores (RAA) and the Autonomous Region of Madeira (RAM) are two archipelagos located in the Atlantic Ocean, two outermost regions of the Portuguese Republic with administrative and political autonomy, with powers of a political, legislative and administrative nature. In matters such as energy, climate or mobility, autonomous regions develop their own strategies and plans taking into account the reality of each region, but aligned with the targets and main objectives set at national level, such as the national renewable target and the national emission reduction target.

The main sectoral policy instruments at regional level that are currently in place or in the final stages of implementation and that contribute to the achievement of energy and climate targets and objectives, and the Energy Union dimensions – decarbonisation, energy efficiency, energy security, internal energy market and research, innovation and competitiveness – are identified below:

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Current TRANSVERSAIS policies and measures:

- Regional Climate Change Strategy (ERAC), approved by Council of Government Resolution No. 123/2011 of 19 October;

TheRegional Climate Change Programme (PRAC), approved by Regional Legislative Decree No 30/2019/A of 28 November 2008;

TheTerritorial Management Tools;

New TRANSVERSAIS Policies and Measures:

THEFOLLOWING: Roadmap towards Carbon Neutrality in the Azores, under development.
THEFOLLOWING: Roadmap for a Regional Circular Economy, under development.

Current ENERGY policies and measures:

- Sugar Strategy for Energy 2030 (EAE 2030), approved by Council of Government Resolution No 6/2023 of 31 January;
- Regional Energy Efficiency Action Plan (REEAP) under development;
- Programme for Energy Efficiency in Public Administration (ECO.AP Azores), approved by Regional Legislative Decree No 19/2019/A of 6 August 2008;
- Programme "PROENERGIA" (system of incentives for the production and storage of energy from renewable sources), approved byRegional Legislative Decree No 5/2010/A of 23 February 2012, as amended;
- EDA's Multiannual Strategic Plan and Budget (PPO);
- Strategy for the incorporation of renewable technologies for energy production in fisheries

New ENERGY Policies and Measures:

- SOLENERGE programme – financial incentives for the purchase of solar photovoltaic systems – approved by Regional Regulatory Decree No 17/2022/A of 8 September.

Current MOBILITY AND TRANSPORT sector policies and measures:

- Strategy for the Implementation of Electrical Mobility in the Azores (EMEA), Regional Legislative Decree No 21/2019/A, of 8 August;
- Plan for electric mobility in the Azores (PMEA) 2018-2024, approved by Council of Government Resolution No 106/2019 of 4 October;
- Sustainable Urban Mobility Plan in the AAR (SUMP).

New policies and measures in the MOBILITY AND TRANSPORT sector:

- Programme of incentives for electric mobility, approved by Resolution of the Council of Government No 49/2020 of 5 March.

Current policies and measures in the RESIDUTS sector:

- Strategic Plan for the Prevention and Management of Waste in the Azores (PEPGRA), approved by Regional Legislative Decree No 6/2016/A of 29 March.

Current AGRICULTURE sector policies and measures:

- Strategy for the Development of Organic Farming and Action Plan for the Promotion of Organic Products of the Autonomous Region of the Azores, approved by Resolution of the Council of Government No 57/2019 of 24 April.

AUTONOMOUS REGION OF MADEIRA

Current TRANSVERSAIS policies and measures:

- Strategy on Adaptation to Climate Change, approved by Council of Government Resolution No 1062/2015 of 26 November (to be updated in the short term);
- Regional agenda for the Circular Economy;
- Regional Energy and Climate Plan for the Autonomous Region of Madeira under preparation.

Current ENERGY policies and measures:

- Sustainable Energy and Climate Action Plan of the Autonomous Region of Madeira (PAESC-RAM), approved by Resolution of the Council of the Regional Government No 1271/2022 of 9 December 2022.

Current MOBILITY AND TRANSPORT sector policies and measures:

- Action Plan for Sustainable Urban Mobility of the Autonomous Region of Madeira (PAMUS-RAM), approved by Council of Government Resolution No 378/2019 of 21 June 2009;
- Integrated Strategic Transport Plan of the Autonomous Region of Madeira (PIETRAM) 2014-2020.

Current policies and measures in the RESIDUTS sector:

- Waste Strategy Document 2020-2030.

1.2.3. Key issues of cross-border relevance

This includes the agreement agreed in 2006 between the Portuguese Republic and the Kingdom of Spain on the establishment of the Iberian Electricity Market (MIBEL), defining an objective of establishing interconnectors with a commercial capacity of 3 000 MW, in order to promote and enhance price convergence between the two markets and to enhance security of supply.

Regional cooperation for cross-border interconnections is a key issue, expressed in the compromise between Portugal, Spain, France and the European Commission on building the infrastructure needed to operationalise an efficient and decarbonised internal energy market. In particular, cross-border interconnections of gas networks (from a perspective of dedicated networks for renewable hydrogen) and electricity will help diversify renewable hydrogen and electricity routes and resources, harnessing the potential and contributing to the achievement of ambitious renewable energy targets, the reduction of dependence on fossil fuels and the further decarbonisation of the economy. This process began in 2015 with the signature of the Madrid Declaration and evolved with the signing of the Lisbon Declaration in 2018. On 20 October 2022, the governments of Spain, France and Portugal signed a commitment they ratified at the Euromed Summit on 9 December 2022 – Alicante Summit – to create a green corridor for 100 % hydrogen ('H2Med') to connect the Iberian Peninsula with the rest of Europe, creating the hydrogen infrastructure needed to enable the development of a pan-European hydrogen market.

A new Memorandum of Understanding was signed on 19 December 2023 between the Governments of Portugal, Spain and France in the framework of the High Level Group on Interconnections in South-West Europe, seeking to adjust the scope of this group to new challenges and topics in the energy sector (in addition to interconnections such as hydrogen and offshore electricity networks), as well as to establish a commitment to implement an action plan to implement certain actions in this High Level Group.

In November 2018, the Valladolid Declaration was signed between Portugal and Spain, in which the two governments underlined the importance of security of energy supply at European level and the need to foster cross-border and interregional interconnections in order to achieve greater integration of the Iberian Peninsula into the rest of Europe, thereby supporting the Energy Union and taking advantage of existing European funding mechanisms. In order to address the challenge of incorporating renewable energy and the development of MIBEL, the two governments affirmed the importance of the operation of MIBEL's internal and external interconnection. Other Luso-Spanish Summits followed, keeping these topics within their objectives, and the last one was held with the signature of a declaration in March 2 023 in Lanzarote, Spain.

In March 2023, at the XXXIV Luso-Spanish Summit, Portugal and Spain advocated the implementation of the H2Med renewable hydrogen project, and more specifically the CelZa (Celorico da Beira and Zamora) infrastructure between the two countries, with the aim of making the Iberian Peninsula a net export region for renewable hydrogen, committing to continue strengthening its electricity interconnections.

1.2.4. Administrative structure for the implementation of national energy and climate policies

Monitoring the implementation of policies, lines of action and action measures is one of the key elements in the management and monitoring of national climate and energy policy as it makes it possible to verify progress achieved, but also to ensure compliance with energy and climate obligations.

In this context, it is important to build on existing monitoring structures at national level, adapting them to the new, more inclusive reality of energy and climate policies.

To this end, the National System of Policies and Measures (SPeM), established by Resolution of the Council of Ministers

No 56/2015 of 30 July 2012, and subsequently governed by Resolution of the Council of Ministers No 45/2016 of 26 August 2009, is used to monitor policies and measures and projections that have an impact on the energy transition.

This system boosts discussion, design and assessment of progress in the implementation of policies and measures contributing to GHG emission reduction and energy transition, in line with the objectives set at national level in this Integrated Plan, strengthening the accountability of sectors in integrating these dimensions into their sectoral policies.

It also aims to contribute to addressing the monitoring, reporting and projection requirements of the Governance Regulation, which derive largely from the requirements previously contained in Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 (MMR).

In addition, in view of the synergies between climate and energy policy and air policies and measures, the SPeM will continue to support monitoring, as well as projections, ensuring appropriate links with the National Inventory System for Emissions by Sources and Removal by Summaries of Air Pollutants (SNIERPA) and the monitoring and reporting system provided for under the National Strategy for Adaptation to Climate Change (ENAAC 2020).

As a result of the needs to monitor the progress achieved and the fulfilment of the various obligations undertaken in the NECP 2030, mechanisms should be developed to monitor and report on the impacts of cross-cutting and sectoral policies and measures on climate change and energy transition, by building indicators and identifying the respective regulatory, financing, fiscal and other instruments.

Governance model

Given the strategic and cross-cutting nature of the energy transition, with cross-cutting impacts on the different sectors of the economy and society, it is essential that the governance model translates into political commitment and is achieved through effective support and action on the progress of the transition. Thus, the coherent articulation of the various components provided for in this Plan requires the definition of a system of governance, with appropriate instruments, without prejudice to the specific competences assigned to the different sectors.

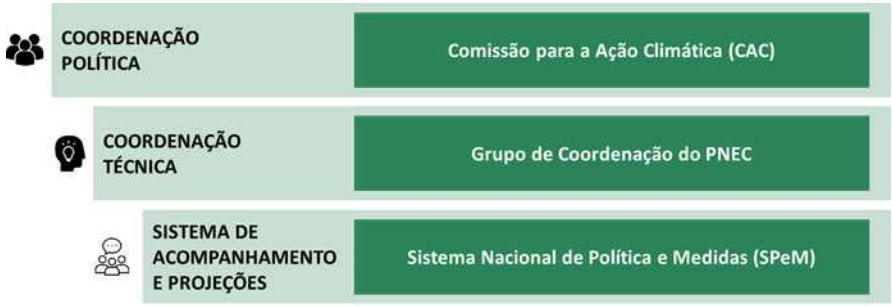
The political commitment to the transition to a competitive, resilient, carbon-neutral and circular economy, in a context of full integration with the objectives of economic growth, led to the creation in 2015 of the Interministerial Commission for Air, Climate Change and the Circular Economy (CA2), which has since been renamed the Commission for Climate Action (CCS), pursuant to Council of Ministers Resolution No 53/2020 of 10 July approving the NECP 2030. chaired by the Member of the Government responsible for environment, climate action and energy transition and integrated by the government departments of energy, spatial planning, finance, agriculture, sea, economy and innovation, transport, health, tourism, civil protection, regional development, local administration, foreign affairs and cooperation, and education and science, and by representatives of the regional governments of the Azores and Madeira.

The Commission provides policy guidance in the field of climate change and air, and has the task of promoting the articulation and integration of climate change policies into sectoral policies and monitoring the implementation of relevant sectoral measures, programmes and actions that may be adopted. The specific competences of CCS are set out in Order No 2873/2017 of 6 April 2012. Particular examples are the monitoring of Portugal's commitments at national, Community and United Nations level, the promotion and monitoring of the relevant national climate change and circular economy plans, the validation of policy options and measures proposed in the field of mitigation and monitoring, and support for the definition of national positioning in international negotiations.

Thus, by adapting the governance structures already in place at national level, the Commission now monitors energy policy and sectoral policies that have an impact on national air, climate change, circular economy and energy objectives, taking into account the synergies between them, and the Commission is responsible for promoting, monitoring and monitoring the NECP.

The model put in place aims to ensure long-term political commitment, as the transition to a carbon-neutral society is of paramount national and international relevance and has significant impacts on the economy and society, while providing an opportunity for the country. The governance model comprises the following levels:

Figure 12 – Overview of the governance structure



The **political coordination** of the NECP is the responsibility as a promotion and decision-making structure at political level. The CAC is responsible for promoting, supervising and monitoring the NECP. In the context of the policy coordination of the NECP, close liaison with other inter-ministerial committees should be ensured, given the relevance of the topic in European development policy and financing, as well as for the fulfilment of national commitments such as the SDGs.as a promotion and decision-making structure at political level. The CAC is responsible for promoting, supervising and monitoring the NECP. In the context of the policy coordination of the NECP, close liaison with other inter-ministerial committees should be ensured, given the relevance of the topic in European development policy and financing, as well as for the fulfilment of national commitments such as the SDGs.

The **technical coordination** of the NECP is the responsibility of the Coordination Group, aims to coordinate and promote the development and revision of the NECP, to ensure the articulation of the national contribution to the fulfilment of the commitments set out under the Regulation on the Governance of the Energy Union and Climate Action, and to facilitate the implementation of the policy guidance contained in the NECP. This NECP coordination group is co-coordinated by the Portuguese Environment Agency, I.P. and the Directorate-General for Energy and Geology.

The **system of monitoring and projections** of the NECP is based on the current system (SPeM) established by Council of Ministers Resolution No 45/2016 of 26 August 2012, which aims to: involve and strengthen sector accountability in climate mainstreaming in sectoral policies; monitor, monitor and report on the implementation of policies and measures and their effects; ensure that projections of GHG emissions and other air pollutants are reported; assess compliance with national obligations, including sectoral targets.

More recently, the publication of the Climate Bill (Law No 98/2021 of 31 December), which entered into force on 1 February 2022, brought a new level of governance in climate and energy policy. First of all, the CLL established the establishment of a specialised and independent Climate Action Council (CAC), composed of individuals of recognised merit, with knowledge and experience in the different areas affected by climate change, including risk management and public policies.

The CAC cooperates with the Assembleia da República and the Government, in particular in the preparation of studies, assessments and opinions on climate action and related legislation, and is responsible for providing advisory opinions on the planning, implementation and effectiveness of climate policy and contributing to the public debate on the conduct of climate policy, taking into account international experiences. In particular, the CCS is responsible for issuing an opinion on climate policy instruments, including on the 2030 NECP. The CAC is supported by a technical support structure, which is part of the services of the Assembly of the Republic, and its composition, organisation and operation have already been defined by Law No 43/2023 of 14 August 2009.

As foreseen in the AML, planning tools such as RNC2050 and NECP 2030 are discussed and voted on by the Assembleia da República.

1.3. Consultations and involvement of national and Union entities and their outcome

1.3.1. Involvement of the national parliament

Under the Constitution of the Portuguese Republic, it is for the Government, within the framework of its administrative and executive competence, to take all the measures necessary to promote economic and social development and to meet collective needs, including the preparation of the revision of the 2030 NECP (published by Resolution of the Council of Ministers No 53/2020 of 10 July).

In compliance with the provisions of the AML, the final version of the revision of the 2030 NECP was preceded by a public consultation process (include reference to the report later), and was approved by the Assembleia da República (put date of approval).

1.3.2. Involvement of local and regional authorities

The involvement of local and regional authorities, as well as sectoral bodies with competences in the different areas, in the update of the 2030 NECP, is carried out through a consultation process that includes meetings and prior listening events.

Meetings with the participating entities of the National System of Policies and Measures (SPeM) and the Coordination Group of the National Adaptation Strategy to Climate Change (GC ENAAC) were first promoted in order to publicise the ongoing review and collect input from the entities, strengthening the review process.

As part of the NECPlatform project, with a view to promoting vertical and horizontal integration of energy and climate policies, it was also possible to participate in a number of multilevel dialogues organised by the association ZERO – Association Sistema Sterreste Sustainable (a non-profit national association) between the second quarter of 2023 and the end of 2024.

The NECPlatform project, co-funded by the European Union under LIFE Grant Agreement 101076359, aims to support the creation of Climate and Energy Dialogues by providing multi-actor exchange platforms. These sessions were attended by different stakeholders, including sectoral associations and agencies, local and regional representatives, as well as the co-coordinating bodies of the NECP, and provided insight into the main concerns of stakeholders. The transport sector has been generally identified as one of the main sectors to be targeted in the energy and climate transition of the next decade, and some barriers and improvements to be promoted in the context of energy sector legislation have been identified, in particular in the context of renewable energy communities.

It should also be noted that the CLL foresees the development of Regional Climate Action Plans, Municipal Climate Action Plans and Sectoral Climate Change Mitigation and Adaptation Plans and foresees that they will be developed in line with the objectives and targets set out in the Carbon Neutrality Roadmap and the 2030 NECP.

Meetings were also held with the five Regional Coordination and Development Commissions (RCCDR) in order to provide guidance for the preparation of these regional plans so that they can contribute to a better delivery on the ground of the NECP 2030 objectives.

1.3.3. Consultations with stakeholders, including social partners, and involvement of civil society and the general public

During the technical work of the 2030 NECP review process, institutional and civic participation and the active monitoring and cooperation of bodies representing the various sectoral interests have been fostered through various discussion activities. This exercise was based on a dialogue with society and technical sessions were held with stakeholders in the different sectors, in particular to discuss and validate assumptions and energy demand in the various activities (session held on 22 March 2023, followed by a period for collecting written contributions).

Participatory Assemblies on the revision of the National Energy and Climate Plan 2030

In preparation for the revision of the 2030 NECP, a regional series of Participatory Assemblies was promoted, with the involvement of the governance areas of energy and climate and regional development, and of the Portuguese Environment Agency, I.P. and the Directorate-General for Energy and Geology, co-coordinating the revision of the 2030 NECP. Five sessions (Vila Nova de Famalicão, Silves, Coimbra, Lisbon and Évora) took place between May and June 2023 and aimed at: (I) the involvement of civil society in the review process of the 2030 NECP; (II) awareness of the strategic objectives of the NECP 2030; and (iii) the collection of contributions that benefit the revision of the 2030 NECP.

Public consultation

As part of the review of the 2030 NECP, a public consultation process was promoted in two separate periods. The first pre-listening period ran from 15 March to 14 April 2023, via the PARTICIPA Portal, with the aim of collecting societal input on the objectives, targets and broad lines of action of the NECP 2030. In this process, 59 contributions were received from

the various sectors of the economy and society, whose contributions were analysed and incorporated into the version of the NECP now presented.

In summary, most participants agree with the strategic objectives set out in the NECP 2030, with around 58 % considering the national targets set for 2030 as very ambitious/ambitious and around 35 % as unambitious, supporting a reinforcement of these targets.

The transport sector has been identified by most participants as having the greatest potential to increase ambition on GHG reduction, renewables incorporation and energy efficiency improvement.

Decarbonisation (including renewables) and energy efficiency dimensions are those that, according to respondents, require more attention in the review process of the NECP 2030, and where the allocation of public funding is considered most pressing. Procedural speed/administrative barriers was the subject of the greatest consensus among participations as a limiting factor in meeting the strategic objectives of the NECP 2030.

Respondents generally consider that new or revised existing policies and measures should be defined for most of the eight objectives set out in the 2030 NECP. The focus on public transport, the just transition and energy poverty, the strengthening of the circular economy and the increased ambition in renewable energy production, were the topics selected as most relevant in the revision of the NECP 2030.

All participations, including the processing of the participations, were included in a prior consultation report available on the PARTICIPA portal.

The second public consultation period, already on the final proposal for revision of the 2030 NECP, ran from 22 July to 5 September 2024, already taking into account the Commission's recommendations on the draft revision submitted in June 2023, received on 18 December 2023. In this period of public consultation there were 177 participations, showing a significant increase compared to the first consultation period mentioned above.

In general, the main comments/concerns and conclusions of this process are considered to be similar to those recorded during the first public consultation process (prior consultation) in the 1st half of 2023, although more detailed and targeted at this stage. In this context, and in summary, there were numerous suggestions for amendments to the chapter on policies and measures, with particular emphasis on the transport sector, but most of the suggestions were already in some way foreseen in the existing measures, where in some cases texts of these measures have been clarified or proposals for amendments/clarifications have been inserted. In addition, questions were raised about the planned storage capacities and were welcomed to increase them in view of project prospects. The report of this 2th public consultation can be found on the Participa Portal.

Strategic Environmental Assessment

In order to comply with Decree-Law No 232/2007 of 15 June laying down the arrangements for the assessment of the effects of certain plans and programmes on the environment, transposing into national law Directive 2001/42/EC of 27 June and Directive 2003/35/EC of 26 May, a Strategic Environmental Assessment (SEA) was carried out in 2019 under the 2030 NECP.

The objective of the SEA is to support the decision on the plan by identifying, describing and assessing its strategic environmental effects in order to determine the opportunities and risks they present for sustainable development. The SEA is based on the identification of critical decision-making factors, relevant for the national territory, in terms of environment and sustainability, covering the sectors covered by the NECP.

Therefore, as this version is a mid-term review of the NECP 2030, while the risks and opportunities identified above remain valid, it is considered that there are no significant differences in approach that would justify the need for a new SEA process and this will be done when a new NECP for the period 2031-2040 is submitted.

1.3.4. Consultations of other Member States

The consultation process with other EU MS has been taken into account, as identified in Chapter 1.4 of this plan.

1.3.5. Iterative process with the European Commission

Portugal has been actively involved in the Energy Union and Climate Action Committee and the European Commission Technical Working Groups on Integrated National Energy and Climate Plans (Working Group 2 of the Energy Union Committee), maintaining an open communication with the European Commission and the other Member States. Through the state of play of meetings of this Group and other exchanges of information, by means of questionnaires or bilateral meetings, Portugal kept the European Commission regularly informed of developments in relation to the updating of the Plan.

In this context, it should also be noted that Portugal participates actively and regularly in the working group on the progress report of the 2030 NECP, as well as in various workshops promoted, directly or indirectly, by the European Commission.

Inthis context, reference should also be made to the recommendations issued by the European Commission in relation to the preliminary version of the 2030 NECP submitted in June 2023, which have been analysed and addressed in this final version whenever possible.

1.4. Regional cooperation in preparing the plan

1.4.1. Aspects subject to joint planning or coordinated with other States

The coordination of policies and measures planned in the NECP 2030 was promoted with other Member States during the process of preparing the updated NECP, as was the case in the preparation of the NECP submitted to the European Commission in 2019, through initiatives aimed at implementing regional cooperation under Article 12 of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.

In particular, the meeting of Directors-General for Energy on 20 October 2023, promoted by the Spanish Presidency of the Council of the European Union, dedicated to discussing the results of the preliminary updated versions of the NECPs, where Portugal presented the best practices of its NECP submitted on 30 June 2023.

1.4.2. Explanation of how regional cooperation is considered in the plan

In addition to point 1.4.1, it should be noted that Portugal promoted, in the framework of its external policy, various interactions with neighbouring MS, in particular Spain, during the NECP development process in 2019, in order to ensure an appropriate level of involvement and agreement in areas of cooperation. This process is maintained on a regular basis in the context of the Luso-Spanish Summits, as referred to in point 1.2.3.

Some of the topics with the greatest cross-border relevance covered by this Plan have been discussed with MS, in particular Spain and France, notably in the High Level Group (HLG) on interconnections in South-West Europe, which led to summits between these countries and with the participation of the European Commission, the last one being held in Alicante (Spain) on 9 December 2022.

2. NATIONAL OBJECTIVES AND TARGETS

2.1. Dimension Decarbonisation

2.1.1. Targets for GHG emissions and removals

i. The Member State's binding national target for greenhouse gas emissions and annual binding national limits pursuant to Regulation (EU) 2018/842

In the framework of Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 (Effort Sharing Regulation) on binding annual GHG emission reductions by MS from 2021 to 2030, a new Union target was set to reduce its GHG emissions by 40 % by 2030 compared to 2 005 in the non-ETS (non-ETS) sectors. The revision of this Regulation, resulting from the Fit-for-55 package, thus updates the previously set GHG emission reduction target, putting the EU on a path towards climate neutrality in 2050.

In this context, national contributions to the Union target have been reviewed, with Portugal having to limit its GHG emissions by at least -28.7 % by 2030 compared to its emissions in 2005, replacing the -17 % target in force so far. Portugal has thus committed to a significantly more ambitious target at Community level in the non-ETS sectors.

Table 4 – Non-ETS CO2eq emissions reduction$_{target}$ (s \ LULUCF) compared to 2005

	2020	2030 (previous target)	2030 (revised target)
National contribution to Union targets (non-ETS)	+ 1 %	— 17 %	— 28.7 %

In order to meet the new target for 2030, the*Annual Emission Allocations (EEA*) set out in Annex II to Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 were subject to review by Commission Implementing Decision (EU) 2023/1319 of 28 June 2023, resulting in a more ambitious emission reduction trajectory in the non-ETS sector. In this context, it should be clarified that the limits for 2021 and 2022 have not been subject to change, while the values provided for in the previous Decision remain in force. The same is true of the figures for the period 2026-2030, which will be subject to review in 2025, taking into account the average emissions of the years 2021, 2022 and 2023. In summary, the figures for the subperiod 2023-2025 have now been revised and will be published in a new Decision.

Thus, for the period 2021-2025, despite the flexibilities provided for in the Effort Sharing Regulation, which have also been adjusted by the new Regulation, which Portugal will make use of if necessary, Portugal should ensure that its annual GHG emissions do not exceed the limit defined by the linear trajectory presented in Table 5.

Table 5 – Emission cap for Portugal in the non-ETS sectors (Mt) established by the Effort Sharing Regulation for 2005[22]

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Emission limit in sectors not — ETS	42,53	40,82	40,06	39,30	38,53	40,62 *	40,57 *	40,52 *	40,47 *	40,42 *

* The figures presented for the sub-period 2026-2030 will be reviewed only in 2025, taking into account the average emissions of the years 2021, 2022 and 2023.

It should be noted that, while under the revision of the Emissions Trading System (ETS) Directive, it also applies to international maritime transport, road transport, buildings and other industrial sectors, the scope of the Effort Sharing Regulation remains.

ii. The commitments of the Member State under Regulation (EU) 2018/841

In the framework of Regulation (EU) 2023/839 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/841 of the European Parliament and of the Council, adopted on 30 May 2018 (the LULUCF Regulation), on the inclusion of GHG emissions and removals from the land use, land use change and forestry (LULUCF) sector, new rules have been laid down and Member States (MS) targets for that sector have been strengthened.

This amendment results from the*Fit-for-55*package and aims to accompany the increased ambition and contribute to achieving the new target of a 55 % reduction in net GHG emissions compared to 1990 levels and to ensure that the LULUCF sector makes a sustainable and predictable long-term contribution to the climate neutrality objective.

The rules laid down in the new Regulation will be implemented in two stages, and during the first phase, which runs until 2025, the system currently in place is maintained, whereby Member States must ensure that emissions from the LULUCF sector do not exceed removals from the LULUCF sector (*the 'no debit rule*'). In the second phase, running from 2026 to 2030, the new targets set for 2030 for each MS should be met in order to meet the increased ambition and contribute to the specific EU target for net GHG removals of at least 310 million tCO_{2eq} by 2030.

Therefore, and on the basis of this new Regulation, in line with the increased EU target, it is for Portugal to ensure that the sum of GHG emissions and removals in the LULUCF sector achieved in 2030 do not exceed the result of the average net emissions of the years 2016, 2017 and 2018 carried forward in 2032, minus the value of 968 kt CO2eq.

In addition, Portugal and the other Member States are also committed to achieving a certain amount of net GHG emissions and removals for the period 2026-2029 ('budget 2026-2029'), in accordance with Article 4 (4) of the abovementioned Regulation.

To this end, and anticipating some difficulty in achieving the demanding target set, Portugal considers using the flexibilities available to support the achievement of this target, as provided for in Articles 12, 13, 13a and 13b of the above-mentioned Regulation. This situation will be duly monitored throughout the

[22] the emission limits submitted for 2021-2022 and 2026-2030 were calculated pursuant to Commission Implementing Decision (EU) 2020/2126 of 16 December 2020. The figures for the subperiod 2023-2026 have been calculated pursuant to Commission Implementing Decision (EU) 2023/1319 of 28 June 2023.

period 2021-2030, in line with the evolution of GHG emissions and removals resulting from the LULUCF sector.

The LULUCF Regulation also lays down the rules for the accounting of emissions and removals from the LULUCF sector and for the assessment of compliance by MS with commitments, defining that accounting for emissions and removals resulting from managed forest land shall be calculated as emissions and removals in the periods from 2021 to 2025 minus the value obtained by multiplying by five the 'forest reference level' (FRL). The FRL represents an estimate, expressed in tonnes of CO_2 equivalent per year, of the average annual net emissions and is calculated and presented by each MS in the National Forest Accounting Plan for the subperiod 2021-2025.

In response to the obligation of Article 8 of the LULUCF Regulation, Portugal has drawn up its National Forest Accounting Plan, availableon the APA Portal, which includes the proposal for a 'Forest Reference Level' to be used for accounting for managed forests in Portugal for the period 2021-2025.

Based on the methodologies, data and assumptions explained in section 3 "Description of the forest reference level" of that plan, the forest reference level has been estimated at 11 165 GgCO 2eq.$_{Year}$ $^{-1}$ (including the contribution of forest products according to the "production approach") or 10 556 $GgCO_{2eq}.Year^{-1}$ (including the contribution of forest products according to the "instantaneous oxidation approach").

In terms of projections of sequestration developments in the LULUCF sector, based on the current modelling exercise, it is estimated that a sequestration value of 6 535 tCO2 can be achieved in 2030. Although the burnt area is expected to decrease, the cut volume reduction or the need to increase the forest area, including through the Voluntary Carbon Market, it should be noted that the sink values obtained also reflect the latest methodological review of the national emission inventory, which estimated the current sink capacity of the LULUCF sector to be low compared to the figures considered in the context of the NCR2050. This revision in turn reflects the results of the latest National Forest Inventory

(IFN).

The post-2030 ransomware capacity will continue to be analysed in the context of the ongoing revision of RNC2050, taking into account that it is from a long-term and neutral perspective that this sector becomes more prominent.

Table 6 – Projection of GHG emissions in the LULUCF sector – Additional Policy Scenario (kt CO_{2eq})

			Additional Policy Scenario
	2020	**2022**	**2030**
LULUCF (4)	— 4 707	— 5 925	— 6 535

iii. Other national objectives and targets consistent with the Paris Agreement and existing long-term strategies. Other objectives and targets contributing to the Union's overall commitment to reduce GHG emissions, including sectoral targets and adaptation objectives

Achieving carbon neutrality in 2050 implies a significant reduction in emissions, based on a reduction path of -55 % in 2030, -65 % to -75 % in 2040 and -90 % in 2050, compared to 2005 levels, and represents a challenge of societal transformation, in particular with regard to production and consumption patterns, the relation to energy production and use, the way cities and housing, work and leisure spaces are thought of, how we move and how mobility needs are thought. Therefore, the following national targets are important for the horizon of this Plan:

Table 7 – National CO2eq emissions reduction target(no LULUCF) compared to 2005

OTHER NATIONAL TARGETS	**2030**	**2040**	**2050**
NECP 2030	— 45 % to -55 %	65 % to 75 %	— 85 % to -90 %
Revision of the 2030 NECP	— 55 %	65 % to 75 %	— 90 %

However, in view of the recent commitment to climate neutrality in 2045, the targets set for the post-2030 horizon could be revised in the context of the revision of RNC 2050 and also in line with the new Community target for 2040.

The figure below illustrates the trajectory for reducing total GHG emissions by 2 030 in view of the 55 % GHG emission reduction target.

—55 % reduction compared to 2005

Figure 13 – Evolution of GHG emissions and 2030 reduction targets (Mt CO_{2eq})

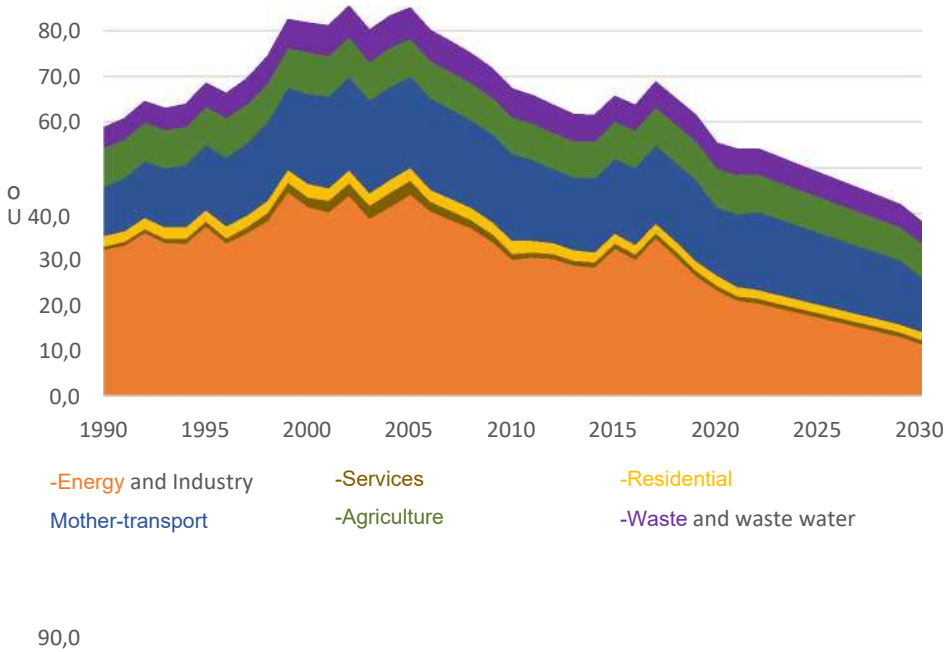
Despite the national decarbonisation trajectory almost since the beginning of the century, a very significant effort will still be needed to reach the target set for 2030 and it will therefore be necessary to ensure that the other sectors of activity contribute to this objective. In this sense, all sectors have the potential to reduce emissions, although this is not the same for all sectors and is largely dependent on technology maturity and cost-effectiveness. Thus, the decarbonisation process is expected to be more pronounced in the current decade in electricity generation, transport and buildings. At sectoral level, the following national targets for 2030 (non-ETS sectors) have been set:

Table 8 – Sectoral national CO2eq emission reduction targets compared to 2005

	2020	2030
Services	— 65 %	— 70 %
Residential	— 14 %	— 35 %
Transportation	— 14 %	— 40 %
Agriculture	— 8 %	— 11 %
Waste and Wastewater	— 14 %	— 30 %

Emissions in 2020 confirm a trajectory to meet the national sectoral targets, with the exception of the agriculture sector, suggesting the need to strengthen policies and measures in this sector in order to correct the trajectory and ensure compliance with the respective sectoral target for 2030. Given the current state of play and the respective sectoral targets set for 2030, there is still a need to strengthen policies and measures in some sectors, with a particular focus on the transport sector.

Figure 14 – Evolution of greenhouse gas emissions by sector and reduction targets by 2030 (Mt CO_{2eq})



90,0

2.1.2. Renewable energytargets

i. Contribution to the Union's binding target of at least 42.5 % renewable energy in 2 030 in terms of the share of energy from renewable sources in gross final consumption of energy

Portugal has strong arguments to further build a strategy based on renewable energy sources towards a carbon-neutral economy. Portugal's ambition and determination to be at the forefront of the energy transition materialises in ambitious but achievable targets, so that the contribution to the Union's binding target of at least 42.5 % renewable energy in 2 030 in terms of the share of energy from renewable sources in gross final energy consumption is among the most ambitious at European level.

Table 9 – Indicative path and Portugal's contribution to the Union's binding 2030 target

Renewables in gross final consumption of energia 22	2020	2022	2025	2027	2030
NECP 2030	31 %	34 %	38 %	41 %	47 %
Revision of the 2030 NECP	31 %	34 %	40 %	44 %	51 %

Portugal's target for the share of renewable energy in gross final energy consumption for 2030 reflects two key aspects: (I) the path already taken in promoting RES, which place Portugal in a leading position at European level; and (ii) existing potential.

In particular, the main *drivers* have been defined to achieve a 51 % share of renewables in gross final energy consumption in 2030, focusing on electrification of consumption, evolution of installed capacity and renewable electricity generation, strong electric vehicle penetration and other more sustainable mobility solutions, the introduction of renewable gases, and complementary to the highest efficiency technologies in the various sectors, and research and innovation/maturation of emerging technologies.

An equally important vector is the promotion of the deployment of power generation centres that physically bring generation closer to electricity consumption, allowing for a shift towards an increasingly decentralised model, with the commitment to individual and collective self-consumption solutions, with advantages also in terms of losses in the distribution and transmission of energy.

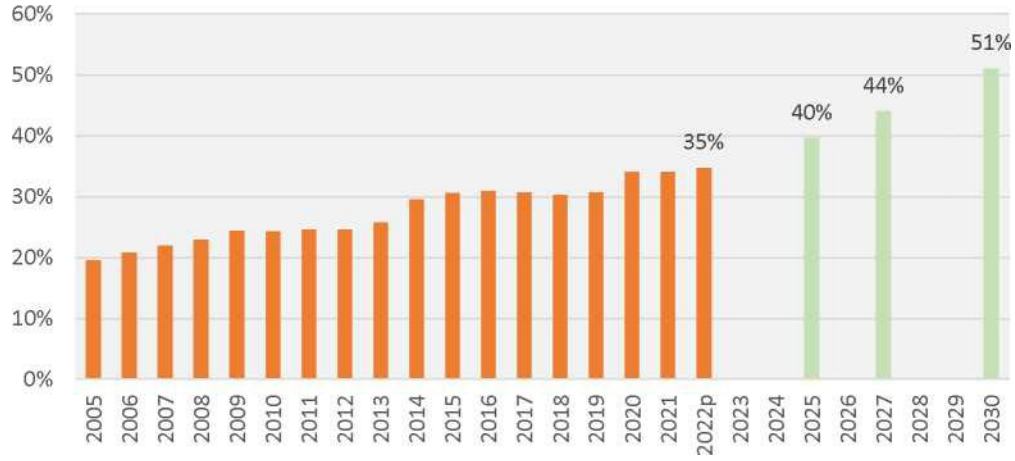
Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of energy from renewable sources was revised by Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 (RED III Directive) and reinforces the commitment of Member States to increase the share of gross final consumption of energy from renewable sources from 32 % to 42.5 % by 2030. To achieve that objective, that Directive incorporates new developments in the sectors of renewable energy and renewable fuels of non-biological origin, and requires Member States to set an indicative target for innovative renewable energy technologies of at least 5 % of the new installed renewable energy capacity by 2030.

In view of the extent and complexity of the provisions laid down in the RED III Directive, the impact on the existing legislative framework, namely Decree-Law No 15/2022 of 14 January 2006, as amended, and the need for proper coordination with the actors in the sectors concerned, a Working Group for the transposition of that Directive (GT-RED III) was set up by Order No 6757-A/2024 of 17 June 2009. The objectives of GT-RED III are to prepare and submit technical and regulatory proposals for the transposition of RED III, and to carry out its work in two stages. A first stage consisting of the preparatory work for the transposition of Article 1 of the RED III Directive, as regards the provisions referred to in Article 5 (1) in fine of that directive, to be completed by 1 July 2024 and a second stage consisting of the transposition of the remaining provisions of the RED III Directive, to be completed by 21 May 2025.

The figure below illustrates the trajectory for the share of energy from renewable sources in gross final energy consumption for 2030.

The indicative22 trajectory for the evolution of renewable energy in Portugal complies with the reference points defined in the Regulation on the Governance of the Energy Union and Climate Action, more precisely in Article 4(a) (2), where it is expected that by 2022, 2025 and 2027, the indicative trajectory shall reach their respective reference points of at least 18 %, 43 % and 65 % of the total increase in the share of energy from renewable sources between the national binding target for 2020 and that of 2030.

Figure 15 – Evolution of the share of energy from renewable sources in gross final energy consumption by 2030



ii. Estimated trajectories for the sectoral share of renewable energy in final energy consumption from 2021 to 2 030 in the electricity, heating and cooling, and transport sector

At sectoral level, considering the achievement of the overall RES target and building on the main *drivers* defined to achieve this target, the following national targets and objectives for 2030 have been defined:

Table 10 – Estimated trajectories for the sectoral share of renewable energy in final energy consumption by 2030

	NECP 2030			PNEC Revision 2030	
	2020	**2025**	**2030**	**2025**	**2030**
Electricity	60 %	69 %	80 %	86 %	93 % *
Heating and Repair	34 %	36 %	38 %	46 %	63 %
Transportation	10 %	13 %	20 %	19 %	29 % * *

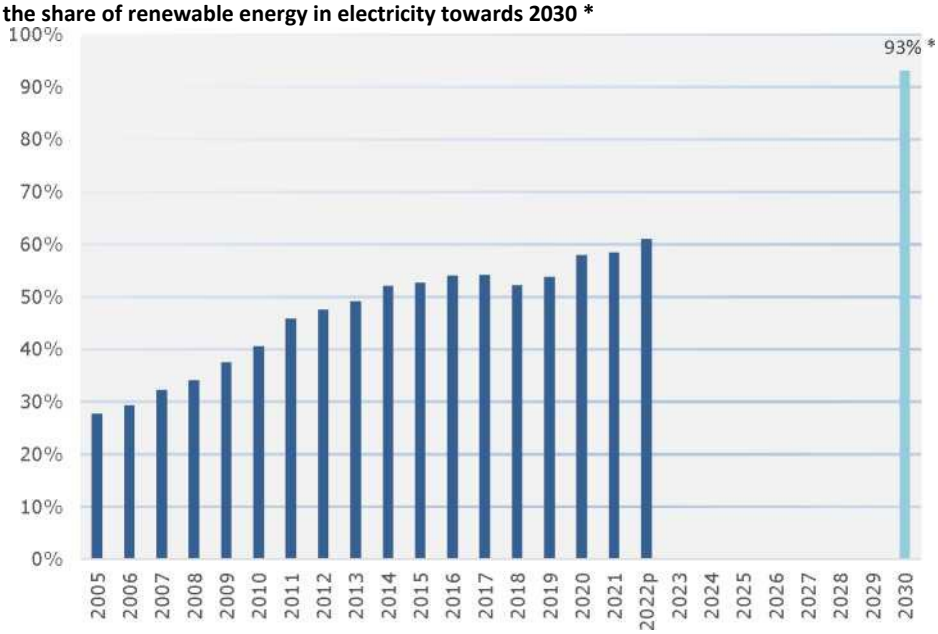
* This figure does not take into account the electricity consumption for hydrogen production as defined in the European methodology for this (under the SHARES of Eurostat).

* * this target considers a share of biofuels and biogas produced from feedstock listed in Part B of Annex IX to the Renewable Directive (EU 2023/2413) of at least 1.9 %.

For the electricity sector, a strong increase in electrification of consumption is envisaged, the acceleration of the exploitation of renewable energy potential, with a particular focus on *onshore and offshore solar and* wind technologies, alongside the promotion of distributed generation, the promotion of storage systems, the strengthening and optimisation of transmission and distribution infrastructure, and the promotion of pilot projects (concentrated thermal solar, stimulated geothermal and wave). In this case too, the importance of power plants in moving towards an increasingly decentralised model is recognised by making it possible to bring production sites closer to energy consumption points. It should be noted that electrification and increased consumption of renewable electricity will also be anchored in the production of renewable gases, in particular renewable hydrogen.

As mentioned above, Portugal has enormous potential to exploit indigenous resources for electricity generation, so that, in order to ensure that the targets are met, the objective for the electricity sector is to increase the exploitation of this potential.

Figure 16 – Evolution of the share of renewable energy in electricity towards 2030 *



* The figure to be achieved in 2030 does not take into account electricity consumption for hydrogen production as defined in the European methodology for this purpose (under Eurostat SHARES).

In this context, with regard to electricity production, it should be noted in particular:

Hydropower	The enhancement of the national hydroelectric potential was achieved by completing the construction of the Alto Tâmega Hydroelectric complex in 2024, consisting of three hydroelectric plants – Gouvães (pumped), Alto Tâmega (turbination) and Daivões (turbination) – which together account for 1.2 GW of new capacity. This complex also contributes to improving security of supply through its pumping capacity. The possibility of an increase of about 0.3 GW in pumping in the ESS by 2030 is also envisaged. In the Autonomous Region of Madeira, in addition to the recent extension of the Calheta hydroelectric plant, the water power plant of the Serra de Água and Calheta I has been redesigned to increase the installed capacity in each plant. In addition, the construction of new reversible hydroelectric systems is in the process of being analysed in order to increase the use of RES.
Eólica *Onshore*	Portugal has untapped wind potential, which should be harnessed. However, current wind farms need to be able to become more productive. e more competitive, via overequipment e reequipment/*repowering*.

Solar Photovoltaic	The high cost reduction of the technology and the high potential for harnessing the national solar resource make this technology key to meeting national targets. For centralised production, the two main tools to be used to accelerate its development will be: (I) auctions for allocation of injection capacity into the grid and (ii) maintenance of the possibility for developers to develop, together with the network operator, grid reinforcements in situations where there is no reception capacity (ideally for large projects). In the spirit of complementarity with centralised energy production instruments, the promotion and dissemination of decentralised production from renewable energy sources and energy communities, which will grow very significantly by 2030, and solar PV will play a key role in this respect, deserves particular importance.
Biomass	Forest biomass residues remain a significant endogenous resource and their energy recovery, under certain conditions of sustainability, contributes to creating value in the forestry sector. The energy recovery of biomass waste is also considered, from a forest management perspective, as a form of forest fire prevention. However, it is important to ensure the biomass cascading principle, compliance with sustainability criteria and to ensure that the use of forest biomass for energy uses is compatible with the sink targets set out in the LULUCF Regulation. Attention should also be paid *to* trade-offs with air quality.
Biogas	Electricity is produced through the use of biogas in landfills. However, as the landfilling of biodegradable waste is expected to decrease due to mandatory separation targets, the production of biogas, and thus of electricity produced through that source, will also decrease.
Geothermal	The Autonomous Region of the Azores still has great potential to enhance the exploitation of its natural geothermal resources. In this context, an increase in installed capacity for electricity production is envisaged, although only on the Terceira and S. Miguel islands. A contribution from stimulated and/or deep geothermal technology is not expected until 2030, however, given the reduction in drilling costs recorded, and the fact that it is a dispatchable electricity generation technology, it is important to promote the development of pilot projects. In the heating and cooling sector, geothermal has been contributing to meeting the targets set in a non-significant but increasing way.
Concentrated Thermal Solar	This technology is considered important because it is linked to energy storage and is a dispatchable source of electricity.
Offshore *wind*	25 MW of wind capacity connected to the national electricity grid, allocated to the Windfloat Atlantic project, is already installed off Viana do Castelo in an adjacent location to which it is intended to become a national offshore technology free zone. Infrastructure has been created to boost the growth of installed capacity in this geographical area.

	Proposals for maritime areas aimed at the deployment of renewable power generation plants originating or located in the ocean have been developed in the framework of the Offshore Renewable Energy Allocation Plan (APR), which was in public consultation in 2023, also considering the needs for compatible development of port infrastructure and connection points to the National Electricity Transmission Network. This process, due to its pioneering nature and its inherent complexity from an infrastructure, economic, financial and environmental point of view, must move forward within a well-founded planning framework. Portugal aims to boost its coastal and oceanic areas for renewable energy production, including with a view to industrial development and investment attraction, and it is therefore important to create scale, synergies and predictability over the medium term. Capacity allocation models are under consideration and the first auction for the allocation of injection capacity into the electricity grid targeting offshore projects is under preparation during 2024. By 2030, there is the objective of creating the conditions for the allocation and installation of 2 GW through capacity auctions. Thereafter, and depending on the maturity of the procedures and projects to be carried out, new auctions could be conducted in a phased manner and new capacities allocated up to 10 GW.
Waves	The potential of wave energy in Portugal is recognised and pilot projects should be supported and extended to new areas. A technology is currently being tested in Portuguese waters and it is planned to create a wave energy park. In addition, *offshore offshore* areas have a relevant resource not only in wind, but also in wave energy, and are open to the installation of capacity in the respective technologies.
Hybrid systems	The promotion of hybrid systems will give more flexibility to the electricity system and resource efficiency, given the possibility of complementarity between energy sources (e.g. onshore wind/solar photovoltaic, offshore/wave wind), while maximising the use of grid connection capacity. The Portuguese legislation was updated in 2022 to provide a framework and legislative densification for hybridisation.
Coal	The *phase* out of coal-fired electricity generation, planned to take place by 2023, was completed in 2021 by closing the two plants operating in mainland Portugal – Pego and Sines.
Gas	Gas plays an important role in the transition to a renewable-based energy system. The use of fossil natural gas is expected to gradually reduce, in line with the objectives of the Climate Law, which provides for a ban on its use for the production of electricity from 2040, provided that security of supply is ensured. The use of natural gas of fossil origin may therefore be limited to *backup* situations of the electro-producer system. Blending of natural gas with renewable hydrogen and other renewable gases such as biomethane is also foreseen for the national gas system. A blending share of up to 10 % hydrogen in the National Gas Transmission Network (RNTG) by volume is considered conditional on demonstrating that the infrastructure associated with the transmission network and storage

	underground are capable of accommodating these hydrogen concentrations, as well as the legal and regulatory framework in force at national and European level, and up to 20 % in the National Gas Distribution Network (in line with the National Hydrogen Strategy currently in force, but which is also in the process of being revised, which may be revised). In addition, the Biomethane Action Plan 2024-2040 also provides for the possibility of substitution by biomethane of up to 18.6 % of gas consumption compared to the consumption values in the Public Gas Network (RPG) planned for 2030. This also ensures a partial decarbonisation of the national gas system and the development of renewable gas production that will enable the decarbonisation of some sectors, notably industry, where electrification is not technically or economically possible.
Gas oil and fuel oil	In particular in the archipelagos of Madeira and the Azores, even because of the isolation of the electricity grid of the various islands, small gas-fired thermoelectric power plants or fuel oil are still used for the production of electricity, ensuring their security of supply. Although the penetration of renewable energy in the electricity mix in the archipelagos of Madeira and the Azores is expected to increase by 2030, the use of these plants will still be necessary even beyond this time line. At the same time, and always ensuring the obligation to guarantee supply, it is intended to start tests for the incorporation of sustainable and alternative fuels, assessing their feasibility as a solution for the future.
Imports/exports	Except in years of exceptional circumstances, where it was a net exporter of electricity, Portugal has used net imports of electricity. This often stems from the market conditions favourable to imports, but also from the need to complete the dispatch in the national electricity system. It will be important for Portugal to gradually reduce import/export imbalances with Spain by 2030. This may already be possible with the planned increase in installed capacity in renewable energy and storage technologies, which requires an assessment of the design of the electricity market.

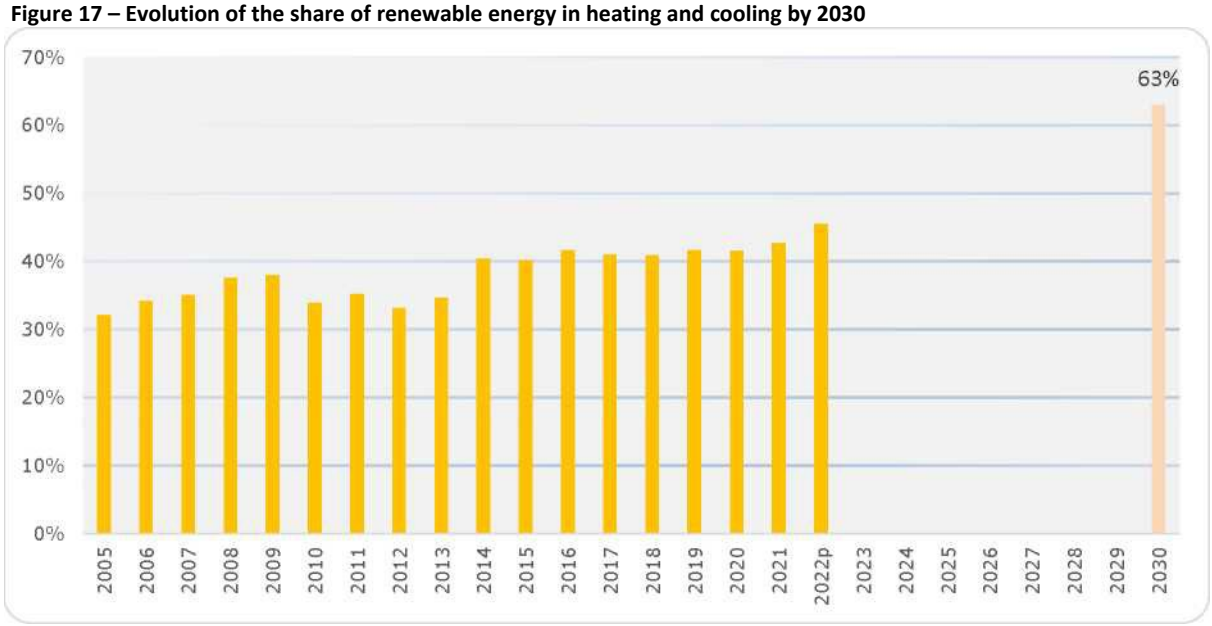
As regards electricity as an intermediate energy carrier, the present revision of the NECP presents important novelties. Although the production and use of renewable hydrogen was already planned, its role in the energy system is now strengthened and its production has to rely on significant amounts of renewable electricity. Thus, with regard to the use of electricity as an intermediate energy carrier, until 2030, in particular in the context of the production of renewable fuels, it refers specifically to:

Hydrogen electrolysis	In view of the hydrogen production targets of EN-H2 – National Hydrogen Strategy, electrolysers with 3 GW of net production capacity (output) should be installed by 2030. The power supply for such a capacity must not conflict with the normal operation of the national electricity system (i.e. for final uses). It is therefore necessary to install additional dedicated renewable electricity capacity, including *onshore* wind, *offshore* wind and solar photovoltaic, totalling around 8.6 GW of new dedicated installed capacity in 2030. This is a considerable effort, as it will amount to around 18 % of the total installed capacity for electricity generation.

Production and transport of renewable fuels and chemicals	In addition to the hydrogen itself, the production of renewable fuels of non-biological origin (RFNBO) is now advocated for the production of biofuels, such as methane, methanol, ammonia and even aviation kerosene, even if this is still envisaged on a small scale by 2030. The manufacture of these chemicals involves processes with exothermic reactions, with significant electricity consumption in the separation/capture of CO or CO_2. These activities must not conflict with the operation of the national electricity system.

As regards the heating and recycling sector, energy efficiency measures and electrification are considered relevant for reducing consumption and emissions, but have little impact on the renewables fraction. This may lead to difficulties in Portugal's compliance with the targets set, in particular as regards the share of renewable energy (increase by 0.8 %/year by 2025 and by 1.1 % per year between 2026 and 2030 under RED III[98]. However, given the expectation that renewable gases such as biomethane and renewable hydrogen could play a more important role by 2030, this perspective could change in the medium term. It should also be noted that, for the first time, it was possible to count the total contribution of heat pumps in gross final energy consumption, so at the modelling level it was possible to include in this Plan the data on heat pumps to the same extent as they were counted for the calculation of the contribution of renewables in gross final energy consumption in the heating and cooling sector, which explains the evolution compared to the historical (2005-2018) and projections for this sector.. However, given the expectation that renewable gases such as biomethane and renewable hydrogen could play a more important role by 2030, this perspective could change in the medium term. It should also be noted that, for the first time, it was possible to count the total contribution of heat pumps in gross final energy consumption, so at the modelling level it was possible to include in this Plan the data on heat pumps to the same extent as they were counted for the calculation of the contribution of renewables in gross final energy consumption in the heating and cooling sector, which explains the evolution compared to the historical (2005-2018) and projections for this sector.

Figure 17 – Evolution of the share of renewable energy in heating and cooling by 2030



Increasing the incorporation of renewables in the heating and cooling sector, and thus contributing to the achievement of the target for this sector, will include:

Biomass	The use of biomass for heating isolated residences (viSales) is still a common activity at national level, and has even been dominant over other options. However, the use of this type of solution has been reduced, partly as a result of urbanisation, and partly by the increased desirability of other technologies. For service buildings, the need for space heating justifies the use of biomass only in limited areas of the national territory with lower temperatures. The burning of biomass for space heating has recently undergone some recovery through the introduction of *pellet* systems, but to the detriment of fireplaces, heat-recuperated fireplaces and salamanders. However, it is important to ensure the biomass cascading principle, compliance with sustainability criteria and to ensure that the use of forest biomass is compatible with the sink targets set out in the LULUCF Regulation, and it is not important to promote a strong increase in biomass combustion, whether in urban or rural environments, also due to problems with air quality. With regard to the industrial environment, studies made with integrated energy system models indicate that also in this case the use of more sustainable biomass for heating, in particular forest residues, has limitations: most sustainable resources are already being used for cogeneration, and the rest is more important and economically advantageous to target advanced biofuels. There are currently small-scale cogeneration systems that can be used at service and industrial level, optimising the use of this resource. Thus, overall, the additional contribution of biomass to renewable heating targets is expected to be zero or even slightly positive.
High-efficiency cogeneration	High-efficiency cogeneration using renewable energy sources, in particular waste and waste from forest biomass, exists in some service buildings, but its use has been the most significant in industry. The pulp and paper sub-sector stands out by far with the use of sulphite liqueurs in integrated production processes. However, the evolution of biomass cogeneration is limited by the expected reduction in the availability of sustainable biomass waste, given the remaining priorities for use.
Renewable gases	The use of renewable gases is the main tool to increase the fraction of renewables in heating. There are two aspects to be considered: first, the introduction of renewable gases (hydrogen and biomethane) into the national gas system, in combination with natural gas. This is facilitated by the fact that the national gas system is relatively new, but still requires certain adaptations. Secondly, the aim is to promote the replacement of natural gas consumption with renewable hydrogen, mainly in industry. This should be possible through hydrogen transported to the site, via local hydrogen networks or preferably through local hydrogen production solutions near their consumption site, via electrolysis, powered by local RES capacity (in particular solar photovoltaic) or obtained from the PPA[25] electricity grid with guarantees of origin.
Geothermal	In 2021, the geothermal potential of Natural Mineral Waters (NMA) with a temperature above 25 °C was assessed in mainland Portugal. This assessment verifies whether most of the concessions studied have potential for geothermal exploitation of the NMA, either directly or through a support system, such as:

[25] PPA – *Power Purchase Agreement*

	by means of geothermal heat pumps, and in the coming years there may be greater use of geothermal resources, the potential of which is underused. In addition, the concessionaires of Caldas de Chaves and Termas de S. Pedro do Sul (CM Chaves and CM S. Pedro do Sul) have developed urban geothermal heat networks which will meet much of the thermal needs of various hotel units and service buildings. These networks are expected to come into operation still in 2024 and still have potential for expansion in relation to the available resource.
Heat pumps	The second largest contribution to the increase of the fraction of renewables in Heating and Repair is expected to come from heat pumps. For example, there has been an increasing demand for surface geothermal systems (geothermal heat pump), the reliability and availability of which makes it possible to meet the needs of residential buildings and services, and possibly to produce cold and industrial heat. The greatest contribution of this technology is expected to come from the air-conditioning and production side of Sanitary Quick Water (AQS) in buildings. In general, there should be an improvement in the average efficiencies of the *stock* of HVAC equipment. The relevant factors are: climate change, pushing for less heating and cooling needs, saturation of the *stock* of equipment in service buildings, the rapid growth observed in the *stock* of residential buildings, which is estimated to continue until 2030, and lower air-conditioning needs in new and renovated buildings (to the point that they can be zero). However, considering that many of these equipment contain F-gases, priority should be given to equipment containing natural refrigerants.
Solar Thermal	Solar thermal is one of the most competitive solutions for the preparation of AQS, given the high solar resource in Portugal, low temperature variations to be won, and high optical efficiency. However, other technologies, such as biomass boilers, heat pumps, and more recently solar photovoltaic heat pumps, have also become or have become more competitive. In this context, it is important to note that energy analyses show that only*backup*electric solar systems should be promoted. In the case of industry, despite the merit of isolated experiments in recent decades, solar thermal has never developed, and this situation is not expected to evolve. There are obstacles to intermittent operation, process temperatures that can be met, and the need to maintain in any way a *backup* system that will have to fully cater for heating demand. The same applies to the use of solar thermal for space heating/air-conditioning in buildings, which is not effective in Portugal.
Thermal Networks Urban	Urban thermal networks present a difficulty in their implementation in Portugal, as shown by the studies required by Article 14 (1) EED. Heating or cooling needs in residential buildings are low due to the mild climate and also the construction density is too low. Occasionally, in thermal areas, urban networks based on geothermal are expected to be implemented or expanded, mainly targeted at the hotel sector, which has constant thermal needs throughout the year, with a minor but growing contribution, contributing to the objectives of the Heating and Repair sector.

For the transport sector, a focus on sustainable mobility and decarbonisation of energy consumption is envisaged through the promotion and enhancement of public transport, complementarity and modal linkage, the promotion of electric mobility, complemented by the promotion of sustainable biofuels and renewable fuels of non-biological origin, including renewable hydrogen, and the promotion of more energy efficiency measures and active mobility solutions.

In line with Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU (AFIR Regulation), Member States will have to review the National Action Framework (NAF) for the development of the alternative fuels market in the transport sector and for the deployment of the necessary infrastructure, which should include the targets set out in that Regulation for electric recharging and hydrogen refuelling infrastructure for road mode, shore-side electricity supply in maritime and inland ports, and electricity supply for stationary aircraft.

On 6 September 2024, Order No 10559/2024 of the Office of the Minister for Infrastructure and Housing and the Office of the Minister for the Environment and Energy was published on the establishment of the AFIR Working Group on the deployment of alternative fuels infrastructure under Regulation (EU) 2023/1804.

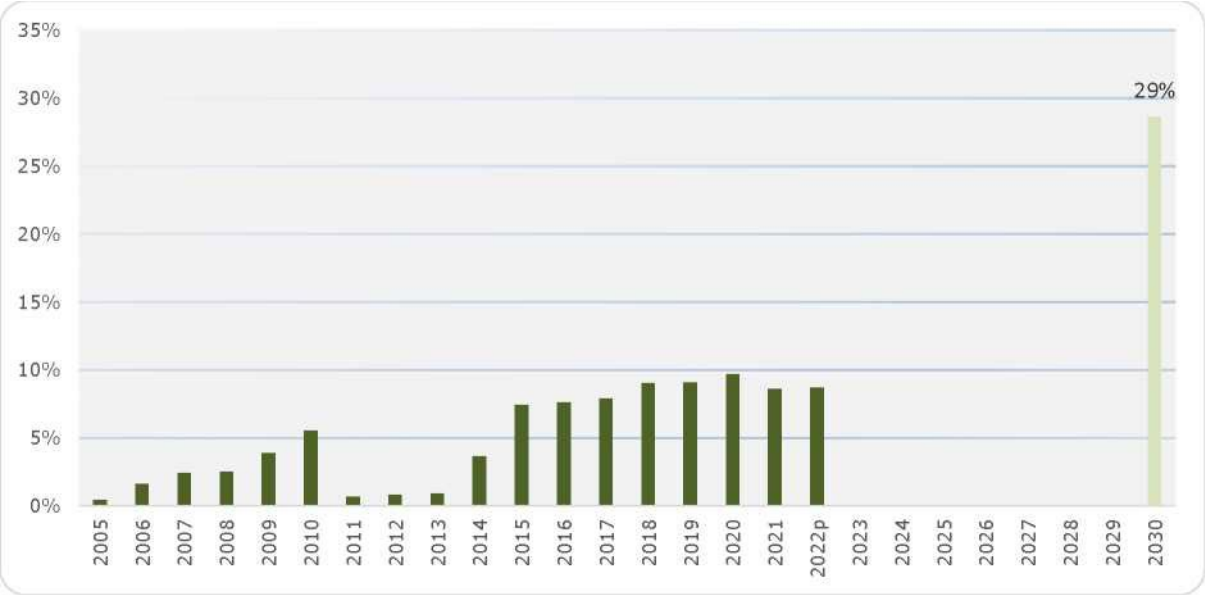
In line with the EU's objective of achieving climate neutrality by 2050 at the latest, reference should also be made to Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels (ex: biofuels and RFNBOs) in maritime transport and amending Directive 2009/16/EC (FuelEU Maritime), which aims to impose a limit on the greenhouse gas intensity of the energy used on-board by a ship arriving in, staying in or departing from ports under the jurisdiction of a Member State, as well as the obligation to use electricity supplied from the land-based network or using zero-emission technologies in ports under the jurisdiction of a Member State.

Furthermore, Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation) aims to establish minimum shares for the supply of sustainable aviation fuels (SAF, and the ESAF synthetic).

In addition, Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September on the uptake of new fuels and emission reductions in maritime transport provides for the adoption of emission reduction measures by 2050 and the uptake of low-carbon fuels. In addition, Portugal is working on the proposal to submit to the International Maritime Organisation (IMO) the establishment of a Low-Emission Control Area (ECA), which has a geographical coverage of the entire mainland coast up to 200 nautical miles. It aims to reduce emissions of: SOx, NOx and particulate matter. The Low-Emission Control Area will be submitted to the IMO in 2025 and is expected to be fully implemented after two years after submission.

Itis also worth mentioning the agreement reached in early 2024 between the European Parliament and the Council on the revision of Regulation (EU) 2019/1242 of the European Parliament and of the Council of 20 June 2019 by strengthening the CO2 emission performance standards for new heavy-duty vehicles. The scope of the Regulation is broadened and these rules apply to almost all lorries, city buses, long-distance buses and trailers, ensuring that this segment contributes to zero-emission mobility. This agreement thus reinforces the commitment of the road transport sector in line with the important revision of the CO2 emission performance standards for new passenger cars and commercial vehicles laid down in Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023.

Figure 18 – Evolution of the share of renewable energy in transport by 2030



The figure to be achieved in 2030 corresponds to the contribution to the overall national renewable energy share target, which is the contribution to the overall EU target.

Decarbonisation in the transport sector will thus involve the use of different sources of energy alternative to conventional fossil fuels, such as electricity, renewable fuels of non-biological origin and biofuels. For example, the use of rich sustainable biofuel blends in heavy-duty vehicle fleets or heavy-duty modes will be an interesting measure to promote GHG reduction in sectors where electrification is more challenging, such as long-distance transport, and the incorporation of sustainable biofuels could lead to savings of between 50 % and 90 % compared to the fuel they aim to replace.

Increasing the incorporation of renewables in the transport sector and thus ensuring that the target for this sector is met will include:

Electric mobility	Electric mobility, with a particular focus on road transport, will be key to ensuring the progressive replacement of fossil fuels and promoting greater incorporation of renewable sources into energy consumption. To this end, the introduction of electric vehicles and enhanced charging infrastructure at the various levels will be promoted and supported, and bidirectionality and smart charging will be promoted, as called for in the AFIR Regulation.
Sustainable biofuels, Renewable hydrogen and other renewable fuels of non-biological origin	Sustainable biofuels, in particular advanced biofuels, renewable hydrogen and other renewable fuels of non-biological origin, are alternative and complementary solutions to electric mobility, in particular for long-distance road heavy goods transport, heavy duty road and rail passenger transport, maritime and aviation, to leverage the decarbonisation of consumption and promote increased consumption of renewable energy sources.

However, the focus on sustainable mobility and decarbonisation of transport is not limited to technological innovation, with the use of more sustainable alternative energy sources. Promoting the use of collective transport and active mobility to the detriment of individual transport, for example by strengthening public transport or creating the necessary infrastructure and conditions for active and shared mobility solutions, is also an important decarbonisation and energy efficiency measure to be pursued.

Transport is one of the main energy consuming sectors and has proven to be a challenging area in decarbonising and

introducing alternative energy sources. Therefore, this sector should increasingly be a priority sector in defining policies and measures to decarbonise them, always bearing in mind that this sector is a cross-cutting and sensitive sector, impacting on almost all other sectors of activity and thus reflecting the competitiveness of the economy.

III. Estimated trajectories by renewable energy technology that the Member State plans to use to meet the overall and sectoral trajectories for renewable energy between 2021 and 2030 23

In view of the scenario envisaged for the evolution of the power generation sector in Portugal, the following table illustrates the expected evolution of installed capacity, broken down by technology, for the purposes of achieving the targets set for this sector and with impacts on other sectors.

Table 11 – Prospects of evolution of installed capacity for electricity generation by technology in Portugal by 2030, based on planned policies and measures – WAM Scenario

(GW)	**2025**	**2030**
Water	**8,1**	**8,1**
of which pumped	3,6	3,9
Wind *	**6,3**	**12,4**
Onshore wind	6,3	10,4
Offshore wind	0,03	2,0
Solar Photovoltaic *	**8,4**	**20,8**
of which centralised	6,1	15,1
of which decentralised	2,8	5,7
Concentrated Thermal Solar* *	**0**	**0**
Biomass/Biogas and Waste	**1,3**	**1,3**
Geothermal	**0,1**	**0,1**
Waves	**0**	**0,2**
Natural Gas	**4,8**	**3,5**
Petroleum products	**0,6**	**0,5**
Storage (Batteries)	**0,5**	**2,0**
TOTAL	**31**	**48**

* Includes installed capacity for hydrogen production.

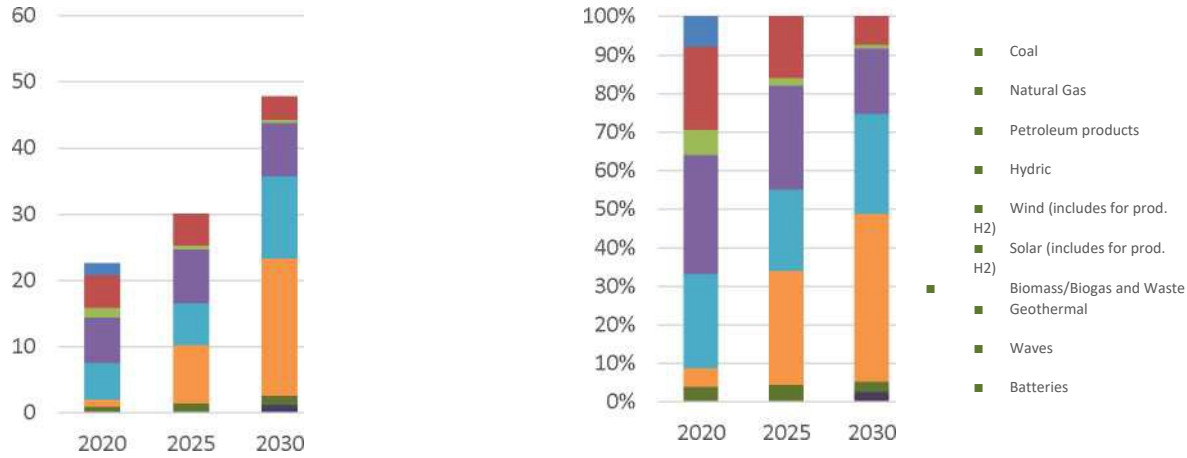
* * this technology is identified in 2040, where an installed capacity of 600 MW is expected

The increase in installed capacity for electricity generation between 2020 and 2030 reflects the decarbonisation of the electricity generation system and seeks to meet the electricity needs arising from electrification in general and in particular from the development of the green industry in Portugal. The outlook for the evolution of installed capacity, in particular offshore wind and wave capacity, will lead to the achievement of the indicative target for innovative renewable energy technologies of at least 5 % of the new renewable energy capacity installed by 2030, as set out in REDIII.

23Including expected gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) by technology and sector in MW.

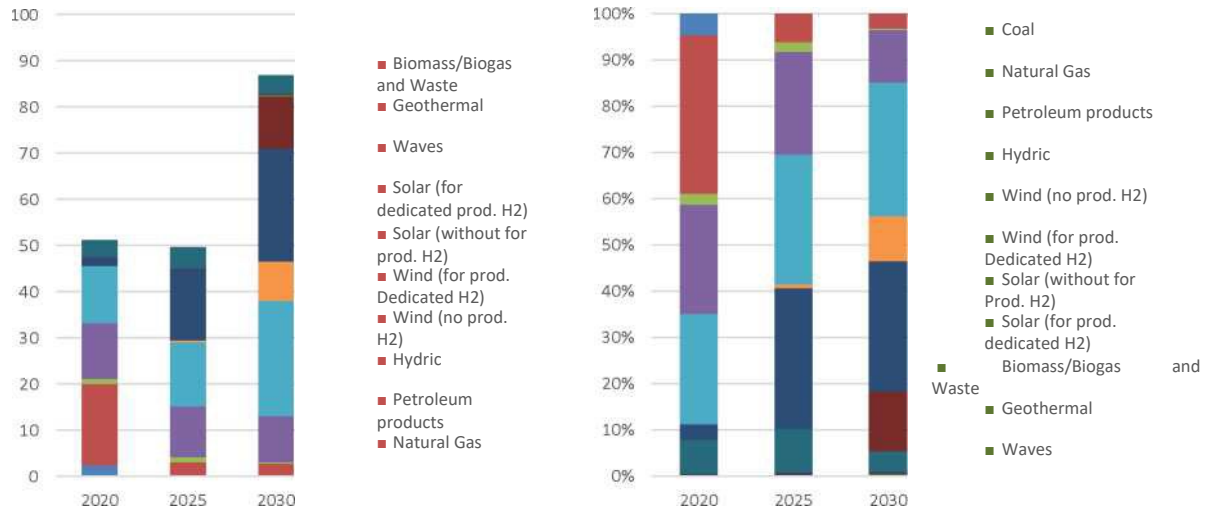
In this context, strong industrial development is expected in Portugal, which is reflected in particular in the existence of H2 production capacity through electrolysis in the order of 3 GW (output), to which the electricity consumption of the rest of the industry dedicated to digitalisation and energy transition will be added. In this green industrialisation scenario in the country, the order of magnitude of electricity consumption is expected to be close to 90 TWh.

Figure 19 – Estimated installed capacity for electricity generation by technology in Portugal over the horizon 2030, based on planned policies and measures – WAM Scenario (GW)



It is expected that 96 % of the electricity produced in the Portuguese electro-generating system will be of renewable origin in 2030 (counting electricity for H2 production), with a focus on wind with around 40 % and solar with around 42 %, which will be the technologies that will show the highest growth in the next decade.

Figure 20 – Estimated evolution of electricity generation by technology in Portugal towards 2030, based on planned policies and measures – WAM Scenario (TWh)



In view of the scenario envisaged for the evolution of the heating and cooling sector in Portugal, the following table illustrates the expected development broken down by technology and energy source for the 2030 horizon for the purpose of meeting the targets set for this sector.

Table 12 – Outlook for the evolution of renewable consumption in heating and cooling by technology in Portugal by 2030, based on planned policies and measures – WAM Scenario

(ktoe)	**2025**	**2030**
Biomass	846	893
Heat pumps	941	1241
Heat by solar thermal	132	184
Heat from cogeneration	550	547
Renewable gases	0	162
TOTAL	**2 470**	**3 026**

In view of the scenario envisaged for the development of the transport sector in Portugal, the following table shows the expected evolution, broken down by energy source, for the 2030 horizon, in order to meet the targets set for this sector.

Table 13 – Outlook for the evolution of renewable consumption in transport by technology in Portugal by 2030, based on planned policies and measures – WAM Scenario

(ktoe)	**2025**	**2030**
Biofuels 1st generation	52,9	58,0
Advanced biofuels	347,5	365,4
Renewable hydrogen	1,1	19,1
Electricity	122,6	273,7
TOTAL	**524,2**	**716,3**

iv. Estimated trajectories on bioenergy demand, disaggregated between heat, electricity and transport, and on biomass supply by feedstocks and origin (distinguishing between domestic production and imports). For forest biomass, an assessment of its source and impact on the LULUCF sink

The demand for bioenergy is broken down in the following table.

Table 14 – Prospects for the evolution of bioenergy demand in Portugal towards 2030, based on policies and planned measures – WAM Scenario

(ktoe)	**2025**	**2030**
Electricity	821	668
Heating and Repair	846	893
Transportation	400	423
TOTAL	**2 068**	**1 984**

v. Other national trajectories and objectives, including long-term or geographicaltrajectories[27]

Not applicable.

2.2. Energy Efficiency Dimension

The new Energy Efficiency Directive (EU) 2023/1791 (EED), adopted by Parliament and the European Council on 13 September, introduced changes to the regulatory framework, in particular to Regulation (EU) 2023/955 in its recast version.

The new Directive sets a legally binding target where Member States collectively ensure a reduction in final energy consumption of at least 11.7 % in 2030 compared to the 2020 EU Reference Scenario 2020 (REF2020) so that the Union's final energy consumption in 2030 does not exceed 763 Mtoe. In terms of the Union's primary energy consumption, Member States shall collectively commit to an indicative target of no more than 992,5 Mtoe in 2030.

1.1 Indicative national energy efficiency contribution to meet the Union's 203[28] energy efficiency target

The recast Energy Efficiency Directive mentioned above requires Member States to set an indicative national energy efficiency contribution based on final energy consumption in order to meet collectively the Union's binding final energy consumption target. In the case of Portugal, the methodology set out in Annex I to the Directive indicates a final energy consumption value not exceeding 14 371 ktoe in 2030. When submitting updates of their NECPs, Member States should also express their contributions in terms of absolute level of primary energy consumption, resulting in a value not exceeding 16 711 ktoe in 2030.

It also follows from the new EED in its Article 5 that Member States must ensure that the total final energy consumption of all public bodies combined is reduced by at least 1.9 % per year compared to 2021.

Just as Portugal demonstrates a high level of ambition and determination to be at the forefront of the energy transition through a strong commitment to renewable energy, energy efficiency also plays an important role by 2030, which is the cornerstone of European energy policy – 'energy efficiency first'.

Table 15 – Indicative national energy efficiency contribution to the Union's 2030 energy efficiency target (in non-energy use primary energy consumption)

	Baseline 2020 (Updated 2020 EU Reference Scenario)	**Target 2030** (Considering the updated 2020 EU Reference Scenario) [29]
Primary energy consumption target – target value (ktoe)[30]	19 444 ktoe	16 711 ktoe

[27] for example, the share of renewable energy in district heating networks, the use of renewable energy in buildings, renewable energy produced by cities, renewable energy communities and renewables self-consumers, energy recovered from sludge obtained from wastewater treatment

[28] target referred to in Article 1(1) and Article 4(2) of Directive (EU) 2023/1791 based on primary and final energy consumption

[29] % reduction in energy consumption and target value (ktoe) calculated according to the methodology provided by the European Commission and identified in Directive (EU) 2023/1791 on Energy Efficiency

[30] excluding non-energy uses

Figure 21 – Indicative outline for the indicative national energy efficiency contribution to the achievement of the Union's 2030 energy efficiency target (in non-used primary energy consumption) energy) [Source: DGEG]

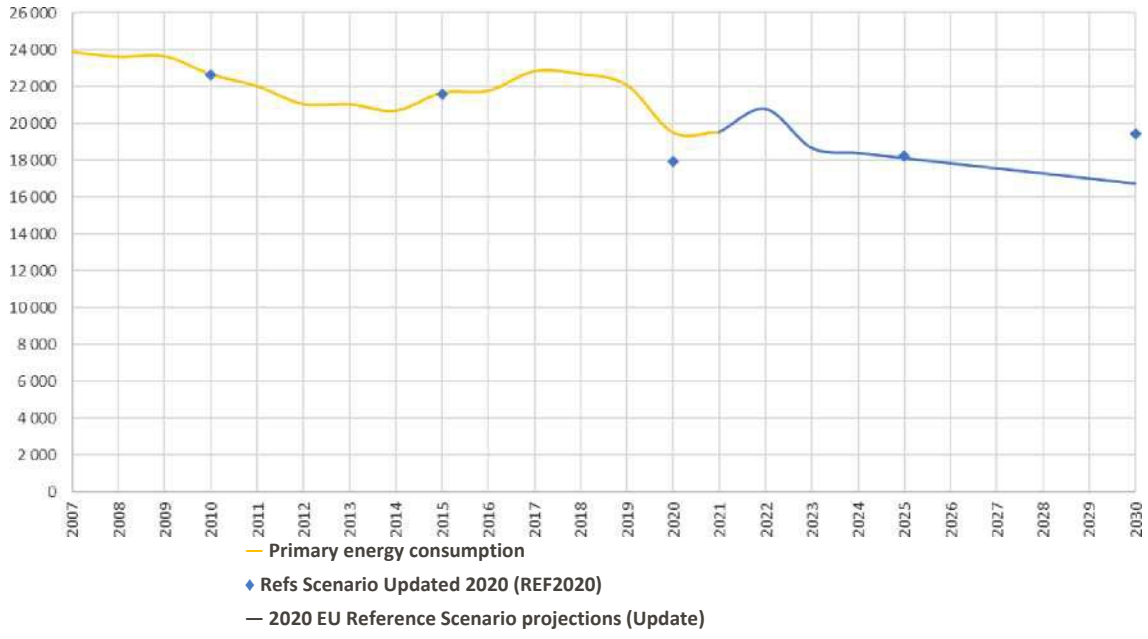


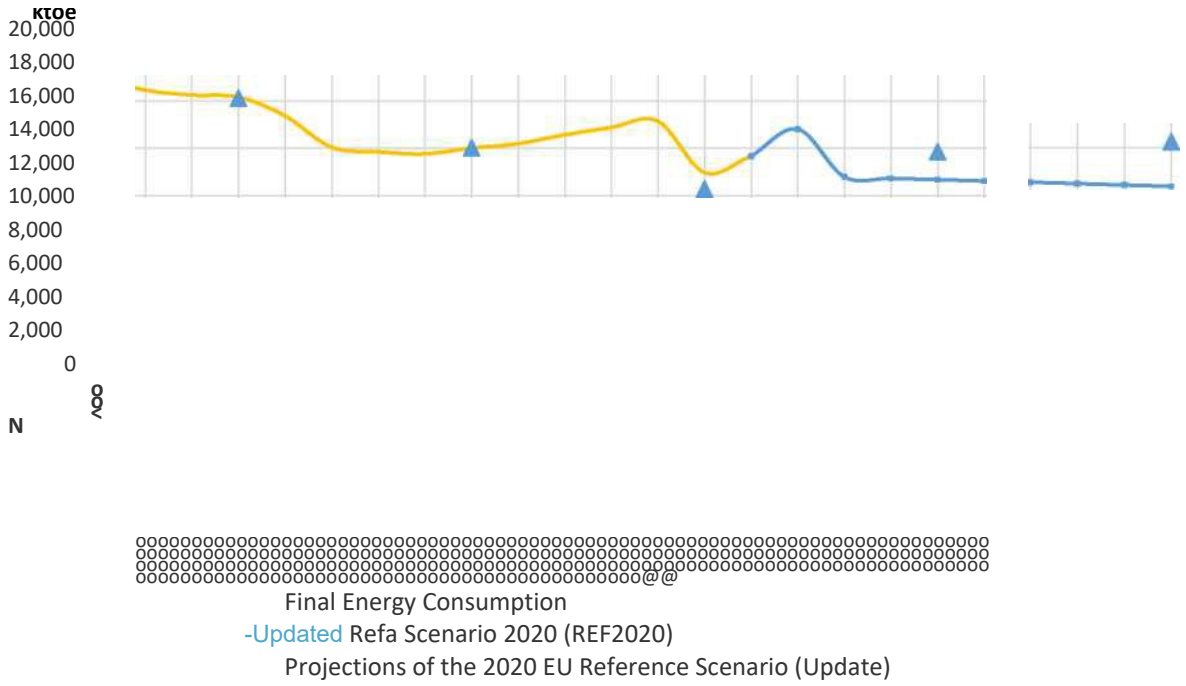
Table 16 – Indicative national energy efficiency contribution to the Union's 2030 energy efficiency target (in non-energy final energy consumption)

	Baseline 2020 (Updated 2020 EU Reference Scenario)	**Target 2030** (Considering the updated 2020 EU Reference Scenario) 24
Final energy consumption target – target value (ktoe) 25	16 252 ktoe	14 371 ktoe

24 % reduction in energy consumption and target value (ktoe) calculated according to the methodology provided by the European Commission and identified in Directive (EU) 2023/1791 on Energy Efficiency

25Excluding non-energy uses

Figure 22 – Indicative path for the indicative national energy efficiency contribution to the Union's 2030 energy efficiency target (in non-energy final energy consumption) [Source: DGEG]



1.2 . Cumulative amount of energy savings to be achieved in the period 2021-2030 26

It follows from Article 8 of the EED that all Member States are required to achieve cumulative final energy savings, equivalent to new annual savings, from 1 January 2021 to 31 December 2023, of 0.8 % of the average annual final energy consumption of the last three years prior to 1 January 2019, rising to 1.3 % from 1 January 2024 to 31 December 2025, to 1.5 % from 1 January 2026 to 31 December 2027, and to 1.9 % from 1 January 2028 to 31 December 2030. To this end, the average final energy consumption for the years 2016 to 2018 was taken into account, thus calculating the value of savings which is also a target to be achieved, as regards the implementation of Article 8 of the EED revision proposal. This target has to be achieved by achieving energy savings through the implementation of energy efficiency obligation schemes as referred to in Article 9 or by adopting alternative policy measures referred to in Article 10 or a combination of both.

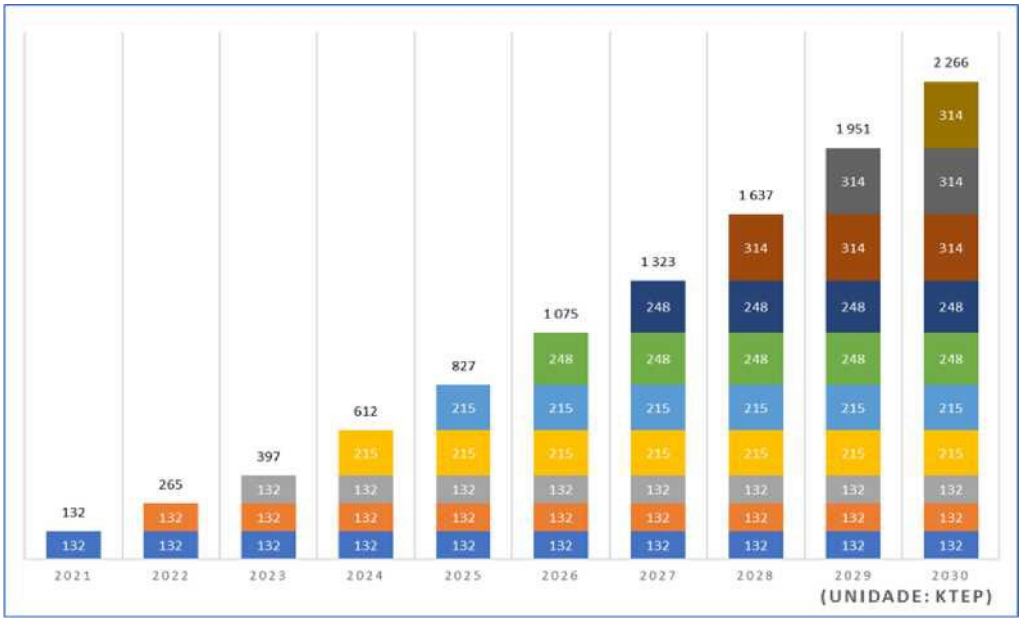
Table 17 – Target for final energy savings/savings – Article 8 EED

	2020	**2030**
Final energy savings according to Article 8 of Directive 2023/1791 – ktoe	n.a.	10 484

The figure below illustrates the cumulative energy savings to be achieved in the period 2021-2030 by virtue of the article.
Article 8 of the Directive.

26Under Article 8 of Directive (EU) 2023/1791

Figure 23 – Cumulative amount of energy savings to be achieved in the period 2021-2030 stemming from Article 8 of Directive (EU) 2023/1791 [Source: DGEG]



Ensuring that energy efficiency targets and objectives are met will include:

Renovation of buildings	Rehabilitating and making buildings more efficient makes it possible to achieve multiple objectives, such as reducing energy bills, improving comfort and indoor air quality, which is why the energy renovation of the existing building stock is of particular relevance and priority. To this end, under Directive (EU) 2024/1275 on the*Energy Performance of Buildings Directive*, the Member States are to draw up a National Building Renovation Plan, including a new model for the energy certificate and the introduction of the zero emission*buildings* concept. It will therefore become essential to revise the SCE, adjusting it to the requirements of the new EPBD, in particular with regard to the energy efficiency targets it contains, and the renovation of the existing building stock, including the decarbonisation of space heating, which involves the redesign of financing/support mechanisms for the renovation of buildings and the implementation/implementation of the Long Term Strategy for the Renovation of Buildings.
Mobility and Transport	The path towards energy transition and carbon neutrality undeniably lies with the transport sector. A combination of active and shared mobility, strengthening public transport, electric mobility and active mobility can promote significant gains in energy efficiency in transport.
Industry	Promoting the decarbonisation of the industry sector involves electrifying thermal processes, in particular those with temperatures below 200 °C, focusing on energy and material efficiency, inter alia, reducing resource use, and promoting the circular economy, optimising as much as possible the energy, water and material efficiency *nexus* at the level of production processes, while ensuring increased productivity and competitiveness.
Agroforestry	In this sector there are opportunities to promote the implementation of energy efficiency measures for the rational use of energy and resources. In the

	meaning, the aim is to promote more efficient agricultural and forestry practices, the acquisition and use of management tools and the installation and use of more efficient
Equipments	The replacement of inefficient electrical equipment with more efficient electrical equipment, in the domestic and service sectors and also in industry, plays a significant role in energy consumption. It is therefore important to promote the replacement of equipment and make the current equipment park more efficient, finding synergies with Ecodesign.

Additional indicators considered relevant for the monitoring of energy efficiency policies and measures are presented below.

Table 18 – Monitoring indicators for energy efficiency

Indicator	2022	Unit	Objective
Energy intensity of primary energy savings	101	toe/MEUR (GDP)	4
Energy intensity of final energy savings	78	toe/MEUR (GDP)	4
Energy intensity in industry	120	toe/MEUR (GVA)	4
Energy intensity in Agriculture and Fisheries	126	toe/MEUR (GVA)	4
Intensity class no Transportation	28	toe/MEUR (GVA)	4
Household energy intensity	22	toe/MEUR (GVA)	4
Energy intensity in services	17	toe/MEUR (GVA)	4
Final energy consumption *per capita*	1,6	toe/inhabitant	4
Consumption from electricity NA	1 030	GWh	4

1.3 The indicative targets of the long-term strategy for the renovation of the national stock of residential and non-residential buildings, both public andprivate 27

By Resolution of the Council of Ministers No 8-A/2021 of 3 February 2012, the Portuguese Government approved the Long Term Strategy for the Renovation of Buildings (ELPRE), which aims to meet European and national objectives to achieve carbon neutrality and promote energy efficiency in existing buildings, with a view to transforming them into NZEB (*Near Zero Energy Building)* buildings.

In this strategy, the investment needed by 2050, with prices for 2020, to deliver the proposed improvement packages is estimated at EUR 143.492 billion, with a larger share earmarked for the renovation of the residential building stock of EUR 110.078 billion, compared with EUR 33.414 billion in the stock of non-residential buildings.

The LTRS target is to achieve primary energy savings of 11 % by 2030 and 34 % by 2050, and to reduce the number of hours of discomfort in housing by 26 % by 2030 and by 56 % by 2050. The total area renovated is expected to be around 364 million square metres in 2030 and 748 million square metres in 2050.

Following the publication of the revision of Directive (EU) 2024/1275 on the energy performance of buildings, a National Plan for the Renovation of Buildings is planned to be drawn up, with the first project to be submitted to the

27Pursuant to Article 2a of Directive 2018/844, which revised Directive 2010/31/EU on the energy performance of buildings

Commission by 31 December 2025 and its final version to be delivered by 31 December 2026.

Table 19 – Objectives for residential buildings with respect to 2018

	2030	
Percentage of primary energy savings	15 %	777,0 ktoe
Percentage of final energy savings		462,5 ktoe
Area to be involved (m^2)	299 524 729	
Investment (EUR M) – figures 2020	26 760	

Table 20 – Objectives for non-residential buildings with respect to 2018

	2030	
Percentage of primary energy savings	7 %	226,6 ktoe
Percentage of final energy savings		134,9 ktoe
Area to be involved (m^2)	64 155 772	
Investment (EUR M) – figures 2020	18 500	

ECO.AP 2030, the Resource Efficiency Programme in Public Administration for the period up to 2030, approved by Resolution of the Council of Ministers No 104/2020 of 24 November, aims to promote the decarbonisation and energy transition of the activities carried out by the State by contributing to the targets for greenhouse gas reduction, energy, water and material consumption, the incorporation of renewables into gross final energy consumption, set at national level for 2030, and to promote the efficient management of these resources in the public administration, setting as a target the rehabilitation and improvement of 5 % of the buildings covered by ECO.AP.

1.4 Total building area to be renovated or equivalent annual energy savings to be achieved from 2020 to 2030 on the exemplary role of public bodies' buildings

Despite the potential primary energy savings in public buildings, which LTRS will prioritise when implementing policy packages in non-residential buildings, it is in private buildings that cumulative primary energy savings will be greater, more specifically, in buildings for commerce.

Table 21 – Savings for the total park according to LTRS

Type of building	Climate zone	Construction period	Primary energy savings (2050) (kWh/m^2)	Primary energy saving (2050) Total building stock (Mtoe)
Single-family	I1	< 1960	24,0	0,06

Type of building	Climate zone	Construction period	Primary energy savings (2050) (kWh/m²)	Primary energy saving (2050) Total building stock (Mtoe)
	I2	< 1960	24,0	0,05
	I3	< 1960	45,3	0,02
	I1	1961-1990	17,2	0,07
	I2	1961-1990	27,6	0,13
	I3	1961-1990	47,8	0,03
	I1	1991-2005	16,4	0,05
	I2	1991-2005	24,5	0,09
	I3	1991-2005	39,4	0,02
	I1	2006-2016	7,0	0,01
	I2	2006-2016	0,7	0,01
	I3	2006-2016	13,7	0,00
	I1	> 2016	5,6	0,00
	I2	> 2016	5,5	0,00
	I3	> 2016	7,4	0,00
Multi-family	I1	< 1960	17,1	0,03
	I2	< 1960	19,4	0,00
	I3	< 1960	27,4	0,00
	I1	1961-1990	16,8	0,14
	I2	1961-1990	19,5	0,03
	I3	1961-1990	28,1	0,00
	I1	1991-2005	18,3	0,11
	I2	1991-2005	21,0	0,04
	I3	1991-2005	30,1	0,00
	I1	2006-2016	14,5	0,02
	I2	2006-2016	15,5	0,00
	I3	2006-2016	25,1	0,00
	I1	> 2016	9,5	0,00
	I2	> 2016	13,3	0,00
	I3	> 2016	10,6	0,00
Public – Other	I1	— —	24,3	0,01
Private – Trade	I1	— —	34,7	0,29
Public – Education	I1	— —	19,9	0,01
Private – Office	I1	— —	17,5	0,08
Private – Hotelaria	I1	— —	22,6	0,08
Private – Residence	I1	— —	25,3	0,03
Public – Health	I1	— —	55,1	0,06
Public – Sport	I1	— —	52,1	0,03

1.5 Theindicative milestones for 2030, 2040 and 2050, the measurable progress indicators set at national level, an evidence-based estimate of expected energy savings and overall benefits, and their contributions to the Union's energy efficiency targets as set out in the roadmaps set out in the long-term renovation strategies for the national

stock of residential and non-residential buildings (private and public)[35]

Under LTRS, a set of objectives for horizons 2030, 2040 and 2050 has been established. These objectives set out the path of progress to be achieved by implementing the packages of improvement measures to be achieved in the stock of existing buildings in terms of expected impact as well as necessary funding.

The objectives shall be established on the basis of the following result indicators:

- Percentage of primary of energy savings;
- Percentage of local renewable energy;
- Percentage of total renewable energy;
- Percentage reduction of GHG emissions in the residential and services sector;
- Renovated building area (m^2);
- Percentage of buildings renovated (with respect to existing buildings in 2018);
- Percentage reduction in of hours of discomfort in housing;
- Investment in improvement measures (EUR 2020/m^2);
- Energy savings (EUR 2020/m^2).

The following tables show, compared to 2018, the targets for the stock of residential buildings, for the stock of non-residential buildings and for the total building stock.

Table 22 – Objectives for residential buildings with respect to 2018

Indicator	2030	2040	2050
Percentage of primary energy savings	15 %	37 %	40 %
Percentage of local renewable energy	10 %	35 %	73 %
Percentage of total renewable energy	57 %	62 %	98 %
Percentage of reduction in CO_2 emissions	16 %	56 %	85 %
Renovated building area (m^2)	299.524.729	513.059.967	514.265.282
Percentage of renovated buildings	70 %	100 %	100 %
Percentage reduction in hours of discomfort	26 %	34 %	56 %
Weighted average investment ($EUR_{2020\ per}m^2$)	82	165	258
Savings ($_{EUR}2020/m^2$)	88	191	279

Table 23 – Objectives for non-residential buildings with respect to 2018

Indicator	2030	2040	2050
Percentage of primary energy savings	7 %	15 %	28 %
Percentage of local renewable energy	11 %	25 %	54 %
Percentage of total renewable energy	78 %	87 %	97 %
Percentage of reduction in CO_2 emissions	15 %	37 %	68 %
Renovated building area (m^2)	64.155.772	122.577.719	233.687.788
Percentage of renovated buildings	27 %	52 %	100 %
Percentage reduction in hours of discomfort	N/A	N/A	N/A
Weighted average investment ($EUR_{2020\ per}m^2$)	81	145	155
Savings ($_{EUR}2020/m^2$)	137	240	447

Table 24 – Objectives for total building stock with respect to 2018

Indicator	2030	2040	2050
Percentage of primary energy savings	11 %	27 %	34 %
Percentage of local renewable energy	11 %	30 %	63 %
Percentage of total renewable energy	68 %	75 %	98 %
Percentage of reduction in CO_2 emissions	15 %	47 %	77 %
Renovated building area (m^2)	363 680 501	635 637 685	747 953 071
Percentage of renovated buildings	69 %	99 %	100 %
Percentage reduction in hours of discomfort	26 %	34 %	56 %
Weighted average investment ($EUR_{2020\ per}m^2$)	82	164	256
Savings ($_{EUR}2020/m^2$)	89	192	283

The results of simulations and the implementation of the abovementioned policy packages suggest cumulative primary energy savings of 40 % in residential buildings by 2050, and 28 % in non-residential buildings, totalling 34 % with regard to all existing buildings to date.

The residential sector has the potential to achieve significant savings mainly due to the replacement of space heating and AQS systems by more efficient ones (e.g.: solar thermal, heat pumps or surface geothermal) and reduced needs by acting on the envelope. In the non-residential sector, savings are lower as existing equipment (mostly heat pumps and chillers) are already efficient to some degree and as such, replacement with new equipment will have less impact.

As far as the uptake of local renewable energy systems is concerned, it is solar photovoltaic panels in non-residential buildings that are most prominent and on which this measure is quite attractive (both in terms of the potential for reducing CO_2 emissions and in terms of the relationship between investment and savings generated). In this specific indicator, it has been estimated that by 2050, around 63 % of energy consumption by all buildings will be produced locally through photovoltaic panels (using batteries) to supply electricity, or through solar thermal panels and biomass systems to supply DHW.

With the significant electrification of systems planned up to 2040, any electricity which is not produced locally is expected to be almost exclusively renewable (90 % to 95 % penetration of renewable energy at source is expected by 2050). Since the simulation model considered that 100 % of the stock of existing buildings in 2018 would be rehabilitated by 2050 (even if several packages of measures are implemented in different stages), in combination with the estimated results for local and source energy production (98 % of total renewable energy), it can be concluded that LTRS aligns with the set objectives of creating a decarbonised, high-energy efficient building stock with existing NZEB buildings.

Taking into account that thermal comfort was established as a priority criterion in the renovation of the existing residential stock, with the roadmap and established packages of measures, a reduction in hours of discomfort can be observed by 56 % of the year, highlighting a positive development in the peak of minimum housing temperature from 10 °C to 16 °C in the worst case scenario, contributing to the set of co-benefits and promoting the fight against energy poverty.

With regard to the analysis of the economic impact, it can be concluded that overall cumulative energy savings over 30 years are always higher than the required investment, for both residential buildings (where the return on investment is low, although positive) as well as non-residential buildings (where the return on investment is quite high). Accordingly, in order to achieve the described packages of measures for the entire building stock, the total investment required by 2050 should be around EUR 256 2020/m² for an expected energy saving of EUR 283 2020/m².

III. Other national objectives, including long-term targets or strategies and sectoral targets and national objectives in areas such as energy efficiency in the transport sector and in relation to heating and cooling

Not applicable.

2.3 energy Security Dimension

Since February 2022, the Russian military aggression against Ukraine has exposed the EU's high dependence on fossil fuel imports from Russia. In particular, there has been a reduction in Russian gas flows through various pipelines serving Europe, contributing to lower levels of security of supply in the EU. In this context, with a view to increasing the security of energy supply, including with regard to reducing dependence on Russian fossil fuels, while accelerating the energy transition, the European Commission has put forward a set of instruments and measures, in particular those set out in the 'REPowerEU' and 'Save gas for a safe winter' communications, and in the following regulations:

- **Regulation (EU) 2022/1032** of the European Parliament and of the Council of 29 June 2022 on gas storage, introducing filling targets and trajectories for underground gas storage facilities through amendments to Regulation

(EU) 2017/1938, seeking to ensure that the European Union increases its level of preparedness to face the winter when gas consumption is highest, as well as a certification procedure for storage system operators through amendments to Regulation (EC) No 715/2009.

Portugal has reported to the European Commission on a monthly basis the evolution of the filling level observed in the Carriço Underground Storage and the Sines LNG Terminal.

- Council**Regulation (EU) 2022/1369** of 5 August 2022 on coordinated demand-reduction measures for gas, which requires MSs to reduce, on a voluntary basis, between 1 August 2022 and 31 March 2023, their gas consumption by at least 15 % compared to the average consumption over the same period of the preceding five consecutive years. This Regulation was amended by Council Regulation (EU) 2023/706 of 30 March as regards the extension of the gas demand reduction period, extending that period by one year until 31 March 2024, and the enhanced reporting and monitoring of the implementation of those measures. The Council Recommendation of 25 March 2024 on the continuation of coordinated demand-reduction measures for gas encourages Member States to continue reducing their gas consumption between 1 April 2024 and 31 March 2025 by at least 15 % compared to their average gas consumption in the period from 1 April 2017 to 31 March 2022.

In compliance with the conditions laid down in Article 5 (5) and (7) of this Regulation, Portugal notified the European Commission of its decision to limit the gas consumption used to calculate the mandatory demand reduction target by the volume of gas corresponding to the difference between the intermediate filling target set for 1 August 2022 and the volume of gas stored on that date, and to limit the mandatory demand reduction by 8 %.

In the same context, Resolution of the Council of Ministers No 82/2022 of 27 September approved the Energy Savings Plan 2022-2023, the validity of which was extended until 31 March 2024 by Order No 1572/2024 of 8 February, defining a set of measures to reduce energy consumption in the sectors.

central government, local government and the private sector (industry, commerce, services and residential), but only in the former case are mandatory. The measures are complementary and do not overlap with existing implementing measures in other existing public policy instruments. Focusing on demand management, the plan has as strategic vectors:

1) Focus on energy and water efficiency in industry, reducing its energy consumption and increasing its competitiveness;
2) Focus on energy and water efficiency in the residential sector, trade and services, as well as campaigns promoting balanced and sustainable consumption;
3) Promote the production of renewable electricity for self-consumption.

By promoting the reduction of electricity consumption due to the dependence of the Portuguese electricity system on natural gas-fired thermal power plants, the Energy Savings Plan 2022-2023 also promotes a reduction in the consumption of gas used for its production. The plan includes mechanisms for regularly monitoring the evolution of gas consumption and, if necessary, proposals to amend the measures adopted. If an alert is declared in the Union, the measures will become mandatory and exceptional measures may also arise.

According to the Regulation, Portugal reported to the Commission every two months the demand reduction achieved and achieved a 22.8 % reduction in total gas consumption over the lifetime. As part of the Council Recommendation, Portugal will continue to monitor the evolution of gas consumption.

– **Council Regulation (EU) 2022/1854** of 6 October 2022 on an emergency intervention to mitigate the effects of high energy prices through exceptional, specific and time-limited measures, which requires Member States to implement measures to reduce their total gross electricity consumption by 10 % compared to the average of gross electricity consumption in the corresponding months of a reference period and to reduce their gross electricity consumption during peak hours by at least 5 % per hour.

As mentioned, the Energy Savings Plan 2022-2023 aims to reduce electricity consumption and consequently the consumption of gas used for electricity production. In this sense, the plan also aims to achieve the objectives set out in this Regulation.

Portugal has reported to the European Commission, at specified intervals, on the reductions in demand achieved and on the implementation of the other measures provided for in the Regulation during its duration.

– **Council Regulation (EU) 2022/2576 of 19** September 2022 enhancing solidarity through better coordination of gas purchases, reliable price benchmarks and exchanges of gas across borders, which includes rules for the implementation of a platform that will enable demand aggregation and joint purchases of gas. The period of application of this Regulation was extended until 31 December 2024 by the adoption of Council Regulation (EU) 2023/2919 of 21 December 2023;

– **Council Regulation (EU) 2022/2577** of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy, in particular temporary emergency measures to accelerate the permit-granting process for the production of energy from renewable energy sources. The period of application of the relevant provisions of this Regulation was extended until 30 June 2025 by the adoption of Council Regulation (EU) 2024/223 of 22 December 2023;

– **Council Regulation (EU) 2022/2578 of 22** December 2022 establishing a market correction mechanism to protect the citizens of the Union and the economy against excessively high prices. The period of application of this Regulation was extended until 31 January 2025 by the adoption of Council Regulation (EU) 2023/2920 of 21 December 2023.

Some of the monitoring indicators for the associated measures can be listed in connection with these initiatives:

Table 25 – REPowerEU Energy Security Monitoring Indicators

Indicator	Outcome	Unit	Objective
Reduction of consumption of natural gas[1]	28,2	%	15 %
Natural gas storage level[2]	107	%	90 %

[1] the assessment shall be carried out in accordance with the terms set out in Council Regulation (EU) 2022/1369, comparing the consumptions for the period April 2023 to March 2024 and those of the reference period;

[2] the figures submitted refer to the situation as at 1 November 2023, since pursuant to point (b) of Article 6a (1) of Regulation (EU) 2022/1032 at that date there was a mandatory compliance target for all Member States of 90 %;

The consequences of the Russian military aggression against Ukraine led, as was demonstrated by the publication of the abovementioned regulations, to the adoption of a set of measures which in some way already affected the security of energy supply for the Union and its Member States. The reduction of Russian gas flows in the second half of 2021, in the midst of economic recovery after the COVID-19 pandemic, was a first alert which, in view of the evolving situation, also required the study and adoption of legislative measures to strengthen the guarantee of security of supply, including the publication of Ministerial Implementing Order No 59/2022 of 28 January setting the minimum overall quantity of gas security stocks and requiring the various market players to build up an additional reserve in the National Gas System during the period from 1 October to 31 March.

With the development of the geopolitical situation and the effects on energy costs, Portugal has adopted an additional set of measures over the period:

– **Decree-Law No 30-A/2022 of 18 April 2007**, as amended, approving exceptional measures to ensure the simplification of procedures for the production of energy from renewable sources. Among the measures approved are administrative simplification for the installation of power plants producing renewable energy sources and the obligation to incorporate at least 1 % of biomethane or hydrogen produced by electrolysis from water using electricity from renewable energy sources into the supply to be made by gas suppliers whose supply to final customers exceeds 2 000 GWh per year by volume of natural gas supplied;

– **Council of Ministers Resolution No 82/2022 of 27 September** 2006 defining preventive measures to deal with the current situation and possible future disruptions, always with a view to ensuring security of energy supply. This law establishes a strategic water reserve in a set of reservoirs associated with hydroelectric facilities, which is currently suspended under Order No 129/2024 of 9 January 2009, but which is subject to quarterly reassessment by the APA

in conjunction with the Global Manager of the National Electricity System. It is also determined that the necessary steps will be taken to increase the underground gas storage capacity in Portugal by at least 1.2 TWh and that investment will be made in Porto de Sines to allow the transfer of up to 8 bcm per year of LNG between ships (*transhipments*). Finally, this Council of Ministers Resolution approves the above-mentioned Energy Savings Plan, which runs until 31 December 2023;

– **Decree-Law No 70/2022 of 14 October 2022** setting out a strategic natural gas reserve, belonging to the Portuguese State, while further establishing extraordinary and temporary measures for the reporting of information and ensuring gas supply security;

– **Ministerial Implementing Order No 15/2023 of 4 January** 2009 establishing the centralised purchasing system for biomethane and hydrogen produced by electrolysis from water using electricity from renewable energy sources. Order No 5971-A/2024 of 27 May 2009 was published, which provides for the opening of a competitive procedure, in the form of an electronic auction, for the centralised purchase of biomethane and hydrogen.

As regards energy security, the measures adopted, which will be further elaborated on in the following paragraphs, have as their main objectives:

- replacing imports of fossil fuels with domestic production of fuels of renewable origin, allowing to support the reduction of energy dependency;
- increasing energy storage capacity, with a particular focus on gas, increasing the flexibility and resilience of energy systems, seen in an integrated manner;
- structural reduction in energy consumption, making more efficient use of energy. This reduction, combined with a change in the origin of energy sources, promoted by the replacement of fossil sources (imports) by (domestic) renewable sources, will enable consistent action to be taken to reduce dependence.

The objectives and targets associated with renewable energy, which also contribute to the REPowerEU initiative, can be found in section 2.1.2 of this Plan. As regards the reduction of Russian gas imports into the national territory, it should be noted that their share was always below 15 % and in 2022 it represented only 5 % of the total imported natural gas. It should also be noted that it is not the Portuguese State responsible for purchasing the natural gas, the same being purchased by importers/suppliers on the international market. However, it is a continuously monitored topic to ensure that the quota does not exceed residual values, as has been the case so far, as the supply of gas to Portugal has a diversified portfolio, essentially based on two major suppliers, Nigeria and the United States of America.

Portugal and Spain are in the process of finalising the Solidarity Agreement on technical, legal and financial measures to implement the solidarity mechanism provided for in Article 13 of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017, whereby, in the event of a gas emergency and a request for aid from one country, the other, without creating insecurity, should ensure that gas supplies to customers other than solidarity-protected customers on their territory are reduced or interrupted to the extent necessary and as long as gas supply to solidarity protected customers in the requesting country is not ensured.

The Solidarity Agreement between Portugal and Spain is in the final stage of preparation, and the completion of the technical part depends on the completion of the work to update the Technical Rules for the Management of the Spanish Gasista System, which may lead to changes to the proposed agreement sent by the Portuguese competent authority to the Spanish competent authority in May 2023. Once the technical part of the document has been completed, it should also be subject to the necessary political and legal process at national level.

It should be noted that Regulation (EU) 2024/1789 of the European Parliament and of the Council of 13 June 2024 amending Regulation (EU) 2017/1938 lays down, in the event that two Member States have not concluded and approved the Solidarity Agreement, the conditions for the supply of gas under the solidarity mechanism, the information to be included in the solidarity request by the requesting Member State, as well as the procedure for ex post control of the final amount of compensation paid by the requesting Member State. Thus, until the conclusion and approval of the Solidarity Agreement between Portugal and Spain, those guidelines laid down in Regulation (EU)

2024/1789 may be followed in the event of the need to activate the solidarity measure provided for in Regulation (EU) 2017/1938.

i. National objectives for increasing diversification of energy sources and supply by third countries in order to increase the resilience of regional and national energy systems

Diversification of energy sources should be fostered from a security of supply perspective and is a national objective. With no production of natural gas and oil, the diversification of energy sources in Portugal is based on the development of indigenous renewable energy resources, which is also reflected in the gradual reduction of energy dependency over the last 10 to 15 years.

Although no specific objectives are set for supply by third countries, for the gas and oil sectors, Portugal already has a diverse portfolio of suppliers and origins of these products (see Chapter 4), which should be further consolidated, as the most recent studies/assessments show a good level of security of supply, fostered by such diversification. The increase in Carriço underground storage capacity determined by Resolution of the Council of Ministers No 82/2022 also contributes to the diversification of sources of natural gas supply to Portugal.

In the case of electricity, the diversification of sources from outside the country is more limited due to geographical issues, so the focus is essentially on diversifying domestic production through production of renewable origin in line with the existing potential in Portugal. The hydrogen energy carrier makes it possible to maximise the exploitation and exploitation of the potential of indigenous RES *and,* through the sector coupling, to promote conditions for flexibility and enhanced security of energy supply across sectors (e.g.: tramway, industry, mobility, etc.). However, the emphasis is also placed on external origins, with a focus on strengthening interconnections with Spain, which will make it possible to better balance the National Electricity System (SEN) and thus improve security of supply.

Finally, it should be noted that, in a spirit of security of supply, diversification of sources and routes of supply of energy resources becomes crucial, without compromising decarbonisation objectives.

ii. National targets for reducing dependence on energy imports from third countries in order to increase the resilience of regional and national energy systems

The energy security achieved by ensuring security of supply will need to take into account decarbonisation objectives, based on the specificities of energy systems and also seek to increase their resilience. At the same time, the aim is to improve the diversification of energy sources, the use of complementarity of renewable resources and the guarantee of supply from third countries, without compromising decarbonisation objectives.

Efforts should also be made to develop energy storage solutions, which in the medium and long term will help reduce external energy dependency.

With this in mind, and continuing with the current path of reducing energy dependency, and in view of Portugal's 2030 targets, which include a stronger commitment to exploiting indigenous renewable energy resources (including renewable gases) and improving energy efficiency, the country's energy dependence on the outside world is expected to be continuously reduced.

Table 26 – Portugal's target for reducing energy dependency by 2030

	2030
Energy dependency	65 %

iii. National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage

Decree-Law No 15/2022 of 14 January 2009, as amended, regulates the autonomous storage of electricity and densifies the procedures inherent in the licensing of this type of plant, as well as storage associated with power generation plants.

Increasing storage capacity and system service integration allows maximising the use of the infrastructure of the Public Service Electrical Network (RESP), reducing its buosity, and contributes to the further integration of renewables

in the national energy system (NSS) and greater flexibility of the ESS, allowing for GHG emission reductions.

As regards the role of storage for the flexibility of the energy system, the following point on national energy storage targets should be consulted.

National targets for the deployment of domestic energy sources:

Portugal will continue to focus on the development of a highly decarbonised power generation sector, in view of the availability of renewable indigenous resources such as water, wind, sun, biomass and geothermal, and because it has developed a reliable and secure electricity system able to cope with the variability that the strong commitment to renewables has introduced, and which is expected to evolve significantly in this decade. By 2030, the aim is to boost the exploitation of renewable energy potential with a particular focus on *onshore/offshore* solar and wind technologies, alongside the promotion of distributed/decentralised generation (focusing on individual and collective self-consumption) and the promotion of pilot projects (concentrated thermal solar, stimulated geothermal and wave).

It is also important to actively promote, encourage and support the recovery of waste (agricultural, urban and industrial) for the production of renewable gases, including for the production of biomethane, which by 2030 could mean around 9 % of total gas consumption (as foreseen in the Biomethane Action Plan 2024-2040). The valorisation, production and storage of renewable gases will be one of the mechanisms with a major impact on increasing the flexibility and independence of the national energy system, considering not only its capacity to increase the deployment of domestic energy sources, but above all the creation of a decentralised and multi-sectoral sustainable value chain.

National targets for increased storage:

Energy storage systems, in their different forms, are a tool for flexibility and stability of the national electricity system over various time and seasonality horizons.

Additional storage capacity is expected by 2030, through pumped reversible hydropower and a contribution from battery technologies. Part of the storage capacity should be linked to the wind and solar installations themselves.

At the level of battery storage, 483 MW were awarded at the 2020 auction. Already in 2024, in a tender under the RRP (RP-C21-i08 Network Flexibility and Storage), 76 applications were submitted which amounted to almost three times the storage capacity of the notice (500 MW). Given the needs and expressions of interest from developers, 2 GW of battery storage capacity is expected to be reached in 2030.

At the hydroelectric plant level, the Gouvães and Daivões plants became operational during 2022 under the Tâmega ElectroProducer System (SET), which also includes the Alto Tâmega plant. This system will have an installed capacity of 1 158 MW and is expected to be fully operational during 2024. It is also planned to convert a generating group from Alto Lindoso to reversible operation, corresponding to a storage project that will add a pumping capacity of 300 MW. With these projects in addition to the existing ones, a pumping capacity of 2 030 GW will become available by 3,9.

It would be very important to increase this capacity to ensure greater resilience and efficiency for the national electricity system. However, it should be noted that the procedures for approving and constructing new hydroelectric plants are rather complex and time-consuming, with constraints at various levels. Projects that were planned under the National Programme for High Hydroelectric Potential Dams (PNBEPH) and could increase pumping capacity, such as the Girabolo HA whose construction was cancelled by the government in 2016, have been abandoned in recent years.

With a view to adding new pumping capacity to the system, a study should be carried out assessing the feasibility of constructing new hydroelectric facilities, but above all the conversion of existing facilities, also taking into account amendments to concession contracts such as the Cabril dam. In general, the projects envisaged for these purposes have little chance of being implemented by 2030, but they may be viable over a longer time horizon.

Table 27 – Capacity installed in battery storage and pumping for 2030

	2025	2030
Battery storage (GW)	0,5	2,0
Pumping (GW)	3,6	3,9

With regard to energy storage objectives in the gas and oil and oil derivatives sector, there are national rules, stemming from Community legislation, for the creation of emergency stocks in response to crisis and emergency/disruption of supply of these products. The current underground storage capacity of Carriço allows the storage of all natural gas security stocks planned for the coming years (LNG storage still exists at the Sines LNG terminal, which gives greater flexibility in the operation of the SNG), and it should be considered, with the needs, that these additional cavities are 100 % H2-compatible and that the existing cavities can be converted to 100 % H_2. It should be noted, as already mentioned, that Resolution of the Council of Ministers No 82/2022 requires the underground gas storage operator to promote the enhancement of storage capacity in order to obtain an additional amount of underground storage capacity of more than 1.2 TWh and to accommodate in such underground storage all the emergency stocks or other reserves that may be defined.

National targets for increasing demand response:

As regards demand response, in the case of the electricity sector, the energy savings associated with the planned and existing efficiency measures and consumption needs taking into account the projected penetration of electric vehicles (with a smart charging perspective) are taken into account in the *evolution of*demand.

In the electricity sector, industrial installations and incentives for behind-the- *meter storage* in buildings and industry will be relevant to make changes in the daily load profile of the public service electricity grid less pronounced, as well as the generalisation of 'smart' charging strategies in electric vehicles and their participation in local or system flexibility services.

Building on what is monitored on security of supply in the annual security of supply monitoring reports for the electricity and natural gas sector (RMSAs), a correct balance between demand and supply is envisaged and planned for a time horizon up to 2030-2040. In the supply envisaged, the permitting procedures for new infrastructure and energy policy guidelines (new installations and decommissioning of existing installations) are taken into account.

For the analysis of the adequacy and balancing of energy systems, in the context of the RMSA, in particular for the National Electricity System (SEN) and the National Gas System (SNG), the following indicators are considered:

Table 28 – Energy system adequacy indicators – electricity and gas

Indicator	Target/Referential	Unit	Objective
Criterion N-1 (for NG)	> 100	%	+
Loss of Load*Expectation*	< 5	h/year	4

2.4. Internal Energy Market Dimension

2.4.1. Electricity interconnectivity

To ensure a better functioning and development of the internal energy market, as well as improvements in the management, flexibility and digitalisation of the energy system, energy interconnections are essential, while ensuring increased competition, stability in energy markets and market integration. This concern was reflected by setting the

EU target of 15 % electricity interconnections by 2030, as set out in the Regulation on the Governance of the Energy Union and Climate Action. Recognising also this importance, Portugal is committed to and committed to the achievement of this target at national level.

In this context, regional cooperation is also considered relevant, which should be strengthened with a view to closer rapprochement between Member States, with a particular focus on Spain and France, with the aim of monitoring and evaluating interconnection projects addressing the interconnection needs of energy markets and systems.

Table 29 – Portugal target for electricity interconnections

	2030
Target for electricity interconnections	15 %

In order to monitor the evolution of this objective, the following complementary monitoring indicator is proposed:

Table 30 – indicators related to capacity/interconnection level

Indicator	**2022**	**Unit**	**Objective**
Interconnection capacity cat[36]	3633	MW	+
Nominal interconnection capacity with respect to peak load	106	%	+
Nominal cross-zonal capacity relative to renewable installed capacity	56	%	+
Average daily market price difference	0,37	EUR/MWh	**4**

[36] annual average commercial interconnection capacity in the direction of Spain – Portugal (direction of import)

2.4.2. Energy transmission infrastructure

▪ **. Key electricity and gas transmission infrastructure projects, and, where relevant, modernisation projects, that are necessary for the achievement of objectives and targets under the five dimensions of the Energy Union Strategy**

In order to meet the commitments set at European level, based on national energy policy, in particular in terms of internal market integration and security of supply, and on the demand for a more robust, efficient and interconnected national electricity system and national gas system, Portugal is seeking to develop its transmission and distribution networks, with projects currently contributing to this objective which are recognised by the European Commission as having a relevant role, in particular for integration into the internal energy market, security of supply and economic sustainability.

As stated in the European Commission's REPowerEU initiative, by 2030, an additional EUR 29 billion of additional investments in the electricity grid are needed to adapt it to an increase in the use and production of electricity. With a view to improving market integration, competitiveness, security of supply and sustainability, a significant part of those relevant projects have already been included in the 1th Union list of Projects of Common Interest and Projects of Mutual Interest, adopted in Commission Delegated Regulation (EU) 2024/1041 of 28 November 2023, published in the Official Journal of the European Union of 8 April 2024. Accelerating the implementation of these electricity projects is crucial to increase the share of renewable energy sources in an interconnected system. High electricity prices highlight the importance of improving cross-border electricity interconnections as an economically beneficial way of ensuring a secure and affordable electricity supply. The European Commission intends to continue to support and encourage the Spanish and French authorities to speed up the implementation of the three planned projects of common interest through the monitoring carried out within the High Level Group on Interconnections in South-West Europe, with the aim of increasing interconnection capacity between the Iberian Peninsula and France, and to support Portugal and Spain in the implementation of the Minho-Galicia interconnection.

In order to meet the objectives and targets in the dimensions of the Energy Union Strategy, namely the decarbonisation of the economy, Portugal recognises the potential of*offshore* ERFs and aims to promote installed *offshore* wind capacity, this may require possible reinforcements of the continental transport network.

On the other hand, green hydrogen has taken on high importance in the current economic and political context in relation to the EU's ambitions to stop Russian fossil fuel imports in the coming years and to achieve climate neutrality by 2050. The EU has set as an ambition for the year 2030 the consumption of 20 million tonnes per year of hydrogen in the Union, and it has been set that of this total, 10 million tonnes per year will be produced within the EU.

On 20 October 2022, the governments of Portugal, Spain and France made a compromise, which they ratified at the Alicante Summit on 9 December 2022, in the presence of the President of the European Commission, to create a 100 % green corridor dedicated to hydrogen ('H2Med') to connect the Iberian Peninsula with the rest of Europe. This project is the first pillar of the*European Hydrogen Backbone*whose aim is to accelerate Europe's decarbonisation by creating the hydrogen infrastructure needed to enable the development of a competitive, liquid and pan-European hydrogen market. Under this H2Med project, two projects are associated with Portugal, one of which is an internal reinforcement of the gas transmission network between Figueira da Foz and Celorico da Beira and an interconnection with Spain, called 'Celza', linking the Celorico da Beira region in Portugal to the Zamora region in Spain.

Important gas transmission infrastructure projects (to be implemented by 2030)

The final proposal for a Plan for the Development of the National Gas Transmission Network for the period 20242033, submitted by the Transmission Network Operator in December 2023, includes projects to address the Government's determinations for the creation of two new cavities in the Carriço Underground Storage, with a view to equipping Portugal with increased gas storage capacity and strategic gas stockpiling, as well as the strategic orientation of Portugal's active involvement in the creation of a green corridor for 100 % hydrogen ('H2Med') to connect the Iberian Peninsula with the rest of Europe. In addition, it also includes the necessary adaptations to the Carriço Carriço transmission network and underground storage to accommodate up to 10 % hydrogen blends with natural gas.

Council of Ministers Resolution No 82/2022 of 27 September 2012, as mentioned above, defined preventive measures to address the current conflict situation in Ukraine and possible future disruptions, and established the need to strengthen the natural gas storage capacity installed in Portugal in at least two additional cavities in order to:

- Obtain an additional amount of underground storage capacity on the Carriço infrastructure of more than 1.2 TWh; e
- Make it possible to accommodate in such underground storage all the emergency stocks or other stocks that may be defined.

In 2022, Portugal, Spain and France agreed to develop the H2Med project as a 248 km hydrogen transmission interconnector, including 162 km on the Portuguese section between Celorico da Beira and Vale de Frades, with an estimated transport capacity of 81 GWh/d.

The National Hydrogen Transport Axis comprises the construction and suitability of the Figueira da Foz pipelines (with the possibility of connection to the Carriço SA) – Celorico da Beira – Monforte, which have obtained PCI status on the 1th list of PCIs and MIPs, published in April 2024, which in combination will enable the sustained and faster decarbonisation of current gas consumption and could provide means to export green hydrogen to Europe if it is technically and financially viable, produced from renewable energy sources, harnessing the *onshore* and *offshore* potential in Portugal.

The projects in Portugal, Spain and France associated with the H2Med green hydrogen corridor were granted PCI status in the 1th list of PCIs and MIPs published in April 2024.

Important electricity transmission infrastructure projects (to be implemented by 2030)

The project on the priority corridor North-South electricity interconnections in Western Europe (NSI West Electricity), which is present in the 1th list of PCIs and MIPs, published in April 2030, is identified for Portugal within the time horizon 2021-2024:

THEFOLLOWING: 2.17 Portugal-Spain interconnection:

Bearіz -Fontefría (ES) – Ponte de Lima (PT) (formerly Vila Fria/Viana do Castelo) and Ponte de Limão-Vila Nova de Famalicão (PT) (formerly Vila do Conde); includes substations in Bearіz (ES),

Fontefría (ES) and Ponte de Lima (PT)

The establishment of a new electricity interconnection between the transmission networks of Portugal and Spain in the Minho/Galicia region will allow reaching a minimum of 3 000 MW of interconnection capacity for commercial purposes in both directions (ES > PT and PT > ES). This value of interconnection capacity was one of the objectives when defining MIBEL at the Valhadolid Summit.

On theother hand, the current proposal for a National Electricity Transmission Network Development Plan for the period 2022-2031, submitted by the Transmission System Operator in March 2021 and approved by the grantor in December 2022, indicates a number of network reinforcements (among others, the Falagueira-Estremoz-Divor-Pegões 400 kV axis, the 400 kV Falagueira-Estremoz-Divor-Pegões axis, and the Alentejo-Ourique-Tavira 400 kV Ferreira axis) that enable the creation of network capacity for the integration of new power generation centres, in particular those using renewable energy sources.

To make it possible to connect the plants of the future dams of the Tâmega cascade (Gouvães, Daivões and Alto Tâmega – with a total capacity of 1 158 MW and a pumping capacity of 880 MW), the 400 kV axis will be achieved by connecting the current Vieira do Minho shuttle station and the future Ribeira da Pena substation, and its extension to the current Feira substation.

It should be noted that the Transmission and Electricity Distribution System Operators (NSRs and E-Networks) will be given an indication that their future proposals for Network Development and Investment Plans (PDIRT and PDIRD) are aligned with the national targets and objectives set out in this Plan and that they include the identification of the necessary investments in the grid, always respecting the criterion of economic rationality, but that they will be essential to meet the 2030 targets and objectives set out here.

- **I. main planned (trans-European energy) infrastructure projects in addition to Projects of Common Interest (PCIs) 28**

In pursuit of the objectives already identified in this point of the Plan, for the period 2021-2030, other infrastructure projects in the electricity and gas sectors can also be considered, which are also considered relevant:

- In the electricity sector, projects linked to the strengthening of internal networks (transmission and distribution) to integrate and accommodate renewable electricity generation (to realise the national potential in this type of electricity generation) are highlighted;
- Also in the electricity sector, the drawing up of a specific investment plan in the Sines area was promoted in order to meet the demand of large consumers (Decree-Law No 80/2023 of 6 September 2009), and the investment has since been approved by the Government;
- On the other hand, depending on the actual evolution of the electricity systems of Portugal and Spain, in particular with regard to renewable generation, it will be necessary to assess, in addition to possible grid reinforcements, the need for new interconnections;
- In the case of the gas sector, projects are envisaged which could increase the use of LNG and increase the capacity to receive liquefied natural gas at the Sines Terminal, seeking to strengthen Portugal's role as a 'gateway' for natural gas to the European internal market by using *transshipment*.

At the level of the transport sector, the National Hydrogen Strategy (Resolution of the Council of Ministers No 63/2020 of 14 August) points to the decarbonisation of maritime transport, in particular in domestic passenger and freight transport, where there is potential for green hydrogen and other renewable based fuels, such as synthetic fuels, to play an important role in decarbonisation, and the current prospects for the decarbonisation of the maritime transport sector point to a growth in global use of these fuels in the medium term (2030-2035).

Portugal, seeking to maximise its potential for renewable energy production, aims to deploy several *hydrogen valleys*.

28In accordance with Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009 (OJ L 115, 25.4.2013, p. 39).

These areas, geographically distributed across different parts of the country, will seek to harness the endogenous regional potential for hydrogen production, taking into account existing and planned infrastructure and consumption potential and typology.

2.4.3. Market integration

With regard to the issue of market integration, monitoring indicators are listed below to be considered for this purpose:

Table 31 – Indicators to promote flexibility of the energy system

Indicator	2022	Units	Objective
Smart metering	4 676 786	NO.	*
Installed capacity of distributed generation	1 165,5	MW	*

Portugal, by means of Decree-Law No 15/2022 of 14 January, in its current wording, (httpsque//dre.pt/dre/detalhe/decreto-lei/15-2022-177634016https://dre.pt/dre/detalhe/decreto-lei/15-2022-177634016) and Order No 14064/2022 of 6 December (https-//dre.pt/dre/detalhe/despacho/14064-2022-204338646https://dre.pt/dre/detalhe/despacho/14064-2022-204338646), defined the timetable for the installation of smart meters, ensuring coverage of 100 % of final customers and their integration into smart grids by the end of 2024 (connected in BT) in mainland Portugal. It is also considered relevant that in the future it is ensured that such a reality will occur in the gas sector.

Autonomous regions are excluded from this objective, since they can adapt the legal regime for the electricity sector in line with their specific characteristics. To that extent, the replacement of existing meters for smart metering equipment for all consumers connected in BT is expected by the end of Q1-2025 for AMR.

In addition, Decree-Law No 15/2022 recognises the existence of a specific regulatory framework, which operationalises the concept of smart grids – Regulation on services for the smart distribution of electric energy under the responsibility of ERSE.

In this context, the target for the coverage of consumers connected in BT with meters installed and integrated in the smart grid should be 100 % by the end of 2025.

It should be noted that ERSE defined a proposal for a timetableHYPERLINK "https://www.erse.pt/media/pmdjohr3/cronograma-contadores-governo-dl15.pdf" for the installation of smart meters in mainland Portugal, as provided forin Decree-Law No 15/2022 of 14 January 2006, as amended, and that the Government approved the timetable for the installation of smart meters and their integration into the infrastructure of smart grids by Order No14064/2022of 6 December 2012 for distribution system operators in mainland Portugal.

i. National objectives related to other aspects of the internal energy market, such as market integration and marketassociation[29], including a timetable for achieving the objectives

Not applicable.

ii. National objectives related to non-discriminatory participation of renewable energy, demand response and

29Such as increasing system flexibility, in particular as regards promoting competitive electricity pricing in line with applicable sectoral law, market integration and association, aimed at increasing the tradable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, dispatching, redispatching and curtailment mechanisms and real-time price signals

storage, including through aggregation, in all energy markets, including a timeline for meeting the objectives

Among other innovations, DL 15/2022 evolves the ESS model into a more decentralised system, with a focus on a more active role for consumers, production and storage for own consumption and possible sale of surpluses for the provision of flexibility and aggregation services, based on the premise that better informed consumers make better choices. This provides for the installation of smart meters and grids and, through the creation of the aggregator figure, the removal of barriers to participation in electricity markets. It is also envisaged, with the provision of dynamic price supply contracts, to adjust the consumption profile to price differentials between timeframes, promoting the provision of flexibility services.

There is also a need for a paradigm shift in the electricity sector, creating the market aggregator figure and laying the foundations for the evolution towards a model that ensures flexibility of distributed resources and demand response. Furthermore, the Manual of Procedures for the Global Management of the Electricity Sector System (MPGGS) was updated by implementing the harmonised European methodology for the treatment of deviations, which results from ACER Decision No 18/2020 (*ISH – Imbalance Settlement Harmonisation*) of 15 July 2020. This manual also sets out the technical and commercial conditions for the management of the NSS interconnectors as regards congestion management on the interconnector, including market unbundling, continuous allocation of cross-zonal capacity to be implemented within the intraday horizon, interconnector controllability, coordinated balancing action and complementary coordinated redispatching.

iii. National objectives to ensure that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters

For this topic, monitoring indicators to be considered for this purpose are listed below:

Table 32 – Indicators for consumer participation in the energy system

Indicator	2022	Units	Objective
Installed capacity in self-consumption (individual and collective)	963,4	MW	*
Energy Communities	2	NO.	*
Citizens' Energy Communities	n.D	NO.	*
Access to information for consumption management	n.D	%	*

Between 1 June 2018 and 31 May 2019, a pilot project was carried out to improve the tariff for access to the Very High Voltage (VHV), High Voltage (HV) and Medium Voltage (MV) networks, in accordance with the rules laid down in Directive No 6/2018 of the Energy Services Regulatory Authority (ERSE) of 27 February, with a total of 82 participants. The purpose of the pilot was to test changes to make network access tariffs more cost-friendly, thus promoting a more efficient use of electricity grids. The changes included the introduction of locational signals through time periods differentiated by network area and the signalling of a super peak period with an aggravated price signal, as well as other changes. This initiative is a complementary tool in promoting the energy transition as it can improve short- and long-term economic signals for efficient use of the electricity grid, thus contributing to an energy transition at a lower cost.

The analysis of the results identified, on average, an additional 2.2 % shift of consumption out of the super peak period by participants. Extrapolating this effect to a 23-year horizon (2018 to 2040), the benefit-cost analysis determined a net benefit of EUR 50.9 million, mainly due to the deferral of new investments for the expansion of the electricity grid in a context of growing overall electricity consumption.

ERSE included in the Electricity Tariff Regulation a new tariff option for network access, known as the tariff for access to the optional networks in MAT, AT and MT for mainland Portugal. The tariff option is characterised by the

specification of time periods for three different geographical groups in mainland Portugal (North, Central, South) and by the differentiation of the power price in peak hours for three seasons (Upper, Medium, Lower). As network access tariffs show negative prices in 2022 and 2023, it has not yet been possible to implement the new tariff option. Maintaining the premise that customers should have access to information to better manage their consumption, it is important to note that E-REDES, with 95 % of the consumption facilities in BT, should maintain the effort in digitalisation. In 2022, around 54 % of consumers connected in BT and 81 % of self-consumers connected in BT had access to load diagrams, with information disaggregated over 15-minute periods. It is important to keep on track and make this information available to all consumers and self-consumers.

Currently, production activity for self-consumption of electricity is regulated by Decree-Law No 15/2022 of 14 January 2003, as amended. This law lays down the discipline applicable to energy sharing schemes by creating the rules for setting up in collective self-consumption (ACC) projects, renewable energy communities (RECs) or citizen energy communities (CDCs), and the rules for permitting and operating PSUs and storage facilities allocated to such projects.

Although there are no major differences to be signalled between Decree-Law No no15/2022 and its predecessor in the area of individual and collective self-consumption or REC, it is worth noting the legal establishment of the Citizens' Community for Energy (CCE) figure, the absence of an opinion from the ORD on CAU depending on contracted power and consumption profile, the densification of the concept of proximity (physical and electrical), the possibility of adopting dynamic management systems, which enable dynamic energy monitoring, control and management, in real time, with a view to optimising energy flows and, finally, the absence of any burden on self-consumers to replace the meter for the installation of use (IU).

In recent years there has been a major change in installed UPAC capacity, which can be explained by the simplification of permitting for installations up to 30kVA of installed capacity (since 2020), the increase in entities authorised to carry out inspections of installations and, more recently, the availability of financial support for citizens and businesses to invest in production through solar PV for self-consumption.

Table 33 – Evolution of installed capacity for self-consumption (MW)

Year	< = 30 kW	> 30 kW E < = 1 MW	> 1 MW	Total
2015	4,6	7,6	0,0	12,2
2016	8,3	20,8	8,3	37,3
2017	9,2	32,7	0,0	41,9
2018	7,1	25,0	6,1	38,2
2019	8,6	81,9	3,6	94,1
2020	29,4	35,7	1,0	66,1
2021	69,6	166,6	6,2	242,5
2022	128,3	298,0	4,9	431,1

Source: DGEG

The approximation of production consumption has many advantages. On the one hand, it reduces losses in the distribution and transmission of energy and the investment needs of the network, on the other hand it makes it possible to protect consumers from price volatility. For energy-sharing projects, the tariff structure needs to be revised to give the right signals about the advantage of ensuring proximity between production and consumption in the development of this type of project.

In line with the previous version of the plan, the promotion of renewable self-consumption, whether individual, collective or through energy communities or citizen energy communities, has been accompanied by programmes to disseminate information and support the implementation of self-consumption projects in order to reduce information asymmetries and support businesses, municipalities and citizens in their development.

Among the initiatives to be implemented, programmes to support the establishment of self-consumption in partnership with municipalities are of particular relevance. The aim of these programmes is to support the establishment of these projects from a technical and financing point of view. Support will be provided through

qualified public entities in partnership with local agencies and partners. In the short term, the aim is to establish self-consumption projects, with a particular focus on inland municipalities and with a higher prevalence of energy poor consumers.

iv. National objectives with regard to ensuring electricity system adequacy, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives shall be met

National objectives for ensuring the adequacy of the electricity system

Ensuring the adequacy of the electricity system is included in the SEN Supply Safety Monitoring Report (RMSA-E), where security of supply indicators are defined. The security of supply of the electricity system is essentially linked to the performance of the electro-generating system in two ways: *Adequacy* (static assessment of the sufficiency of installed capacity to cover hourly electricity demand) and *security* (operational analysis with assessment of system responsiveness to disruptions in electricity/demand balance).

The assessment of the security of supply conditions over the RMSA-E horizon is carried out by means of probabilistic indicators, resulting from the simulation of the configurations of the electro-producer system using the PS-MORA model, which reflect its performance in the two abovementioned strands. This model is applied by the transmission system operator who collaborates with the DGEG in drawing up the RMSA-E:

i) *Adequacy*

The assessment of the adequacy of the available power to cover hourly electricity demand is carried out using the Ponta Probabilistic Coverage Index (ICP), which is the lower of the 12 monthly LPIs each year. In this analysis, the contribution of 10 % of NTC (*Net Transfer Capacity*) is considered. For verifying the adequacy of the system's ability to cover the peak of consumption, the ICP with a probability of exceedance between 95 % and 99 % shall not be less than 1,0.

ii) *Security* 30

Operational reserve needs are assessed by the deviations in net demand balance that occur between all elementary periods. Those requirements are addressed with the existing production resources each year that are capable of supplying the operational reserve. The operational reserve shall consist of the secondary reserve and the tertiary reserve up to 1 hour.

The LOLE (Loss of*Load Expectation) indicator calculated by the RESERVAS model, which incorporates the expectation of loss of load associated with the Adequacy component (or static LOLE*) and the expectation of loss of load due to insufficient operational reserve – Security component, shall be used to measure overall the security of supply levels provided by the analysed national electroproducer system *configurations*. In the analysis of guarantee of supply, according to studies developed by the transmission system operator, this indicator shall be equal to or less than 5 (h/year).

It should be noted that, in accordance with Regulation (EU) 2019/943, provision is made for the definition of the methodology and its application for the European Resource Adequacy Assessment and for the National Resource Adequacy Assessment. This assessment is based on the definition/calculation of indicators such as the *Value of Lost Load* (VOLL), *Cost of New Entry* (CONE) and LOLE (*Lost of Load Expectation*).

National targets for flexibility of the energy system

With the increasing integration of variable renewable production into the ESS, there is an urgent need to equip the Global Technical Manager of the System with tools for greater and better real-time monitoring of this production, as well as flexibility mechanisms to ensure that production is balanced with consumption.

It should be30 noted that the *Security* strand only analyses stationary system disturbances (sufficiency of secondary and tertiary reserve) and therefore does not include dynamic analysis of the system (under transitional arrangements).

In view of the above, all self-generating power plants and storage systems with installed capacity of more than 1 MW and UPAC with excess energy injection of more than 1 MVA, and which are connected to the transmission and distribution networks, should implement means of communication to receive instructions from the System Manager to interrupt or reduce in real time the energy they produce. For this purpose, the production facility must be provided with the necessary and appropriate means of communication, measurement and control so that it can receive the interruption or reduction instructions from the System Manager, either directly or through the dispatching centre to which the producer's facility is associated. Such needs have already been laid down in legislation in Decree-Law No 15/2022.

The existence of interconnection capacity between the various European systems leads to an increase in the flexibility of the system, which is usually linked to the possibility of exchanging reserves through these electricity infrastructures to address imbalances between electricity demand and supply.

A part of the new hydroelectric plants with storage and reversibility capacity (pumping mode) expected to be put into service by 2026 (reversible Gouvães, Daivões and Alto Tâmega) make an important contribution to increasing the flexibility of the system in the face of the integration of intermittent renewable production, as this type of technology is an operational reserve for rapid deployment (up- and downward reserve).

The adequacy of the Portuguese electricity system (medium-/long-term assessment) in terms of flexibility corresponds to the assessment of security of supply under the Security strand referred to in the previous point.

v. National objectives to protect energy consumers and improve the competitiveness of the retail energy sector

To ensure that the retail market is resilient, sustainable and continues to protect consumers, it is necessary to promote its competitiveness, the stability of cost-reflective fair and sustainable prices, less costly outflows of suppliers and adequate protections for consumers in need.

Flexible regulation that adapts to a changing and innovative market and enables effective competition, offers consumers the best options is a market that works better for consumers, is more resilient and supports the transformation of the energy system. Removing regulatory barriers, together with wider system changes such as promoting flexibility in the electricity system and spreading distributed generation and self-consumption and energy communities, make the market more resilient to possible wholesale price volatility and better able to protect consumers.

Ensuring transparency and access to information, developing platforms for price comparison in a clear and accessible way, ensuring that information on energy products is understandable to all, setting clear rules that promote fair competition, and maintaining enforcement to combat unfair trading practices are ways to support the transformation of the energy system.

Promoting consumer education, empowerment and literacy is also a priority for consumers to make informed decisions, encourage innovation and the use of new technologies, including in solutions that increase energy efficiency, energy management systems, or access to clean energy technologies, stimulating the active participation of consumers in the energy transition.

Supporting new energy market participants by reducing entry barriers for new businesses and providing incentives for innovation will increase the diversity of options and foster competition.

National objectives to protect energy consumers

Stresses the strategic objective of the NECP to ensure a just, democratic and cohesive transition, strengthening the role of the citizen as an active actor in decarbonisation and energy transition; create a level playing field for all; fight energy poverty; create tools for the protection of vulnerable citizens; and to promote the active involvement of citizens and territorial enhancement.

Within the framework of the National Long-term Strategy for Combating Energy Poverty (ELPPE) 2023-2050, the main objective of which is to eradicate energy poverty in Portugal by 2050 by protecting vulnerable consumers and actively

integrating them into the energy and climate transition, which is intended to be just, democratic and cohesive, in particular Axis 2 – Promoting universal access to essential energy services, 3 – Promoting integrated territorial action and 4 – Promoting knowledge and informed action, pursue the following objectives:

Strategic Objective 2.1 – Reducing the number of households struggling to pay for essential energy services.

Strategic Objective 2.2. — Ensure the protection of vulnerable consumers in energy poverty.

Strategic Objective 3.1 – Strengthening the action of local structures in supporting the citizen.

Strategic Goal 4.2 – Increasing energy literacy.

The Strategic Objectives mentioned above aim to:

- Reducing the number of households struggling to pay for essential energy services by implementing instruments to reduce energy bills (Strategic Goal 2.1);

- The protection of vulnerable consumers in energy poverty through the development of mechanisms to prevent supply interruptions in critical times, as well as tools to ensure the provision of minimum services (Strategic Objective 2.2);

- The promotion of an integrated network of Citizen Energy Spaces providing information, advice and support services (Strategic Objective 3.1);

- Increasing energy literacy by acting on different target audiences, ranging from the general public, children and young people and populations facing severe energy poverty and/or at risk of exclusion (Strategic Goal 4.2).

The ELEPP, as part of its Strategic Objective 3.1 – Strengthening the action of local structures to support citizens, aims to strengthen the action of local structures to combat energy poverty by promoting an integrated network of high territorial permeability Citizen Energy Spaces, providing information, advice and support services for the implementation of interventions and the adoption of sustainable energy practices, promoting the integration of combating energy poverty into local public policies, and removing barriers to the development of municipal renewable energy communities.

It should be noted that the energy sector and climate issues are complex, making citizens not always aware of the options available to them. It is therefore important to promote consumer energy literacy through more transparent information and wider dissemination of knowledge for energy and climate areas, enabling citizens to make more informed choices and promoting more and better consumer information, contributing to the transparency and competition of the energy market. A better informed consumer represents better, more efficient and sustainable choices, and a consumer at the heart of decision-making represents a more active consumer in the energy transition, available to participate in the structural changes that are needed to achieve this challenge.

This includes measures to promote information for consumers and businesses by contributing to better energy literacy and to simplify interaction with the market. Some initiatives have already been implemented by the Distribution System Operator (DSO) and the National Regulatory Authority (ERSE).

2.4.4. Energy poverty

1. National targets in relation to energy poverty, including a timetable for the achievement of the targets

Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September on energy efficiency established for the first time a common definition of energy poverty, which was adopted in the National Long-term Strategy for Combating Energy Poverty 2023-2050 (ELPPE), which is defined as 'the lack of access of a household to essential energy services, where such services provide basic and decent levels of life and health, including heating, hot water. adequate cooling and lighting and the energy needed for household appliances, taking into account the relevant national context, existing national social policy and other relevant national policies, caused by a combination of factors, including at least lack of affordability, insufficient disposable income, high energy expenditure and poor

energy efficiency of housing'.

With the approval of ELEPP 2023-2 050 in Council of Ministers Resolution No 11/2024 to 8 January 2024, the following targets have been set in the framework of Energy Poverty:

- Reduce the population living in households that are unable to keep their home adequately warm from 17.5 % in 2020 to 10 % in 2030, 5 % in 2040 and below 1 % in 2050;
- Reduce the population living in uncomfortably cool dwellings during summer from 35.7 % in 2012 to 20 % in 2030, 10 % in 2040 and less than 5 % in 2050;
- Reduce the population living in dwellings with infiltration, moisture or impoverished features from 25.2 % in 2020 to 20 % in 2030, 10 % in 2040 and less than 5 % in 2050;
- To eliminate by 2050 situations where energy expenditure represents more than 10 % of total household incomes, 1 202 567 households were in this situation in 2016, reducing to 700 000 by 2030 and 250 000 in 2040.

With regard to this topic, national objectives relating to energy poverty, and in accordance with Tables 4 and 5 of Council of Ministers Resolution No 11/2024 of 8 January, approving the National Long-term Strategy for Combating Energy Poverty 2023-2050, the following are the main and complementary indicators for measuring energy poverty in Portugal:

Table 34 – Key indicators for measuring energy poverty in Portugal

Indicator	Value	Reference	Value/Ano 31
Population living in households without the capacity to keep home adequately warm	17.5 %	2020	16,4/17,5 2021 /2022
Population in poverty and living in households without the capacity to keep their home adequately warm	33.8 %	2020	27,9/35,8 2021 /2022
Energy performance of dwellings (efficiency class C or below)	69.6 %	2020	n.D
Population living in dwellings with problems of infiltration, humidity or tasting elements	25.2 %	2020	n.D
Poor population living in dwellings with infiltration, moisture or impoverished elements	36.4 %	2020	n.D
Population living in dwellings not comfortably cool during summer	35.7 %	2012	n.D
Population in households where energy expenditure represents + 10 % of total income	1.202.567	2016	n.D
Households in poverty whose energy expenditure represents + 10 % of total income	263.033	2016	n.D

Table 35 – Complementary indicators for measuring energy poverty in Portugal

Indicator	Value	Reference
Population at risk of poverty	16.2 %	2020
Population with debts to utilities	3.5 %	2020
Population living in poverty and debt to utilities	8.6 %	2020
Interruptions attributable to the consumer	524.143	2019
Share of residential energy consumption satisfied by local renewable energy production	6.6 %	2021
Overall energy literacy of private consumers	43,8 points	2020

The above indicators and targets linked to the ELEPP Strategic Objectives are also presented.

31Years prior to NECP monitoring (2023)

Table 36 – Strategic objectives and targets of the ELEPP

Axis Strategic	**Objective Strategic**	**Indicator**	**Value of Reference**	**2030**	**2040**	**2050**
EE 1 Promoting Sustainability Energy and Environmental Housing	**SO 1.1** Increasing the energy performance of housing	Population living in dwellings without the capacity to keep their home adequately warm (**Main Indicator**)	**17, 5 %** (-1.8 million people) 2020	10 %	5 %	< 1 %
		Population living in dwellings not comfortably cool during summer (**Main Indicator**)	**35.7 %** (-3.7 million people) 2012	20 %	10 %	5 %
		Population living in dwellings with infiltration, moisture or tasting problems (**Main Indicator**)	**25.2 %** (-2.5 million people) 2020	20 %	10 %	< 5 %
		Fraction of existing residential buildings of energy class C or below (**Main Indicator**)	**69.6 %** 2020	50 %	40 %	30 %
	SO 1.2 Decarbonising energy consumption in housing	Share of energy consumption met by local renewable energy production	**6.6 %** (1 139,9 ktoe) 2021	10 %	35 %	73 %
EE2 Promoting universal access to essential energy services	**SO 2.1** Reducing the number of households struggling to pay for services	Households whose energy expenditure represents + 10 % of total income (**Main Indicator**)	**1.202.567** (-3.0 million people) 2016	700.000	250.000	0

Axis Strategic	**Objective Strategic**	**Indicator**	**Value of Reference**	**2030**	**2040**	**2050**
	essential energy	Population at risk of poverty	**16.2 %** (-1.7 million people) 2020	10 %	7 %	< 5 %
		Population with debts to utilities	**3.5 %** (-443 thousand persons) 2020	3 %	2 %	< 1 %
		Number of interruptions due to event attributable to the consumer	**524 143** 2019	500.000	300.000	100.000
	SO 2.2 Ensuring the protection of vulnerable consumers in energy poverty	Number of interruptions attributable to vulnerable consumers in energy poverty	n.a.	80 %	90 %	100 %
EE3 Promoting integrated territorial action	**SO 3.1** Strengthen the action of local structures in supporting the citizen	Number of local public administrations and energy agencies involved	**< 3 %** (-3 400) 2022	10 %	30 %	50 %
		Number of social sector structures involved	**< 3 %** (-6 700) 2022	5 %	10 %	15 %
	SO 3.2 Strengthening the supply of high energy performance public housing	Number of dwellings NZEB20	To be defined			
		Number of new dwellings NZEB20	To be defined			
EE4 Promote knowledge and	**SO 4.1** Increase the ability to identify	Extent of population population in the situation of	**—1 200 000** 2020/2016	< 1.000.000	< 750.000	< 500.000

Axis Strategic	**Objective Strategic**	**Indicator**	**Value of Reference**	**2030**	**2040**	**2050**
informed action	households in energy poverty	energy poverty based on key indicators				
	SO 4.2 Increasing energy literacy	Overall energy literacy of private consumers	**43,8 point** (Scale from 0 to 100 points)	60	75	90
	SO 4.3 Stimulating research and innovation	Number of projects and initiatives	To be defined			
		Number of entities involved	To be defined			
	SO 4.4 Stimulate the training of professionals	Number of certified persons	n.d.	+ 30.000	+ 50.000	+ 70.000

The ELEPP measures are summarised below, by Strategic Objective and by Strategic Axis

Table 37 – Summary of measures by Strategic Objective and Strategic Axis

Strategic Axis	Strategic Objective	Measure
EE1 Promoting Sustainability Energy and Environmental Housing	PO 1.1. Increasing the energy performance of housing	M1.1.1 Promote energy rehabilitation, increased passive thermal comfort and reduction of infiltration, moisture and apodage problems
		M 1.1.2 Promote energy efficiency and increased active thermal comfort
	SO 1.2 Decarbonising energy consumption in housing	M 1.2.1 Promoting self-consumption of renewable electricity

		M 1.2.2 Promoting renewable heating and cooling
		M 1.2.3 Promoting the electrification of consumption
EE 2 Promoting universal access to essential energy services	SO 2.1 Reducing the number of households struggling to pay for essential energy services	M 2.1.1 Promote the reduction of energy bills
		M 2.1.2 Promoting self-consumption and sharing of renewable electricity involving vulnerable consumers
	SO 2.2 Ensuring the protection of vulnerable consumers in energy poverty	M 2.2.1 Prevent interruptions at critical times
		M 2.2.2 Ensure minimum services
EE 3 Promoting territorial integration integrated	SO 3.1 Strengthen the action of local structures in supporting the citizen	M 3.1.1 Promote an integrated network of Citizen Energy Spaces
		M 3.1.2 Promoting the integration of the fight against energy poverty into local public policies
		M 3.1.3 Facilitate the development of municipal renewable energy communities
	SO 3.2 Strengthening the supply of high energy performance public housing	M 3.2.1 Promote energy rehabilitation and increased thermal comfort
		M 3.2.2 Promote new construction
		M 4.1.1

		Develop and strengthen survey tools
EE 4 Promoting knowledge and informed action	SO 4.1 Increase the capacity to identify households in energy poverty	M 4.1.2 Develop knowledge on energy poverty
		M 4.1.3 Diversify structures supporting the identification of households in energy poverty
	SO 4.2 Increasing energy literacy	M 4.2.1 Promoting energy literacy for children and young people
		M 4.2.2 Promoting energy literacy for consumers in severe energy poverty and/or at risk of exclusion
		M 4.2.3 Promoting consumer energy literacy in general
	SO 4.3 Stimulating research and innovation	M 4.3.1 Promoting social innovation
		M 4.3.2 Promoting technological innovation
		M 4.3.3 Promoting innovation in funding
	SO 4.4 Stimulate the training of professionals	M 4.4.1 Promoting vocational training for specialisation and acquisition of new skills

The Strategy defines and dimensiones measures to tackle energy poverty by providing benefits that ensure the supply of energy to vulnerable customers or by providing support for energy efficiency improvements in housing, among others, as set out in Table 37 above.

With the aim of actively monitoring national levels of energy poverty, enhancing territorial information and contributing to the design, implementation and evaluation of public policies, SmPC 11/2024 also established the

establishment of the National Energy Poverty Observatory (ONPE-PT).

Under the Long Term Strategy for Combating Energy Poverty (ELEPP), ONPE-PT should:

a) Define new strategic indicators with territorial disaggregation to assist the design, implementation and evaluation of public policies;
b) Propose public policies for the eradication of energy poverty;
c) Promote the articulation between different public policy areas that contribute to the objectives of the ELEPP, in particular in the fields of energy, housing, solidarity and social security, economy, health, education, territorial cohesion and finance;
d) To promote decentralised territorial action by linking entities directly and autonomously administered by the State, in particular local authorities, and by networking with other local actors, including energy agencies and private social solidarity institutions;
e) Promote, in conjunction with the National Statistical Institute (INE), the improvement of basic information and the development of new statistics through the integration of different data sources;
f) Draw up and propose to the Government the ten-year action plans to combat energy poverty (PACPE) (horizons 2030, 2040 and 2050), revised every three years;
g) Evaluate the progress of the implementation of the ELEPP every year from the date of entry into force of Council of Ministers Resolution No 11/2024 of 8 January 2012, the result of which should be published on the websites of the ONPE-PT, the Directorate-General for Energy and Geology (DGEG) and the ADENE (Energy Agency) (ADENE);
h) Submit to the government a proposal for a revision of the ELEPP every five years or whenever it considers it necessary;
i) Promote and implement capacity-building actions for national, regional and local actors, public and private, involved in the implementation of the ELEPP;
j) Propose financial instruments, fiscal and/or financing, public or private, of energy efficiency measures appropriate to the profile of identified households in energy poverty, as well as the methods for their adoption, where applicable;
k) Develop materials and campaigns to increase energy literacy appropriate to the profile of identified households in energy poverty;
l) Promote, valorise and disseminate work related to the phenomenon of energy poverty.

The Regulation of the ONPE-PT, published by Order No 1335/2024 of 2 February 2013, determines its composition and functioning. The ONPE-PT consists of a Management Unit, chaired by the DGEG and with technical and operational support from ADENE, accompanied by a Strategic Commission, made up of relevant government areas, and an Advisory Commission, with representatives of the different areas of civil society knowledge.

In its implementation, the ELEPP must be integrated and linked, inter alia, to the Long-term Strategy for the Renovation of Buildings, approved by Resolution of the Council of Ministers No 8-A/2021 of 3 February, and to the National Strategy for Combating Poverty 2021-2030, approved by Resolution of the Council of Ministers No 184/2021 of 29 December.

The “Valley Efficiency” programme is part of a set of measures to tackle energy poverty. It is an instrument to finance (EUR 1.300 + VAT) the investment of economically vulnerable households in improving the thermal comfort of their housing, either through interventions in the environment or through the replacement or purchase of energy-efficient equipment and solutions.

The first phase of the “Valley Efficiency” programme ran from August 2021 to May 2023. The second phase of this programme (the deadline for submission of applications on 20 November 2023) is intended to respond to the main difficulties encountered in the first phase of its implementation.

In the Long Term Strategy for the Renovation of Buildings (LTRS), the fight against energy poverty is included in Package 1 and is included in the Accompanying Axes of the Buildings Programme number 5 (EA5), which provides for policies such as “Provision of funding and tax benefits for those who rehabilitate and improve comfort conditions”.

"Package 1 – Improving comfort and tackling energy poverty"

This package of improvement measures aims to act on the thermal envelope of buildings so as to ensure acceptable levels of comfort (category III) without increasing energy consumption for heating, thus helping eliminate situations of energy poverty. The implementation of this package is divided into two distinct phases:

By 2030, to be implemented in residential buildings with worst energy performance, more specifically, permanent dwellings built prior to 1990, corresponding to 65 % of national building stock in 2018;

By 2040, in remaining residential buildings built up to 2016, corresponding to almost 100 % of national building stock in 2018.

In the case of non-residential buildings, the results of the simulations showed worsening comfort conditions and a consequent increase in energy consumption, especially in summer, mainly due to the high internal thermal load coinciding with daytime occupancy. Therefore, this package of measures was not considered in non-residential buildings.

It envisages **the following as progress indicators** in the fight against energy poverty:

- Number and percentage of people affected by energy poverty, by geographical location (preferably statistical sub-section);
- Proportion of disposable income of households spent on on Energy, by location geographical (preferably statistical sub-section);
- Late payments of utility bills public, by location geographical (preferably statistical sub-section);
- Number and percentage of people living in unsuitable housing conditions (including thermal discomfort), by geographical location (preferably statistical sub-section);
- Energy poverty vulnerability index, by geographical location (preferably statistical sub-section);
- Impact on the vulnerability to energy poverty index after energy renovation in a building;
- Value attributed in energy cheques by geographical location (preferably by sub-section) statistics), if implemented;
- Public investments in policies addressing problems related to energy poverty;
- Amount awarded in subsidies for the replacement of ambient heating and DHW systems with more efficient systems.

2.5. Research, Innovation and Competitiveness Dimension

i. National objectives and funding targets for research and innovation in the public and private sectors

Portugal is committed to developing actions to ensure its leadership in the penetration of renewable energy sources and new carbon-neutral technological solutions to continue the decarbonisation path of the economy and achieve the 2030 targets set under this Plan. The promotion of research, innovation and competitiveness (R & I & C) in support of the implementation of the NECP is essential for the success of the Plan and consideration should be given to the various national competences as well as their framework for ongoing cooperation and activities within the EU.

The Portuguese government has committed to a global investment in research and innovation (R & I) of 3 % of GDP in 2030. Portugal's 2030 targets for energy and climate and the pathway towards carbon neutrality imply continued investment in carbon-neutral technologies. This will lead to increased R &Dinvestments in energy and climate by 2030.

Table 38 – National funding targets for public and private research and development (% of GDP)

	2030
Total R & I investment in Portugal	3.0 %

Investment in R & I in Energy	0.2 %
Investment in R & I in Water and Climate	0.2 %

The European Strategy for Research and Development and Innovation (R & D & I) for energy and climate builds on the European Green Deal, the EU Strategy on Adaptation to Climate Change and the latest EU initiative, REPowerEU. The R & D & I actions of these strategies are supported by the *European Strategic Energy Technology Plan (* SET Plan) and Regulation (EU) 2024/795 (29 February) which established the Strategic Technologies for Europe Platform (STEP) to support critical and emerging strategic technologies in 3 sectors (i.e. deep tech and digital technologies, clean and efficient technologies, and biotechnology) in their value chains, with a specific focus on the development and manufacturing phases of these technologies. An inter-ministerial working group for the implementation of this STEP Regulation has since been set up by Order No 6475/2024 of the Council of Ministers, Economy and the Environment and Energy. There are a number of European financial instruments to be highlighted in supporting the strategy being implemented in the SET Plan and STEP, including: Horizon Europe *(*the European Framework Programme for R & I funding for the period 2021-2027*)*, the Innovation Fund, the Cohesion Policy Support Funds, the*Just Transition Fund*, the European Defence Fund, and the InvestEU Programme.

Portugal's participation in European collaboration and cooperation under the SET Plan has proven to be beneficial in combining efforts towards common targets for penetration of new technologies and for addressing joint challenges in disruptive actions. Portugal has participated in the various implementation groups and activities, considering important the collaboration between expert groups in the development of coordination actions and other forms of collaboration for the development of targeted projects, with the aim of achieving the ambitious targets by 2030.

Taking into account the objectives and targets set for the remaining dimensions of the NECP, it is recommended to boost national R & D programmes, which in a first approach should include at least the following themes: (I) Intelligent energy management systems and new infrastructure; (II) energy storage; (III) low-carbon technologies; (IV) Energy efficiency; and (v) Hydrogen as an energy carrier.

In parallel, competitiveness programmes in the area of energy and climate should be envisaged with a view to increasing the quality and competitiveness of national research and accelerating the implementation of results and their replication. Competitiveness programmes should include the following themes: (I) support for participation in high-quality international research and development; (II) support for the establishment of technological pilots; (III) support for qualification, empowerment and mobility; (IV) support for the creation of industrial clusters in new areas of technological development; (v) supporting the promotion of business models based on low-carbon products and services; (VI) Support to the implementation of results.

Under component 5 'Business Capitalisation and Innovation' of the Recovery and Resilience Plan (RRP), the Interface Mission, with a budget of around EUR 186 million, has the main objective of deepening the effort to widen and consolidate the network of interface institutions (Technology and Innovation Centres – CTI and Collaborative Laboratories – CoLAB) between the academic, scientific and technological system and the Portuguese business fabric, ensuring the necessary support to leverage the impact on promoting R & D investment and increasing the competitiveness of the private sector. The Interface Mission aims to ensure basic public funding to strengthen the network of interface institutions, including alignment with the Smart Specialisation Strategies' priority areas and, in a cross-cutting way, monitoring the focus on decarbonisation and circular economy and digital technologies, as reflected in the twin transition.

In particular, the STI are entities active in the production, dissemination and transfer of knowledge, oriented towards business and the creation of economic value, contributing to the pursuit of public policy objectives within the national priority areas of specialisation or the regions in which they operate. With a commitment of EUR 92.8 million to finance ITCs from 2022 to 2026, Portugal has already implemented EUR 8 million (9 %) to finance the 31 active entities, of which at least 9 are active in areas of particular interest to the PNEC2030: including CTCOR and root in "Agri-food, Biodiversity and Forest", BIKiNNOV, BLC3, CVR and STAR in "Circular Economy and Urban Sustainability" and CEiiA Oceano & Space, Seapower and WavEC in Space, Ocean, Energy and Sustainability (2023 CTI Annual

Report)32.

On the other hand, CoLABs are entities active in the production, dissemination and transmission of knowledge through the pursuit of their own research and innovation agendas. Based on a portfolio of higher value-added products or systems, CoLABs are geared towards facilitating business access to global markets through exports, as well as supporting the attraction of foreign investment in technology-intensive areas. CoLABs can be national, regional/local, or entrepreneurial, directing their activities towards the creation of qualified jobs and of economic and social value in the middle of the innovation system. With a commitment of EUR 96.6 million to finance CoLABs between 2022 and 2026, Portugal has already implemented EUR 12 million (12 %) to finance the 41 active entities, of which at least 17 are active in areas of particular interest to the PNEC2030: BIBERF, HYLAB, Net4Co2, Smart Energy LAB and VG CoLAB in 'Energy and Sustainability', AlmaScience, BUILT CoLAB, C5LAB, CECOLAB and CEiiA-S2ul in 'Materials, Circular Economy, and Urban Sustainability', + Atlatinc B2E, Green CoLAB and S2AQUAcoLAB in 'Climate, Space and Ocean' and ForestWISE, InnovPlantProtect and MORE in 'Biodiversity and Forest' (2023 CoLAB Annual Report)33.

In 2019, Portugal developed a set of Thematic Agendas for Research and Innovation, coordinated by the Foundation for Science and Technology, I.P. (FCT), one of which was dedicated to Climate Change which mobilised experts from R & D institutions and companies in identifying challenges and opportunities in the national scientific and technological system.which mobilised experts from R & D institutions and companies in identifying challenges and opportunities in the national scientific and technological system.

It is hoped that these agendas can also contribute to the development of research and innovation, contributing to the response to the problems or needs of different sectors of society. The main objective of the thematic agendas was to promote collective reflection on the knowledge base supporting the country's scientific, technological and socio-economic development in the themes concerned.

The inclusive and dynamic process of developing agendas, involving experts from academia, research centres, businesses, public authorities and citizens, in a dialogue between different national actors, makes it possible to specify the areas that are considered to be emerging and promising for Portuguese Research and Innovation, with a medium- and long-term perspective, up to 2030.

Also under the Sustainable Bioeconomy Action Plan Horizon 2025 (PABS), Portugal has ongoing macro and sectoral actions to boost a genuine sustainable bioeconomy. The implementation and enforcement of the measures envisaged under the PABS will also be key to meeting the national energy and climate commitments, in particular the primary principle of the PABS to reduce dependence on non-renewable raw materials and to progressively increase the share of indigenous renewable raw materials used in the production of products, promoting a less carbon-intensive and energy-intensive society.

The PABS sectoral actions target three sectors of economic activity – Textile and Clothing, Footwear and Natural Resina, with the potential to decisively leverage the implementation of bioeconomy-based models, with objectives defined for each of the targeted sectors, as well as targets for 2025 and 2030. Targets include reducing GHG emissions in the textile and clothing industry by 40 % by 2025 and increasing the circularity of post-consumer textiles by 40 % by 2030. In the case of the footwear sector, the target of incorporating 25 % of biomaterials in footwear and leather products is noteworthy, raising this target to 50 % in 2030. With regard to the targets for the natural resin sector in 2030, the improvement of industrial productive efficiency by 10 % and the transition of at least eight industries from the 1th and 2th transformation to renewable energy are highlighted.

The investments planned in the three sectors under component 12 of the RRP 'Promoting the Sustainable Bioeconomy' fall under the policy area 'Research and innovation processes, technology transfer and cooperation between enterprises, focusing on the low-carbon economy, resilience and adaptation to climate change', ensuring the development of less carbon-intensive products. It should also be noted that the promotion of Integrated Projects, which are under development by December 2025, led by consortia established for this purpose, will be assessed

32 https-//www.ani.pt/pt/valorizacao-do-conhecimento/interface/cti-centros-de-tecnologia-e-inova%C3%A7%C3%A3o
33https-//www.ani.pt/pt/valorizacao-do-conhecimento/interface/laborat%C3%B3rios-colaborativos-colab/

through the achievement of different contracted-targets and milestones, in particular the implementation of 164 "Research, Development and Innovation (R & D & I) lines" for all three ongoing projects.

ii. National objectives, including long-term targets, for the deployment of low-carbon technologies

Not applicable.

iii. National competitiveness objectives

With a view to promoting and facilitating research and development activities in the field of production, storage, promotion of electric mobility and self-consumption of electricity, Decree-Law No 15/2022 established an appropriate legal framework for pilot projects for innovation and development through the creation of three technology-free zones (TFZs).

In the effort for the energy/climate transition, there is a need to develop training and reskilling programmes for workers in a wide range of sectors, with a greater focus on those most impacted by this transition. There is also a need for the development of industrial *clusters* and the creation of new jobs, the so-called "green jobs".

The re-skilling of workers, with the development of new technical skills, is of paramount importance for companies to adapt to a new energy/climate reality, or even for phase-out situations of *industrial* units, and there is a transfer of workers between different sectors. This was the example of workers in coal thermal power stations that had since been decommissioned in 2021 and who were able to receive training in the field of renewable energy. The Just Transition Fund was set up to support this transition process with a view to diversifying the local economy by supporting research and innovation in small and medium-sized enterprises (SMEs) in the renewable energy, agri-food and tourism and sustainable mobility sector, and is expected to create around 200 new jobs and support the reorientation of workers in the region affected by the shutdown of coal-fired power plants through training and reskilling.

A similar situation occurred at the closure of the Matosinhos Refinery, where the Just Transition Fund will also support the creation of a new innovation centre with a particular focus on sustainable mobility, clean energy, advanced manufacturing and the maritime economy. In this region, this fund will create 150 new jobs in supported SMEs and reskill 170 long-term unemployed.

In view of the importance of training and acquisition/deepening of skills in the context of the energy transition, the " *Green Skills and Work Programme" promoted by the Institute of Employment and Vocational Training, in collaboration with ADENE and*APREN, was established in early 2023 by Order No 21/2023 of 6 January with a view to promoting the re-skilling of workers and the qualification of unemployed people for the areas of renewable energy and energy efficiency. In the meantime, and in view of the attractiveness of the above-mentioned programme in 2023, it was decided to extend its scope by means of Ministerial Implementing Order No 7/2024 amending the previous one.

Information to the general public on energy and climate issues and the consideration of these topics in the education of children and young people, the promotion of knowledge and a greater degree of public information on these issues are highly relevant. More and better informed consumers and customers of energy services are also important, therefore the promotion and promotion of energy literacy is of utmost importance.

The colabor, Collaborative Laboratory for Labour, Employment and Social Protection, founded in 2018, has the main objective of contributing to the promotion of competitiveness and acting as a facilitator of the energy and climate transition. Integrating an interdisciplinary approach between the economy, sociology and data science, the colabor aims to study and anticipate challenges in the areas of work, employment, social protection and the social economy, which is enriched by collaboration between academia, business and public administration. Through its strategic vision, the colabor directly addresses the green transition, the digital transition and the demographic transition as key trends in its research agenda.

Investment RE-C05-i01.01 – Agendas/Mobilising Alliances for Business Innovation aims to mobilise and strengthen Portugal's scientific and technological capacities through the implementation of ambitious research and innovation agendas based on consortia between companies and academic institutions. The investment shall consist primarily of

grants for the implementation of the Mobilising Agendas/Alliances for Business Innovation by means of two complementary instruments: Innovation pacts that promote cooperation and lead to the development of innovative projects; and mobilising projects for R & D and its transformation into new goods and services through public and private investment. 53 mobilising Agendas were approved, with 5 identified in the energy area, with an overall investment of EUR 2 085 million. This investment from the 5 energy mobilising Agendas includes an investment in RDI of around EUR 360 million. (IAPMEI – C5 | Business Capitalisation and Innovation).

3. PLANNED POLICIES AND MEASURES

The 8 objectives of the NECP, described in chapter 1, include 66 lines of action and 314 associated action measures, which are described by means of fiches for each line of action. These include their description, the identification of the main sectors covered, the action measures contributing to each line of action and their time horizon for implementation, the analysis of climate risks and vulnerabilities in cases of medium and high relevance, the main links with other strategic public policy instruments and which frame the measures considered, indicative sources of funding and pre- identification of the entities responsible for the development and implementation of the measures. It should be noted that much of the measures are expected to continue over time and therefore the time horizon indicated is the same as in this plan. In each line of action the contribution to each of the dimensions of the NECP is further identified. A few lines of action have been added for climate risk and vulnerability analysis, and their relevance for achieving national objectives, targets and contributions in the different dimensions of the Energy Union. As mentioned above, the analysis focuses on the lines of action considered most relevant, as this risk and vulnerability analysis should be carried out in detail by each sector within its own sectoral climate change adaptation plan.

For the purpose of filling *in this template*, the distribution of the measures has been adjusted, while retaining their original numbering.

OBJECTIVE
Target which Portugal intends to achieve and which sets out the strategy to be adopted for that purpose

LINE OF ACTION
Main policy objective linked to national axes/targets for 2030

MEASURE
Concrete action contributing directly to achieving the set goals and objectives

3.1. Dimension Decarbonisation

3.1.1. GHG emissions and removals

1. Policies and measures to achieve the target set out in Regulation [ESR] as referred to in sub-chapter 2.1.1 and policies and measures to comply with Regulation [LULUCF] covering all main sectors

As mentioned in sub-chapter 1.1.3, one of the strategic objectives of the NECP is to ensure a national GHG emission reduction trajectory to achieve the 2045 climate neutrality objective, in line with the Climate Law, and to promote the*mainstreaming*of mitigation objectives in sectoral policies.

In line with RNC 2050, the scenarios analysed in this context confirm the existence of GHG emission reduction potential in all sectors of the national economy, and the feasibility and high cost-effective potential of energy efficiency and renewable energy penetration options are identified, contributing to the achievement of climate policy objectives. The modelling carried out makes it possible to infer cost-effective trajectories and a set of guidelines for sectoral policies – lines of action – that contribute to GHG emission reduction, renewable energy and energy efficiency objectives.

In order to decarbonise the economy and achieve the nationally set targets for reducing GHG emissions in 2030 (-55 % compared to 2005), action is needed in all sectors of activity, including energy, residential and services, industry, transport and mobility, waste and wastewater, agriculture and forests and other land uses. There is also a need to act horizontally in promoting green taxation, developing a more circular economy and sustainable territory and cities. Public administration also has an important role to play in leading this decarbonisation path, and the role of research and innovation is also essential. Decarbonising the national economy is a cross-cutting objective to which the different objectives set contribute, namely energy efficiency, renewable, mobility and transport, agriculture and forestry and industry.

LINE OF ACTION

1.1. PROMOTING THE DECARBONISATION OF THE POWER GENERATION SECTOR

DESCRIPTION

Promote the energy transition with a view to gradually reducing the use of fossil fuels in electricity production, with a strong focus on indigenous renewable resources, reducing the country's energy dependency. Renewable energy sources will have to play an increasingly decisive role in view of the decommissioning of coal-fired power plants and the ban on the use of fossil natural gas for electricity production from 2040, provided that security of supply is ensured. Storage will also play an increasingly important role in the operation of the electricity system and in ensuring security of supply.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote the decarbonisation of the electro-producer system, in addition to the action measures of Objective 3 – REFORCE TO SUPPORT THE ENERGY RENOVABLE AND REDUZED THE ENERGY DEPENDENCE OF THE COUNTRY, the following action measures are foreseen:

1.1.1. Stopping coal-fired electricity generation – Measure achieved

The progressive discontinuity of the use of fossil fuels for electricity generation, in particular coal, is essential to ensure the energy transition towards a carbon-neutral society. Thus, in 2016 Portugal made a commitment to stop producing electricity from coal by 2030 at the latest, being a member of the *Powering Past Coal Alliance* (PPCA), a global alliance of national and sub-national governments, companies and organisations working to promote the transition of coal-fired power generation, a timely and necessary transition to meet the international commitments set by the Paris Agreement.

To this end, and taking into account the existence of factors that discourage coal-fired electricity production, such as the increase in the price of CO_2 allowances, the end of the ISP exemption and the increase in the price of coal, as well as studies on security of supply already carried out, the closure of Pego thermal power stations in 2021 and Sines in 2023 was envisaged. With this in mind, the necessary technical assessments have been developed that took into account the evolution of the electricity grid and the power generation stock to assess the impacts and anticipate possible mitigation measures for the ESS.

This measure was implemented in advance in 2021, with the definitive closure of coal-fired electricity production in Portugal.

With a view to ensuring a just transition, a number of measures have been adopted to support workers and the economic diversification of affected regions, including their inclusion in the territorial areas that can access the Just Transition Fund, measures that continue to be pursued through the launch of targeted notices to support economic diversification and productive innovation in the regions covered. To this end, a study was carried out in 2021 to assess the retraining needs of plant workers ('Study on the reskilling and identification of employment opportunities of workers affected by the end of coal-fired electricity production in Pego and Sines power plants' – ISCTE – financed by the Institute for Employment and Vocational Training, I.P.). A 'Just Transition Compensation Mechanism', financed by the Environmental Fund, was also set up with the aim of ensuring that the income of workers directly and indirectly affected by the closure of coal-fired electricity production at Pego Termoelectric Power Plant, and its consequent closure, are maintained, a transitional mechanism. [Date: 2021]

1.1.2. Assessing the conversion of coal-fired power plants to renewable sources – Measure achieved

To mitigate the effects of the closure of the two coal-fired power plants, alternative solutions are being implemented to recycle and reuse the space and equipment of thermal power plants for the production of energy from renewable energy sources.

The Sines plant is undergoing decommissioning and partial retrofitting to renewable energy projects, including renewable hydrogen production. Pego Central had the grid connection capacity subject to a competitive procedure with the aim of allocating the available capacity to renewable energy projects. The winning proposal integrates electricity generation from wind and solar energy, including electrochemical storage (batteries) and production of renewable gases. Decree-Law No 15/2022 of 14 January 2009 created a technology-free area (ZLT) for renewable energy in the municipality of Abrantes, aimed at establishing innovation

and development projects for the production, storage and self-consumption of electricity from renewable energy sources, to be developed as part of the decommissioning process of the existing coal-fired power plant. In order to make the ZLT-Abrantes operational, Order No 10228/2023 was published on 4 October 2023 by the Secretary of State for Energy and Climate. [Date: 2023]

1.1.3. Promote the use of sustainable fuels in electricity production in the Autonomous Regions.

Autonomous regions have implemented an energy policy in line with the national and international guidelines and commitments entered into in this area, and are also committed to decarbonising the economy and electricity generation, as is the way they have been doing in promoting renewable energy sources with the aim of reducing GHG emissions and fossil fuel imports.

In the case of the electricity sector, decarbonisation will entail the conversion of thermal power plants using fuel oil or gas oil as fuel to the use of sustainable and alternative fuels, complemented by other solutions ensuring security and quality of supply. To this end, available solutions will be assessed and tested according to the technical and specific constraints, characteristics of the Autonomous Regions. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security,

KEY INSTRUMENTS

RNC2050; RMSA-E; EAE 2030

SOURCES OF FUNDING

Regional Operational Programmes North 2030 and Alentejo 2030 which are part of the Just Transition Fund; The Modernisation Fund; Innovation Fund; RRP; Environmental Fund

ENTITY RESPONSIBLE

SAM; Madeira Regional Government (GRM); Regional Government of the Azores (GRA)

LINE OF ACTION

1.2. CONTINUE THE IMPLEMENTATION OF THE EU ETS

DESCRIPTION

Ensure the proper implementation of the ETS scheme in Portugal, adapting it to the new EU rules, in order to promote GHG reduction in a cost-effective and economically efficient manner. **SECTOR (ES)**

Energy; Industry Buildings; Transportes; Waste

MEASURES FOR ACTION

In order to continue the implementation of the EU ETS, in addition to its national implementation, the following action measures are foreseen:

1.2.1. Continue with a strategy for the exclusion of installations from the EU ETS

The procedure has been established at national level for the possible exclusion from the EU ETS of installations emitting less than 25 000 tCO_{2eq}, provided that they are subject to measures that achieve an equivalent emission reduction contribution, and for the possible exclusion of installations emitting less than 2 500 tCO_{2eq} (without subjecting them to equivalent measures).

This procedure is provided for in Decree-Law No 12/2020 of 6 April, and the European Commission was notified of the optional exclusion of 12 operators for the period 2021-2025 under Articles 27 and 27a of the ETS Directive, indicating the corresponding equivalent emission reduction measure, where applicable. This measure will be continued for the period 2026-2030. [Date: 2020-2030]

1.2.2. Apply the indirect cost compensation mechanism in the EU ETS

The rules on State aid measures under the ETS scheme have been established, with special and temporary measures adopted in favour of sectors and subsectors exposed to a significant risk of carbon leakage, addressing costs related to GHG emissions passed on in electricity prices.

This measure was implemented by the publication of Ministerial Implementing Order No 203/2021 of 28 September 2012, as amended by Ministerial Implementing Order No 231/2021 of 2 November 2012, establishing an aid measure in favour of installations covered by the ETS scheme operating in sectors and subsectors deemed to be exposed to a significant risk of carbon leakage due to the costs related to GHG emissions passed on in the electricity price, in order to compensate for those costs, usually referred to as indirect costs.

This aid measure applies, in respect of indirect costs incurred annually by eligible ETS installations, between 1 January 2021 and 31 December 2030, and the planned aid has already been granted in respect of costs incurred in 2021 and 2022, and the

assessment period for applications relating to the year 2023 is ongoing. This measure will be continued for the period 2023-2030.

[Date: 2021-2030]

1.2.3. Bringing the ETS system into line with the new requirements resulting from the revision of the Directive – New measure

Adjust the new provisions on the implementation of the EU ETS resulting from the publication of Directives (EU) 2023/958 and (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Union. This review concerns phase 4 of the implementation of the EU ETS scheme (2021-2030) and includes a number of significant changes, such as:

- Reduction of allowances available annually with a view to achieving the new ETS emissions reduction target for 2030, in this case -62 %, replacing the previous -43 %;
- Revision of the rules for free allocation of allowances;
- Review of the industrial sectors covered;
- Inclusion of the monitoring of GHG emissions from municipal waste incineration installations in the ETS scheme;
- Revision of aviation rules to ensure that aviation contributes to EU climate objectives, inter alia by increasing the auctioning of allowances and ending the free allocation process from 2026 onwards;
- Extension of the EU ETS to the maritime transport sector to make a significant contribution to reducing greenhouse gas emissions from maritime activities and increasing the efficiency of maritime activities.
- Creation of a new and separate ETS scheme covering buildings and road transport as well as other sectors corresponding to industrial activities not covered by Annex I to Directive 2003/87/EC.
- Strengthening the Innovation and Modernisation Funds and establishing the new Social Climate Fund (FSAC).

[Scheduled date: 2024]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

KEY INSTRUMENTS

The ETS Directive

SOURCES OF FUNDING

FA; FSAC; MFF 2021-2027

ENTITY RESPONSIBLE

SAM; GRA; GRM; APA

LINE OF ACTION

1.3. REDUCING THE CARBON INTENSITY OF THE BUILDING STOCK

DESCRIPTION

Reducing the carbon intensity of buildings, using energy more efficiently, promoting greater electrification of the sector, replacing fossil fuels with renewable energy sources, promoting the use of low-carbon materials, promoting behavioural changes and increasing the sharing economy, focusing in particular on rehabilitation for greater energy and water efficiency and increased thermal comfort, contributing to reducing energy poverty. Alongside electrification, the importance of renewable gases, namely biomethane and renewable H_2, is worth noting, taking advantage of existing gas networks and ensuring a carbon-neutral and cost-efficient solution compared to electrification.

SECTOR (ES)

Energy; Buildings; Industry

MEASURES FOR ACTION

In order to reduce the carbon intensity of the building stock, in addition to the action measures on energy efficiency improvement in buildings under Objective 2 – REFERENCE TO ENERGY EFICIENCY and the action measures of Objective 3 – REFORCE TO SUPPORT IN ENERGY RENOVAL AND REDUCE TO THE ENERGY DEPENDENCE OF THE COUNTRY, the following action measures are envisaged:

1.3.1. Promoting regeneration as the main form of action at the level of buildings and urban development Promote the rehabilitation of buildings as the main form of intervention in the building stock by increasing the useful life of buildings with the consequent return on the environmental resources already invested, contributes to the reduction of greenhouse gas emissions, minimises construction waste and contributes to the conservation of nature and biodiversity. Support and promote one-stop-shops in support of citizens, supported by digital platforms and/or physical spaces, as information dissemination tools and catalysts for small and major renovations of buildings aiming at resource efficiency and the use of alternative sources. [Scheduled date: 2020-2030]

1.3.2. Promoting sustainable techniques in construction and resource efficient and sustainable buildings

Promote the incorporation of secondary and bio-based, indigenous or locally produced raw materials into components for construction, bioclimatic architecture, passive houses and modular, multifunctional and dynamic architecture. Focus on the reuse of building components and the use of recycled materials, both in new construction and rehabilitation operations. Promote the treatment and recycling of construction materials in such a way that they can be reused, making the sector more sustainable. Promote the certification of water and material efficiency of buildings as a distinctive tool for resource efficiency and sustainability in construction. Promote the improvement of energy and water efficiency of buildings and the reduction of water and energy needs, including those incorporated in the construction itself, and promote the use of renewable energy sources. In addition, promote the importance of decarbonising, taking into account the social dimension (through inclusion), such as the New Bauhaus initiative. [Scheduled date: 2020-2030]

1.3.3. Promote the electrification of buildings while increasing the incorporation of renewables

Electrification of final consumption is identified as one of the most important drivers of decarbonisation of the economy, notably because it is linked to an increasing incorporation of renewable sources into its production. This electrification should therefore be promoted in both existing and new buildings. To this end, the solar potential of the building stock should be mapped and publicised, thus ensuring that cost-optimal investments are favoured, with the right balance of solar thermal and photovoltaic technologies, according to the different energy needs (electricity and heating and cooling), thereby promoting the replacement of fossil fuels in buildings. The replacement of equipment should therefore be encouraged and investment should be channelled towards the electrification of residential buildings and services. [Scheduled date: 2020-2030]

1.3.4. Encouraging the use and interoperability of digital platforms for realising opportunities for improvement in the energy and water performance of buildings – New measure

With the digital transition taking place in parallel with the energy transition, digital platforms increasingly claim to be an effective tool in raising consumer awareness and stimulating the implementation of more energy and water efficient solutions in buildings. More extensive use of existing platforms such as the CasA + Portal, a digital one-stop shop for the expeditious implementation of energy and water efficiency measures in households, should therefore be encouraged, making use of its interoperability with the Energy Certification System for Buildings (ECS) and the water efficiency assessment and classification system for buildings (AQUA +) to facilitate the process of converting the improvement opportunities identified in energy certificates and in the water efficiency classification of buildings. In this context, interoperability between digital one-stop-shops supporting the citizen, such as the CasA + Portal, and other platforms and entities will be boosted by leveraging their functioning as *hubs* facilitating consumer interaction with credible providers of technical and financing solutions in the market, as well as expeditious access to financial or fiscal incentives. [Scheduled date: 2020-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; Energy Efficiency; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- Urban design and renovation of buildings by making them more efficient, including by acting on thermal insulation and energy management, could minimise the influence effects of climate scenarios;
- Measures promoting water efficiency and energy performance in buildings (*water-energy nexus*) minimise the effects of water scarcity;
- Decentralised energy production and the implementation of storage systems could help the continuous supply of energy by minimising electricity losses on the grid, which are expected to occur in higher temperature scenarios.

KEY INSTRUMENTS

RNC2050; ENAR; SCE

SOURCES OF FUNDING

IFRRU 2020; FNRE; Restore to Arrendar programme; RRP; FA; MFF 2021-2027

ENTITY RESPONSIBLE

SAM; MH; DGEG; ADENE; AREAM; GRA; GRM; LNEG

LINE OF ACTION

1.4. REDUCE WASTE GENERATION AND LANDFILLING AND PROMOTE RECYCLING

DESCRIPTION

With a view to decarbonising the waste sector, it is a priority to reduce waste generation and where it cannot be reintroduced into the economy with the highest added value. In compliance with Community legislation and the national strategy in this area, the most noble operations of the waste hierarchy should be encouraged by reducing landfilling and increasing the separate collection of recyclable materials with a view to promoting recycling, including organic recycling.

SECTOR (ES)

Waste and UWWTD;

MEASURES FOR ACTION

In order to reduce waste generation and landfilling and promote recycling, the following interrelated action measures are envisaged:

1.4.1. Preventing the generation and hazardousness of waste

Prevention of waste generation and hazardousness will be achieved through prevention actions among industry/businesses, including trade and consumers, promoting innovative sustainable production, business and consumption models, encouraging the design, manufacturing of products that reduce the presence of hazardous, resource-efficient and durable substances. Examples include promoting extended producer responsibility, voluntary agreements with priority vectors to encourage cleaner production and sustainable product design, reducing food waste and encouraging the reduction of the use of single-use packaging. [Scheduled date: 2020-2030]

1.4.2. Increase preparation for re-use, recycling

It will be achieved by increasing the quantity and quality of both the separately collected material fraction sent for recycling and the bio-waste recycled through the promotion of separate collection, differentiated treatment of individual fractions, the implementation of technical specifications ensuring the quality of waste, the promotion of anaerobic digestion of bio-waste and domestic and community composting, and a strong awareness among the population and businesses. [Scheduled date: 2020-2030]

1.4.3. Reduce landfilling

The reduction of landfilling will be achieved through the diversion of recyclables, including bio-waste, encouraging their separate collection and differentiated treatment, but also the refuges and tailings from UK treatment, ensuring the recovery of this residual fraction as a resource through the adoption of the best available technologies, focusing on obtaining high added value materials/products and energy replacing fuels of non-renewable origin. Increasing the Waste Management Fee and the expected benefits for municipalities that meet the targets set out in the respective municipal plans will also promote the diversion of municipal waste from landfills. [Scheduled date: 2020-2030]

1.4.4. Consolidate and optimise the waste management network, reducing the impacts associated with waste management

By encouraging the proximity of the collection network to the user and the separation of the various fractions, enhancing synergies in the collection and treatment of waste in a spirit of complementarity and improving treatment efficiencies through the application of best available techniques, it will be possible to consolidate and optimise the waste management network. Also by promoting digitalisation, self-sufficiency in the competitiveness and sustainability of the sector, it will be possible to reduce the impacts associated with waste management. Promote methodologies to facilitate the separation of waste by citizens, calling for knowledge of recyclable materials. [Scheduled date: 2020-2030]

1.4.5. Promote the recovery and disposal of waste and materials resulting from waste treatment

In promoting a circular economy, it is important to ensure that the principle of the waste hierarchy is applied by promoting the direct reintroduction of waste into the economy, into new applications or after recovery, preferably by preparing for re-use or recycling. The aim is to extend secondary raw materials covered by waste declassification mechanisms such as by-product or end-of-waste status, legal and economic and financial regulations that encourage the recycling of waste and the use of recycled products and materials over virgin raw materials, research and development of new products and applications, awareness raising and education on preference for recycled or containing products and materials. With regard to energy, the recovery of biogas and electricity produced from the UK is also important. [Scheduled date: 2020-2030]

1.4.6. Promoting waste recovery practices in a regional logic by maximising energy production – New measure

Benefiting from economies of scale, the recovery of bio-waste for energy generation should be promoted by aggregating various sources of waste, without compromising the application of the principle of the waste hierarchy. By fostering the collection of organic waste, the recovery of organic waste should be regionally aligned through the creation of energy communities that optimise their treatment, maximising the production of biomethane and other waste/materials including digestate, with the potential to be used as fertiliser in the agricultural sector – minimising investment costs linked to economy of scale. [Scheduled date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

KEY INSTRUMENTS

RNC2050; PERSU 2030; PNGR 2030; ENEA; ENCDA; PEPGRA

SOURCES OF FUNDING

RRP; MFF 2021-2027

ENTITY RESPONSIBLE

MMAC; GRA; GRM

LINE OF ACTION

1.6. DECARBONISING AND MAKING MORE RESILIENT BUSINESSES, CITIES AND TERRITORIES

DESCRIPTION

Mobilising and involving local and regional actors, strengthening the role of civil society and businesses in building a carbon-neutral society, is key to the decarbonisation process. In addition to the mitigation component, increasing resilience should also be promoted at both local and regional level. The aim is to promote sustainable mobility by creating the conditions for paradigm change in urban mobility, reducing the carbon intensity of the stock of buildings (residential and commercial) and using energy more efficiently, enhancing knowledge on climate change mitigation, disseminating best practices and boosting behaviour in society. The sustainable and rational use of the territory, minimising GHG emissions and intensifying carbon sequestration will also be promoted; focus on containing urban perimeters by limiting the soil sealing and climate resilience of cities, promoting the classification and improvement of the water performance of buildings, contributing to efficiency in the water and energy nexus and ensuring a structural response to the problem of drought and inherent water scarcity.

SECTOR (ES)

Territory and Cities; Businesses; Mobility and Transport

MEASURES FOR ACTION

In order to decarbonise cities, in addition to the action measures provided for in the action lines of Objective 5 – PROMOVER TO SUSTAINABLE MOBILITY and Objective 2 – TO FIRST THE ENERGY EFICIENCE, the following action measures are foreseen:

1.6.1. Reducing the carbon intensity of the transport mobility system by developing and implementing Sustainable Urban Mobility Plans

Develop and implement Sustainable Urban Mobility Plans (SUMPs) in accordance with Article 47 (4) of the Climate Law (CBL). Promote a stronger link between mobility planning and urban planning in order to reduce the need and distance of travel. [Scheduled date: 2020-2030]

1.6.2. Promote the development of carbon neutrality plans and strategies, emissions accounting and reporting by business sectors

Promote the development of carbon neutrality plans and strategies in the business sector, including regular GHG emissions accounting and reporting associated with their business. These short to medium and long-term strategies should be aligned with the NECP 2030 and the national objective of achieving carbon neutrality by 2045, and to this end they should be articulated with the sectoral carbon neutrality roadmaps where they exist and integrated with municipal plans and strategies, fostering collaboration between the different actors with relevant contributions in the territories. [Scheduled date: 2020-2030]

1.6.3. Boosting the participation of organisations in actions to promote, disseminate and demonstrate good practice and information-sharing networks with objectives of carbon neutrality and improvement of air quality

Promote participation in initiatives to disseminate good practices on climate change mitigation, participation in networks, including with a view to sharing information with carbon neutrality objectives, dissemination and awareness-raising to the public through local media. Also promote environmental education programmes in schools to raise awareness of climate change and air quality among younger people, as well as promote living labs for decarbonisation in cities, involving the municipality, knowledge institutions and businesses in the development of pilot projects. In this context, emphasis is placed on boosting the participation of cities in the Covenant of Mayors for Climate and Energy, enabling the sharing and replication of best practices and the creation of common methodologies that foster collaboration and facilitate the monitoring of progress at national level. [Scheduled date: 2020-2030]

1.6.4. Contain the expansion of urban areas and limit soil sealing

Avoid the conversion of green areas and the subsequent sealing of their surface. Strengthen the development of existing urban areas and promote the coordination of natural values to be safeguarded. Support the implementation of rehabilitation and regeneration operations of the built fabric throughout the planning process, at the expense of new constructions. Take care of the urban design that should favour pedestrian traffic. Promote greater inter-municipal cooperation. Include strict preventive measures in the Territorial Management Instruments and boost effective enforcement. Concentrate all binding rules for individuals on municipal management plans. Clarify the soil regime, ending with built-up land. Making territorial planning more flexible. Make the strategic environmental assessment procedure more effective in carrying out, at the most upstream stage of planning, the scrutiny of strategies, plans and programmes in relation to increased risk and impact in relation to climate change,

land degradation and GHG emissions. Deliver an operative governance framework at regional level. [Scheduled date: 2020-2030]

1.6.5. Regenerate and revitalise urban centres, taking into account sustainability criteria

Promote functional densification of urban tissues, including diversification and enhancement of the provision of community-based services and trade that foster sustainable mobility patterns. Promote energy sustainability in public space and urban systems, including the energy efficiency of public lighting and the energy and water efficiency of urban water and sanitation systems. Promote regeneration and revitalisation of riparian urban fronts through resilient projects, promotion of the blue economy and promotion of sea-related sport activities and sustainable tourism. Promote the energy sustainability of industrial, technological and business parks and ports and logistic platforms. Promote urban agriculture by creating dedicated spaces for this purpose integrated into the urban structure. Foster the extension, qualification and integration of urban green spaces by enhancing their role as carbon sinks and urban microclimate regulators. [Scheduled date: 2020-2030]

1.6.6. Promoting the development of sectoral mitigation plans – New measure

Ensure the development of sectoral climate change mitigation plans, in line with the guidelines of the Climate Law (Article 22), consistent with the sectoral targets to be defined and planning tools for mitigation. Sectoral plans should be approved every five years in dialogue with the representative structures of each sector and should be in place over the same time horizon. [Scheduled date: 2023-2024]

1.6.7. Promoting the development of municipal and regional climate action plans – New measure

Develop climate action plans, at municipal and regional level, with a view to contributing to the objectives and targets set out in the national policy planning instruments for climate action, including those set out in the Climate Law. These plans should be linked to other planning instruments relevant to the territory concerned, in particular territorial management tools, and should use existing information from other previously developed local or regional plans, such as inter-municipal and local climate change adaptation plans, plans in the context of the Covenant of Mayors for Climate and Energy, Just Transition Plans or regional carbon neutrality roadmaps, where they exist. They should also be compatible with the Local Heating and Repair Plans under the Energy Efficiency Directive, Article 26. In this context, it is also necessary to promote the establishment of a network of cities and a platform to support it as a technical group with comprehensive expertise, from energy management in cities to the establishment of investment plans appropriate to different contexts, including the empowerment of the technical frameworks of the Municipalities and the encouragement of mobilisation and experience sharing activities at national and international level. [Scheduled date: 2022-2024]

1.6.8. Decarbonising the Historical Villages of Portugal by testing and affirming the concept of efficient and renewable villages – New measure

Implement the pilot project “Historical villages of Portugal towards carbon neutrality” with the Network of Historical Villages of Portugal, which aims at improving the sustainability of Historical Villages and their classification as Sustainable Historical Villages, through an integrated approach focusing on energy and water efficiency, on the water-energy nexus, renewable energy, water use from alternative sources, efficient mobility, circular economy and energy and water literacy. This project will address the particular challenges of these low-density regions in pursuing decarbonisation projects, maintaining their characteristics as Historical Villages, and disseminate solutions and best practices at national and European level through the development of replication guides, enabling the adoption of these practices by the other Historical Villages in Portugal and Europe. [Scheduled date: 2024-2030]

1.6.9. Reducing the need for commuting by promoting teleworking and promoting greater use of public transport by teleworkers

Promote teleworking through specific measures to increase the rate of remote workers compared to the current number, reducing the need for commuting with emission reduction benefits in the transport sector. However, it will also be necessary to take into account the need to avoid the possibility of a ‘rebound effect’ on emissions, motivated by the inherent change in behaviour, such as increasing the use of individual transport to the detriment of public transport. In this context, the creation of a teleworking pass encouraging the use of public transport by workers in this employment situation and/or the removal of the fixed validity of the pass should also be promoted, allowing its validity to begin on the date of its acquisition. [Scheduled date: 2024-2030]

1.6.10. Strengthening decarbonisation measures in the health sector – New measure

The adoption of the measures set out in the Strategic Low-Carbon Plan and the Public Administration Energy Efficiency Programme (Eco.AP) in the Ministry of Health should be updated and accelerated, helping this sector to enhance its greenhouse gas emissions reduction performance. [Scheduled date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & C

KEY INSTRUMENTS
RNC2050; Sustainable Cities 2020; ENAR; PNPOT; SUMP; PMEA; PROTA
SOURCES OF FUNDING
RRP; FA; MFF 2021-2027; PACS
ENTITY RESPONSIBLE
SAM; MIH; MCT; MS; GRA; GRM;

LINE OF ACTION

1.8. PROMOTING THE TRANSITION TO A CIRCULAR ECONOMY

DESCRIPTION
With a view to decarbonising the economy, the aim is to increase the levels of circularity of material and water use, lead to a substantial adoption of (new) business models that replace the supply of goods with the provision of services and ownership by use, promoting the proximity between production and consumption and reducing consumption by transforming waste into (new) resources. Pursue the vision and circular economy actions, contributing to GHG emission reductions, set out in the Circular Economy Action Plan (CEAP).
SECTOR (ES)
Waste and UWWTD; Industry Services; Residential; Transportation
MEASURES FOR ACTION
To promote the transition to a circular economy, the following actions are envisaged:

1.8.1. Promoting the recirculation of water materials

Boosting the market for recyclable materials. Enhance classification as a by-product and end of waste status, including coordination with collaborative laboratories for the circular economy. Strengthen systems for managing specific waste streams with a view to creating synergies and assessing the application of Extended Producer Responsibility (EPR) to emerging flows. Promote the establishment of new industrial areas developed with a view to industrial symbiosis, with material and energy rationalisation plans and the rehabilitation of existing industrial areas. Promote regional agendas based on regional metabolism analysis and identify opportunities for closing cycles. Improve the treatment of the solid sewage treatment plant in order to optimise the process from an environmental, economic and technical point of view and to recover sludge. Develop innovation projects in the area of conversion of sewage treatment plants to resource valorisation factories, typically with Near-Zero GHG emissions, embracing existing but not widespread technologies. Promote the production and use of reclaimed water (RSAs), obtained from waste water treatment. Promote sectoral agendas for the circular economy. Promote the use of compost resulting from the recovery of bio-waste and other appropriate organic waste. Strengthen material energy recovery. . Promote the incorporation of waste into biofuels. [Scheduled date: 2020-2030]

1.8.2. Promoting material efficiency and circularity of products

Improve production processes by minimising waste generation. Reuse components in the production process. Encourage *eco-design* of products so that they have an intrinsically long lifespan and are reusable, upgradable, repaired and remanufactured, compiling these strategies with minimising the use of virgin materials and critical raw materials, focusing on the use of recyclable materials and facilitating the separation of products, components and materials. Promote life-cycle assessment of eco-design products to ensure effective reduction of their impact on the environment and a greater contribution to decarbonisation. Encourage and inform about production methodologies under *zero defect production, eco-design, and safe and sustainable by design initiatives and measures.* [Scheduled date: 2020-2030]

1.8.3. Boosting circular business models

Encourage the provision of innovative products, which can replace existing ones and which, by offering the same function, are able to make existing products redundant (e.g. through digitalisation). Encourage more intensive use of products through sharing and servitisation business models. Encourage the use of repair, maintenance and updating services, the purchase of 2nd hand or remanufactured products and the creation of business models based on sharing and servitisation that favour the recovery of materials, components and products with a view to their relocation to the market. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy Efficiency; I & I & C
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- Water recirculation processes may suffer interference due to changing water availability patterns and increasing water scarcity;

- Water infrastructure could suffer from extreme climate events, for example by disrupting supply chains.

KEY INSTRUMENTS

RNC2050; CEAP; PERSU 2020 +; PENSAARP2030; PEPGRA

SOURCES OF FUNDING

FA; RRP; MFF 2021-2027

ENTITY RESPONSIBLE

SAM; ME; MIH; ADENE; LNEG

Activity HEADING – New line of action

1.10. PROMOTING TOOLS TO ENHANCE CLIMATE ACTION

DESCRIPTION

Promote the implementation of instruments across all sectors to leverage climate action, either in the strategic planning process of climate policy, in the budgetary management process or in the legislative procedure.

In the budgetary management process, it is particularly important to identify measures, and their allocations, that contribute directly or indirectly to the achievement of climate policy, as well as those contributing to the six environmental objectives included in the European Union taxonomy for sustainable activities: climate change mitigation; climate change adaptation; the sustainable use and protection of water and marine resources; the transition to a circular economy; pollution prevention and control and the protection and restoration of biodiversity and ecosystems.

SECTOR (ES)

Everyone

MEASURES FOR ACTION

To promote instruments to enhance climate action, the following action measures are envisaged:

1.10.1. Preparing Carbon Budgets – New Measure

Ensure carbon budgeting, in line with the guidelines of the Climate Law (Article 20), which set a total limit of five years of greenhouse gas emissions, in line with other climate policy instruments and international guidance, by carrying out a forward-looking climate policy analysis to ensure compliance with that limit. [Scheduled date: 2022-2030]

1.10.2. Preparing the Green Budget – New Measure

Identify in the State Budget the measures that contribute, directly or indirectly, to the achievement of the main policy instruments for each of the six objectives of the European Union taxonomy for sustainable activities: climate change mitigation; climate change adaptation; the sustainable use and protection of water and marine resources; the transition to a circular economy; the prevention and control of air, water and soil pollution and the protection and restoration of biodiversity and ecosystems, with an indication of the respective consolidated budget allocation to be made available for the implementation of each of those measures in the various budgetary programmes.

Provide an estimate of the contribution of the measures included in the State Budget to the achievement of the targets set out in the Climate Law. In this context, the Green Budget Working Group is established to be responsible for the preparation of the Climate Action Budget and the Green Budget. [Scheduled date: 2024-2030]

1.10.3. Consolidating the Climate Action Legislative Impacts Assessment – New Measure

Consolidate the Legislative Impact Assessment for Climate Action which has been incorporated, as a pilot project, into the pre-existing Legislative Prior Impact Assessment system (Resolution of the Council of Ministers No 5/2021 approving the model of the pilot project on prior legislative impact assessment on climate action, which entered into force on 20 January 2021), ensuring that bodies with legislative competence take into account an assessment of the impact of legislative initiatives on the climate balance, in line with the Climate Law (Article 27).
The legislative impact assessment on climate action aims to determine the alignment of legislative proposals and sectoral policies with climate action policy, fostering more informed decision-making by the Council of Ministers, and promoting better policy-making. [Scheduled date: 2021-2030]

CONTRIBUTION TO 5 DIMENSIONS

All

KEY INSTRUMENTS

Climate Bill; Legislative Procedure (AIL)

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE
SAM; MF

Activity HEADING – New line of action

1.11. ESTABLISH A VOLUNTARY CARBON MARKET AND SET THE RULES FOR ITS FUNCTIONING

DESCRIPTION
Promote the implementation of domestic GHG emission reduction and carbon sequestration projects that contribute to the mitigation of GHG emissions and the generation of environmental and socio-economic co-benefits such as the protection of biodiversity and natural capital, by: (I) project certification, in line with European and international principles and best practices, enabling the generation and consequent transaction of carbon credits; (II) Framework for emissions offsetting actions and financial contributions for climate action.

SECTOR (ES)
Everyone

MEASURES FOR ACTION
To establish a voluntary carbon market, the following actions are foreseen:

1.11.1. Establishing the legislative framework for the functioning of the voluntary carbon market – New measure

In addition to central governments, local authorities and businesses are also taking measures to make their municipalities or their organisations/services/products more sustainable, committing to emission reduction objectives and targets to support the overall goal of achieving carbon neutrality by at least 2050. In this context, there has been a growing interest from society at large, albeit with greater emphasis from the private sector, in using voluntary carbon markets as a tool for offsetting emissions.

However, action by the various parties needs to be properly framed so that they are credible and transparent, avoiding *greenwashing* practices and contributing to national climate action objectives.

In order to make the best use of these types of instruments and to maximise the benefits such as supporting biodiversity and fostering natural capital, it is crucial to establish a regulatory framework at national level to ensure transparency and quality – compatible *with* European and international monitoring, reporting and verification standards – PRM. **[**Scheduled date: 2022-2025]

1.11.2. Develop the project registration and carbon credits platform – New measure

Transparency of voluntary carbon market activity is key to ensuring its effectiveness and credibility, which is one of the key principles governing such markets, which is essential to avoid double counting of GHG emission reductions or carbon sequestration. In this way, the registration platform should enable the registration of projects, market players, carbon credits and transactions carried out, which should be publicly available. [Scheduled date: 2023-2024]

1.11.3. Promote the development of methodologies to monitor and account for GHG reductions and/or carbon sequestration in each project typology – New measure

Methodologies are essential to quantify the benefits of any future project on the voluntary carbon market and should define a set of parameters, criteria and procedures to determine the baseline (or *baseline*), from which emission reductions or carbon sequestration are calculated, assess additionality, monitor relevant parameters and, finally, quantify the GHG emission reductions or removals that will generate credits over the life cycle of the project. They should be subject to public consultation and regular review to ensure that they continue to reflect best practices and technical developments in a given sector to which they relate. [Scheduled date: 2023-2030]

1.11.4. Promoting the development of the voluntary carbon market through the empowerment of market players – New measure

Develop a digital platform to promote the involvement and empowerment of market players, along with the development of guidance documents, allowing for the clarification of doubts and the sharing of expressions of interest in relation to market participation. [Scheduled date: 2023-2025]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy Efficiency; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- The risk of fire may interfere with the functioning of the voluntary carbon market;
- Until 2030 the probability of ignition of a mega fire is 2 times higher than the historical record, according to the projections of the National Adaptation Roadmap 2100.

KEY INSTRUMENTS

RNC2050; Climate Bill

SOURCES OF FUNDING

Environmental Fund

ENTITY RESPONSIBLE

MAEN; APA; ADENE

Activity HEADING – New line of action

1.12. PROMOTING CLIMATE RESILIENCE THROUGH WATER EFFICIENCY

DESCRIPTION

Promoting water efficiency measures is a strategic area of intervention in the face of the need to mitigate water scarcity, in a context of increasing vulnerability of the territory to increasingly frequent climate change related droughts. As such, it is important to ensure the resilience of the territories, in particular those most affected by drought, based on climate change scenarios and the perspective set out in the National Strategy on Adaptation to Climate Change (ENAAC) and the Climate Change Action Programme (P-3AC), contributing to the diversification of the economic activity of the different regions and their economic, social and environmental development.

SECTOR (ES)

Waste water; Industry Agriculture; Buildings

MEASURES FOR ACTION

1.12.1. Promoting the optimisation and resilience of water services – previously classified as action measure 2.3.2 – New measure

Increase the resilience of public water supply systems by improving their performance, in particular with regard to reducing water losses; Increase the resilience of wastewater sanitation systems by eliminating undue connections, adapting sewage treatment plants to extreme climatic events and producing reclaimed water (RSAs), both for own use and for supply to third parties; Promote the segregation of rainwater drainage systems by eliminating undue infiltration, the damping of flows in periods of heavy rainfall and the reutilisation of rainwater; eliminate untreated discharges, creating, where possible, redundancy in lifting and treatment systems. Reduce the energy consumed in water services by improving energy and water efficiency and increasing the level of energy self-sufficiency of sewage treatment plants and ETA and other installations. Promote the use of reclaimed water in non-potable urban uses and carry out public awareness campaigns on water saving. [Scheduled date: 2020-2030]

1.12.2. Improving Water Efficiency – New Measure

A more efficient use of water, to the extent necessary and free of waste, requires buildings and equipment to be more water-efficient, and businesses, professionals and citizens to be better able to use it efficiently, thereby promoting the water-energy nexus in the management of water supply systems and the use of this resource in relevant sectors such as agriculture, public supply and tourism, among others. Promote the improvement of the efficiency of public and private irrigation, in particular by promoting the following actions: refurbishment and/or replacement of degraded infrastructure; managing the operation of irrigation networks and increasing their efficiency on plots; promoting the use of more effective irrigation practices (as foreseen in Action Measure 6.4.1); adapting crops to our climate and less water-consuming; use of weather stations and soil moisture monitoring probes to adjust, more accurately and in real time, irrigation needs according to evapotranspiration rates. Expected date: 2020-2030]

1.12.3. Promoting the use of Water for Reuse (RSA) – New measure

To address the growing demand for water, reuse is an alternative source, contributing to the sustainable use of water resources, as it allows water to be maintained in the environment and preserved for future uses, while safeguarding present use, in line with the principles of the circular economy. The use of RSAs is, moreover, an example of what can be a climate change adaptation measure and a good water management practice, in particular to address water scarcity aggravated by increased frequency and intensity of drought periods, thus making systems more resilient.

Potential uses (urban, agricultural, forestry, industrial, landscape, etc.), including ecosystem support, should therefore be considered and potential producers and potential users assessed so that this strategy can also contribute to the climate and energy transition. In this context, the installation of PRA projects, brackish water desalination, rainwater recovery and natural recharge of aquifers, energy sustainable, based on renewable sources, complementing other supply-enhancing measures, and allowing for modularity and the possibility of additional water availability increases to mitigate future water scarcity risks in more vulnerable regions should therefore be promoted [Planned date: 2023-2030]

1.12.4. Promoting seawater desalination projects – New measure

Promote the installation of energy sustainable desalination plants based on renewable sources in addition to other supply-enhancing measures, allowing for modularity and the possibility of additional water availability increases to mitigate future water scarcity risks in more vulnerable regions. In addition, combined water demand reduction solutions through water efficiency and loss reduction and the enhancement of water supply that minimise energy consumption and maximise the use of energy sustainable sources based on renewable sources, including desalinator plants, should also be promoted. [Scheduled date: 20232026]

1.12.5. Review the National Water Plan (2035) – New measure

The revision of the National Water Plan for 2035 should guide the decarbonisation needs of the sector in addition to the concerns to adapt to the impacts of climate change. The new water planning cycle will have to ensure alignment with the objectives of the NECP 2030 by introducing measures that contribute to the different targets. [Scheduled date: 2024-2025]

1.12.6. Create the Action Programme for the Integrated Digitalisation of the Water Cycle – New Measure

This programme should include measures and investments to modernise water management in a technological transformation logic, also considering the water efficiency/energy efficiency nexus. The digital transition and technological innovation make it possible to monitor multiple parameters contributing to the rationalisation of water and energy consumption. It should be borne in mind that there are large financial costs associated with energy consumption in water and sanitation systems. It is crucial to speed up all processes in a spirit of decarbonisation, circularity and economic rationality. [Scheduled date: 2025-2026]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy Efficiency; I & I & C
CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated
- Changing water availability patterns, increasing scarcity and droughts, temperature increase (or other extreme events) can interfere with the optimised management of the water sector;
- Climate risks associated with different sectors and regions, varying according to water availability, could interfere with the production process of RWA;
- Increased salinity will require increased treatment and energy needs in the desalination process, particularly in summer;
- Extreme events such as storms, floods or fires have adverse effects on water infrastructure (promoting resilient infrastructure).

KEY INSTRUMENTS
RNC2050; PGRH; PENSAARP2030; PEPAC; PNUEA; RNA2100
SOURCES OF FUNDING
RRP; ERDF
ENTITY RESPONSIBLE
AEM

LINE OF ACTION

6.2. PROMOTING THE DECARBONISATION OF LIVESTOCK FARMING

DESCRIPTION
It aims to reduce the carbon intensity of livestock farming, in conjunction with the line of action on renewable energy sources in the agricultural and forestry sectors.
SECTOR (ES)
Agriculture; Energy
MEASURES FOR ACTION
To promote the decarbonisation of livestock farming, the following action measures are envisaged:

6.2.1. Promote the installation or conversion of effluent management and treatment systems to reduce GHG and ammonia emissions

Develop and adopt livestock effluent management systems as a key factor in reducing GHG and ammonia emissions in this sector. [Scheduled date: 2020-2030]

6.2.2. Support digestibility improvements in animal feed

Promote food strategies to increase digestive food efficiency, minimising potential pollutant load, in particular with regard to GHG and ammonia. [Scheduled date: 2020-2030]

6.2.3. Promote integrated solutions for the treatment of livestock and agro-industrial effluents

The new National Strategy for Agri-Livestock and Agri-Industrial Efluents (ENEAPAI 2030) is based on the concerted desire between the environment and agriculture to provide technically and economically viable solutions for the sectors under review, focusing primarily on pig, poultry and intensive cattle farming.

The new ENEAPAI 2030 (RCM No 6/2022) is based on five axes related to: (*I*) compliance with environmental and sectoral legislation; (*II*) the establishment of a monitoring structure for ENEAPAI 2030; (*III*) promotion and prioritisation of sustainable solutions and management models; (*IV*) involvement of territories and producer organisations; and (*v*) promoting a framework for Research, Development and Innovation (R & D & I), training and communication. Its main focus is the five hotspots: (1) municipalities of Leiria and Alcobaça; (2) municipality of Rio Maior (far from the previous ones); (3) the Esposende -Vila do Conde dairy basin, forming part of the respective NVZ, (Vila do Conde, Mos los, Póvoa do Varzim and Vila Nova de Famalicão); (4) West Region (Torres Vedras); (5) municipalities of Montijo, Palmela and Setúbal.

The solutions found from ENEAPAI should be aligned with the guiding principles of the Circular Bioeconomy and RNC2050. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- Increased temperature, reduced water availability and prolonged droughts could interfere with the functioning of agrolivestock and agro-industrial effluent management systems, requiring more robust and resilient treatment solutions;
- Changing climate patterns could interfere with the availability and quality of animal feed. **KEY INSTRUMENTS**

RNC2050; RDP 2020; PEPAC; ENEAPAI 2030; NREAP

SOURCES OF FUNDING

EAFRD; EAGF; The Cohesion Fund

ENTITY RESPONSIBLE

MAP; SAM; GRA; GRM;

LINE OF ACTION

6.3. REDUCE NITROGEN FERTILISER CONSUMPTION

DESCRIPTION

Encouragement to reduce the use of nitrogen fertilisers, with reference to the Code of Good Agricultural Practice (Order No 1230/2018 of 5 February 2007), the Code of Good Patical Emission Reduction (2022) under the National Teams Directive (Decree-Law No 84/2018 of 23 October 2012) and the EU Regulation for fertilising products (which will replace the current EC Regulation 2003/2003 on fertilisers).

SECTOR (ES)

Agriculture;

MEASURES FOR ACTION

To reduce nitrogen fertiliser consumption, the following action measures are envisaged:

6.3.1. Adoption of the Code of Good Agricultural Practice

Implement recognised codes of good practice for this purpose, with a view to reducing the use of nitrogen fertilisers, as a promoter of GHG and ammonia emission reductions. [Scheduled date: 2020-2030]

6.3.2. Improve efficiency and effectiveness in land application of fertilisers

Promote the uptake of fertilisation techniques that minimise nutrient losses by expanding organic farming, conservation and precision, reducing animal effluent emissions and fertiliser use, and promoting increased carbon sequestration resulting from increases in soil organic matter content and reduction of nitrogen losses into the atmosphere. [Scheduled date: 2020-2030]

6.3.3. Replacement of the use of mineral fertilisers with organic fertilisers

Encourage the production of organic fertilisers, together with the promotion of substitution of synthetic (mineral) chemical fertilisers with organic ones. The recovery of agricultural waste through the composting process, of which the URSA – Alqueva Subproduct Recirculation Unit – is an example, as well as the recovery of municipal waste, alongside agricultural waste, is a determining factor in this context. The existence of a set of recirculation plants located close to the production sites of the by-products will help to encourage substitution of mineral fertilisers by compost. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— Climate risks could interfere with the organic fertiliser production process: temperature increase and humidity reduction affect the microbiological process of organic compost/fertiliser production.

KEY INSTRUMENTS

RNC2050; RDP 2020; PEPAC; ENEAPAI 2030; ENAR; NREAP; BREF birds and pigs

SOURCES OF FUNDING

EAFRD; EAGF

ENTITY RESPONSIBLE

MAP; SAM; GRA; GRM

LINE OF ACTION

6.5. INCREASE THE NATURAL CARBON SINK CAPACITY OF AGRICULTURE AND FORESTRY

DESCRIPTION

The aim is to ensure an increase in the carbon sink capacity of agriculture and forestry.

SECTOR (ES)

Agriculture; Forest

MEASURES FOR ACTION

To increase the natural sink capacity of agriculture and forestry, the following action measures are envisaged:

6.5.1. Supporting afforestation and improvement of the environmental value of forests

It will be achieved through support for the afforestation of non-agricultural land, afforestation in areas with high susceptibility to desertification, support for actions improving the resilience of forest stands, support for the conservation and restoration of high nature value habitats and forest areas, support for the maintenance and conservation of riparian galleries, support for the conversion of installed stands under unadjusted ecological conditions, using better adapted species, support for increasing the area subject to forest management plans and promote the improvement of the economic value of forest stands; support for the certification of sustainable forest management, promotion of the implementation of management models and standards for Regional Forest Planning Programmes (PROF), promotion of Forest Intervention Areas, Forest Management Units, Forest Management Entities, qualification of actors in the sector and promotion of ecosystem services.

In this context, it will also be important to promote the implementation of the intervention programme measures provided for in the Landscape Transformation Programme (PTP), which is a strategy for vulnerable forest areas with high fire hazard. The implementation of the Landscape Transformation Programme, approved by Resolution of the Council of Ministers No 49/2020 of 24 June, will be carried out in the medium and long term through four programmatic measures:

a) Landscape Management and Planning Programmes (PRGP), aimed at promoting landscape design as a reference for a new economy of rural territories, promoting a multifunctional, biodiverse and resilient forest, more profitable, more carbon sequestration capacity and capable of delivering better services from ecosystems;

b) Integrated Landscape Management Areas, which define a pooled management model, operationalised through Integrated Landscape Management Operations (OIGP), targeted at specific micro-territorial contexts, preferably included in the PRGP, with an appropriate scale for active and rational management;

c) 'Village condominium' means the Integrated Support Programme for Villages located in forest territories, with the aim of ensuring fuel management around settlements in areas with high forest density and large number and dispersion of small rural settlements;

d) 'Parcel to Ordenar' programme, with a view to encouraging an increase in the physical size of agricultural land in the context of mini-famílage, thereby increasing viability and economic, social and environmental sustainability.

The Landscape Transformation Programme is aligned with the PNPOT guidelines, the National Forest Strategy 2030 (ENF 2030) and the National Nature Conservation and Biodiversity Strategy 2030 (ENCNB 2030). In conceptual and programmatic terms, the PTP also responds to the guidelines of the Inland Recovery Programme.

[Scheduled date: 2020-2030]

6.5.2. Increasing the resilience of the landscape to rural fires and reducing their incidence

The aim is to implement landscape plans that promote species diversity and multifunctionality in forest areas, contributing to a higher income for forest producers and making the territory more resilient to rural fires and pests. [Scheduled date: 2020-2030]

6.5.3. Conserve, restore and improve agricultural and forest soils and prevent erosion

It will be achieved through the installation, conservation and restoration of riparian galleries that maintain the water regime and prevent erosion, the adoption of agricultural and forestry techniques that promote increased levels of soil organic matter and soil carbon sequestration, including through minimum tillage, direct seeding and sowing between permanent crop lines. The application of fertilisers resulting from the recovery of agricultural waste, livestock waste, sewage sludge, bio-waste or other materials, which will contribute to increasing the share of soil organic matter with benefits in soil structure and fertility, as well as reduced water erosion, will also be relevant in this area. The installation of biodiverse permanent pasture, the maintenance of permanent crops as well as other operations to improve soil fertility and structure and the use of crops/species appropriate to the soil characteristics will also be supported. [Scheduled date: 2020-2030]

6.5.4. Continue to support and develop Remuneration Programmes for Ecosystem Services in Rural Spaces

Phase 1 of the Programme for the Remuneration of Ecosystem Services in Rural Spaces, launched in 2019, aims to make rural areas more competitive and ensure a model of greater environmental sustainability, with less exposure to risks, in particular fires. The aim of remuneration for ecosystem services is to promote the biodiversity of territories, reflecting a transformation in the way territories are exploited, moving from a short-term profitability model to a model whose profitability needs a longer time lag, but which ensures greater value for and resilience of territories.

The aim is to further promote such mechanisms to compensate unvalued contributions from the market, among which to contribute to erosion control, carbon sequestration, hydrological cycle regulation, biodiversity conservation, reduced fire susceptibility and improved landscape quality. [Scheduled date: 2020-2030]

6.5.5. Liaising with the National Nature Restoration Plan – New Measure

The process of preparing the National Nature Restoration Plan should ensure alignment with the National Energy and Climate Plan, as provided for in Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024. It is crucial to ensure that their objectives and measures are reconciled, considering that the energy transition cannot accelerate ecosystem degradation and biodiversity loss, and that more appropriate instruments should be developed in terms of compensation for impacts on socio-ecological systems. [Scheduled date: 2024-2026]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP
Decarbonisation; I & I & C
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- Some climate effects, such as increased temperature, reduced precipitation, increased fire risk, proliferation of harmful biotic agents and extreme events, may interfere with the effectiveness of forest and agricultural management measures, which increase sink capacity.
- By 2070, approximately 30 to 40 days per year of extreme fire weather hazard could occur in an RCP4.5 scenario, according to the projections of the National Adaptation Roadmap 2100;
- In addition to the fires, the combined effect of increased extreme precipitation events, which are responsible for soil erosion and affecting its capacity as a natural carbon sink.

KEY INSTRUMENTS
RNC2050; ENF; RDP 2020; PEPAC; ENCNB; PTP
SOURCES OF FUNDING
EAFRD; EAGF; The Cohesion Fund; FA; PRR
ENTITY RESPONSIBLE
MAP; SAM; GRA; GRM; DGT; ICNF; AGIF

LINE OF ACTION

6.6. PROMOTE MORE EFFECTIVE MANAGEMENT OF THE FARMING AND FORESTRY SYSTEM WITH A REDUCTION IN THE BURNT AREA AND THE IMPACT OF BIOTIC AGENTS

DESCRIPTION
The aim is to reduce the number of fires, the burnt area and the emissions caused by rural fires by reducing the area affected and emissions caused by biotic agents.
SECTOR (ES)
Agriculture, Forests and Other Land Use
MEASURES FOR ACTION
In order to promote more effective management of the agroforestry system by reducing the burnt area and the impact of biotic agents, the following action measure is envisaged:

6.6.1. Reduce abiotic risks and empower the rural fire management component

It will be achieved through the implementation of the primary network of fuel management bands, fuel management mosaics and secondary network of fuel management bands, among other measures foreseen in the National Plan for Integrated Rural Fire Management, in particular those under the strategic objective "Care of rural areas". Support the functioning of Forest Sapator Teams, increase their efficiency, and provide the ICNF with a force of forest firefighters. Implement the National Control Fire Plan and the National Rural Fire Event Reduction Programme. [Scheduled date: 2020-2030]

6.6.2. Promoting productivity and improving the economic value of forest stands

It will be achieved through professional and active management of stands, maximising the potential of the stations, making use of improved plants, multifunctionality, more demanding technical solutions, certification of sustainable forest management, consolidation or conversion of existing forests, as part of a new specialisation of the territory, as well as the restoration of degraded or undercrowded forest systems. The sectors should invest in forest-based products with higher added value and charge fair prices to the producer, creating a value chain from production to marketing of the final product. [Scheduled date: 2020-2030]

6.6.3. Reducing biotic agricultural and forestry risks – resulting from the breakdown of action measure 6.6.1 – New measure

Implementing the Forest Health Operational Programme and Action Plans, Contingency Plans, Control Plans for harmful biotic agents. Implement the Action Programme for the Control of Invasive Species. Strengthen the control of imports and movements of timber and agricultural and forest reproductive material. Support the empowerment of the sector for more effective monitoring and control and strengthen the early detection capacity of invasive biotic agents. Control emerging pests and diseases in agricultural and forestry systems. [Scheduled date: 2020-2030]

6.6.4. Promoting the reduction of the spread of fires, protecting infrastructure, including the high-voltage, medium and low-voltage power grid, and isolating potential fire ignition outbreaks – New measure

Build up and restore Secondary Fuel Management Fund Networks in accordance with current legislation, which has been evolving and increasing the amount of infrastructure in need of these defence networks built around them. In parallel and taking into account the state of electricity grids and the ageing of their assets, consider alternative solutions such as converting overhead networks into underground networks or, in the case of the Low-Voltage network, replacing uninsulated overhead networks with isolated ones. These alternatives aim to promote not only greater security of network operation, but also enhance the technical quality of service and the efficiency of their operation. [Scheduled date: 2020-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— Some climate effects, such as increased temperature, reduced precipitation, increased fire risk, proliferation of harmful biotic agents and extreme events, could interfere with the effectiveness of forest and agricultural management measures.

KEY INSTRUMENTS

RNC2050; ENF; RDP 2020; PEPAC; PNPOT; PNGIFR; PDIRD-E; PDIRT-E

SOURCES OF FUNDING

EAFRD; The Cohesion Fund; ERDF; FA; PRR

ENTITY RESPONSIBLE

MAP; SAM; GRA; GRM; ERSE; DGEG; Network Operators

LINE OF ACTION

6.7. ENCOURAGING THE ROLE OF THE BIOECONOMY FOR DECARBONISATION

DESCRIPTION

Promote the decarbonisation of bio-based economy value chains by increasing the use of existing bio-based primary and secondary raw materials (e.g. by-products/residual materials from agriculture, livestock, forestry, and marine resources) per region, allowing to identify synergies that contribute to increased and better cascading use, with new circular business areas that contribute notably to GHG emission reduction.

SECTOR (ES)

Agriculture; Forest; Energy

MEASURES FOR ACTION

In order to encourage the role of the bioeconomy for decarbonisation, in addition to the appropriate links with the action lines concerning the transition to a circular economy from Objective 1 to the use of Objective 3 biomass and alternative fuels of Objective 5**,** the following action measures are envisaged:

6.7.1. Promoting the use of forest and agricultural residual biomass

Boost regional material markets and strengthen management systems for primary and secondary raw materials (e.g. use compounds resulting from the recovery of bio-waste and other organic waste, exploit biomass resulting from cuttings, cuttings, pruning and harvesting), respecting circular economy principles, in particular cascading use, promoting new business areas (e.g. developing inventories of availability of primary and secondary raw materials and material flows, in the same geographical area). It becomes important in high forest dense municipalities where power plants are planned to be installed for the consumption of surplus biomass.[Planned date: 2020-2030]

6.7.2. Support the establishment of areas of crops for energy purposes of very short rotation forest species – Measure eliminated

Measure removed taking into account the hierarchy of biomass uses and the need to promote the permanence of the natural base sink.

6.7.3. Promote the use of bio-based resources (agricultural, livestock, forestry and by-products from other sectors) as substitutes for fossil materials

It will be achieved through the development of new bio-based products through innovation and incorporation of biological resources, in the textile, footwear and natural resin sectors, by focusing on new raw materials incorporating forest biomass and alternative natural fibres, by-products and bio-waste from the agri-food or industrial sector, as well as the development and implementation of new production processes enabling the recycling of materials and the recovery of waste generated in production and post-consumption, reducing the environmental impact and reducing waste, with the aim of developing new circular processes. Support for the establishment and modernisation of first processing units for agricultural and forestry products and for the installation of centres for the collection and transport of residual biomass. Promotion of the transformation (conversion) of chemical energy from organic compounds, biogas and biomethane from agrolivestock to thermal and electrical energy (cogeneration). [Scheduled date: 2020-2030]

6.7.4. Promoting the development and production of new bio-based products for circularity – New Measure Aposting knowledge of materials and production systems that enable the recycling and re-use of produced goods, with a view to developing new product concepts (e.g. ecological, durable, repairable, such as lower environmental footprint) based on *ecodesign* approaches and life cycle analysis, the development of methodologies and metrics for the sustainability and circularity of materials, as well as tracking tools (e.g. product CVs), with a view to promoting circularity. [Scheduled date: 2024-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— Drought and fire risks could interfere with reducing forest biomass, reducing agricultural crop productivity and changing the quality of renewable agricultural, livestock and forestry materials.

KEY INSTRUMENTS

RNC2050; ENF; PABS; RDP 2020; PEPAC; PNPB

SOURCES OF FUNDING

EAFRD; The Cohesion Fund; ERDF; PRR

ENTITY RESPONSIBLE

MAP; SAM; GRA; GRM;

LINE OF ACTION

7.1. PROMOTING THE DECARBONISATION OF THE INDUSTRIAL AND BUSINESS SECTOR

DESCRIPTION

As part of the strategic objective of promoting an innovative, competitive industry, the aim is to decarbonise industry by promoting the use of renewable resources, energy storage, electrification and the use of renewable gases. With a highly renewable based-electricity system, the aim is to promote and enhance the use of electricity in the different sectors of activity and the economy, alongside the increased use of other renewable energy sources such as biomass, sustainable biofuels and renewable fuels of non-biological origin, including renewable hydrogen. The industrial sector will play an extremely important role, in this context being one of the main hubs of need for innovation and the creation of new business models. Strengthening the prospects for the circular economy, “industry 4.0” and technology innovation is a key factor in the path towards identifying and creating innovative, efficient and emission close to zero solutions in the next 30 years.

SECTOR (ES)

Industry Energy; Waste

MEASURES FOR ACTION

To promote the decarbonisation of industry, the following action measures are envisaged:

7.1.1. Promoting Renewable Energy – Eliminated Measure

Promote and incentivise the penetration of renewable energy sources, in particular solar thermal, solar photovoltaic, green hydrogen and biomethane, as well as promoting increased competitiveness by reducing energy costs. Measure deleted because it is considered that the topic in question is already addressed/included in other more specific measures.

7.1.2. Increase the use of renewable alternative fuels and other domestic resources with potential for use as an energy source, promoting emission reductions in industry

Promote and encourage the exploitation and penetration of renewable energy sources, in particular renewable gases, renewable fuels of non-biological origin, waste derived fuels (CDR) and other sustainable fuels.

The replacement of highly polluting fuels by others with lower emission factors, notably those of renewable origin such as biomethane, green hydrogen, synthetic methane and STL in the aviation industry), the use of efficient equipment and optimised consumption management are crucial processes to ensure decarbonisation, as they substantially reduce energy bills and GHG emissions, due to the progressive and viable replacement of high polluting fuels with cleaner sources, while promoting an increased competitiveness of the industry. A stronger focus on the use of biomethane and hydrogen as a vector for the decarbonisation of industry meets the REPowerEU objectives of accelerating the transition to electrification and the use of renewable hydrogen, increasing the capacity of production processes and reducing GHG emissions. [Scheduled date: 2020-2030]

7.1.3. Promoting electrification in industry

Electrification of consumption is a crucial process to ensure decarbonisation, as it substantially reduces energy bills and GHG emissions due to the replacement of fossil fuels with indigenous and cleaner sources, while promoting greater competitiveness of industry. The role of hydrogen as a green vector (and produced using water from alternative sources such as Water for Reuse) is also important for the decarbonisation of industry, notably in the ceramics and glass sectors, in line with the REPowerEU objectives of accelerating the transition to electrification. [Scheduled date: 2020-2030]

7.1.4. Assess the geological potential of the country for geological carbon storage and consider the potential contribution of Carbon Capture and Geological Storage (CCS) and Carbon Capture and Use (CCU) activities in the industrial sector – New measure

In order to address the need to increase the level of carbon removal to counterbalance hard-to-abate GHG emissions in very specific sectors,such as some industrial sectors where existing technological solutions do not yet fully eliminate emissions (e.g. process emissions from the decarbonisation of materials used, incineration of municipal waste), the geological potential for geological carbon storage is being assessed and the potential contribution of activities promoting the capture and geological storage of CO_2 (CCS) or capture with a view to the subsequent use of CO_2 (CCU) to achieving the national climate neutrality objective in 2045 should be considered.

In line with Regulation (EU) 2024/1735 of 13 June 2024 (Net*Zero Industry Act)*and in line with the Commission Communication on Industrial Carbon Management (COM (2024) 62 final), a national strategy for CCUS activities should be developed. This strategy should assess the possibility of creating a regulatory framework for the treatment of different types and uses of CO2, their accounting and lifetime assessment of their storage, including the development of a dedicated CO2 pipeline infrastructure [Planned date: 2024-2030]

7.1.5. Supporting business investment in decarbonisation – New measure

Leverage the decarbonisation of the industrial and business sector and promote a paradigm shift in the use of resources, delivering on the targets set at national level in the medium to long term and contributing to accelerating the transition to a carbon-neutral economy. Power-to-X (P2X) strategies, through their versatility embedded in the variable 'X' that includes different energy carriers or molecules derived from renewable hydrogen, will play a crucial role in achieving this through sustainable and carbon-neutral pathways. By providing carbon-neutral alternatives to fossil fuels, P2X offers a viable pathway to significantly reduce carbon emissions in carbon-intensive sectors that are difficult to electrify and account for around 30 % of global emissions. Moreover, in addition to being key to the effective implementation of the Renewable Energy Directive and the application of the circular economy concept, P2X technologies provide: (I) a flexible and efficient way to store and use excess renewable energy, and (ii) a versatile solution due to its ability to produce a variety of energy and industrial carriers and products, thus contributing significantly at system level to the overall energy transition.

This aims to promote the competitiveness of companies in manufacturing, capital goods industry in the framework of the implementation of NZIA (EU) 2024/1735 of 13 June and other sectors of the economy by decarbonising them, to support

business investment in productive innovation processes, in particular by incorporating low-carbon processes and technologies and developing new goods and services, promoting resource efficiency, reducing energy consumption and promoting the use of renewable energy sources, as well as supporting the development of decarbonisation roadmaps.

- Component 11 of the RRP – Decarbonisation of Industry as part of the Climate Transition Dimension – is part of this type of support.
- The Mobilising Agendas for Business Innovation, which include the so-called Green Agendas, aim to consolidate and expand synergies between the business fabric and the scientific and technological system in Portugal, contributing to increasing the competitiveness and resilience of the Portuguese economy, innovation and the diversification and specialisation of the productive structure. The aim of these agendas is to support the development of projects that make it possible to transform the specialisation profile of the Portuguese economy by encouraging higher added value and knowledge-intensive activities geared towards international markets and the creation of skilled jobs. This is an initiative included in the RRP.

[Scheduled date: 2023-2026]

7.1.6. Ensuring the implementation of the Carbon Border Adjustment Mechanism (CBAM) – New measure

Ensure the implementation of the Carbon Border Adjustment Mechanism (CBAM), established by Regulation (EU) 2023/956 of the Parliament and of the Council of 10 May 2023, which aims to impose a carbon price on imported goods based on their embedded emissions, ensuring an equivalent carbon price between an imported product and the same product produced in the European Union (EU), thereby avoiding the risk of carbon leakage.

The aim is to gradually replace existing measures to prevent the risk of carbon leakage in the EU, such as the free allocation of allowances available to sectors covered by the European Emissions Trading System (ETS). This gradual reduction of the free allocation will be done as the gradual introduction of this carbon border adjustment mechanism also takes place, so as to ensure that the rules applicable to third countries are compatible with World Trade Organisation rules.

The industrial sectors covered by this mechanism are Cement, Fertilisers, Iron and Steel, Aluminium and Chemistry (Hydrogen) and apply also to imported electricity. [Scheduled date: 2023-2030]

7.1.7. Promoting the Development of a Green Industry – New Measure

Following the RRP reprogramming process, a 'REPowerEU chapter' – Component 21 was included, with the aim of increasing the ambition of the RRP and ensuring that its effects are maximised taking into account the geopolitical context in Europe, by increasing the funds available for measures supporting climate objectives comprising investment RP-C21-i05 – 'Support to the development of a green industry' for businesses, which aims to increase the production capacity of technologies for renewable energy, decarbonisation and energy efficiency. Therefore, and since it is necessary to create a nucleus encompassing all the functions of ensuring that decisions are taken, with the required speed and technical rigour, on matters relating to the operationalisation and monitoring of the implementation of this investment, the Coordinating Committee for investment RP-C21-i05 – 'Support for the development of a green industry' was set up by Order No 3759/2024 of 8 April, with the aim of developing, coordinating and monitoring the implementation of the measures provided for in this investment RP-C21-i05 – 'Support for the development of a green industry'. [Scheduled date: 2023-2030]

7.1.8. Promoting mechanisms for electro-intensive customers – New measure

Approve and regulate access to electro-intensive customer status and in particular the extent to which distance restrictions on the self-consumption centre are removed, promoting remote self-consumption using the public network. Develop regulatory mechanisms to enable highly growing electro-intensive customers to install their own renewable production, either near the consumer facility or further away, making it possible to use the networks by strengthening them. [Scheduled date: 2024-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; Energy Efficiency; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- Changing patterns of availability of renewable resources affects energy production;
- Climate risks could interfere with the production of renewable fuels (affecting the quality and availability of these resources);
- Extreme climate events could lead to electricity supply disruption;

KEY INSTRUMENTS

RNC2050; ENAR; PERSU 2020 +; PRAEE

SOURCES OF FUNDING

Community Funds (PACS, Regional OPs; PITD); RRP; PT2030; CEF2; Horizon Europe; LIFE; Innovation **Fund RESPONSÁVEL**

SAM; ME; MIH; GRA; GRM; APA; DGEG and LNEG

LINE OF ACTION

7.3. REINDUSTRIALISATION FOR SUSTAINABILITY

DESCRIPTION

The paradigm shift in industry needed for the energy transition and carbon neutrality follows a more incremental path compared to other sectors. Eco-innovation, digitalisation and more sustainable business models are tools that drive decarbonisation, differentiating in competitiveness, and their promotion can translate into economic and environmental gains.

SECTOR (ES)

Industry Energy

MEASURES FOR ACTION

To foster eco-innovation and cleaner production processes, promote the digitalisation of industry (Industry 4.0), the following actions are foreseen:

7.3.1. Promoting digital industry (Industry 4.0)

Promote the digitalisation of the industrial sector by incorporating resource efficiency logics, improving process efficiency, reducing energy and resource consumption, and promoting the decarbonisation of processes, products and services. Digitalisation of support to the energy transition, including through sensing, communication and storage of data and micro-services. [Scheduled date: 2020-2030]

7.3.2. Promoting a reindustrialisation creating green jobs – Measure eliminated

Promote the creation of green jobs to address the needs of the energy and climate transition through entities accredited for this purpose. Included in the new measure 8.3.5. [Scheduled date: 2020-2030]

7.3.3. Minimise the consumption of F-gases with a view to replacing them with natural refrigerants

Prohibit the placing on the market of equipment with F-gases with high GWP (Global Warming Potential). Prevent the release of F-gases into the atmosphere. Promote the use of natural refrigerants instead of fluorinated gases. Promote alternatives to sulphur hexafluoride (SF6) with very high GWP. [Scheduled date: 20202030]

7.3.4. Green Industrial Strategy – New Measure

As industrial activity is a crucial area of activity to achieve greenhouse gas emission reduction targets, European and national policies include a strategic framework duty to facilitate the transition of industry. In this context, and in accordance with the Climate Law (Article 68), a green industrial strategy should be developed to support companies in the process of the industrial sector's climate and energy transition and in meeting emission reduction targets, enhancing their competitiveness. This strategy should also be linked to the innovation and development agenda, and should be adopted following a procedure involving a number of national, regional and local authorities. [Scheduled date: 2024]

7.3.5. Deepening mechanisms to attract industry to sustainability – New measure

This measure aims to deepen the mechanisms for attracting new investment for sustainability, focusing on suppliers of goods and equipment needed to ensure the climate and energy transition, partnering with key consumer sectors such as heavy transport and industry, and taking advantage of Portugal's competitive advantages in terms of access to low-cost electricity and green hydrogen, and the most extensive lithium reserves in Europe, enjoying the conditions existing in Portugal so that their operation can develop with a lower environmental footprint. Highlights in this context a commitment to the green steel industry, the production of electric and zero-emission vehicles, the battery and hydrogen value chain. [Scheduled date: 2023-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; Energy efficiency

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- Consider the need to install resilient infrastructure for sensing, communication and storage of data and micro-services (especially critical networks and infrastructures: energy networks, data networks and computer networks);
- The risks associated with the scarcity of natural resources could have an impact on the green steel industry, the production of electric vehicles, batteries, etc.;
- The temperature increase associated with the increased demand for and use of refrigeration systems (currently using florated gases) could interfere with the implementation of the Green Industrial Strategy and the replacement of florated gases with green refrigerants;

KEY INSTRUMENTS

RNC2050; INDUSTRY 4.0

SOURCES OF FUNDING

FITEC; Portugal 2030; Environmental Fund; PITD; PRR

ENTITY RESPONSIBLE
ME; SAM; MIH; GRA; GRM

LINE OF ACTION

7.4. PROMOTING THE CIRCULAR ECONOMY IN INDUSTRY

DESCRIPTION
By promoting the circular economy in industry, it is possible to develop innovation, develop new products and business models, reduce the consumption of energy, water and materials, contributing to the fight against climate change.

SECTOR (ES)
Industry Services; Waste

MEASURES FOR ACTION
To promote the circular economy in industry, the following actions are envisaged:

7.4.1. Promoting the low-carbon and circular economy in industry

Promote the circular economy, resource efficiency, including water, and waste prevention, including through the use of waste materials such as raw materials, industrial symbioses, the extension of the use of goods and equipment, the extension of product-service business models and eco-design of, inter alia, low-carbon products. [Scheduled date: 2020-2030]

7.4.2. Promoting industrial symbioses (urban, local, regional)

Through the recovery of material streams (e.g. by-products and waste) to replace raw materials and the recovery of thermal energy (recovery and reuse of excess industrial heat and cold). The promotion of these symbioses contributes to increasing the circularity of resources and the energy efficiency of industrial, urban and local systems, contributing to the reduction of energy consumption and pollutant emissions. [Scheduled date: 2020-2030]

7.4.3. Promoting the development of low-carbon products and services

Through the adoption of tools for assessing and classifying circularity of products and services (such as life cycle assessment, certification (e.g. ISO, EMAS, eCIRCULAR) or labelling (e.g. eco-label)), promotingproduct *design* (goods, services, or both), and R & DD + i (research, development, demonstration and innovation).
This allows companies to align their business with circular economy, resource efficiency and sustainability principles. [Scheduled date: 2020-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP
Decarbonisation; Energy efficiency
KEY INSTRUMENTS
RNC2050; PAEC
SOURCES OF FUNDING
FITEC; FA; LIFE; HORIZON EUROPE; PRR
ENTITY RESPONSIBLE
SAM; ME; MIH; GRM; GRA; ADENE; APA; LNEG

LINE OF ACTION

8.3. INCREASE KNOWLEDGE ON CLIMATE CHANGE MITIGATION, DISSEMINATE BEST PRACTICES AND DRIVE LOW-CARBON BEHAVIOURS IN SOCIETY

DESCRIPTION
Promoting outreach to the citizen and civil society is key to the success of climate and energy policies. This requires a message of greater proximity and connection to people. It is therefore necessary to make visible the role that everyone can play in adopting solutions, in particular as regards behavioural change and the introduction of more sustainable consumption decisions. Empowering society and creating skills that should be linked to the creation of green jobs, directing individual behaviours towards efficient decisions in low-carbon resource management and promoting the active involvement of society in this transition, supporting the dissemination of good practices and participation in networks for the exchange of experience.

SECTOR (ES)
Everyone

MEASURES FOR ACTION
In order to deepen knowledge on climate change mitigation, disseminate best practices and boost low-carbon behaviours in

society, in addition to the action measures on developing low-carbon plans and strategies and disseminating best practices and knowledge on climate change at local level in Objective 1 – decarbonise NATIONAL ECONOMIA, the following action measures are envisaged:

8.3.1. Fostering empowerment (education and training) in climate change mitigation, carbon neutral economy and air quality

Implement the carbon neutrality and air quality dimensions of the National Environmental Education Strategy. Develop pedagogical initiatives on climate change mitigation and air quality within the existing themes in the curricula. Support the development of training and capacity building actions to support the transition to a carbon-neutral and better air quality economy, including with local authorities and other local actors, as a key point of connection with businesses and citizens. [Scheduled date: 20202030]

8.3.2. Deepening knowledge in climate change mitigation and carbon neutral economy

Develop studies and projects to help deepen knowledge, improve access to information, develop tools to support the design of climate change mitigation and carbon-neutral economy policies. In this context, it should be noted that the National Capacitation Project (LIFE CAP PT II – Portugal *Capacity Building for Better Use of LIFE II) i*sbeing implemented to disseminate the LIFE financial instrument to increase the number of project proposals for LIFE applications and to improve their quality. Part of the project is dedicated to the sub-programme "Mitigation and Adaptation to Climate Change" (CLIMA) through dissemination and information sessions on the financing of Climate Change Mitigation/Governance and Information projects, which contribute to the transition to a carbon-neutral economy. [Scheduled date: 2020-2030]

8.3.3. Promoting awareness raising on low-carbon behaviours – Measure removed

Different actions and in line with the measures identified at sectoral level in the "behaviour" vector. Development of awareness campaigns on the carbon-neutral economy. Measure included in measure 8.3.4

8.3.4. Promote awareness raising and empowerment (education and training) for low-carbon behaviours and more sustainable production and consumption patterns

Ensure that citizens have access to relevant information and awareness of behaviours leading to more sustainable production and consumption patterns, including low-carbon behaviours by promoting the transition to a carbon-neutral economy. To this end, awareness-raising campaigns will be developed, involving and liaising with the various stakeholders in the value chains (manufacturer-distributor-consumer), with a particular focus on sectors with a particular multiplier effect, such as the distribution sector and the tourism sector, for their direct influence on the consumer and supply chains. Empowerment will also be promoted, in the field of education at the level of compulsory education, through the insertion of educational content/projects in the field, such as the Energy Road Literacy project. Promote the training of entrepreneurs and consumers, in liaison with stakeholders and non-governmental organisations, as well as, in liaison with the distribution sector and agricultural cooperatives, by striving for proper empowerment of employees along the entire value chain. [Scheduled date: 2020-2030]

8.3.5. Promoting training and reskilling of the professional sector for the energy and climate transition – New measure

Promoting the empowerment and valorisation of companies and workers in Green Skills, with the aim of enhancing technical skills in the area of energy and climate transition. Training and reskilling of the professional sector is essential. Active collaboration between the public and private sector for building a solid knowledge and skills base and strategic partnerships for the development of curricula tailored to emerging market needs, as well as practical internship programmes, will allow the necessary experience to address the specific challenges of the energy transition. In this context, particular emphasis is placed on the operationalisation of the Protocol Centre for Vocational Training for Energy Transition, based in Vila Nova de Santo André. [Scheduled date: 20202030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & C

KEY INSTRUMENTS

RNC2050; ENEA

SOURCES OF FUNDING

FA; Community Funds (PO SEUR, Regional OP); LIFE; RRP; Green Work and Skills Training Programme **ENTITY RESPONSÁVEL**

SAM; MIH; GRA; GRM; DGEG; APA; ADENE; IEFP; APREN; AREAM

LINE OF ACTION

8.5. PROMOTE DIALOGUE PLATFORMS FOR SUSTAINABLE DEVELOPMENT AND LEVERAGE INTERVENTION CAPACITY AT NATIONAL, REGIONAL AND LOCAL LEVEL DESCRIPTION

Promote permanent and lasting dialogue and discussion platforms, at national and local level, involving the main actors in the various sectors, and which can actively contribute to building a more transparent, proactive and inclusive energy policy that ensures compliance with national energy and climate targets and commitments.

SECTOR (ES)
Everyone
MEASURES FOR ACTION
In order to promote dialogue platforms for sustainable development and to leverage the capacity for action at national, regional and local level, the following actions are envisaged:

8.5.1. Promoting the establishment of the Portuguese National Energy Council – Measure abolished

Measure deleted as organs already exist in these matters.

8.5.2. Leveraging the role of Regional and Municipal Energy and Environment Agencies, regional and local associations and cooperatives

Regional and municipal energy and environment agencies, regional and local associations and cooperatives, in view of their proximity to local actors and citizens, appear to be key entities in promoting, on a local level, the sustainable development of the territory (s) in which they form part, and are key players at local level in the pursuit of national objectives. They play a very important role in local sustainable development, through the promotion of energy efficiency, the rational use of energy in the various sectors, the use of local indigenous energy resources, the promotion of the use of new technologies, the promotion of information and awareness-raising measures, contributing to the sustainable development of the region and the country. Given their mission and demonstrated capacity to act with municipalities and citizens, they can make an important contribution by supporting public climate action policies, including municipal and regional climate action plans. [Scheduled date: 2020-2030]

8.5.3. Create and make available the Climate Action Portal – New Measure

Develop, in line with the provisions of the Climate Law (Article 10), a public digital tool, free of charge and accessible via its own website, enabling citizens and civil society to participate in climate action and to monitor systematic and national information on:

a) Greenhouse gas emissions and the sectors that contribute most to those emissions;
b) The progress of the targets referred to in Section II of Chapter IV;
c) The sources of funding available at national, European and international level for climate change mitigation and adaptation actions, for the public and private sectors, and their implementation status;
d) The international targets and commitments to which the Portuguese State is bound;
e) Studies and research and development projects developed in the field of climate change; e
f) International cooperation projects on climate change.

[Scheduled date: 2022-2024]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
KEY INSTRUMENTS
n.a.

SOURCES OF FUNDING
PRR
ENTITY RESPONSIBLE
SAM; GRM; GRA; ADENE; RNAE; AREAM

ii. Regional cooperation measures in this area

Not applicable.

iii. Financing measures in this area at national level

See paragraph 5.3 (iii).

3.1.2. Renewables

Portugal aims for a shift from fossil fuels to new forms of energy production and consumption towards a future with a carbon-neutral economy. This path includes further harnessing and maximising the existing endogenous renewable

potential in Portugal, which is in part still untapped, such as solar, geothermal and *offshore* wind, while adopting more demanding consumption patterns and embarking on new and emerging clean technologies.

I. Policies and measures to achieve the national contribution to the 2030 binding EU-level target for renewable energy

LINE OF ACTION

3.1. ACCELERATING ELECTRICITY GENERATION FROM RENEWABLE ENERGY SOURCES

DESCRIPTION

The contribution of indigenous renewable energy sources to electricity production has developed greatly over the past few years, contributing to the reduction of GHG emissions, energy dependency of the country, generating wealth, employment and economic development. However, Portugal has huge potential to produce clean energy from renewable resources, which are largely untapped, in particular for solar and offshore wind. It is therefore important to strengthen and review the existing mechanisms for promoting renewables in order to ensure that the 2030 targets are met. Reaching at least 80 % renewable energy sources in the electricity sector by 2025 implies a doubling of renewable installed capacity in the period 2021-2030.

SECTOR (ES)

Energy; Industry

MEASURES FOR ACTION

To accelerate the production of electricity from renewable energy sources, the following action measures are envisaged:

3.1.1. Promote the development of new renewable capacity, including through the implementation of a system of periodic auctions for the allocation of injection capacity into the electricity grid

In a scenario of strong demand for generation allowances and scarcity of reception capacity on the grid, auctions are one of the best ways to respond to that demand and accelerate investment in new capacity, giving priority to projects with lower costs and higher execution guarantees, allowing better articulation between the permit-issuing process and investments in new grid capacity. With this in mind, the implementation of an auction system offers a number of advantages, including: (I) limitation of investor risk (ii) economic efficiency, (iii) achievement of energy policy objectives.

The design of the auction takes into account the market context and aims to respond to its needs, without compromising the achievement of the targets set out in the NECP and without putting a burden on consumers. Considering the energy intensity and expected growth of the renewable hydrogen industry, auctions should consider the injection capacity dedicated to projects whose purpose is to produce hydrogen and its derivatives, while keeping in mind the need for installed capacity for the gradual installation of electrolysers. The periodicity, the number of auctions to be held each year, the format and the target technology (s) of each auction shall be defined on an annual basis taking into account the objectives of evolution of installed capacity to meet the NECP targets and the evolution of the transmission and distribution networks. The auction (s) shall be announced sufficiently in advance to ensure greater predictability for potential stakeholders.

The following auctions have already taken place: solar FV auction in 2019, solar PV auction in 2020 and floating solar auction in 2021. In addition to these, the competitive procedure for the reserve of connection capacity previously used by Pego's coal thermal power plant was also carried out in 2021, which was attributed to a hybrid solar-wind generation proposal with storage and production of renewable gases. Auctions for capacity allocation for offshore wind projects are also planned for 2030.

In addition to the allocation of the reserve title through auctioning, the allocation of new allowances for the production of electricity from renewable sources will also be possible through the following ways: (I) where there is capacity on the network, by issuing the reserve permit for injection capacity into the grid under the general scheme (RESP); or (ii) by agreement between the applicant and the operator of the RESP, with the applicant bearing the financial burden arising from the construction or reinforcement of the grid necessary for the reception of the energy produced by the power generating centre.

The procedures for obtaining a capacity reservation certificate (general scheme, competitive procedure and agreement between the interested party and the network operator) are governed by Decree-Law No 15/2022 of 14 January 2009. [Scheduled date: 2019-2030]

3.1.2. Encouraging the spread of hybrid systems based on renewable technologies by working towards their regulation – Measure implemented

The implementation of hybrid systems gives more flexibility and better use of resources as it allows for complementarity between forms of energy and thus the possibility of minimising production costs. On the other hand, it makes it possible to maximise grid connection capacity through capacity building without necessarily resorting to additional grid investment. To enable this type of solution to be developed and implemented, the appropriate legal framework as well as the technical criteria to be met by such

systems have been developed, which will give the necessary impetus to the implementation of these solutions.

This measure was implemented by the publication of Decree-Law No 15/2022 of 14 January, in its current wording, subsection III, which establishes the organisation and functioning of the National Electricity System. It transposes, inter alia, Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules.

for the internal market in electricity, and the partial transposition of Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources. [Date: 2022]

3.1.3. Encourage the increase of *onshore* wind production, in particular by means of over-equipment and the *Repowering*

Portugal also has untapped wind potential, while enabling the current wind farms to become more competitive. This measure may be applicable in conjunction with the previous one, promoting overequipment or repowering in parallel with hybridisation, increasing net energy production and the availability factor in the use of the connection point.

Overequipment is a rational route to be considered. The new power will be installed in existing plants, where the essence of the environmental impact has already been addressed and where untapped network capacity will be exploited.

In terms of *repowering*, as with overequipment, the sites where the power plants are located the essence of the environmental impact has already been addressed and the transmission and distribution networks are already built. It will also make an important contribution as it allows the replacement of existing wind farms as they reach their end of life with more efficient equipment.

Decree-Law No 15/2022 of 14 January 2009 creates favourable conditions and the regulatory framework to enable overequipment and repowering. The current limitations (20 % of additional connection power) could be revised in order to increase the contribution potential of *onshore wind production.* The review of these conditions will be integrated with the plans for development and investment in electricity transmission and distribution networks. [Scheduled date: 2019-2030]

3.1.4. Promoting renewable cogeneration and gradually reducing incentives for fossil-based cogeneration. CHP systems play a very important role in energy efficiency and in reducing GHG emissions, as it is one of the most efficient solutions for energy production (electricity, heat and cold). On the other hand, the fact that cogeneration installations are close to energy consumption points is reflected in the reduction of losses and the need for infrastructure investment. It is therefore important to promote the uptake of cogeneration based on renewable energy sources, as well as the conversion of existing plants from fossil fuels to renewable energy sources, by valuing indigenous resources. In the case of biomass specifically, the cogeneration sector must take into account the following measures and lines of action: 1.4.5. Promote the recovery and disposal of waste and materials resulting from waste treatment; 1.8. PROMOTING THE TRANSITION TO A CIRCULAR ECONOMY, 3.6.6. Establish support mechanisms to increase the installed capacity of biodigesters; 3.6.7. Establishment of the Biomethane Action Plan (already implemented); 3.7. ENCOURAGE BETTER USE OF BIOMASS FOR ENERGY USES. [Scheduled date: 2020-2025]

3.1.5. Promoting ocean renewable energy

Portugal has a very important resource for ocean renewable energy that needs to be exploited and, at the same time, has the potential to create a new export chain for these new energy technologies. Indeed, offshore renewable energy can ensure the development in Portugal of competitive industries that export high value added products and services to an increasingly global market, thereby boosting the development of a value chain. The ecological development of a sustainable blue economy ensures the protection of oceans and their ecosystems, and uses Maritime Spatial Planning (MSP) as a tool for integrated maritime spatial planning.

Portugal has a high offshore wind energy potential, which can be harnessed mostly through turbines installed on floating platforms, as well as wave energy potential. Multi-use of space is also sought by combining technologies relevant to the energy system and, more broadly, to the blue economy.

To exploit this potential, a multidisciplinary and inter-ministerial working group at national level was set up in 2022.

In that context, and in order to expand installed capacity, potential areas for the exploitation of renewable energy in the Atlantic Ocean are being delimited and will be integrated into the National Maritime Spatial Planning Situation Plan, along with the necessary expansion of the National Electricity Transmission Network (NNT) and port infrastructure supporting and strengthening energy interconnections. The development of models for the allocation of injection capacity into the RESP, including by auction, is also under way, which should draw on the recommendations of the Working Group held after the expressions of interest and public discussions with stakeholders. In support of innovation, the regulation of a free technology area off Viana do Castelo for the development of demonstration projects for less mature and innovative technologies is in place (see further details/related to action measure 3.1.7). [Scheduled date: 2020-2030]

3.1.6. Strengthening electricity production from Geotermia

The Autonomous Region of the Azores, which is rich in high-enthalpy geothermal resources and which it already operates for the production of electricity, will continue to focus on this resource with the aim of achieving maximum productivity in the light of the available resources and technologies. [Scheduled date: 2020-2030]

3.1.7. Promote demonstration and low scale renewable energy pilot projects

Among the projects to be promoted, the focus is on dispatchable solar thermoelectric power plants with storage, floating solar, agrovoltaic and wave energy projects, as well as renewable synthetic gas plants and other technologies based on ocean location or source.

Decree-Law No 15/2022 of 14 January 2009 establishes three Technological Free Areas dedicated to pilot projects using renewable energy sources in mainland Portugal. One located in the municipality of Abrantes, dedicated to projects for the production, storage and self-consumption of renewable electricity to be developed as part of the decommissioning process of the existing coal-fired thermal power plant. Another located off Viana do Castelo for offshore renewable energy projects. Another located in the Rega do Mira perimeter, intended for projects to make land use compatible with agricultural activities and, at the same time, to produce electricity. [Scheduled date: 20202030]

3.1.8. Implement a system of guarantees of origin for renewable electricity and gases

It is essential that consumers know the origin of the electricity they consume, especially when it comes from renewable sources. The implementation of a system of guarantees of origin shall aim to demonstrate to the final customer, by issuing electronic certificates, the share or quantity of energy from renewable sources in the energy mix of a given supplier.

ERSE, through Public Consultation No 112, launched the "Proposal for a revision of the Manual of Procedures of the Authorising Authority of Guarantees of Origin(EEGO)" (https-//www.erse.pt/atividade/consultas-publicas/consulta-p%C3%BAblica-n-%C2%BA- 112/), which introduces renewable and low-carbon gases into the Guarantee of Origin Emissions System. ERSE Directive No 17/2023 of 31 August 2009 adopted the Manual of Procedures of the Authorising Authority for Guarantees of Origin.

Onthe other hand, Decree-Law No 84/2022 of 9 December, in its current wording, which sets targets for the consumption of energy from renewable sources when completing the transposition of Directive (EU) 2018/2001 (https-//dre.pt/dre/detalhe/decreto-lei/84-2022-204502328) https://dre.pt/dre/detalhe/decreto-lei/84-2022-204502328, also establishes the mechanisms for issuing guarantees of origin (see Chapter VI, Articles 28 to 35).

The system of guarantees of origin for renewable gases is crucial for the consistency of operation of the entire energy production and consumption system, and has already been launched through Decree-Law No 60/2020 of 17 August 2009, which reinstates the mechanism for issuing guarantees of origin for low-carbon gases and for gases of renewable origin. Consolidation of the systems for issuing guarantees of origin for renewable gases is under development and its operationalisation is expected to be completed by 2024. [Scheduled date: 2023-2024]

3.1.9. Promoting increased reception capacity on energy networks – New measure

Capacity to receive energy in certain areas of the grid is limited, so that in order to further promote not only distributed but also decentralised renewable energy production and self-consumption of energy (individual, collective), or through energy communities – in order to contribute structurally and operationally to a coherent and consistent adoption of the concept of a renewable energy community (REC), in line with the Green Deal concepts, in the light of the concepts of ACC – Collective Self-Consumption, and CCE – Citizens' Communities for Energy, it is essential to invest in this front in legal and methodological terms, in addition to focusing on the electricity grid with investment in the creation of capacity for the reception of energy from renewable sources in the areas of the distribution grid with the highest demand. The investment shall consider not only the reinforcement and expansion of infrastructure, but also the introduction of dynamic and probabilistic models of smart management, optimising the integration of energy production, consumption and storage capacities. Accordingly, under the RRP, the Environmental Fund launched in 2024 (31 July-2 September) a

EUR 99.75 million call for tender for projects promoting greater flexibility of the national electricity grid through battery energy storage systems. [Scheduled date: 2025-2030]

3.1.10. Train technicians specialised in installation, operation, maintenance and dismantling of production plants offshore renewable energy – New measure

The capacity targets to be installed (not only national but also European capacity, to which the Portuguese industry must contribute as an exporting sector) provide for a high pace of activity in the supply chain to which it is estimated that there are not yet sufficient human resources. This is a recognised and targeted limitation of priority action referred to in international

publications (*Strategic Research and Innovation Agenda* of ETIP Wind and other international sources such as IRENA) and the training of these technicians should be the subject of stimulus measures. [Scheduled date: 20242030]

3.1.11. Creating the legal framework to accelerate the deployment of renewable energy through renewable power purchase agreements – New measure

The integration of higher renewable generation capacity has consequences for the evolution of the spot market, with more volatile prices due to the intermittent nature of these technologies. The development of renewable power purchase agreements (renewable electricity PPAs) contracts allow covering the market price risk for both counterparties and facilitate the financing of renewable generation park development projects. The commitment of different productive sectors to the energy transition also increases demand for electricity from renewable energy sources. The PPA contracts, in addition to ensuring a stable and predictable price in the future, allow companies to guarantee access to renewable energy sources.

In accordance with Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024, regulatory and administrative barriers and disproportionate or discriminatory procedures or burdens for long-term renewable power purchase agreements (renewable electricity PPAs) will be assessed and the legal and regulatory framework will be put in place that will promote and facilitate the use of such contracts in the long term while preserving the competitive and liquid electricity market. [Scheduled date: 2024-2025]

3.1.12. Developing port infrastructure to support offshore renewables – New measure

Promote the development of supporting port infrastructure to prepare for the challenges of the offshore wind targets, in particular for the logistics of the installation of the projects, with the definition of connection conditions, including the offshore interconnection point, and the investments necessary for the development of the transmission network, ensuring an interconnected system with the rest of Europe, especially with Spain. [Scheduled date: 2024-2030]

3.1.13. Promoting the development of regulatory sandboxes – New measure

Promote the development of regulatory sandboxes covering a wider range of pilot projects than those to be developed in the LTAs. With the aim of supporting the growth of projects and facilitating the involvement of industry, aiming at commercialisation of the projects after the successful implementation of the pilot, it is necessary to incorporate mechanisms aiming at the growth of the pilot projects, promoting their approval and market entry [Planned date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- The variability of renewable energy sources could have a major impact on energy production (especially in hydropower, solar and wind systems) and their integration into the electricity grid. The diversification of renewable energy sources and the implementation of storage systems to ensure continuous supply, involving investment and modernisation of energy networks, could support the acceleration of renewable electricity generation;
- The occurrence of increasingly frequent extreme climate events could lead to the need to build more resilient infrastructure;
- Accelerated wear and tear of infrastructure and equipment due to climatic events (e.g. wind turbines exposed to extreme temperatures, heavy rainfall, sand storms, etc.) could lead to higher maintenance costs;

KEY INSTRUMENTS

RNC2050; EAE 2030; EI-ERO 2017-2030; PDIRD-E; PDIRT-E

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OP); FA; NER 300 and Innovation Fund; Horizon Europe; The Structural Funds; InnovFin Energy Demo Projects; PRR

ENTITY RESPONSIBLE

SAM; MAP; ME; MIH; GRA; GRM; DGEG; DGRM; APA; ERSE; TSO; ORD

LINE OF ACTION

3.2. SPREADING DISTRIBUTED GENERATION AND SELF-CONSUMPTION OF ENERGY AND ENERGY COMMUNITIES

DESCRIPTION

Promoting the spread of distributed generation, i.e. production at or close to the place of consumption, results in reduced transmission and distribution network costs, reduced losses and optimisation of energy generation solutions.

SECTOR (ES)

Energy; Residential; Industry Services; Agriculture

MEASURES FOR ACTION

To promote a wider spread of distributed generation and energy self-consumption and energy communities, the following actions

are foreseen:

3.2.1. Promoting distributed generation and self-consumption of energy from renewable sources by removing barriers to its dissemination

The need to give a strong boost to distributed energy generation, in particular with regard to local solar electricity production, will play a key role in strengthening the consumer as an active actor, boosting energy communities, impacting on the need for grid reinforcement and centralised energy production, while boosting the emergence of new markets and technological solutions. Decree-Law No 162/2019 of 25 October was published, repealed by Decree-Law No 15/2022 of 14 January, approving the legal regime applicable to self-consumption of renewable energy, from which there was a significant increase in installed PSUs, more than tripling the installed capacity between 2020 and 2022 (from 256 MW to 842 MW). The rule of generation adequacy for consumption could be adapted to maximise the exploitation of a facility/site and to allow for increased renewable energy production on the local grid. In addition, there is a need to promote not only distributed but also decentralised renewable energy production and self-consumption (individual, collective) or through energy communities – in order to contribute structurally and operationally to a coherent and consistent adoption of the concept of renewable energy community (REC), in line with the Green Deal concepts, in the light of the concepts of ACC – Collective Self-Consumption, and CEC – Citizens' Communities for Energy.

There is also the possibility of creating technical and security rules allowing for the licensing of behind-the-meter systems associated with energy generation systems for self-consumption or sharing in the local grid. [Scheduled date: 2019-2030]

3.2.2. Promoting the creation and development of renewable energy communities

Energy communities will play a key role in promoting social innovation, empowering citizens for the energy sector and its problems, social and economic local development, while contributing significantly to alleviating energy poverty.

Following the publication of Decree-Law No 162/2019 of 25 October 2006, repealed by Decree-Law No 15/2022 of 13 January 2012, in its current wording, which established the legal framework, inter alia, for renewable energy communities, and partially transposed Directive (EU) 2018/2001 with a view to implementing this legal framework, the promotion of energy communities must be accompanied by a programme to disseminate information and support community building in order to reduce information asymmetries and support municipalities and citizens in their development.

There is also a need for adequacy and relaxation of criteria for access to finance and for streamlining and relaxing permitting procedures. [Scheduled date: 2020-2030]

3.2.3. Promote programmes to support the establishment of energy communities in partnership with municipalities

It aims to provide support, both technically and financially, for the establishment of energy community projects at municipal level. Support will be provided through qualified public entities in partnership with local agencies and partners. The aim is to establish energy community projects, with a particular focus on inland municipalities and with a higher prevalence of energy poor consumers as social housing projects. [Scheduled date: 2020-2025]

3.2.4. Redesign the Portal of Self-Consumption and Renewable Energy Communities

The permitting of individual and collective self-consumption projects and renewable energy communities requires the existence of a platform ensuring interoperability between the systems of the licensor and the grid operators. With this platform licensing procedures are digitalised and some of the processes are also automated, such as checking compliance with the rules of physical and electrical proximity between members or checking compliance of delivery point codes. This tool will speed up permitting procedures, as well as ensure transparency and visibility of the process and procedures. This platform reformulates the current self-consumption portal (former Electronic System for Registration of Production Units) and should be integrated into the One-Stop Shop for the licensing of renewables. [Scheduled date: 2020-2024]

3.2.5. Implement an electronic information portal on self-consumption and renewable energy communities

This portal will aim to inform consumers and facilitate the whole process of installing systems for self-consumption, individual, collective and within renewable energy communities. It is essential to create a platform or complement an existing one by aggregating in a single place information enabling public and private entities to clarify doubts about licensing, care to be taken, legislation, training, etc., to disseminate reference projects that can be replicated and synergies can be enhanced. [Scheduled date: 2023-2024]

3.2.6. — Integration of self-consumption and storage at electric mobility recharging points – New measure to facilitate the integration of self-consumption and storage with the electric mobility model adopted in Portugal by studying possible changes to the existing model that promote integration.

At the same time, simplifying the electric mobility model in Portugal by aligning it with Community legislation, in particular with the AFIR Regulation, the EPBD Directive and the RED III Directive, in order to facilitate the integration of renewable energy sources

(RES) and promote the creation of complementary markets that encourage activity such as the establishment of credits for the supply of renewable energy in the transport sector, as set out in RED III. [Scheduled date: 2023-2025]

3.2.7. Promoting a programme for simplified access for public authorities to self-consumption – New measure Public entities, including but not limited to municipalities, are important vehicles for the promotion of collective self-consumption and renewable energy communities. Their participation is potentially limited by the current rules, in particular as regards public procurement. It is therefore important to set up a programme for simplified access for public authorities to self-consumption. [Scheduled date: 2023-2025]

3.2.8. Develop a programme for empowerment actions for the different actors in self-consumption – New measure

The empowerment of the various actors participating in the national electricity system is crucial for the success of self-consumption activity. It is proposed to strengthen skills and clarify procedures by creating guides and developing training and awareness-raising actions focusing on individual, collective self-consumption and renewable energy communities, addressing administrative, technical, economic and legal aspects. [Scheduled date: 2023-2030]

3.2.9. Promoting the definition of technical guides to promote agrovoltaic – New measure

Establish guidelines for the uptake of photovoltaic systems in agriculture according to different business models, including self-consumption and renewable energy communities, including through the promotion of technical guides. This action measure relates to action measure 6.1.1. [Scheduled date: 2023-2030]

3.2.10. Promoting storage capacity associated with self-consumption generation systems and energy sharing schemes – New measure

Recognising the importance of the role of buildings towards carbon neutrality, integrated solutions should be promoted, combining self-consumption, storage and smart charging to achieve a more efficient and dynamic energy system.

Behind-the-meter provides greater protection to consumers – domestic, industrial or in the trade and services sector – from price volatility and, when combined with self-consumption solutions, encourages their active participation in the energy market. Furthermore, when integrated into energy sharing schemes (ACC, REC or ECC), it promotes more efficient sharing in the local grid, optimising the use of renewable energy sources (RES) and enhancing energy cohesion and resilience among its members.

Storage also allows the surplus renewable energy produced to be used in the hours of highest demand, thus increasing the use of RES and reducing the need to use the grid in these periods.

To maximise these benefits, it is crucial to create funding lines that enable investment in storage systems for all types of consumers. These measures not only protect consumers from price fluctuations, but also help to smooth load variations in the public service electricity grid, contributing to a more stable and efficient management of the energy system. [Scheduled date: 2024-2030]

3.2.11. — Definition of a strategy for renewable energy production by energy communities and self-consumption – New measure

Creating a strategy for 2030, in line with the targets for distributed generation, with objectives and trajectories for the capacity to be installed and renewable energy generation by energy communities and self-consumption. [Scheduled date: 20252030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- The commitment to diversification of renewable sources and storage systems to ensure a continuous supply of energy will minimise the risks associated with the variability of renewable sources in energy production;
- The increased demand for electricity for cooling (due to increased temperature and heat waves) in the residential and service sectors may imply the need to scale up energy networks and infrastructure (transmission, distribution, storage);
- Exposure to extreme events could lead to the need to build resilient energy storage infrastructure.
- Increased frequency and intensity of strong winds may lead to the outflow of distributed production.

KEY INSTRUMENTS

RNC2050; PAESC-RAM

SOURCES OF FUNDING

FEE; UPS; Community funds; RRP; LIFE; CEF2

ENTITY RESPONSIBLE

SAM; MAP; MIH; GRM; GRA; AREAM; DGEG; ERSE; EEM; ADENE; IHRU

LINE OF ACTION

3.3. PROMOTING EFFICIENCY AND INTEGRATION OF RENEWABLE ENERGY IN HEATING AND COOLING SYSTEMS

DESCRIPTION

Energy consumption for space heating and cooling has a relevant weight on the energy bill. On the other hand, there is great potential for energy efficiency gains in equipment through optimisation and replacement of equipment, taking advantage of renewable energy technologies (renewable heat and electricity and renewable gases).

SECTOR (ES)

Residential; Industry Services; Energy; Agriculture

MEASURES FOR ACTION

To promote the efficient use of renewable energy in heating and cooling systems, the following action measures are envisaged:

3.3.1. Promote the renovation of renewable heat and cooling systems

Encourage the replacement of outdated heat and cold systems by more efficient ones that promote the production/consumption of renewable energy, including biomass, renewable gases, solar thermal, geothermal energy and ambient heat.

Promote the indicative classification of space heating and sanitary hot water preparation systems through energy label as a way to raise awareness among consumers and professionals about the planned replacement of this equipment with renewable and more efficient solutions.

Promote the creation of funding programmes with advantageous conditions for the replacement of inefficient heating and cooling equipment by systems with resources for renewable solutions. [Scheduled date: 2020-2030]

3.3.2. Promoting efficient use of heating and cooling systems – New measure

Support municipalities in the definition of municipal heating and cooling plans under Article 26 of the new Energy Efficiency Directive, fostering the integration of renewables and equipping them with resources and methodologies appropriate to the reality of Portuguese cities.

The plans should aim at involving the whole market/value chain, ranging from consumer information campaigns to industry and businesses and offering new energy and heat supply models, exploring new models that enhance demand aggregation and synergies with large consumers of heat/cold. [Scheduled date: 20232027]

3.3.3. Promote the development of a National Action Plan for Calor Bombas – New Measure

Development of a national action plan to accelerate the uptake of heat pumps in Portugal in buildings and industry, within the framework of the EU Calor Bombas Action Plan, and giving visibility on current and future consumption by heat pump categories. Promote electrification of heating and cooling by promoting the purchase and use of heat pumps for AQS, and ambient air heating and cooling in buildings. In addition, the implementation of new ESSE-type financing models for the sale of energy and heat from renewable systems, including heat pumps, will be promoted. [Scheduled date: 2023-2025]

3.3.4. Promoting innovation through pilot actions for experimentation and demonstration of smaller TRL and CRL technologies – New measure

Support innovation through pilot actions focusing on innovative renewable A technologies, the implementation of which is not yet sufficiently widespread. In order to allow the emergence of innovative solutions that are not yet known at present, the specification of technologies is still open until each support measure is implemented. Examples of heat pumps in their different variations, geothermal use or the introduction of micro-cogeneration solutions through fuel*cell*swith multi-fuel operating capacity can only be mentioned at this stage. [Scheduled date: 2023/2024-2030]

3.3.5. Fostering the empowerment of the professional sector for the integration of renewable solutions in the heating and cooling sector – New measure

Promote the empowerment of the professional sector for the integration of renewable solutions in the heating and cooling sector, from dimensioning to operation, maintenance and decommissioning.

Foster the technical empowerment of public authority professionals to define, operationalise and monitor Local Heating and Repair Plans, considering the exploitation of the local potential of renewables in the heating and cooling sector. [Scheduled date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficiency

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- The variability of climatic factors could interfere with renewable energy production;
- The expected increase in electricity demand for cooling may lead to the need to adapt energy supply systems. In the future,

cooling needs are expected to overlap with heating needs due to the increase in the global average temperature.

KEY INSTRUMENTS

RNC2050; PROENERGY

SOURCES OF FUNDING

FA; PRR

ENTITY RESPONSIBLE

SAM; MIH; DGEG

LINE OF ACTION

3.4. OPTIMISE AND SIMPLIFY THE LICENSING PROCESS ASSOCIATED WITH RENEWABLE POWER PLANTS

DESCRIPTION

In order to promote greater use of renewable energy sources, permitting should be amended with a view to optimising them and introducing simplified and dematerialised procedures in line with international standards.

SECTOR (ES)

Energy

MEASURES FOR ACTION

In order to optimise and simplify the licensing process associated with renewable power generation centres, the following action measures are envisaged:

3.4.1. Review and optimise the current legal framework for the organisation and functioning of the national electricity system

The revision of the current legal framework for the organisation and functioning of the national electricity system aims, inter alia, to improve and simplify the system for the allocation of power generation allowances and to generalise the competitive procedure as a means of managing the scarcity of reception capacity of the RESP, ensuring that the allocation of injection capacity into the grid necessarily brings a benefit to consumers.

This measure was partially implemented by the publication of Decree-Law No 15/2022 of 14 January 2006, in its current wording, which establishes the organisation and functioning of the National Electricity System. It remains relevant, given the complexity of the current legislative framework for the sector, to continue to carry out a general review with a view to simplifying, clarifying and reducing the number of legislation, contributing to better clarity and efficiency in the implementation of new projects, in order to achieve internal ambition, as well as to meet the requirements of the European emergency regulation, Regulation (EU) 2022/2577. [Decree-Law No 15/2022 of 14 January 2009; Decree-Law No 30-A/2022 of 18 April 2009; Decree-Law No 72/2022 of 19 October 1989; Decree-Law No 11/2023 of 10 February 2009]

However, with a view to improving the integrated electricity market design, the reform of the Union electricity market carried out by Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024 amending Regulations (EU) 2019/942 and (EU) 2019/943 as regards improving the Union's electricity market design and Directive (EU) 2024/1711 of the European Parliament and of the Council of 13 June 2024 amending Directives (EU) 2018/2001 and (EU) 2019/944 will be incorporated into the national legislative framework. [Scheduled date: 2023 – 2025]

3.4.2. Operationalise the One-Stop Shop for Renewable Licensing

The operationalisation of a One-Stop Shop will speed up permitting procedures for energy generation projects, reduce permitting times and provide simple information to developers and citizens. The central figure for the operationalisation of this action will be the "project manager" who, among other tasks, should: (I) identify, manage and resolve major problems; (II) proactively manage the licensing process; (III) disseminate the information of the case to the parties involved; (IV) identify, manage and mitigate process risks; (v) ensure interoperability with other existing licensing platforms (e.g.: Single Environmental Licensing and the Maritime Electronic Point).

In order to support the one-stop shop for licensing, an electronic platform will be set up, namely the one laid down in Decree-Law No o15/2022 of 14 January 2009, which facilitates the processing of and information on licensing procedures. This platform should aggregate and make available in a simple and practical manner information on the permitting process of energy generation projects, including information on the progress of the process, thus bringing market actors closer to the institutions involved in the permitting process, contributing to burden reduction. [Scheduled date: 2020-2024]

3.4.3. Operationalising the Mission Structure for the Licensing of Renewable Energy Projects (EMER 2030) – New Measure

The task of EMER 2030 is to ensure that the objectives of the NECP 2030 are met and to speed up the implementation of renewable energy projects. EMER 2030 will be responsible for:

- Procedural operationalisation resulting from the consolidation of the legal and regulatory framework applicable to electric and environmental licensing (measure 3.4.1.);

- Development, implementation and management of the Single Balance for Licensing and Monitoring of Renewable Energy Projects (Measure 3.4.2.)
- Proposal of the Sectoral Programme "Accelerating areas for renewables" (measure 3.4.4.);
- Develop an annual schedule for the allocation of new capacity for renewable energy projects, based on 'Renewable Energy Acceleration Areas';
- Actions to empower managers and technicians of central public administration bodies (DGEG, APA, ICNF, Cultural Heritage, I.P., DGADR), regional (CCDR) and local authorities in permitting procedures for renewable energy projects, in line with procedural operationalisation, ensuring the involvement of the network operators (DSOs and TSOs).

[Scheduled date: [2023-2030]

3.4.4. Develop and implement the Sectoral Programme "Accelerating areas for renewables" – New measure

Identify renewables go-to areas (acceleration areas for renewables), i.e. specific sites (onshore or offshore) deemed suitable, without significant environmental impacts, for the installation of renewable energy units, in line with REPower EU guidelines and other initiatives stemming from the Fit-for-55 package, concerning the promotion of the use of energy from renewable sources, energy performance of buildings and energy efficiency.

The Sectoral Programme for "Accelerating areas for renewables" will be developed under the Legal Regime for Territorial Management Instruments and will be built on the work "Preliminary identification of areas with less environmental and heritage sensitivity for the location of renewable electricity generation units", carried out by the informal working group coordinated by the National Energy and Geology Laboratory and involving the Portuguese Environment Agency, the Directorate-General for Energy and Geology, the Directorate General for Territory, the Institute for Nature Conservation and Forests and the Directorate-General for Cultural Heritage and the results of the working group for the definition of renewables acceleration areas (Order No 11912/2023 of 23 November 2009), ensuring proper involvement with the network operators. The sectoral programme should be linked to the results of the working group for the transposition of the RED III Directive (Order No 6757-A/2024, of 17 June). [Scheduled date: 2022-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy security; Internal Market
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
— The effects of climate change could interfere with the organisation and functioning of the national electricity system (SEN): variability of renewable resources changes energy production patterns and creates challenges for electricity system integration. Diversification of renewable sources and the implementation of storage systems will minimise the effects of climate change.
KEY INSTRUMENTS
n.a.

SOURCES OF FUNDING
Community Funds (OP SEUR, PACS, Regional OP)
ENTITY RESPONSIBLE
SAM; GRA; GRM; DGEG; APA; IAPMEI; LNEG; DGT; ICNF; PC, I.P.; DGADR; CCDR; PT2030

LINE OF ACTION

3.5. PROMOTE APPROPRIATE TRANSMISSION AND DISTRIBUTION GRID PLANNING TO ENHANCE THE INTEGRATION OF NEW RENEWABLE ENERGY GENERATION AND STORAGE CAPACITY

DESCRIPTION
With a view to achieving the objectives set for 2030, in particular with regard to increasing renewable generation, the planning of electricity transmission and distribution networks shall ensure the existence of grid capacity for the reception and delivery of electricity, with adequate levels of quality of service and security, and its proper and efficient development, within the internal market for electricity.
SECTOR (ES)
Energy
MEASURES FOR ACTION
To promote appropriate planning of transmission and distribution networks to enhance the integration of new renewable capacity, the following action measures are envisaged:

3.5.1. Adapt the criteria for planning transmission and distribution networks

Proper planning of transmission and distribution networks is crucial for the success of policies to promote renewable energy in the electricity generation system, as only in this way ensures the efficient flow of the electricity produced to the final consumer,

ensuring security of supply and continuity and quality of service, and ensuring that only the necessary investments are made that meet the needs of grid evolution.

The new criteria to be adopted or revised should take into account the new challenges for electricity transmission and distribution networks towards the energy transition, in particular as regards distributed generation and self-consumption, smart meters and grid intelligence, management support systems, storage, energy management, energy communities, electric vehicles, among others. [Scheduled date: 2020-2025]

3.5.2. Adjust the definition of new generation reception capacity

In order to allow for increased reception of new renewable generation without the need for grid reinforcement, it will be necessary to assess and revise the criteria by which reception capacity to the grid is defined at each point of the network. This new definition should take into account criteria that enable network capacity to be optimised, ensuring its reliability and security. An important step in this direction has already been taken with the publication of Decree-Law No 15/2022 of 14 January 2006, in particular as regards restrictions on connections and controllability. [Scheduled date: 2020-2030]

3.5.3. Promoting and scaling up storage capacity in the national energy system – New measure

Promote the increase of renewable energy storage capacity available to the national energy system, ensuring visibility on its breakdown by voltage level (NNT and RND), in centralised and decentralised systems (*in front of the meter) for conversion into* another form of energy, such as chemical, potential or kinetic energy, and by enabling the exploitation of different use cases, including by grid operators (to address specific grid needs). Expected date: [2023/2024-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy security; Internal Market
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
— The effects of climate change could interfere with network planning: variability of renewable resources changes energy production patterns and creates challenges for electricity system integration. Diversification of renewable sources and the implementation of storage systems will minimise the effects of climate change.
KEY INSTRUMENTS
PDIRT-E; PDIRD-E
SOURCES OF FUNDING
n.e.c.

ENTITY RESPONSIBLE
SAM; GRA; GRM; ERSE; DSO; TSO

LINE OF ACTION

3.6. PROMOTE THE PRODUCTION AND CONSUMPTION OF RENEWABLE GASES.

DESCRIPTION
The use of renewable gases is recognised as one of the viable alternatives towards a low-carbon economy, promoting the substitution of fossil fuels and reducing the country's energy dependency.
SECTOR (ES)
Energy; Industry Transport; Waste; Agriculture
MEASURES FOR ACTION
To promote the production and consumption of renewable gases, the following action measures are envisaged:

3.6.1. Regulate and promote the injection of renewable gases into the Public Gas Network (RPG)

Publish the SNG regulations provided for under Decree-Law No 62/2020 of 28 August 2006 laying down the technical, quality and safety requirements for renewable gases, as well as the procedures applicable to the licensing of raw gases and their injection into the SNG infrastructure, which is necessary to promote the introduction of renewable gases, in particular hydrogen and biomethane, both into the gas transmission and distribution networks and for transport use, by removing existing barriers.

This Decree-Law stipulates that a number of sectoral regulations must be amended to incorporate the new legislative model, and ERSE therefore approved in 2021 the SNG regulations under its responsibility, namely the Infrastructure Operation Regulation (ROI) and the Network, Infrastructure and Interconnection Access Regulation (RARII), laying down the technical and commercial conditions for access to the networks for producers of renewable or decarbonised gases. Also in terms of management and operation of networks with gas blends, rules have been established for system operators, in particular on the monitoring of gas flows in the grid and the management of gas injections, as a basis for defining injection limits for producers. Enabling renewable and low-carbon gases to be injected into natural gas networks and infrastructure led ERSE to amend its Quality of Service

Regulation for electricity and gas (RQS) in 2023 to provide for the characteristics of renewable and low-carbon gases to be injected into gas networks that ensure the interoperability of its infrastructure with the other infrastructure to which they are connected.

The DGEG also promoted the revision of several safety regulations:

- Regulation from RNTG, approved by Order No 806-C/2022, of 19 January
- Regulation from RNDG, approved by Order No 806-B/2022, of 19 January
- Regulation from Terminal for the Reception, Storage and Regasification of Liquid Natural Gas, approved by Order No. 1113/2022 of 27 January 1996
- Regulation on underground gas storage in natural salt formations, approved by Order n.o1112/2022 of 27 January.

As part of the reforms approved in the review of the Recovery and Resilience Plan (RRP) in 2023, according to the Council of the European Union Implementing Decision (CID), the revision of the Regulations of the RNTG and RNDG is foreseen.

In particular, reform RP-C21-46 – Regulatory framework for renewable hydrogen, included in the REPowerEU chapter, provides for the revision of the regulatory framework for national gas transmission and distribution networks to promote the use of renewable gases and in particular for hydrogen, as part of a more comprehensive transition strategy towards a decarbonised economy. [Scheduled date: 2023-2025]

3.6.2. Study and define targets for the incorporation of renewable gases

Create the necessary conditions and mechanisms to enable, valorise and promote demand for renewable gases, in particular renewable hydrogen and biomethane, with a view to the emergence of a genuine market for renewable gases in Portugal. To this end, targets for the incorporation of renewable gases into natural gas networks will be studied, reassessed and redefined (in addition to that already set out in Council of Ministers Resolution No 63/2020 and Orders Nos 806b and 806-C/2022) and in the various sectors of the economy where their incorporation is valuable and enables the decarbonisation of consumption. Portugal established the National Hydrogen Strategy (EN-H2) annexed to Council of Ministers Resolution No 63/2020 of 14 August, as well as an Action Plan for Biometano34, approved by Resolution of the Council of Ministers No 41/2024 of 15 March 2024. [Scheduled date: 2020-2024]

3.6.3. Define and implement a quality certification system for renewable gases

In order to ensure that renewable gases comply with minimum quality requirements and do not jeopardise the security of energy supply and continuity and quality of service, a certification scheme should be established to enable this assessment to be carried out. [Scheduled date: 2020-2025]

3.6.4. Implement a system of guarantees of origin for renewable gases

It is essential that consumers know the origin of the energy used to produce the renewable gases they consume. The implementation of a system of guarantees of origin shall aim to demonstrate to the final customer, by issuing electronic certificates, the share or quantity of energy from renewable sources in the energy mix of a given supplier. [Scheduled date: 2020-2024]

3.6.5. Promoting the production, transmission, distribution and consumption of renewable hydrogen

Hydrogen has huge potential as an energy carrier, which could serve as energy storage, raw material for derived green products or fuel for various sectors of the economy.

The development and implementation of technologies for the production of green hydrogen from renewable energy sources (as defined in the European Renewable Energy Directive and its associated delegated acts) will be promoted with a view to disseminating and exploiting indigenous renewable sources, as well as diversifying energy sources and reducing energy dependency. The national strategy also integrates the objective of avoiding and minimising pressure on water bodies by promoting the diversification of sources of water used for renewable H_2 production. By shifting the use of water from the public supply system to the background, priority is given to the use of water from alternative sources, such as treated waste water for reuse, thus enabling its reuse and avoiding further depletion of natural water reserves.

In this sense, an industrial policy is being developed with a view to the implementation in Portugal of a cluster for the production of renewable gases, in particular green hydrogen, with the aim of positioning Portugal as a major European *player* in the green hydrogen market, initially leveraged at this stage by solar energy as a competitiveness factor, but also by the availability of more established renewable sources such as wind and hydro. The development of a renewable hydrogen production industry in Portugal will enable a faster and deeper decarbonisation of several sectors in Portugal, with a particular focus on hardest decarbonisation sectors.

34DR124-001-00051-117430352-054-041.pdf (diariodarepublica.pt)

As part of the national hydrogen strategy, a collaborative green hydrogen lab, Hylab35, was set up to create a world-leading R & D & I cluster with a strategic R & I agenda focusing on enhancing hydrogen competitiveness and creating new products and services. In addition, HyLab will promote innovation by addressing the relevant components of the supply chain to enable a hydrogen-driven economy and promote the creation of skilled and value-added jobs.

In the meantime, funding programmes for the production of renewable gases were launched in 2019 (EUR POSEUR) and 2021 and 2023 (RRP C14), and small-scale projects for decentralised production of green hydrogen were approved. The national hydrogen strategy foresees the injection of renewable gases into the existing SNG networks and it is recognised that it is equally important to study both the reconversion of existing networks and the construction of new dedicated networks for renewable gases, in particular for renewable hydrogen. The benefits of proximity to production and consumption sites, reducing transport needs and increasing the efficiency of the system as a whole, have promoted the development of hydrogen production and consumption clusters in some regions and led to the emergence of several *H2 Valleys*. In 2023, an R & I project for a hydrogen valley in Alentejo was funded by the European *Clean Hydrogen Joint Undertaking* under Horizon Europe. [Scheduled date: 2020-2030]

3.6.6. Set up support mechanisms to increase the installed capacity of biodigesters – New measure

Portugal has very favourable conditions to be at the forefront in decarbonising renewable gases. In addition to the climatic and geographical conditions that favour the production of green hydrogen at a competitive cost, there is a high productive potential for biomethane, both at the level of installations that already produce biogas (ETARs, municipal waste treatment plants, landfills) and at the level of agricultural, livestock, industrial and forestry production units. As this production potential is known, which benefits from mature technology that can be used after processing (purification) to remove carbon dioxide and contaminants, producing biomethane, which can play an important role in replacing natural gas, it will be important to encourage the exploitation of this indigenous and renewable energy source in Portugal. Other biogas production technologies that require a higher CAPEX but can capitalise on forest residues, such as gasification, need to be supported through specific incentives modelled on the higher or lower greenhouse gas emission reduction potential.

High productive potential, technological readiness, mandatory shares of renewable energy and biomethane (REPowerEU: 35 BCM by 2030) highlight the strong need to support and encourage biogas production and purification. In particular, to set up support

35 https-//www.hylab.pt/

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

Extreme events and variations in climatic factors interfere with the production of renewable gases, and at the limit may lead to supply disruptions;

— Fluctuations in, and dependence on, solar and wind energy production can affect the production of green hydrogen;

— Droughts or floods may affect the availability and quality of biomass for biogas production;

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— The availability of residual biomass, whether from agricultural or forestry sources, may be affected by prolonged droughts, water scarcity and fires;

ENTITY RESPONSIBLE

SAM; MAP; GRA; GRM

MEASURES FOR ACTION

In order to promote information to consumers and businesses by contributing to better energy literacy and to simplify interaction with the market, the following action measures are envisaged:

8.4.1. Promote more and better outreach services to consumers

E-services and platforms do not reach all consumers, in particular the most vulnerable and with less access to such services, and therefore dissemination should also be done through services close to consumers. Examples are citizen's shops and the Energy Citizen Space, which are local support structures, focus on increasing energy literacy, empower citizens to implement energy and water efficiency measures as well as to adopt energy sustainable behaviours, inform about the various funding options and help apply for public and private incentives at local and governmental level. These services will be combined with services that already exist and provide similar and consumer-oriented information on this issue, such as the Cities Housing and Energy Points. This action measure will also be promoted through the implementation of ELEPP, in particular Action Line 3.1.1 Promoting an integrated network of Citizens Energy Spaces of the Strategic Objective (SO). [Scheduled date: 2020-2030]

8.4.2. Promoting the simplification and standardisation of energy bills by setting minimum requirements at the level of content and structure – Measure achieved

A clearer and simpler energy bill makes a significant contribution to improving consumers' understanding of the price structure of various energy products, allowing consumers to behave more efficiently to reduce their bills. [Scheduled date: 2019-2030]

mechanisms to increase the installed capacity of biodigesters in the agricultural, livestock, forestry and industrial sectors (*greenfield*projects) and existing sewage treatment plants that offer high production potential but expect support to alleviate the initial investment burden associated with the creation of new biogas plants or the extension of existing digestion capacity. Pursuing this strategy has benefits in meeting the statutory obligations to properly manage waste in the various sectors of economic activity, promoting compliance with the waste management hierarchy and the principles of the circular economy, reducing environmental impacts and aiming at the decarbonisation of the economy, which contributes to the competitiveness of the respective activities. [Scheduled date: 2023-2030].

3.6.7. Implementation of the Biomethane Action Plan – New Measure

The Biometano Action Plan in Portugal, approved and published by Resolution of the Council of Ministers No 41/2024 of 15 March 2024, incorporates a set of tools to define objectives and targets for the production of this renewable gas in Portugal, setting out an integrated strategy aimed at achieving the objectives and targets set out therein and the sustainable development of the biomethane market in Portugal. The first phase of the Action Plan seeks to propose an appropriate regulatory framework, coupled with a set of public policies supporting the creation of an internal market for biomethane, with a coordinated approach to supporting production and placing on the market, further developing concrete measures to promote the set of actions foreseen in the BAP (e.g. to elaborate on key subjects or studies for the development of the biomethane chain). As a second step, the plan will seek to assist the scale-up of production, cost reduction and the development of new value chains at regional level. [Date: 2024-2040]

3.6.8. Accelerating the simplification of permitting procedures – New measure

Accelerate and encourage the promotion of initiatives promoting renewable gases, as a sustainable pillar and as part of a more comprehensive transition strategy towards a decarbonised economy. In order to promote the use of such gases in the energy system, it is necessary to review a set of measures and targets for incorporation in the various sectors of the economy. Such a revision will entail creating the necessary conditions for this change, including laws, regulations and standards.

The advancement of renewable gas projects, in particular biomethane, can become complex due to the fact that they are subject to numerous regulations of various kinds (waste, agriculture, livestock, industrial, urban planning, liquid discharges, noise, odour, transport, etc.) involving several bodies.

It is therefore important to simplify the administrative procedure for the construction and licensing of plants producing renewable gases (biogas and biomethane, green hydrogen and synthetic fuels). In this regard, efforts will also be made to develop knowledge in the technical staff of the competent bodies assessing and approving renewable gas production projects. [Scheduled date: 2023-2030].

3.6.9. Implementation of a centralised auction system for the purchase of renewable gases for injection into the gas grid – Measure achieved

In order to encourage and implement this reform, Ministerial Implementing Order No 15/2023 of 4 January 2009 establishing the centralised purchasing system for biomethane and renewable hydrogen was published. In order to implement this measure, Order No 5971 – A/2024 of 27 May was published, which provides for the opening of a competitive procedure, in the form of an electronic auction, for the centralised purchase of biomethane and hydrogen and the procedure is ongoing. This auction will make it possible to create an offtaking system in a non-existent market environment, thereby enabling domestic production of these renewable gases to start up. While that Order laid down the rules for the auction (quantity and maximum price), the parts of the competitive auction procedure laid down in detail the criteria for the procedure and were launched in June 2024. [Date: 2024].

3.6.10. Increase of mandatory shares of renewable gases in suppliers' energy supply portfolio – New measure

For gas suppliers, whose supply exceeds 2 000 GWh per year, the mandatory share to be incorporated in their supply to at least 10 % of biomethane or hydrogen by electrolysis from water in supplied gas will be progressively increased, with an update to Decree-Law No 30-A/2022. [Scheduled date: 2024-2030]

3.6.11. Revision of the National Hydrogen Strategy (EN-H2) – New measure

Revise the National Hydrogen Strategy (EN-H2) to implement the mandatory incorporation targets for renewable H2 and its derivatives (RFNBO) in transport and industry, which will be transposed from the REDIII Directive. [Date: 20252026].

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; I & I & C

- Fluctuations in feedstock availability affect biomethane production;
- The incidence of increasingly frequent extreme climate events may lead to the need to build more resilient infrastructure.

KEY INSTRUMENTS

EN-H2; RNC2050

SOURCES OF FUNDING

FA; UPS; Community Funds (OP SEUR, PACS, Regional OP); Horizon Europe; Innovation Fund; The Structural Funds; InnovFin Energy Demo Projects; PRR (investments Mobilising Agendas); The Just Transition Fund; PRR

ENTITY RESPONSIBLE

SAM; ME; DGEG; LNEG; APA

LINE OF ACTION

3.7. ENCOURAGING BETTER USE OF BIOMASS FOR ENERGY USES

DESCRIPTION

In view of the importance of forests and associated sectors in the national economy, and bearing in mind the problem and the economic and social dimension of rural fires, it is essential that, in parallel with the development and improvement of forest management and planning systems, energy use solutions can be considered to help manage rural areas by removing the existing fuel burden on rural areas, by means of a solution or set of solutions that can justify and benefit from these interventions, creating a real locally established and managed business model linked to the creation of a national market for biomass or at least self-sustainable regional markets.

SECTOR (ES)

Energy; Forests; Agriculture

MEASURES FOR ACTION

In order to encourage better use of biomass for energy uses, the following measures are envisaged:

3.7.1. Promoting local energy generation based on residual biomass

Promote and support the installation of small decentralised thermal power plants, which do not put pressure on biomass availability and the energy system, promoting the substitution of fossil fuels and the decarbonisation of consumption across sectors, ensuring that the waste hierarchy and circular economy principles are respected, reducing environmental impacts and aiming at the decarbonisation of the economy. This solution could be combined with other solutions of varying size and using other types of combustible raw materials, but always with the triple objective of helping to reduce fuel load in forest, agricultural and agro-industrial areas, using energy-efficient solutions and minimising the burden on the National Electricity System. The solutions presented should take into account the minimisation of air quality impacts. [Scheduled date: 2020-2030]

3.7.2. Promote and support the dissemination of centres for collecting, storing and making available biomass at municipal or inter-municipal level

Centres for the collection and storage of biomass, on a local and distributed basis, ensure proper management of forests, agriculture, livestock, the food industry and other organic waste, making it possible to optimise collection and reception processes, making available resources that can be used and recovered from a local energy aspect. [Scheduled date: 2020-2030]

3.7.3. Promote information and awareness-raising actions

The activities to be carried out include the development of an educational dossier for vocational training to improve and optimise the collection and processing of residual forest biomass, the production of a handbook of good practices for the use of residual forest biomass, including other forms of dissemination and information on the potential uses of residual forest biomass, as well as the various types of biomass user/consumer equipment showing possible returns and good practices for burning biomass. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; I & I & C

— The incidence of increasingly frequent climate events may lead to the need to build more resilient infrastructure, avoiding its construction in places vulnerable to fire risks etc.

KEY INSTRUMENTS

RNC2050; PAESC-RAM

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OP, OP Madeira)

ENTITY RESPONSIBLE

SAM; MAP; GRM; GRA; DGEG; AGIF; ICNF; Municipalities

LINE OF ACTION

6.1. PROMOTING THE PRODUCTION AND USE OF RENEWABLE ENERGY SOURCES IN THE AGRICULTURAL AND

FORESTRY SECTORS

DESCRIPTION

Increase the production and use of renewable energy sources in the agriculture and forestry sectors, in conjunction with action line 7.1 Promoting the decarbonisation of industry under Objective 7 for agro-industry and the bioeconomy of this objective, as well as action line 3.2.

SECTOR (ES)

Agriculture; Forest; Industry Energy

MEASURES FOR ACTION

To promote the production and use of renewable energy sources in the agricultural and forestry sectors, the following action measures are envisaged:

6.1.1. Promote the installation and conversion of equipment and infrastructure for the production and use of thermal and electrical energy from renewable sources on livestock, agricultural and forestry holdings

The technological solutions to be adopted include the installation of renewable sources (e.g.: solar panels, shallow geothermal systems, wind) for use in agricultural and forestry installations and equipment (e.g. intensive livestock farming, irrigation equipment). It is also important to use agrovoltaic or floating photovoltaic plants to be installed in reservoirs and reservoirs of water facilities for lifting water and distributing pressurised water. In the latter case, consideration should be given to the potential impact on water quality derived from the installation of photovoltaic panels in reservoirs. [Scheduled date: 2020-2030]

6.1.2. Increasing the use of alternative fuels and other national resources with potential for use as an energy source

Promote and encourage the exploitation and penetration of renewable energy sources, in particular biomass and biofuels. [Scheduled date: 2020-2030]

6.1.3. Promoting the installation of equipment and infrastructure for the production of thermal/electrical energy from the use of biomass and biogas or biomethane – Measure eliminated

Considering the potential for the use of biomass and biogas or biomethane produced on livestock, agricultural and forestry holdings, the adoption of these production systems should be encouraged (e.g.: biodigesters). Measure removed because it includes intentions included in other measures, notably in 3.6.6 and 3.7.1

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- The livestock, agricultural and forestry sectors are exposed to climate risks – droughts, water scarcity, fires, which may affect the availability of resources/raw materials for thermal or electrical energy production;
- The incidence of climate risks and extreme events may lead to the need to build more resilient equipment and infrastructure for energy production.

KEY INSTRUMENTS

RNC2050; RDP 2020; PEPAC; ENEAPAI 2030; PARCA; PARF

SOURCES OF FUNDING

EAFRD; ERDF; The Cohesion Fund

ii. Estimated excess production of energy from renewable sources that could be transferred to other Member States

Not applicable. This analysis/assessment should be carried out on an annual basis after closing the renewable share values and thus assess the possibility of statistical transfers, by means of the existence and magnitude of any surplus of renewable energy in final energy consumption.

iii. Specific measures relating to financial support

See point 5.3 (iii).

iv. Specific measures to introduce one or more contact points, to facilitate administrative procedures, information and training, and to facilitate the adoption of energy purchase contracts

LINE OF ACTION

8.4. PROMOTING INFORMATION FOR CONSUMERS AND BUSINESSES BY CONTRIBUTING TO BETTER ENERGY LITERACY AND SIMPLIFYING MARKET INTERACTION

DESCRIPTION

The energy sector and climate issues are complex and often communicate with language that is not perceived by everyone, making citizens unaware of the options they have at their disposal. It is therefore important to promote consumer energy literacy through more transparent information and wider dissemination of knowledge for energy and climate areas, enabling citizens to make more informed choices and promoting more and better consumer information, contributing to the transparency and competition of the energy market. A better informed consumer represents better, more efficient and sustainable choices, and a consumer at the heart of decision-making represents a more active consumer in the energy transition, available to participate in the structural changes that are needed to achieve this challenge.

SECTOR (ES)

Civil society; Companies

This measure was implemented byLaw No 5/2019 of 11 January 2012 – Scheme for compliance with the obligation to inform the consumer of the energy supplier, and the Amiga Fatura Project (PPEC). [Date: 2019/2020]

8.4.1. Promote and develop new platforms for the promotion of energy literacy

Spread existing platforms and promote the emergence of new and better platforms that make use of new information technologies to enable a leap in communication with the public, taking advantage of the increasing awareness and willingness of citizens to use new technologies. Examples of these platforms are CINERGIA – the Energy Information Centre, the Energy Route, the Energy Observatory, the SCE portal, and the CasA + and EVA – Energy Virtual Assistant. .

This action measure will also be promoted through the implementation of the ELEPP, in particular the action lines of the following Strategic Objectives (SOs):

- Increase the capacity to identify households in energy poverty (SO 4.1);
- Increase energy literacy (SO 4.2).

[Scheduled date: 2020-2030]

8.4.2. Promote and develop new platforms to improve market interaction

Promote and generalise the use of the Poupa Energia portal, with the aim of facilitating the switching of supplier in the retail market, including user information, simulation for tariff choice and facilitating switching of electricity suppliers to electric mobility.

The National Observatory on Energy Poverty (ONPE – PT), established by Council of Ministers Resolution No 11/2024 of 8 January 2013, aims to strengthen the territorial information base on energy poverty; contribute to the design, implementation and evaluation of public policies to eradicate energy poverty in Portugal, ensuring links with the National Energy and Climate Plan 2030, the Social Climate Plan and the Action Plan to Combat Poverty; ensuring decentralised action, in close coordination with local actors; and promoting energy literacy throughout the territory. Activities related to the creation of the ONPE-PT portal are included in the operationalisation axis of the ONPE-PT, which will aggregate the information on the topic of energy poverty. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; Internal Market

KEY INSTRUMENTS

FA; Community Funds (OP SEUR, PACS, Regional OP); ELPRE; ELPPE

SOURCES OF FUNDING

Community funds

ENTITY RESPONSIBLE

SAM; MIH; GRA; GRM; DGEG; APA; ADENE; ERSE

v. Assessment of the need to build new*district heating*and cooling infrastructure from renewable energy sources

Unlike most EU countries, in Portugal the potential for district heating and cooling is very low. One of the main barriers to the uptake of district heating and cooling networks is the very low construction density in inland areas with the most extreme climate in contrast, with a mild climate in coastal areas that sustain denser urban areas.36

36DGEG (2021). Assessment of District Heating and Cooling Potential in Portugal. Deir Studies on the Portuguese Energy System 003. Director-

However, in thermal areas, small geothermal heat distribution network projects have been developed, mainly targeted at the hotel sector, which has constant thermal needs throughout the year.

3.1.3. Other evidence

i. National policies and measures affecting the ETS sector

The sectors covered by the EU ETS (in particular the electro-producer and industrial sector) are regulated at European level and the policies and measures identified focus mainly on the non-ETS sectors. Nevertheless, several of the measures identified directly or indirectly affect sectors covered by the EU ETS, in particular the following lines of action, described in Chapter 3.1.1:

- 1.1: "PROMOTING THE DECARBONISATION OF THE POWER GENERATION SECTOR"
- 1.2: "CONTINUE WITH THE IMPLEMENTATION OF THE EU ETS"
- 1.7. "CONTINUING GREEN TAXATION"
- 7.1.: "PROMOTING THE DECARBONISATION OF THE INDUSTRIAL AND BUSINESS SECTOR"
- 7.3.: "REINDUSTRIALISATION FOR SUSTAINABILITY"
- 3.6.: "PROMOTING THE PRODUCTION AND CONSUMPTION OF RENEWABLE GASES"

ii. Policies and measures to achieve other national targets

These elements are identified, where relevant, in the respective chapters and sub-chapters.

iii. Policies and measures to achieve low-emission mobility (including electrification of transport)

A pathway towards energy transition and carbon neutrality undeniably lies with the transport sector, with the prospect of a complete decarbonisation of road and rail modes in the medium and long term, and an increasingly significant contribution to this decarbonisation of maritime and inland waterway transport. Improving resource efficiency also means how we move. To this end, there is a need to encourage the sharing of means of transport, the use of cleaner vehicles and make public transport more attractive, quality, convenient, quick, integrated and easily accessible, favouring intermodality and, where possible, complementing soft modes of transport.

LINE OF ACTION

5.1. PROMOTING MODAL SHIFT TO PUBLIC TRANSPORT

DESCRIPTION

Making public transport more attractive and promoting intermodality will make it possible to reduce urban congestion and achieve more efficient and clean mobility, providing greater comfort, speed and quality of life with lower energy consumption. The aim is to provide citizens with a quality, more convenient, faster and easily accessible public transport service, helping to foster social cohesion and maximising accessibility for all citizens. The aim is to promote modal shift by improving the provision of and access to public transport, reducing dependence on individual transport on daily journeys.

SECTOR (ES)

Transportation

MEASURES FOR ACTION

To promote modal shift, the following action measures are envisaged:

5.1.1. Public Passenger Transport Incentive Programme

The Incentiva + TP is a programme for financing the powers of transport authorities (TAs) and the public service obligations of public transport operators and is also intended to finance measures to promote public transport, contributing to the reduction of the associated costs and thus increasing their accessibility. [Scheduled date: 20202030]

5.1.2. Expand public transport networks and equipment across the territory

Promote the expansion of the high capacity collective public transport network and maintain the momentum of continuity in

General for Energy and Geology, Divison of Research and Renewables, Lisbon, Portugal. January 2021. 49 pp.

the expansion of these systems. Among the projects to be implemented, emphasis is placed on the expansion of the Lisbon and Porto metro networks.
With a view to territorial cohesion, the aim will be to improve the supply, diversification of public transport in the inland regions of the country, in both road and rail transport, ensuring the necessary connectivity with urban centres in each of the regions. [Scheduled date: 2020-2030]

5.1.3. Actions to promote multimodal interurban public transport

Improve quality of service, tariff integration, intermodality and information to the public, with a view to achieving an increase in the share of public transport use in the modal split. [Scheduled date: 2020-2030]

5.1.4. Implementation of an integrated information and ticketing system

Implement integrated information and ticketing solutions in the Autonomous Region of Madeira for public transport and complementary services, based on new real-time information technologies and dematerialised forms of payment, specifically suitable for the resident population, young people and tourists. [Scheduled date: 2020-2030]

5.1.5. Strengthening rail passenger transport

Improve the frequency and quality of rail passenger services to increase the use of this mode of transport at the expense of individual transport by investing in new rolling stock. [Scheduled date: 20202030]

Measure previously foreseen in action line 5.2 (measure 5.2.3).

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- Extreme climate events (floods, storms, heat waves, landslides, fires, etc.) could interfere with the provision of public transport and the implementation and effectiveness of the programme;
- Climate risks and extreme events could interfere with the process of expanding public transport networks and equipment (infrastructure resilience).

KEY INSTRUMENTS
RNC2050; PNI; PART; PIETRAM; PAMUS-RAM
SOURCES OF FUNDING
Community Funds (OP SEUR, PACS, Regional OP); FA; AMR budget; PRR
ENTITY RESPONSIBLE
SAM; MIH; GRM; GRA; Inter-municipal Communities; Metropolitan Areas; Transport authorities; IMT

LINE OF ACTION

5.2. ENCOURAGE THE ENERGY TRANSITION IN THE TRANSPORT SECTOR.

DESCRIPTION
Achieving the decarbonisation of the transport sector is crucial for achieving the energy and climate objectives for 2030 and 2050. In this sense, the aim is to ensure an effective energy transition and energy efficiency gains in all transport sectors, ensuring the use of clean energy such as electricity, advanced biofuels, renewable hydrogen, biomethane and renewable fuels of non-biological origin.
SECTOR (ES)
Transport; Energy
MEASURES FOR ACTION
To stimulate the energy transition of the transport sector, the following action measures are envisaged:

5.2.1. Renew bus fleets.

The national bus fleet is estimated to have an average age of 16 years, contributing significantly to the increase in GHG and other pollutant emissions and, above all, contributing to the degradation of air quality in urban areas. It is therefore important to continue to stimulate fleet renewal with the purchase of buses powered by more sustainable alternative energy sources, while increasing efficiency in their use through the energy performance classification of fleets. Fleet renewal should be accompanied by incentives for decommissioning.

promoting the uptake of electric vehicles, and the development of the appropriate charging network (in line with the measure 5.3.9 [scheduled date: 2020-2030]

5.2.2. Incorporate and valorise environmental and carbon performance criteria in the process of contracting the

concessions for public passenger transport services

Pursuant to Regulation (EC) No 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road, all public passenger transport services on national territory must be linked to a contract for the provision of services or a service concession by the transport authorities to operators. Environmental performance criteria should be included in the contract process, particularly in view of the improvement of the respective energy classification of the vehicle fleet and, in line with Community guidelines and in particular Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2009 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles, which sets minimum procurement targets for the share of clean and clean heavy-duty vehicles per Member State. [Scheduled date: 2020-2030]

5.2.3. Strengthening rail passenger transport – Measure Eliminated

Improve the frequency and quality of rail passenger services to increase the use of this mode of transport at the expense of individual transport by investing in new rolling stock. Measure included in action line 5.1

5.2.4. Renewing the fleet of passenger and cargo vessels

The fleet of active passenger and cargo vessels in Portugal has significant ageing conditions. The use of sustainable alternative fuels ships and vessels in transport and other maritime activities should be encouraged, highlighting the importance of electrification in short-distance inland waterway passenger transport and cargo of ships at berth in a port. [Scheduled date: 2020-2030]

5.2.5. Promote the use of renewable energy sources in transport fleets

Through the revision of the Regulation on the management of energy consumption in the transport sector, consider benefits for the use of renewable fuels in their fleets, thus encouraging companies to incorporate renewable energy sources into their fleets. [Scheduled date: 2020-2030]

5.2.6. Study the retrofitting of diesel equipment to green hydrogen for non-electrified lines – Measure eliminated

Hydrogen has the potential to play an important role in the decarbonisation of rail transport, as an alternative to track electrification. This would reduce costs and reduce the environmental impact of such interventions. In this regard, the potential of retrofitting diesel equipment to hydrogen should be explored, which could be carried out with a large national component, followed by the implementation of a pilot project. [Measure removed because hydrogen has been found not to be cost effective in the rail sector and therefore does not seem to be a solution].

5.2.7. Revision of the Energy Efficiency in Transport Regulation

In the transport sector, the Regulation on the Management of Energy Consumption for the Transport Sector (RGCEST) applies, which aims at improving energy efficiency in the transport sector, applying to transport companies and companies with their own energy-intensive fleets and sets targets for the progressive reduction of specific energy consumption. Given the weight and size of the sector, there is a clear opportunity to create new requirements and targets for transport companies and companies with their own energy-intensive fleets, ensuring the harmonisation of the different legal instruments in force, as well as updating and promoting the implementation of energy consumption legislation in the sector. [Scheduled date: 2020-2025]

5.2.8. Introducing cleaner forms of energy in ferries operating between islands in the Autonomous Regions of Madeira and the Azores

Renew passenger and vehicle (ferry) vessels operating between Madeira and Porto Santo and in the Azores Region, introducing cleaner and more efficient forms of energy. [Scheduled date: 2020-2030]

5.2.9. Promoting the energy transition of port areas – New measure

Promote the energy transition of port areas and related logistics areas, including the replacement of transport equipment and vehicles in ports using conventional fuels with electric or green fuel transport systems. Promote the creation of energy communities from the perspective that ports are logistics, energy hubs and the confluence of multiple activities (logistics, storage, industry) and represent interfaces between maritime, road and rail modes, consumers and energy producers. The

port infrastructure is a key element for the storage and transport of hydrogen and derived products and it is therefore crucial to provide ports with the right conditions to promote this activity. [Scheduled date: 2023/2024-2030]

5.2.10. Develop strategies for the production of renewable fuels in the maritime and maritime transport sectors air transport – New measure

Foster the development of strategies related to the production of renewable fuels for maritime and air transport modes where it is most difficult to decarbonise them.

For the production of both *Sustainable Aviation Fuels* and renewable fuels used in maritime transport, there is a need to have access to various raw materials, such as hydrogen and carbon, currently in small quantities on the market. Guidelines should therefore be developed to avoid competition for raw materials. [Scheduled date: 2023/2024-2030]

5.2.11. Development of projects with a strong contribution to the improvement of public transport systems – New measure

The main objective of Sustainable Mobility is to ensure the development of robust projects that make a strong contribution to the improvement of collective transport systems, that promote the strengthening and increasing use of public transport with the consequent reduction of dependence on individual road transport, that promote the decarbonisation of the transport sector, and that make an important contribution to the recovery from the economic and social effects of the pandemic crisis, in particular on employment. The challenge of sustainable mobility is reflected in the European Green Deal, where it is defined as a measure to achieve the proposed objectives of implementing cleaner, cheaper and healthier forms of public and private transport. The importance of sustainable mobility is reflected in the investments made available through the Environmental Fund, or through the RRP, whose component C15 envisages supporting sustainable mobility through the following projects:

- Investment:Expansion from Lisbon Metro Network
- Investment:Expansion from Porto Metro Network
- Investment: Decarbonisation of Public Transport
- Investment:Acquisitionfrom electric ships and batteriesfor a fleetfrom Transtejo Soflusa
- Investment:Acquisitionfrom railway rolling stock from Trains Portugal

[Scheduled date: 2024-2030]

5.2.12. National Aviation Decarbonisation Roadmap (RONDA) – New measure

As part of the National Roadmap for the Decarbonisation of Aviation (RONDA) and a principle of cooperation between the different stakeholders of the civil aviation system in Portugal, the Coalition for Sustainable Aviation and Smart Decarbonisation (CoASDI) should be established.

CoASDI aims to build a systemic and founded discussion to outline economically feasible and scientifically structured measures and actions, building the mechanisms of action that can lead economic actors in meeting the necessary objective of decarbonising air transport. This coalition should bring together the various stakeholders, not only from the aviation sector, but also associations, interest groups, representatives of institutions and academia and companies operating in different capacities in the supply chain and in the transport and logistics sector in general, stimulating a thorough debate integrating the different dimensions of sustainability (social, economic and environmental) and the contributions of the various actors involved. [Scheduled date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated
- Extreme climate events can interfere with the disruption of raw materials supply chains and increase the vulnerability of transport networks and infrastructure, with consequences for delayed fleet renewal, interruptions in the production of renewable fuels and the operability of transport networks and infrastructure (road, rail);
- Rising average sea levels and coastal storms can affect ship operation and port infrastructure, increasing operational costs and security risks;
- The use of renewable energy sources in transport fleets or for the production of green hydrogen may be affected by variations in the availability of renewable resources due to climatic events;
- The development of robust projects for collective transport systems should include climate risk analysis and the integration of adaptation measures (*climate proofing*).

KEY INSTRUMENTS
RNC2050; PIETRAM; PAMUS-RAM
SOURCES OF FUNDING
Community Funds (OP SEUR, PACS, Regional OP); FA; AMR budget; RRP; CEF2; PT2030
ENTITY RESPONSIBLE
SAM; MIH; GRM; GRA; DGEG; IMT; ENSE; Public transport operators

LINE OF ACTION

5.3. PROMOTE AND SUPPORT ELECTRIC MOBILITY.

DESCRIPTION

Electric mobility is a key factor in ensuring the progressive replacement of fossil fuels in road transport to renewable electricity, contributing to an effective reduction of GHG emissions. Electric mobility should therefore be promoted and supported by encouraging the introduction of electric vehicles and strengthening charging infrastructure.

SECTOR (ES)

Transport; Services; Energy

MEASURES FOR ACTION

To promote and support electric mobility, the following action measures are envisaged:

5.3.1. Monitoring the model for electric mobility

Portugal has established an innovative electric vehicle charging network management model with significant benefits for users. This model has already been implemented for part of the network since 2014, notably for fast charging stations, and it is essential to expand to the entire public access network in operation. It is important to monitor the benefits it brings to the system and the results in promoting electric mobility. It is also important to reassess the benefit of the model in relation to the supply of other market models, the evolution of the electricity system in particular in the context of distributed generation, and the flexibility allowed by electric vehicles in temporary storage. Consideration will also be given to the new guidelines of Community legislation, in particular those set out in the new Regulation on the deployment of alternative fuels infrastructure (AFIR) and the Energy Performance of Buildings Directive (EPBD), the reform of the current design of the European electricity market (EMD) and the revision of the Renewable Source Directive (RED III). [Scheduled date: 2020-2025]

5.3.2. Foster efficient electric mobility in Madeira and Porto Santo.

Renew public transport fleets, taxi fleets, logistics services fleets and other transport fleets, as well as private vehicles, promoting a transition towards efficient electric mobility, particularly by providing financial, fiscal and other incentives.

In this context, mention should be made of the Porto Santo Sustainable – *Smart Fossil Free Island* initiative, an incentive granted by the Regional Government to purchase electric vehicles, which was extended to the island of Madeira through the Programme of Incentives for Electrical Mobility of the Autonomous Region of Madeira (PRIME-RAM – 2023), with an initial allocation of EUR 625 000,00. [Scheduled date: 2019-2030]

5.3.3. Maintain and promote incentives for the acquisition of 100 % electric light vehicles, as well as the range of fiscal incentives available.

Since 2015, Portugal has provided a framework of incentives for the purchase of highly competitive electric vehicles, with purchase support of EUR 4 000 (passenger cars) and EUR 6.000 (light goods vehicles), as well as exemptions from vehicle tax, autonomous taxation and IUC. As long as the cost of purchasing an electric vehicle is significantly higher than comparable to traditional combustion, it is necessary to ensure, and even expand in both the allocation and the typologies covered, the existing incentive framework. In the case of electric vehicles for companies and other organisations, the incentive framework should also entail the optimisation and continuous improvement of the overall energy performance of the respective fleet. Support for charging electric vehicles should also be maintained. This support is planned to continue in 2024, in accordance with Order No 341/2024, which provides for the approval of the financial support, via the Environmental Fund, for Electricity Traders for Electrical Mobility (CEME) to partially cover the costs associated with charging electric vehicles, resulting in a discount applicable to the cost of each charging registered in the national electric mobility network. In addition, the incentive to purchase zero-emission vehicles should be maintained and the incentive for the scrapping of light-duty vehicles, including internal combustion, should materialise, with investment targeting 100 % electric vehicles. [Scheduled date: 2020-2025]

5.3.4. Promote electric vehicles in urban micrologistics.

Urban micrologistics, including*last mile*freight transport, show a potential for the use of zero-emission vehicles such as electric vehicles, quadricycles and electric cargo bikes. [Scheduled date: 2020-2030]

5.3.5. Promote two-wheeler electric vehicles.

Despite the great potential for converting two-wheel vehicles into electric vehicles, the market for two-wheel electric vehicles is still somewhat incipient. The use of this segment of electric vehicles should be promoted financially or through positive discrimination measures. [Scheduled date: 2020-2025]

5.3.6. Promote the development of the publicly accessible recharging network.

The publicly accessible recharging network shall monitor the size of the electric vehicle fleet circulating in Portugal. Considering that sales of electric vehicles have been increasing significantly in recent years, it is important to ensure that the charging network increases in order to maintain ratios between vehicles and charging stations. Among the initiatives to be promoted to strengthen the charging network are: (I) adoption of mandatory criteria for the installation of recharging points, in particular in residential

and commercial areas (public and private areas with public access), ensuring appropriate alignment with network operators, to enable the identification of investment needs for grid reinforcement, which are considered in the electricity grid development plans; (II) make it mandatory to install charging stations for electric vehicles on publicly accessible infrastructure, as provided for in the Energy Performance of Buildings Directive (EPBD) (iii) to encourage/support investments to bring the fast charging network to the entire territory, as foreseen in the AFIR, while ensuring the necessary investments for these developments, including in the power grid. [Scheduled date: 2020-2025]

5.3.7. Promote the roll-out of charging points for electric vehicles in private buildings.

Create the appropriate technical and regulatory conditions and incentives to scale up the electric vehicle charging network in private buildings, including the facilitation of new grid connections, reinforcement of existing ones and smart charging solutions. In 2022 and 2023, through the Environmental Fund, the Government supported the installation of shippers in condominiums up to EUR 1.800. [Scheduled date: 2020-2025]

5.3.8. Promote smart recharging of electric vehicles with two-way energy flows.

Create the legal framework for smart charging of electric vehicles and for the use of functionalities enabling bi-directional energy flows with system services, including in public or private car parks and charging stations, to contribute to the security of supply of the electricity system and increase the penetration of renewable energy sources, including in an isolated island context (on islands). Promote, both in mainland Portugal and on islands, the integration of local renewable production and storage at charging stations and participation in flexibility services. [Scheduled date: 2020-2030]

5.3.9. Promote recharging facilities for electric buses.

Create a charging network for electric buses, for night charging and additional charging at terminal stops or parking areas, covering public transport and tourism services, aiming at decarbonising the transport sector, minimising impacts on an electricity grid and increasing the penetration of renewable energy sources in an isolated island context. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficiency

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- Extreme climate events (such as floods, heat waves, landslides) can cause damage to electric vehicle charging networks and infrastructure, resulting in interruptions and increased maintenance and repair costs (building climate-resilient networks and infrastructure);
- Strengthening the electric vehicle charging network implies the dimensioning of electricity grids, which could be affected by variations in the availability of renewable resources due to climatic events, which could be minimised by the integration of decentralised renewable energy sources;
- In the case of smart charging, energy fluctuations and blackouts could jeopardise the effective implementation of bidirectional charging solutions;
- Two-wheeled and micrologistic electric vehicles may be more vulnerable to adverse or extreme weather conditions (intense heat reduces the lifetime of batteries, heavy rainfall causes damage to electrical components) and can cause service interruptions or increase the risk of accidents.

KEY INSTRUMENTS

RNC2050; PNI; PIETRAM; PAMUS-RAM; PAESC-RAM (under preparation); PAESC-RAM; EMEA; PMEA

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OP); FA; OP Madeira; PRR

ENTITY RESPONSIBLE

SAM; MIH; GRM; GRA; DGEG; ERSE; EEM; ADENE; EDA; AREAM

LINE OF ACTION

5.4. PROMOTE VEHICLE SHARING SERVICES

DESCRIPTION

Alongside the promotion of public transport, other urban mobility formats should be encouraged to reduce the pressure of road traffic, reduce GHG emissions and promote people's well-being and quality of life. This aims to promote vehicle sharing services, with a focus on electric and active mobility.

SECTOR (ES)

Transport; Services

MEASURES FOR ACTION

To promote vehicle sharing services, the following action measures are envisaged:

5.4.1. Boosting shared mobility initiatives such as *car sharing*, *bike sharing* and *car pooling*

The provision of a vehicle sharing system is a solution that increases the efficiency of the use of a fleet. These sharing systems can be cars, bicycles, motorcycles, and more recently scooters. The use of such car-sharing systems leads to a reduction in environmental impact and high energy efficiency, as well as a reduction in the occupation of public space. [Scheduled date: 2020-2025]

5.4.2. Promote the uptake of mobility management support tools and of information systems and technologies supporting mobility and communication

Incorporating new technologies and smart systems into mobility management are essential tools to increase logistics, energy and environmental efficiency. On the other hand, in an information society such as the current one, the process of choosing the mode of transport is highly conditional on the provision of real-time information on the conditions of the various transport options through the integration of intelligent transport systems and communication systems with the passenger. [Scheduled date: 2020-2030]

5.4.3. Promote *mobility and service tools (* mobility as a service)

The concept of mobility as a service consists of the provision of a service which allows travel between a point A and a point B, through the mode of transport which best suits the needs of the passenger and the characteristics of the journey to be made. As an alternative to the acquisition and possession of a vehicle, mode of transport, mobility as a service allows the use of multiple modes of transport and the choice of the most efficient mode for the journey concerned. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficiency

KEY INSTRUMENTS

RNC2050; EMEA; PMEA

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

SAM; GRA; GRM; IMT; Municipalities; Transport operators; ADENE

LINE OF ACTION

5.5. PROMOTE THE PRODUCTION AND CONSUMPTION OF ALTERNATIVE RENEWABLE FUELS

DESCRIPTION

Clean alternative fuels, in particular advanced biofuels, hydrogen and renewable fuels of non-biological origin (such as ESAF) are taken as an alternative and complementary solution to electric mobility by 2030 and 2040, in particular for the long-distance heavy goods road transport, heavy passenger transport, maritime freight and aviation sectors to ensure the energy transition in this sector. In the case of advanced biofuels, Portugal already has a significant biofuel industry and the infrastructure to do so.

SECTOR (ES)

Transport; Industry Energy; Waste; Agriculture

MEASURES FOR ACTION

To promote the production and consumption of alternative renewable fuels, the following action measures are envisaged:

5.5.1. Promoting the production of sustainable biofuels by valorising national indigenous resources

National biofuel production is intended to be achieved through the recovery of residual or low economic value biomasses, waste recovery and recovery, including municipal waste, provided that it is part of waste policy, and used cooking oil (UCO), and other indigenous alternative resources.

To this end, the National Plan for the Promotion of Biorrefineries, approved by Council of Ministers Resolution No 163/2017, will be reviewed and implemented, which aims to strengthen the national commitment to the valorisation of renewable energy sources through the sustainable use of biomass as an alternative energy source to fossil resources, promoting the production of a variety of products, including advanced biofuels and the emergence of new value chains around biomass, in a precedent of a bioeconomy and circular economy. To a large extent, it will go through the transposition of the new Renewable Energy Directive and will result in the setting of targets for the incorporation of advanced biofuels for the decade 2021-2030. [Scheduled date: 2020-2030]

5.5.2. Moving forward with the *phase* out of conventional biofuels

Under Directive (EU) 2018/2001 and the new Renewable Energy Directive (RED III), published in November 2023, the share of high indirect land-use change-risk biofuels, bioliquids and biomass fuels produced from food and feed crops should by 31 December 2030 gradually decrease to 0 %. In this sense, the necessary changes should be promoted to comply with this rule by promoting

advanced biofuels instead. [Scheduled date: 2021-2030]

5.5.3. Promote mixtures that have higher shares of bioenergy.

Assess current national legislation with regard to fuel quality by promoting the incorporation of higher shares of biofuels. This evaluation should take into account the latest developments in Community legislation, in particular as defined in Directive (EU) 2023/2413, which amended Directive 98/70/EC.

The national strategy has been to set incorporation targets within the limits of the technical specifications for diesel (EN 590) with the maximum physical incorporation limit of 7 % (v/v) of FAME, building on existing fuel infrastructure. However, higher percentages (B15 and higher) could be used to decarbonise heavy mobility and dedicated fleets, also taking into account the provisions of Directive (EU) 2023/2413. Incentives for the introduction of rich bioenergy blends into professional gas oil will be considered.

There will be a need to create an incentive for the use of rich biofuel blends, as there is a significant economic gap between biofuels *and* fossil fuels they will replace. [Scheduled date: 2020-2024]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy Security
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- Agricultural and forestry production associated with the production of biofuels could be impacted by high temperatures, droughts, water scarcity and fires. Effects can be minimised with the adoption of crops and species adapted and resilient to the effects of climate change, investments in more efficient irrigation technologies, adoption of sustainable forest management strategies (e.g. creating fire buffer zones);
- Reducing import dependency, subject to interruptions due to climatic events in other regions, could lead to the need to develop a local production chain for advanced biofuels, enabling the phase *out* of conventional biofuels;

KEY INSTRUMENTS
RNC2050; PNPB

SOURCES OF FUNDING
FA; UPS; Community Funds (OP SEUR, PACS, Regional OP); Innovation Fund; PRR

ENTITY RESPONSIBLE
SAM; DGEG; LNEG; APA

LINE OF ACTION

5.6. PROMOTE RENEWABLE ALTERNATIVE FUELS REFUELLING INFRASTRUCTURE

DESCRIPTION
The transport sector is a priority for the definition of policies and measures to promote the decarbonisation of the economy and society, with a very significant potential for improvement in the areas of diversification of energy sources and energy efficiency. It will be important to align with new European guidelines and legislation, in particular with the new Alternative Fuels Infrastructure Regulation (AFIR).

SECTOR (ES)
Transport; Energy; Waste

MEASURES FOR ACTION
To promote alternative fuels refuelling infrastructure for renewable fuels, the following action measures are envisaged:

5.6.1. Promote the installation of 100 % renewable liquid and gaseous fuel refuelling stations in public transport and municipal service fleets

As regards biofuels, the national strategy has been to incorporate biofuels into conventional fuels, within the limits of their technical specifications and by taking advantage of the existing infrastructure for such conventional fuels. However, the focus on local solutions for the use of advanced biofuels, biomethane and hydrogen other renewable fuels, either in pure form or at high concentrations in fossil fuels, will include promoting the installation of refuelling points for 100 % renewable liquid and gaseous fuels in public transport and municipal service fleets. Preference will be given to locations close to the production facilities for these renewable alternatives and preferably to projects associated with the exploitation of residual or low economic value biomasses. [Scheduled date: 2020-2030]

5.6.2. Promote and support the installation of renewable hydrogen and biomethane refuelling points

The potential of green hydrogen and biomethane as energy carriers enabling GHG emission reductions, increasing shares of

renewable energy in final consumption and offering high flexibility in use is recognised and hydrogen can be used as a form of storage of electricity produced from renewable sources. Exploiting these and other benefits, these alternative fuels can play an important role in decarbonising the transport sector, where the penetration of renewables has been challenging, and the availability of hydrogen and biomethane refuelling infrastructure is key to promoting its consumption.

The deployment of this network will take place in a phased manner and has already started with pilot and demonstration projects, mostly associated with public transport and logistics distribution fleets, promoting the evolution towards a network that ensures significant territorial coverage enabling the progressive penetration of mobility to renewable gases aligned with the targets for supply infrastructure set out in the new Alternative Fuels Infrastructure Regulation (AFIR).[Deaded date: 2023-2030]

5.6.3. Promote the development of infrastructure for the provision of renewable energy sources to ships in quays or ports

Promote the use of renewable energy sources by ships at berth in a port, such as electricity or hydrogen and renewable fuels of non-biological origin, by making On-shore*power supply*available to vessels at the expense of the use of conventional fossil fuels for domestic use, which improves air quality in those locations, as well as contributing to the reduction of GHG emissions if such electricity is produced from renewable sources. Increasing the supply of electricity to port areas often requires the construction of substations at terminals or their surroundings, allowing not only the supply of energy to ships, but also stabilising the network on port fronts and boosting the use of electrical cargo handling equipment, replacing those of fossil fuels, contributing to the decarbonisation and reduction of levels and noise, which would otherwise not be possible. [Scheduled date: 2020-2030]

5.6.4. Review the National Policy Framework for the deployment of alternative fuels infrastructure

The new Regulation on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU of the European Parliament and of the Council (AFIR) aims to establish a common framework of measures and minimum requirements for the deployment of such infrastructure at European level and Member States should develop a new National Policy Framework for the development of the market for alternative fuels in the transport sector and for the deployment of the necessary infrastructure, which should take into account the targets set out in that Regulation. [Scheduled date: 2023-2024]

5.6.5. Creation of "Green Lanes" for supply with biofuel blends for heavy mobility – New measure

Creation of "green lanes" corresponding to a national distribution network, with geographical distribution locations in proportion to the location of the fleets, and creation of fuel distribution logistics for the supply of such points.

The commitment to local biofuel production solutions could bring to the national production, development and revitalisation market, which currently uses only 50 % of its installed capacity. [Scheduled date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- The incidence of coastal risks, storms, floods and extreme climate events could lead to the need to build more resilient fuel supply infrastructure, avoiding its installation at risk sites;
- Water reuse or desalination in renewable hydrogen production minimises the effects of frequent water scarcity and droughts.

KEY INSTRUMENTS

RNC2050

SOURCES OF FUNDING

FA; UPS; Innovation Fund, RRP, MFF 2021-2027

ENTITY RESPONSIBLE

SAM; MIH; DGEG; LNEG

LINE OF ACTION

5.7. PROMOTING ACTIVE MOBILITY AND MORE EFFICIENT BEHAVIOUR

DESCRIPTION

Favouring active mobility over motorised individual transport is a growing trend in developed societies, because of the excellent value for money and huge benefits it brings in areas that are fundamental to the quality of life of all – even for those who are not (yet) actively moving. In particular, the promotion of cycling must be viewed in an objective, systematic, cross-cutting and ambitious manner. With the progressive availability of electrically assisted bicycles, which widen and make it possible to generalise the benefits of adopting active travel patterns in society, there are strong reasons for adopting new forms of mobility and improving the use of the transport system. This aims to promote active mobility and more efficient behaviour by increasing the modal share of cycling and pedestrian.

SECTOR (ES)

Transportation

MEASURES FOR ACTION

To promote active mobility and more efficient behaviour, the following action measures are envisaged: **5.7.1. Implementing the National Strategy for Active Mobility 2020-2030**

Portugal has huge potential for active mobility, which should be harnessed and realised for the benefit of all. However, in order to achieve levels of success comparable to those of other European countries, it is crucial to be creative and innovative in policy implementation, adapting international best practices to national and local contexts.

In 2030, any citizen in Portugal should be able to choose naturally to walk or cycle. This will require mobilising a large number of different actors for this national purpose, who can contribute to the development of an active society that values, supports and celebrates walking and cycling in all its forms: on the road and off-road, on daily journeys, pleasure and sports activities. In order to ensure the most efficient and effective use of available resources, it is important to establish an action plan, focused on end-users (pedestrians and cyclists) and properly results-oriented, to maximise the return on investment.

The National Strategy for Active Mobility consists of two separate instruments: the National Strategy for Cycle Active Mobility 2020-2030 (ENMAC) and the National Strategy for Domestic Active Mobility (EnMAP).

The objectives of the ENMAC, adopted in 2019, are: (I) increasing the modal share of cycling within the national territory; (II) increasing the modal share of cycling in cities; (III) increase in the active modal share (cycling and pedestrian) in the national territory; (IV) increase in the total length of cycle paths (ensuring safe pedestrian zones); (v) reduction of road accidents for pedestrians and cyclists. EnMAP has the mission of "providing the country with direct and indirect conditions so that walking is possible at all times in a safe and universal manner, making this way of preference for daily travel and linking it, in particular, with cycling and public transport, as a decisive contribution to improving the quality of life of citizens. The following are defined as targets to be achieved by 2030: (I) increase the modal share of pedestrian travel from 16 % to 35 %; (II) increase the public space that can be used by all by 50 %. [Scheduled date: 2020-2030]

5.7.1. Portugal Cycle Programme 2030

The Programme Portugal Cicable 2030 provides an incentive to increase infrastructure dedicated to cycling as a mode of transport capable of gaining relevant weight as a sustainable solution to meet many of the mobility needs of the urban population, both in the two major metropolitan areas of the Portuguese mainland, and in urban conurbations (diffuse urbanisation) and consolidated cities.

This programme foresees the construction of 1 000 km of cycle lanes by 2030 ensuring the expansion and upgrading of cycling and pedestrian networks, improving their connectivity. The link between the need to expand cycling routes and ensuring the safety of pedestrian zones is considered important. [Scheduled date: 2020-2030]

5.7.2. Increasing incentives for active mobility

Ensure that the incentives created for the promotion of active mobility, bicycles and other lightweight vehicles, including electric versions, are maintained and increased. [Scheduled date: 2020-2030]

5.7.3. Promotion of cycling and other active modes with a view to increasing soft modes in the modal split

Promoting active behaviour, in particular in relation to cycling, involves an integrated marketing and communication effort – including continuous and consistent awareness-raising campaigns, events and impactful activities, as well as education promoting active modes and road citizenship – geared to stimulating a profound change of attitudes. [Scheduled date: 2020-2030]

5.7.4. Promoting cycling by changing mobility behaviours in school and/or university age segments

Education for active and sustainable road mobility should be provided from pre-school onwards and continued at the following levels, encouraging shared and responsible use of public space. Resources, initiatives and communication campaigns targeting groups with differentiated needs and expectations will be developed and promoted, where there is significant potential to increase the use of active mobility, such as students. [Scheduled date: 2020-2030]

5.7.5. Creation of a network of complementary equipment to support active mobility

Appropriate bicycle parking will be provided at all relevant destinations (safe, well located and in the required quantities). The transport of bicycles should tend to be practical and accessible, in rail, inland waterway and, in justified situations, in road, interurban and urban transport. [Scheduled date: 2020-2025]

5.7.6. Improvement of pedestrian infrastructure

Implement measures to facilitate pedestrian traffic in consolidated urban areas by facilitating the safe movement of pedestrians and the reduction of bottlenecks resulting from the terrain and scarcity of space on some urban roads in the Autonomous Region

of Madeira. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- Promoting active mobility under different climatic conditions could benefit from awareness-raising and education campaigns;
- The infrastructure network to promote active mobility should avoid the construction of pedestrian and cycling routes in risk areas (floods, landslides, etc.) by incorporating natural base-solutions that minimise the effects of temperature increase and heat waves (providing shadows, water points, rest stops).

KEY INSTRUMENTS
RNC2050; ENMA 2020-2030
SOURCES OF FUNDING
Community Funds (OP SEUR, PACS, Regional OP); FA; PRR
ENTITY RESPONSIBLE
SAM; GRA; GRM; IMT; ADENE; AREAM

LINE OF ACTION

5.8. PROMOTING FREIGHT TRANSPORT BY RAIL, SEA AND INLAND WATERWAYS

DESCRIPTION
Freight transport is among the main contributors to fossil fuel consumption and GHG emissions in the transport sector, notably by the high modal share of road transport. The promotion of rail, sea and inland waterway transport results in a significant increase in the energy and environmental efficiency of freight transport and, at the same time, contributes to the improvement of air quality and the decongestion of roads, which is particularly relevant in large urban agglomerations.
SECTOR (ES)
Transportation
MEASURES FOR ACTION
In order to promote the transport of goods by rail, sea and inland waterway, the following action measures are envisaged:

5.8.1. Increasing the competitiveness of rail transport

Reduce journey time and transport costs (EUR/km), increase capacity (number and length of trains). [Scheduled date: 2020-2030]

5.8.2. Improve international links.

This improvement will be achieved via the following corridors: Sines/Setúbal/Lisbon-Caia; Leixões/Aveiro – Vilar Formoso. The use of railways to and from national ports will be promoted. [Scheduled date: 2020-2030]

5.8.3. Creating conditions for rail interoperability

Promote the electrification of lines and the use of ERTMS for signalling. Increase the length of freight trains to 750 m, and at gauge level promote the installation of (multi-purpose) sleepers that allow the gauge to be changed on international corridors. [Scheduled date: 2020-2030]

5.8.4. Promotion of the use of dry ports – New measure

According to Decree-Law No 53/2019 of 17 April 2006, dry ports aim to increase the concentration and unloading of goods moving between temporary storage facilities, increasing the competitiveness of ports and the domestic exporting and importing sector. This will not only decrease the pressure of cargo storage in seaports, but also facilitate cargo flows and increase rail's share of the port interface, contributing to a decrease in GHG emissions. These measures could be:

complemented by solutions using green means of transport. To this end, the Department of Ports of Douro, Leixões and Viana do Castelo, S.A. (APDL) has planned investments in the Leixões Rail Freight Terminal and the Guarda Rail Freight Terminal. [Scheduled date: 2023-2030]

5.8.5. Electrify rail *last-mile* to ports by introducing operational improvements to access railway lines port terminals – New measure

Promote the electrification of access railway lines to port terminals and operational improvements in the last rail *mile* connecting to port terminals, with the aim of decarbonising the rail interface, increasing the competitiveness of rail transport and increasing the share of rail use in freight transport to the *hinterland* of ports. [Scheduled date: 2023-2030]

5.8.6. Promoting and supporting inland waterway freight transport – New measure

Remove financial and procedural obstacles to the development of navigability projects and dedicated inland waterway terminals [Deadline: 2023-2030]

5.8.7. Enhancing maritime connectivity of mainland commercial ports network – New measure

The reinforcement will be achieved by improving the navigability conditions of commercial ports on the mainland in order to empower them to deal with larger vessels, thereby increasing the efficiency of maritime transport and thus increasing the modal share of short sea shipping. [Scheduled date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- Resilience of rail infrastructure to the effects of climate change: this includes installing electrical, communications and signalling systems that are resilient to extreme temperatures; avoid train paths in risk areas (fire, landslides, etc.), improve runway drainage, soil stabilisation;
- To address the rise in the average sea level and the occurrence of extreme coastal events in the planning and construction of port (maritime and river) infrastructure;
- The implementation of monitoring, alert and rapid response systems to extreme events benefits the operability and efficiency of freight transport by rail, sea and inland waterway.

KEY INSTRUMENTS
RNC2050; PNI
SOURCES OF FUNDING
Community Funds (OP SEUR, PACS, Regional OP); RRP; PT 2030 (PACS); CEF 2 and MFF 2021-2027
ENTITY RESPONSIBLE
MIH

IV. National policies, timelines and planned measures to phase out energy subsidies, in particular for fossil fuels

In order to make taxation an instrument for the transition to carbon neutrality, a Labour Group was set up in 2 018 in Portugal37 withthe task of promoting an analysis of taxation on energy, in particular with a view to identifying and studying incentives harmful to the environment and proposing their phasing out, as well as proposing the revitalisation of the carbon levy, taking into account possible impacts on the economic sectors concerned, within a framework of decarbonisation of the economy. In June 2019, the report “The Tax Benefits in Portugal” was published. 38

A process of phasing out the exemptions associated with the use of coal for electricity production started in 2018 and is described below.

Elimination of exemptions to the use of coal for electricity generation

The State Budget Law for 2018 (Article 251) established the phasing-out of the exemption from the tax on petroleum and energy products (ISP) for coal and coke used for the production of electricity and cogeneration.

Thus, coal and coal coke (classified under codes NC2701, 2702 and 2704) used for electricity and heat production will be subject in 2018 to a rate corresponding to 10 % of the ISP rate and to 10 % of the surcharge on CO_2 emissions (carbon tax). These rates shall be amended on 1 January of each year as follows: (I) 25 % in 2019; (II) 50 % in 2020; (III) 75 % in 2021; (IV) 100 % in 2022.

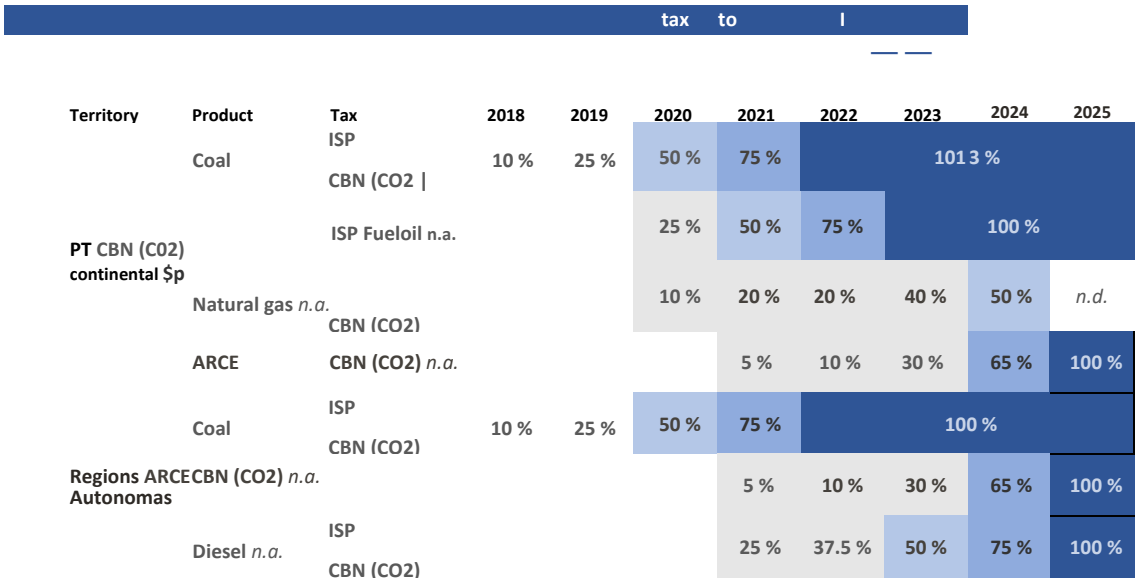
The revenue obtained from this phasing out of the exemption from the ISP and the addition of CO_2 emissions is allocated to the National Electricity System (SEN) at 50 % for the reduction of the electricity tariff deficit to be allocated to the Systemic Sustainability Fund for the Energy Sector and to 50 % for the Environmental Fund for implementation in decarbonisation projects.

For 2019, an adjustment has been introduced to reflect the carbon price already paid for these installations and a base price of EUR 20/t has been established for the determination of the carbon levy.

The removal of ISP and carbon tax exemptions continued in 2020, 2021, 2022 and 2023, with an extension of the scope in terms

37Order No 2835/2018, published in the Diário da República, Series 2, No 56, of 20 March 2018
38Cad-CTF-217-Os-Beneficios-Fiscais-em-Portugal.pdf (portaldasfinancas.gov.pt)

of energy products and uses, as can be seen from the figure below (in the Report accompanying the State Budget for 2023).



Arce – Energy Consumption Rationalisation Agreement

The PSI tax expenditure analysis identified in 2017 around EUR 441 billion associated with fossil fuel tax exemptions. In 2020 this figure reached EUR 413.5 million, EUR 257.7 million in 2021 and EUR 237 million in 2022 (provisional execution figures), according to the Report accompanying the State Budget for 2023.

In 2022, as an inflation mitigation measure, among other measures, the increase in the carbon rate, which maintained the value of 2021 until 2023, was put on hold. The gradual unfreeze of the carbon rate update started in May 2023.

In the context of the Energy Taxation Directive, there are optional exemptions, such as those granted to energy-intensive industries. It should be noted that although this Directive requires Member States to exempt fossil fuels used for electricity generation, it also provides that for environmental policy reasons they may be taxed.

It is therefore a national intention to pursue the elimination of environmentally harmful subsidies, strengthening the application of the carbon levy and promoting higher taxation on resource use, recycling, as is already the case today, revenues for decarbonisation and the just transition.

LINE OF ACTION

1.7. PURSUING GREEN TAXATION

DESCRIPTION

Contributing to more sustainable production and consumption patterns, promoting GHG emission reductions, fostering more sustainable behaviours, promoting eco-innovation and resource efficiency, fostering entrepreneurship and job creation, reducing energy dependency from outside, efficiently achieving international targets and objectives, and diversifying sources of revenue.

SECTOR (ES)

Energy; Industry Mobility and Transport; Services

MEASURES FOR ACTION

In order to pursue green taxation, the following action measures are envisaged:

1.7.1. Taxation for the decarbonisation of the energy sector

Revitalise the carbon tax – carbon taxation in sectors not covered by the European Emissions Trading System (ETS) with a rate indexed to the carbon price in the sectors covered by the EU ETS. Phase out environmentally harmful incentives, including fossil fuel subsidies, including the review of tax benefits and other incentives linked to the use of fossil fuels. [Scheduled date: 2020-2025]

1.7.2. Fiscal measures for the decarbonisation of the transport sector and promoting sustainable mobility.

Incentives for electric mobility with measures that will have an impact on income tax (IRS), corporation tax (IRC), VAT, vehicle tax (ISV) or autonomous taxes or the allocation of a subsidy for the purchase of new electric or plug-in hybrid vehicles. Revision of the ISV and IUC to enhance the positive discrimination of vehicles with better environmental performance by maintaining taxation according to CO_2 emissions. Study of potential incentives for mobility with hydrogen, bioenergy and RFNBO, differentiating bioenergy from fossil fuels, promoting the use of more bioenergy rich blends. [Scheduled date: 2020-2025]

1.7.3. Taxation for the decarbonisation of the residential and services sector

Introduce tax incentives for energy efficiency and introduction of renewable energy and a more favourable tax regime for buildings incorporating renewable energy technologies for the production of electricity and/or thermal energy (e.g.: create fiscal incentives, such as the reduction of IMI, for nearly zero-energy buildings (NZEB). [Scheduled date: 2020-2025]

1.7.4. Taxation for the promotion of low-carbon and renewable energy products and services Creating tax incentives, such as a reduced VAT rate, for low-carbon and renewable energy products and services, including those with certification or incorporation of recycled material. [Scheduled date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
KEY INSTRUMENTS
RNC2050; Green Taxation
SOURCES OF FUNDING
n.e.c.

ENTITY RESPONSIBLE
MF; AEM

3.2. Energy Efficiency Dimension

Energy efficiency is one of the most important drivers for a transition to a carbon-neutral economy while generating growth, jobs and investment opportunities. This is why energy efficiency is not only taken as an opportunity for development and modernisation, but also as a priority energy source, in the sense that energy that is not produced/consumed is the safest, cleaner and cheapest energy. This vision is in line with EU policy and the EU has set itself as one of the guiding principles of its energy policy, "*Energy efficiency first*".

I. Energy efficiency obligation schemes and alternative policy measures pursuant to Articles 8, 9 and 10 of Directive (EU) 2023/1791

LINE OF ACTION

2.2. PROMOTE MORE EFFICIENT EQUIPMENT

DESCRIPTION
It aims to make the current equipment park more efficient either by direct replacement or by discouraging the purchase of new equipment with significantly lower energy and environmental performance than the best practices already existing on the market, or by stimulating a change in energy purchasing and consumption behaviour.
SECTOR (ES)
Residential; Services; Industry Transport; Agriculture and fisheries
MEASURES FOR ACTION
To promote more efficient equipment, the following action measures are envisaged:

2.2.1. Promote the replacement of inefficient household equipment

Through mechanisms set up for this purpose, awareness-raising campaigns, technical consumer support and financial incentives, based on the energy label and supporting the purchase of equipment on the top two classes of the scale, in line with market availability and linking with EPREL – European Product Database, the aim is to promote the replacement of equipment by more efficient ones, thereby reducing the specific consumption of the equipment park. The guidelines and new provisions following the publication of the new Directive on the performance of buildings, Directive (EU) 2024/1275, as well as Regulation (EU)

2024/1781 establishing a framework for setting ecodesign requirements for sustainable products should be taken into account and priority should be given to the purchase of essential equipment. [Scheduled date: 2023/2024-2030]

2.2.2. Promote the appropriate dissemination of information and communication of the energy label, in particular the new generation of labels resulting from the implementation of Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017

The new generation of labels results from the application of the new energy labelling framework to different types of products. In order to ensure the success of this new generation of labels, it will be crucial to continue to focus on careful, coherent and effective information and communication to economic operators and consumers so that they can gain greater knowledge of the topic and contribute to their energy literacy. [Scheduled date: 2024-2030]

2.2.3. Affirming and expanding the use of the energy label as a simple and effective tool for communication between consumers and the market regarding the energy efficiency of building elements – New measure

The energy label is a privileged means of communication and support for consumers' decision to purchase new products.

The scope of this initiative should be extended to building elements with labels such as windows, walls, roofs, floors, doors, etc. (e.g.: Class +) as a national voluntary initiative to be developed in conjunction with industry in the sector. To this end, this label should be included in the elements to be made available by manufacturers or suppliers to consumers, either through the applicable technical regulations or as a performance requirement for the allocation of financial incentives. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficiency

KEY INSTRUMENTS

n.a.

SOURCES OF FUNDING

RRP; PPEC; FA; EO; The Cohesion Fund; ERDF; EAFRD; EMFAF

ENTITY RESPONSIBLE

SAM; MAP; MIH; ME; GRA; GRM; DGEG; ADENE; ERSE; AT; Managing Authorities of the Funds; IFAP; AREAM

LINE OF ACTION

2.3. ENSURE BETTER MANAGEMENT OF ENERGY CONSUMPTION IN THE VARIOUS SECTORS OF THE NATIONAL ECONOMY

DESCRIPTION

Significantly improving the monitoring and management of energy consumption by reducing the consumption and costs associated with running businesses and managing the domestic economy contributes significantly to increasing the competitiveness of the economy and sectors, freeing up resources to boost domestic demand and new investments.

SECTOR (ES)

Residential; Services, Industry; Transport; Agriculture and fisheries

MEASURES FOR ACTION

In order to ensure the improvement of the management of energy consumption in the various sectors of the national economy, in addition to the action measures set out in Objective 1 – decarbonise NATIONAL ECONOMY, Objective 6 – PROMOVER UMA AGRICULTURE SUSTENTÁVEL and to enhance the sequestration of CARBONO and Objective 7 – INDUSTRIA INDUSTRIA AND COMPETITIVE INDUSTRIA, the following action measures are foreseen:

2.3.1. Promote the establishment of an Energy Consumption and Efficiency Management System (EEMS) in energy-intensive installations and fleets in the industry and transport sectors

Establish a common system for reporting and monitoring energy consumption on the basis of a threshold to be defined for the industry and transport sector, installations and fleets, integrating existing systems (Intensive Energy Consumption Management System (SGCIE) and Regulation on the Management of Energy Consumption for the Transport Sector (RGCEST)) complemented with a performance assessment and classification methodology that supports and guides organisations towards continuous improvement. This system will make it possible to introduce, in a simpler and more integrated way, different reporting obligations, audits and action/rationalisation plans depending on the sector and level of energy consumption, promoting harmonisation and simplification of procedures. [Scheduled date: 2024-2025]

2.3.2. Promoting the development of a Cross-cutting Monitoring System – New Measure

Set up a cross-cutting monitoring system integrating the information reported under various instruments, including Directive (EU) 2023/2413 on the promotion of renewable energy sources and Directive (EU) 2023/1791 on energy efficiency. The aim is to

respond to the monitoring requirements set out in the various instruments, from a comprehensive and complementary perspective allowing an up-to-date overview of the state of implementation of the various sectoral initiatives (industry, buildings and transport). [Scheduled date: 2024-2025]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
KEY INSTRUMENTS
SCE; SGCIE; RGCEST; ECO.AP 2030
SOURCES OF FUNDING
n.e.c.

ENTITY RESPONSIBLE
SAM; GRA; GRM; DGEG; ADENE; ERSAR (ADP); ANMP (E-REDES);

LINE OF ACTION

6.4. ADOPT MORE ENERGY AND WATER EFFICIENT FARMING AND FORESTRY PRACTICES

DESCRIPTION
It aims to promote the uptake of more resource-efficient and regenerative agricultural and forestry practices with an impact on GHG emission reduction, and on improving energy and water efficiency.
SECTOR (ES)
Agriculture; Forest; Energy
MEASURES FOR ACTION
To adopt more energy and water efficient agricultural and forestry practices, the following action measure is foreseen:

6.4.1. Promoting energy and water efficiency

Establish mechanisms to promote the acquisition and use of management tools, installation and use of more efficient technologies, including precision and measurement equipment and support for good irrigation practices.
It will be achieved through the purchase and use of management tools, installation and use of more efficient technologies (e.g.: engine optimisation, pumping systems, ventilation and compression systems, heat and cold recovery, efficient lighting) including precision equipment (e.g.: systems to monitor actual crop water needs) and by supporting good irrigation practices (e.g.: monitoring, use of the water balance in the decision on irrigation, inspection and assessment of the effectiveness of irrigation installations applying compost and increasing soil organic matter content by favouring its water retention capacity) and the recognition of good practices of irrigated farms with regard to the efficient use of water by supporting water certification of irrigated farms, as well as opting for crops with lower irrigation needs and resistance to water stress. [Scheduled date: 20242030]

6.4.2. Establishing an Energy Efficiency Regulation in Agriculture and Forestry – Measure eliminated

Considering that there is a clear opportunity to generate improvements in energy consumption, this new regulation will aim at the rational use of energy in installations in agriculture, forestry and fisheries, promoting the reduction of unnecessary costs.

As the share of this sector in low final energy consumption is removed, it is considered more important to focus efforts on sectors with the potential to reduce energy consumption that have the greatest impact on meeting the targets.

CONTRIBUTION TO THE DIMENSIONS OF THE NECP
Decarbonisation; Energy Efficiency; I & I & C
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- The energy and water efficiency of the agricultural and forestry sectors can be affected by the effects of climate change, including increased temperatures, water scarcity and droughts.
- The implementation of efficient irrigation systems, construction of water storage infrastructure, water reuse for irrigation, choice of species with lower water needs, adoption of soil water conservation techniques and sustainable forest management techniques (including the establishment of fire protection zones) could minimise the effects of climate change.

KEY INSTRUMENTS
RDP 2020
SOURCES OF FUNDING
EAFRD; EAGF; The Cohesion Fund; ERDF; FA; PRR
ENTITY RESPONSIBLE
MAP; SAM; GRA; GRM; Managing Authorities of the Funds; IFAP

LINE OF ACTION

7.2. PROMOTING ENERGY AND RESOURCE EFFICIENCY

DESCRIPTION

Promote energy and resource efficiency in the industry sector, optimising as much as possible the energy, water and material efficiency angles at the level of production processes. The aim is to increase resource productivity, separate economic growth from resource use and increase competitiveness.

SECTOR (ES)

Industry Energy

MEASURES FOR ACTION

To promote energy and resource efficiency, the following action measures are envisaged:

7.2.1. Promoting the uptake of more efficient technologies

Engine optimisation, pumping systems, ventilation and compression systems, combustion systems, heating and cooling systems, exchangers and heat recovery, and industrial cold. Also promote efficient lighting. [Scheduled date: 2020-2030]

7.2.2. Promoting high-efficiency cogeneration based on renewable energy sources

High efficiency cogeneration, given its significant primary energy saving potential and its preferential use by energy-intensive industries, should be further promoted. To this end, high-efficiency cogeneration systems that take advantage of renewable resources should be added, making it possible to improve the cost of production, making industry more competitive, also contributing to achieving the energy and climate targets. To this end, consideration should also be given to retrofitting cogeneration units for operation also with renewable gases. [Scheduled date: 2024-2030]

7.2.3. Revision of the Industry Energy Efficiency Act – Measure deleted

At industry level, the Intensive Energy Consumption Management System (SGCIE), which aims to promote energy efficiency and monitor the energy consumption of these plants, applies to energy-intensive installations. Given the weight and size of the sector, there is a clear opportunity to create requirements and targets for the industry sector. To be developed in line with the Energy Consumption and Efficiency Management System (SGCEE) platform

Measure revised and included in measure 2.3.1 which has been amended.

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; Energy efficiency

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— Increasing demand for renewable energy in industry exposes the sector to different supply risks. The diversification of renewable sources, reducing dependence on energy sources vulnerable to the effects of climate change, and the implementation of energy storage systems, could ensure stability and efficiency in the industrial sector.

KEY INSTRUMENTS

RNC2050; ENAR; SGCIE; PRAEE

SOURCES OF FUNDING

PRR

ENTITY RESPONSIBLE

SAM; ME; GRA; GRM; ADENE

ii. Long-term strategy for the renovation of the national stock of residential and non-residential buildings, both public andprivate [39]

LINE OF ACTION

2.1. PROMOTE ENERGY RENOVATION AND RESOURCE EFFICIENCY OF THE BUILDING STOCK AND NZEB/ZEB BUILDINGS

DESCRIPTION

It aims to mobilise the necessary efforts to promote energy and resource efficiency through the renovation and rehabilitation of buildings. Rehabilitating and making buildings more efficient makes it possible to achieve several objectives simultaneously, whether by reducing energy, water and other resource costs, reducing emissions or improving health and comfort, increasing their resilience to extreme events associated with climate change, such as drought and heat waves, which is why energy

39Including policies, measures and actions to stimulate cost-efficient deep renovation, and policies and actions to reach the worst-performing segments of the national building stock in accordance with Article 2a of Directive 2010/31/EU on the energy performance of buildings as amended by Directive 2018/844

renovation of buildings should be a priority.

SECTOR (ES)

Residential; Services

MEASURES FOR ACTION

To ensure an effective energy renovation of the building stock and the promotion of NZEB/ZEB buildings, the following action measures are foreseen:

2.1.1. Implement the National Plan for the Renovation of Buildings

Implement and monitor a plan to promote the renovation of buildings, contributing to increased energy, water and material efficiency of the building stock and to change the paradigm of recent decades, focusing solely on new construction, and contribute to an increase in the quality of the existing building stock, which is increasingly in need of urgent action that significantly improves people's comfort levels, thereby reducing energy poverty and generating gains in energy efficiency and other resources. The implementation of this plan should be monitored through a multidisciplinary working group set up for this purpose. It is of high importance to establish a national system for assessing and monitoring the evolution of the national building stock (overall) as well as its energy and resource performance. [Scheduled date: 2025-2030]

2.1.2. Update the Energy Certification System for Buildings (SCE)

The update of the SCE, in the context of the transposition of Directive (EU) 2024/1775 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (EPBD), will bring about a number of changes, including energy performance requirements (MEPS); harmonisation of A to G energy classes; introduction of renovation passport schemes for deep renovation of buildings; the concept of zero-emission buildings; the Smart Readiness Indicator (SRI); the concept of lifecycle global warming potential as an indicator to be included in future energy certificates for the calculation of embodied energy in buildings; strengthening the analysis associated with heating and preparation equipment for hot water (potential integration of the classification/indicative energy label for existing heating equipment and/or AQS; the interoperability of the energy certificates database to enable the exchange of information with other platforms and the availability of the energy certificate to the final consumer (owner and/or tenant) and other real estate asset holders (eg. financial institutions), thus allowing agile access to this document for the different contexts where it is needed. Aggregated and anonymised energy certificate data should be publicly available and transferred annually to the Building Stock Observatory in order to monitor the evolution of the building stock. As provided for in Order No 6476-A/2021, for the purposes of Article 17(g) of Decree-Law No 101-D/2020 of 7 December 2009, water performance indicators (s) must also be included in the ECP and CE model for residential buildings and extended to other buildings. [Scheduled date: 2024-2030]

2.1.3. Provide a new version of the Energy Certificate

In line with the requirements of the EU Directive on the energy performance of buildings, it is recommended to strengthen the image and role of the Energy Building Certificate, with the introduction of a new version that will also be aligned with the expectations of its target audience. In particular, the new energy certificate, by presenting a language closer to the citizen, will make it possible for the citizen to gain a better understanding of the characteristics and performance of his building, whether by means of qualitative assessments – rather than quantitative – but also by creating more easily assimilated benchmarks, such as comfort indicators, thus meeting the objectives of an energy efficiency policy for buildings.

The new certificate will also set out the way forward if improvement measures are to be implemented and the corresponding real impact of these improvements. The ranking and prioritisation of these measures will be in line with the strategy to be taken at the level of rehabilitation, first of all by reducing energy needs, and only then by acting at the level of technical systems, including through the use of renewable energy.

In the context of strengthening the role of the energy certificate, it is expected that this document will: support the assessment of the energy performance of buildings and the fulfilment of applicable requirements at the time of their design or renovation, in a manner adapted to the new European legislative context; support the periodic assessment of the energy performance of large retail and service buildings in order to identify opportunities for improvement; support consumers prior to legal transactions in buildings by providing detailed information on energy performance and building elements, as well as opportunities for improvement; support owners in identifying opportunities for improvement of buildings and implementing them; to support access to financing instruments, providing identification of the building condition and improvement needs, and subsequently monitoring, monitoring and validation of the implementation of energy performance improvement measures; to support the granting of tax benefits, in particular by encouraging the implementation of improvement measures as well as the design or renovation of buildings with a view to achieving high energy performance; reference and allow access to other water and material efficiency certificates or classifications, preferably by means of interoperability with the respective platforms. [Scheduled date: 2020-2025]

2.1.4. Revise the Energy Efficiency Regulations in Housing and Services Buildings (public and private) – Measure deleted

The scope of this regulation is the energy upgrading of residential buildings and public and private services, ensuring better comfort and quality for their users.

The revision of the Regulation, through the transposition of the Energy Performance of Buildings Directive, will have, inter alia, the following objectives:

(i) promote solutions capable of improving the energy performance of buildings, contributing to reducing energy demand, the need for heating and cooling and improving the energy performance of buildings;
(ii) enable high-efficiency alternative systems that safeguard compliance with the NZEB requirements;
(iii) define charging infrastructure requirements for electric mobility;
(iv) adapting buildings for the integration of smart technologies, such as automation and monitoring technical building systems electronics;
(v) carry out inspections of lighting and heating and cooling systems;
(vi) promote registration and documentation of installation, replacement or upgrade of technical systems;
(vii) ensure greater transparency in the methodologies for calculating the energy performance of buildings by aligning them with existing standards;
(viii) ensure interoperability with other systems that assess, classify and promote water efficiency, material efficiency and decarbonisation of the building.

Therefore, the envisaged revisions are aligned with measure 2.1.2. Update the Energy Certification System for Buildings (SCE).

2.1.5. Promote NZEB/ZEB buildings

Nearly zero-energy buildings, known as NZEB, are characterised by very high energy performance and their nearly zero or very low energy needs, largely covered by energy from renewable sources, whether produced on-site or nearby. In turn, a zero-emission building, called ZEB, is defined as a building with a very high energy performance, with the very low amount of energy still needed fully covered by energy from renewable sources and with no on-site carbon emissions from fossil fuels.

Directive (EU) 2024/1275 of 24 April (new EPBD) aims to promote the improvement of the energy performance of buildings and the reduction of greenhouse gas emissions from buildings within the Union, with a view to achieving a zero-emission building stock by 2050, taking into account outdoor and local climatic conditions as well as indoor climate requirements and cost-effectiveness.

In view of the fact that the implementation of the ZEB concept establishes a new paradigm, the involvement of the main actors concerned in the construction sector will be promoted and measures should be put in place to promote the adoption of this paradigm by those actors, as well as the study and dissemination of a portfolio of technical solutions enabling new and existing buildings to gradually reach the ZEB level. In the case of existing buildings, guidelines and guidelines should also be established to support the rehabilitation project, which call for the monitoring of consumption, the implementation of efficient and durable equipment and the optimisation of consumption in a sustainable manner, promoting the understanding and adaptation of existing mechanisms to the specific nature of these constructions and their potential. [Scheduled date: 2024-2030]

2.1.6. Encouraging more efficient construction and renovation – New measure

By supporting different projects by the RRP, it is intended that new constructions to be promoted by the State should meet the requirement to be NZEB or ZEB for new buildings by 2030 (2027 for new buildings owned or occupied by public authorities), and for rehabilitation to achieve an improvement of at least 10 % compared to the pre-works heating or repair performance indicator. [Scheduled date: 2021-2030]

2.1.7. Prosumer hedges/active consumers – New measure

In state (and private sector) housing buildings promote rooftop energy rehabilitation, with improved thermal insulation, sealing and renewable energy systems for electricity and sanitary hot water production [Planned date: 2023-2030]

2.1.8. Promoting financing and technical assistance for the rehabilitation of buildings – New measure

The updating of the SCE, in the context of Directive (EU) 2024/1275 on the energy performance of buildings, is intended to address a number of purposes, with the aim of supporting compliance with minimum energy efficiency requirements by developing policies and measures to:

- Provide adequate financial support, in particular targeted at vulnerable households, people affected by energy poverty or living in social housing;

- Provide technical assistance, including through one-stop-shops to support citizens, enhancing the assessment of the performance of buildings and the implementation of improvement measures;

- Design funding schemes to promote rehabilitation;
- Remove non-economic barriers, including split incentives;
- Monitor social impacts, in particular on the most vulnerable households.

[Scheduled date: 2024-2026]

2.1.9. Promoting a strategy for energy, water and other resource audits in service buildings – New measure

Implement a strategy for carrying out audits in service buildings aimed at quantifying actual consumption, so as not only to promote the identification of opportunities for improvement in energy and water efficiency, with an impact on the reduction of monthly bills, but also to provide support for funding programmes aimed at energy renovation. [Scheduled date: 2024-2030]

2.1.10. Creating and disseminating the network of Citizen Energy Spaces – Points of Single Contact for Citizens – New Measure

Promote the dissemination of one-stop shops for energy efficiency for citizens (Citizen Energy Spaces) offering services to citizens, such as: (a) provision of information and technical support, from the interpretation of energy bills to sustainable energy use and consumer rights; (b) advice, including on energy purchase, purchase of equipment, selection of energy efficiency and renewable energy solutions, selection of commercial offers for the application of solutions, implementation of private electric charging; (C) energy assessment of dwellings and investment proposals to increase thermal comfort and reduce energy bills; (D) advice on access to public and private, national and local incentives and funding instruments; (e) collecting data on those supporting policies to combat energy poverty, in conjunction with the National Energy Poverty Observatory; (f) legal advice providing the necessary clarifications, including on the laws, regulations and procedures in force. The creation of these desks, which should work as a network with a common digital platform and empowered professionals, is one of the reforms envisaged in the RRP and is also framed by ELEPP, notably under its Strategic Axis 3 – Promoting action, integrated territorial, Strategic Objective 3.1 – Strengthening the action of local structures in support of citizens, Measure 3.1.1 – Promoting an integrated network of Citizen Energy Spaces. It is also aligned with Directive (EU) 2024/1275 on the energy performance of buildings, which gives more prominence to the Points of Single Contact as key information and advice tools for renovation. [Scheduled date: 2024-2030]

2.1.11. Promoting energy renovation of condominiums or neighbourhoods – New measure

In view of the developments linked to Directive (EU) 2024/1275 on the energy performance of buildings, it is recommended to support integrated city renovation programmes addressing topics such as energy, mobility, green infrastructure, waste and water management, circularity and sufficiency. With regard to mobility, it is essential to provide support and a regulatory framework compatible with the flexibility of charging electric vehicles. [Scheduled date: 2024-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficiency

KEY INSTRUMENTS

RNC2050; SCE; MaisHousing; ELPRE

SOURCES OF FUNDING

The Cohesion Fund; ERDF; Efficient Box 2020; FA; IFRRU 2020; Restore to Arrendar programme; FNRE; PRR

ENTITY RESPONSIBLE

SAM; MIH; GRA; GRM; DGEG; ADENE; IHRU; LNEC; AREAM

iii. Description of policies and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers preventing the uptake of energy performance contracting and other energy efficiency service models

LINE OF ACTION

1.5. DECARBONISING PUBLIC ADMINISTRATION

DESCRIPTION

Decarbonise public administration, in the transport and mobility vectors, infrastructure, equipment and buildings, as well as public purchasing, leading for example in the adoption of innovative and ambitious policies, providing public administration with low-carbon mobility options, reducing energy intensity and increasing the efficiency of its transport fleet, promoting a low-carbon built stock and adopting low-carbon requirements in public purchases.

SECTOR (ES)

Mobility and Transport; Energy; Public Sector of the State

MEASURES FOR ACTION

To decarbonise the Public Administration, the following actions are foreseen:

1.5.1. Further decarbonise the public administration building stock

With a view to promoting the decarbonisation of the stock of state buildings, along with public equipment, infrastructure and fleets, a revision of the current Energy Efficiency Programme for Public Administration (ECO.AP 2030), approved by Council of Ministers Resolution 104/2020 of 24 November, will be carried out with a view to defining new targets and objectives for this programme, as well as aligning its scope, including universe, taking into account Directive (EU) 2023/1791, and the Climate Law. ECO.AP 2030 is also the programme for the decarbonisation of public administration and applies to the management bodies of direct and indirect government departments, independent administrative bodies and executive bodies of local authorities and public associations, which should promote the development of decarbonisation and efficiency plans ECO.AP 2030. [Scheduled date: 2024-2025]

1.5.2. Promote the uptake of *easy-wins,* energy efficiency and/or renewable energy incorporation solutions

The solutions to be adopted include promoting the electrification of buildings and increasing the incorporation of renewables, by installing solar thermal collectors or superficial geothermal systems, solar photovoltaic panels and heat pumps for heating in buildings or equipment with high needs such as swimming pools, sports venues, schools and multi-purpose halls and the implementation of more efficient air-conditioning solutions, as well as the installation of solar systems for self-consumption electricity production. [Scheduled date: 20202030]

1.5.3. Promoting Green Public Procurement (GPP) in line with the New National Green Public Procurement Strategy 2030 – ECO360

Incorporate sustainability and circularity requirements into public purchases of energy goods and services, equipment and buildings, public purchases of vehicles and transport services as well as road construction contracts, and public purchases of other goods and services. Construction contributes significantly to GHG emissions, with public buildings and civil engineering projects such as schools, hospitals, roads and railways being particularly energy and material intensive. In line with the Council of Ministers Resolution No 13/2023 proving the National Strategy for Green Public Purchasing 2030 – ECO360, the aim is to strengthen the inclusion of green criteria in public procurement procedures by entities under direct and indirect administration by the State and the State-owned enterprise sector. The aim is for the public administration to act as a vehicle for positive change in the desired transition to an environmentally more sustainable, more competitive and resilient economy, contributing directly to achieving environmental policy objectives related to climate change, resource use or sustainable consumption and production.

The same Strategy identifies as one of its Strategic **Objectives – Boosting the Portuguese economy towards climate neutrality,** which integrates three specific objectives, each linked to targets for 2025 and 2030:

- OESP. 3.1 promote the systematic integration of energy efficiency criteria in the procurement of public administration products, services, buildings and works – The systematic integration of energy efficiency requirements into public procurement of products, services, buildings and works can contribute to significantly reducing the energy consumption of government, in line with the objectives of ECO.AP 2030. This objective is also of particular importance in the context of the European*Renovation Wave*initiative, which aims to increase the energy efficiency of buildings in Europe.
- OESP. 3.2 increasing the share of renewable energy and sustainable mobility in public administration entities – GPP should be a vehicle to promote the purchase of renewable electricity services in public administration entities as well

as to contribute to the uptake of energy generation systems based on renewable energy sources in line with ECO.AP 2030 and the objectives of the NECP 2030. At the same time, GPP should also contribute to the promotion of sustainable mobility in public administration bodies, focusing on the use of electric vehicles, public transport and soft means of mobility (e.g. bicycles).

- OESP. 3.3 promote the integration of life-cycle carbon emissions accounting into product, service and works procurement processes, using indicators such as carbon footprint. This objective is particularly relevant in categories of products and services where embedded carbon content can be very high, such as construction, buildings, food and others. It is intended that contracting authorities will integrate carbon footprint information into pre-contractual procedures, giving priority to the provision of those containing this information.

GPP is progressively being incorporated into different policy areas, ranging from climate change to the circular economy, increasingly extending to areas beyond the strict scope of environmental policies, such as economic, agricultural, digital transition policies, etc., with increasing levels of demand. An example of this trend is the integration of the EPC as a vector of action in the European Green Deal, including the Circular Economy Action Plan. At Community level, GPP has been progressively incorporated into a number of mandatory regulatory initiatives, such as: Reg. (EU) 2023/1542 on Batteries; Directive (EU) 2023/1791 on Energy Efficiency; Reg. (EU) 2024/1781 – Ecodesign; Reg. (EU) 2024/1735 – Net Zero Industry, to list the main examples;

With regard to GPP and at national level, reference should also be made to Resolution of the Council of Ministers No 132/2023 of 25 October 2006 laying down the ecological criteria for the conclusion of contracts by entities operating directly and indirectly by the State, in particular for the following groups of products and services, some of which are mandatory:

- Power purchase agreements, including for public pay telephones for electric mobility;
- Contracts for the purchase of energy certification, energy audit and design services and the purchase and installation of self-consumption photovoltaic systems;
- Vehicle purchase contracts and operational vehicle rental contracts;
- Public works contracts.

[Scheduled date: 2020-2030]

1.5.4. Promoting the introduction and use of low-emission vehicles and sustainable mobility in the state

Promoting increasingly sustainable mobility should start in state institutions, leading by example in adopting innovative and ambitious policies. By creating an obligation for the State administration to meet electric vehicle purchasing quotas, as well as by providing incentives for the introduction of electric vehicles into the state vehicle fleet, such as the ECO.mob project, it will be possible to achieve high levels of electric vehicle penetration in the State's vehicle fleet. It is therefore important to draw up a new programme for public administration aimed at classifying the performance of bodies and their fleets in relation to sustainable mobility, continuing the ECO.mob programme and pursuing its objectives. In another area, mobility management should be promoted, including the promotion of the use of public transport and *car sharing and car pooling initiatives, as well as behavioural change*, including the development of eco-driving training. [Scheduled date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficiency

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- Decarbonisation and incorporation of renewables should consider the need to install infrastructure (e.g. production for self-consumption, recharging points, etc.) resilient to the effects of climate change and extreme events;

- Climate events can lead to interruptions in the supply chain of products linked to green public procurement (e.g. organic food).

KEY INSTRUMENTS

RNC2050; ECO.mob; ECO.AP 2030; ECO.AP Azores; ENAR; ENCPE; PAESC-RAM

SOURCES OF FUNDING

FA; AMR budget; PRR

ENTITY RESPONSIBLE

SAM; MF; MIH; GRM; GRA; ESPAP; APA; DGEG; ADENE; Municipalities

LINE OF ACTION

2.4. PROMOTE ENERGY EFFICIENCY IN STREET LIGHTING

DESCRIPTION

The Public Lighting (IP) accounts for a very significant part of electricity consumption, in particular in municipalities, corresponding to a very significant annual financial burden. On the other hand, there is still a great potential for energy savings which should be a further driver for municipalities. In this context, it is essential to promote investment in an efficient and new generation IP, which will make it possible to adapt the lighting levels needed for pedestrian and vehicle safety, increasing energy savings, enabling the introduction of new functionalities and applications for consumer management and control, and leveraging Smart Cities. Policies will be put in place to promote the development of an efficient and new generation IP, promoting energy upgrading towards energy savings and ensuring adequate lighting, in line with the existing normalisation for public roads across the country.

SECTOR (ES)

Energy; State-owned enterprise sector

MEASURES FOR ACTION

To promote energy efficiency in street lighting, the following action measures are envisaged:

2.4.1. Define a legal framework for the upgrading and installation of public lighting infrastructure

In view of the need and appropriateness of creating and implementing technical rules, taking a proactive and pedagogical attitude, in support of the work carried out by IP infrastructure designers and installers, a technical manual should be created and published, which should address at least the main concepts of Luminotechnia, criteria for IP projects (including the provision of a calculation tool) based on EN13201 and review, in conjunction with the APA, the definition of criteria provided for in the national strategy for green public procurement under the IP. [Scheduled date: 2024-2026]

2.4.2. Introduce a Public Lighting Consumption Management System

In conjunction with the other measures, and in response to the objectives required by the mandatory application of Article 8 of the new EE Directive published in November 2023, it is important to set up a Public Lighting Consumption Management System (SGCIP) with the aim of promoting energy efficiency and monitoring the energy consumption of the national PI infrastructure. It is also important to promote the installation of intelligent metering systems. The SGCIP should include the obligation to draw up and report on the existing IP Cadastre and an IP Energy Recovery Plan for 2030, with annual reporting of the energy savings achieved by those responsible for managing this infrastructure. PI's energy upgrading plan will aim to create conditions for improving the quality of lighting on roads and public spaces, but also to reduce energy consumption, while promoting the cadastre of existing infrastructure and upgrading in line with the needs of each case. [Scheduled date: 2024-2026]

2.4.3. Promoting the upgrading of the street lighting park – New measure

The upgrading of the national (LED) street lighting park, managed by municipalities, low-voltage distribution system operators or other entities, should be promoted with a view to increasing energy efficiency levels and promoting the reduction of municipalities' energy costs. [Scheduled date: 2020-2028] **CONTRIBUTION TO 5 DIMENSIONS**

Decarbonisation; Energy efficiency

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— The modernisation and installation of efficient and resilient street lighting networks mitigate the effects of climate change and extreme events.

KEY INSTRUMENTS

n.a.

SOURCES OF FUNDING

FA; RRP; EN 2030

ENTITY RESPONSIBLE

GRA; GRM; DGEG; Municipalities

IV. Other policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030, as well as other targets presented in 2.2.

LINE OF ACTION

2.5. PROMOTING VOCATIONAL TRAINING FOR THE ENERGY EFFICIENCY SECTOR

DESCRIPTION

Enhancing the skills and professional qualifications of technicians in the field of energy efficiency makes it possible to meet the targets and objectives set at national and European level, in particular with regard to building renovation, which point to an

increase in the energy efficiency of the economy and of the various sectors, contributing to the efficient use of resources. On the other hand, skills and vocational training are key factors for competitiveness, economic growth and job creation.

SECTOR (ES)

Services; Industry Energy; Transport; Agriculture and Forest; Waste

MEASURES FOR ACTION

To strengthen vocational training for the energy efficiency sector, the following action measures are envisaged:

2.5.1. Promote new training of specialist technicians for the energy efficiency and renewable energy sector

Among the new skills to be promoted, focus on: (I) Energy Efficiency Project and Audit, complying with the technical standards to be introduced by the Energy Efficiency Regulations in Service Buildings, Industry and Transport; (II) project and installation of Solar Thermal and Solar Photovoltaic, complying with the technical standards defined by the State; (III) energy management and maintenance of service buildings; (IV) professionalisation and qualification of Public Lighting Installators and Projetists; (v) control management systems to meet the requirements of Directive (EU) 2024/1275 on the energy performance of buildings and the introduction of new technological solutions in buildings; (VI) Research Measurement Verification of energy efficiency improvement projects, based, for example, on IPMVP (International Measurement and Verification Protocol) methodologies, as a way to adjust the quantification of avoided consumption and to standardise methodologies for assessing energy savings; (VII) efficient window designers and installers and thermal insulation applicators in buildings; (VIII) water efficiency technicians and specialists and the water-energy nexus in buildings; (IX) technicians inspecting technical (x) technical systems for natural ventilation, mechanical ventilation and indoor air quality (xi) professionalisation and energy simulation qualification; (XII) technicians specialising in renewable gases such as biomethane and green hydrogen, including design skills, production, storage, distribution and application of these gases; (XIII) technicians for the conversion and use of renewable gases in industrial processes. [Scheduled date: 2023-2030]

2.5.2. Promote training for NZEB and ZEB building technicians and specialists

In view of the fact that the implementation of the ZEB concept establishes a new paradigm and the relevance of the link between the NZEB and ZEB buildings and the quality of their construction (in order to ensure their proper performance in their life cycle), support for the technical training of the various actors will be promoted, from the design phase, through the construction phase, to the exploitation/use phase of these buildings. [Scheduled date: 2023-2030] **CONTRIBUTION TO 5 DIMENSIONS**

Decarbonisation; Energy efficiency

KEY INSTRUMENTS

n.a.

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

ME; MTSSS; SAM; GRA; GRM; DGEG; ADENE; DGES; ANQEP; ETC

v. Description of measures to use the energy efficiency potentials of gas and electricity infrastructure

Not applicable.

vi. Regional cooperation in the field of energy efficiency

Not applicable.

vii. Financing measures, including EU support and the use of EU funds, in the area of energy efficiency at national level

See paragraph 5.3 (iii).

3.3. Energy Security Dimension

Security of supply should be ensured by adopting appropriate measures reducing external energy dependency, counteracting a supply-demand imbalance, in particular those relating to the overall technical management of the system, encouraging diversification of supply sources and contributing to the planning, construction and maintenance of the necessary infrastructure. Increasing interconnection capacity, storage systems (key in an essentially renewable energy system), the adoption of new grid planning mechanisms, the dissemination of smart grids, decentralisation of production and flexibility, among others, will contribute to this.

1. Energy security policies and measures

LINE OF ACTION

4.1. PROMOTING STORAGE SYSTEMS

DESCRIPTION

For better management of the national energy system in its various sub-sectors, appropriate storage systems, in their different forms, as a tool for flexibility and stability of the system are considered crucial and crucial. It is therefore important to maintain and promote the uptake of reversible pumping systems in hydropower plants and to seek to develop other technological solutions that will include the application of battery system technology and hydrogen technologies.

The commitment to the production and consumption of gases of renewable origin, changing import exclusivity to a situation where there is a significant proportion of domestic production, will have to be accompanied by storage systems to ensure the flexibility and stability of the national energy system. It is also important to ensure, on the one hand, the exploitation and valorisation of existing assets and, on the other hand, the transition period for a 100 % renewable gasist infrastructure. It is therefore crucial to create the conditions to reduce the risks to the security of gas supply and to make storage infrastructure fit for 100 % renewable solutions.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote storage systems, the following action measures are envisaged:

4.1.1. Creating the legal framework for the implementation of storage systems – Measure achieved

Establish the legal framework enabling and encouraging the implementation of storage systems, in their different forms, in particular for the electricity sector.

This measure was implemented in the electricity sector with the publication of Decree-Law No 15/2022 and in the gas sector with the publication of Decree-Law No 62/2020. [Date: 2022]

4.1.2. Develop and implement the National Storage Strategy

The main objective of the strategy will be to provide a practical, independent and objective analysis of the various possible trajectories to implement storage systems, aligned with the renewable and decarbonisation objectives, taking into account the security of supply, quality of service and the economic sustainability of the options to be adopted. It should be based on an economic analysis and on the interface between storage systems and network development.

The Strategy will assess and define short- and medium-term energy storage needs and solutions in a technology-neutral approach, taking into account the technical characteristics of the available technologies, such as unit cost, response time, energy storage capacity, availability, etc., supporting the development of solutions that bring the necessary flexibility to the electricity system.

This document should be updated at least every 5 years to take account of technological developments and costs. New guidelines resulting from the electricity market review/reform process promoted by the European Commission should also be taken into account. The study on energy storage potential in Portugal was published in 2021, updated in May 2024. [Scheduled date: 2020-2025]

4.1.3. Promote the implementation of storage projects linked to renewable power generation centres with a view to flexibility in the ESS

Support the development of pilot projects to promote the implementation of low scale and mature technologies with a view to improving their technical and economic viability, with a focus on linking renewable production and storage. In parallel to

increasing generation and storage capacity, access to networks should also be promoted and facilitated. The 2020 solar auction included the possibility of including storage, and several of the winning proposals put forward battery-storage solutions. Subsequently, Decree-Law No 15/2022 provided the legal framework for the storage activity, and the promotion of storage projects associated with renewable power plants should be further promoted.
At the same time, an increase in electricity storage capacity should be ensured, using reversible water systems, batteries, hydrogen and other technologies, so as to implement a flexible management of the electricity system thus making it better able to respond to the energy transition challenges, including increased penetration of intermittent renewable energy sources and the expected increase in electricity consumption. This measure must be implemented in conjunction with the National Storage Strategy (measure 4.1.2) [Planned date: 2023-2030].

4.1.4. Promote storage on islands

Increase electricity storage capacity in island territories with isolated electricity grids, using reversible water systems, batteries, hydrogen and other technologies, in conjunction with the implementation of smart electricity grids, to increase the stability and resilience of small isolated electrical systems and increase the penetration of intermittent renewable energy sources. There are already several projects implemented and others in preparation in both the Autonomous Region of the Azores and the Autonomous Region of Madeira (most recent examples include the hydroelectric facilities of Calheta and Serra de Água). [Scheduled date: 2020-2030]

4.1.5. Ensuring increased gas storage capacity – New measure

The consequences of the geopolitical situation stemming from the war in Ukraine have led to a need to consider strengthening the EU's energy independence and accelerating the promotion of indigenous renewable energy (RepowerEU). However, even if gas consumption is expected to be reduced, it is necessary to ensure storage capacity compatible with security of supply. With the development and upgrading of renewable gas markets, with a particular focus on biomethane and renewable hydrogen, storage infrastructure will continue to play a critical role in the management of the energy system. It is therefore essential to guarantee storage capacity on the national territory in order to allow a constant flow to consumers, while always focusing on the suitability of these facilities for hydrogen consumption. [Scheduled date: 2023-2028]

4.1.6. Promoting regulation for storage batteries – New measure

Promote appropriate regulation of batteries for storage by establishing incentives and the applicable environmental licensing framework for their development, including through capacity and system services markets for the procurement of all services on the market and ensuring their remuneration (VCF, mFRR- capacity, Inercia, Voltage Control, etc.). [Scheduled date: 2025-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy security; Internal Market; I & I & C
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- The occurrence of heat waves, floods, storms and high fire risk may affect the integrity of the infrastructure. Similarly, water scarcity can affect the cooling and security processes of infrastructure. The design of resilient energy storage systems adapted to the effects of climate change will be important to ensure security of energy supply;

- The inclusion of a climate risk analysis could benefit the planning and implementation phase of new storage systems (*climate proofing*).

KEY INSTRUMENTS
RNC2050; PAESC-RAM;
SOURCES OF FUNDING
ERDF; FA; Community Funds (OP SEUR, PACS, Regional OP); Horizon Europe; Innovation Fund, PRR
ENTITY RESPONSIBLE
SAM; GRM; GRA; DGEG; ERSE; EEM; AREAM; Network Operators

LINE OF ACTION

4.4. PROMOTING THE DIGITALISATION OF THE ENERGY SYSTEM

DESCRIPTION
Promoting the energy transition of the energy sector will necessarily require consideration of a new model for transmission and distribution networks, which will be based on seeking synergies between the various options, including speedy and progressive

reinforcement and modernisation of infrastructure and reconfiguration and digitalisation of the market. This is in line with the concerns of the European Commission, which published in 2020 an Action Plan on Digitising the Energy System and a Path to the Digital Decade (by 2030).

SECTOR (ES)

Energy; Residential; Services; Industry Agriculture; Forest

MEASURES FOR ACTION

To promote the digitalisation of the energy system, the following action measures are envisaged:

4.4.1. Promoting the expansion of smart meters

In an increasingly modern and digitalised energy system, smart meters play a key role in the way information is obtained and used for the benefit of, and made available to, consumers, which allows for more dynamic and efficient management of the system, favouring energy efficiency, improved offers for consumers and more efficient operation of networks. The timetable for the installation of smart meters and their integration into smart grid infrastructure was approved by Order No 14064/2022 of 6 December, ensuring coverage of 100 % of final customers by 2 024 in mainland Portugal. At the same time, access to more accurate information through smart meters will also have a positive impact, for example, on the transparency and reliability not only of information but of all actors involved. An important step has already been taken to promote smart meters in the electricity sector with the publication of Decree-Law No 15/2022. Equal measures to promote and expand smart meters could be taken in the gas sector (together with the incorporation of renewable gases). [Scheduled date: 2020-2024]

4.4.2. Promoting the development of *smart grids*

The planning and investments of transmission and distribution networks shall include an innovation component that enhances high performance levels based on intelligent systems. At environmental level, it is recognised that smart electricity and gas grids are levers for the energy transition, as they drive the growing consumption of renewable energy. This is where R &Dprojects will be promoted to address the growing and imminent need for dynamic network control, monitoring and management, taking into account the various types and sources of energy circulating on networks. This monitoring will be done using technologies such as quality tracking systems and technologies to respond to the heterogeneity of producers and consumers (particularly in remote locations with low energy demand but high productive potential).

It is therefore essential to encourage innovation, in accordance with the guidelines laid down for that purpose, which must take into account the need to maintain the resilience of systems and networks by mitigating and preventing security impacts.

An important step has been taken for smart grids in the electricity sector with the publication of Decree-Law No 15/2022 and in the gas sector with the publication of Decree-Law No 62/2020, but the definition of complementary rules and guidelines, based on laws and regulations, implementing the development of smart grids will be promoted. While obtaining more accurate information on the use of smart grids, it will also have a positive impact, for example, on the transparency and reliability not only of information but of all actors involved, as well as the safeguarding of information and network security due to cybersecurity-related events and events. [Scheduled date: 2022-2030]

4.4.3. Promote the development of a long-term plan for the digitalisation of the energy sector

The energy sector will necessarily undergo significant transformations in the coming years partly due to the increasing digitalisation of the sector. Such transformations that will be complex and challenging for both businesses/operators and consumers should be studied and anticipated in order to prepare the system and consumers for the changes ahead in the sector. This new reality may also require legislative changes to ensure an appropriate legal framework to enable, for example, the availability of granular consumption data and the setting of deadlines for the creation of new solutions. [Scheduled date: 2020-2025]

4.4.4. Promoting the development of network information, sensing and automation systems – New measure

Managing a network with increasing levels of complexity and an increasingly broad set of active/dynamic resources requires the development of more advanced network information, sensing and automation systems that provide the levels of observability of grid controllability that are indispensable for network operators to make efficient use of flexibility resources, including storage, and investment in this area is crucial.

Considering that consumers should play an increasingly active role in issues related to the energy transition and, given the need for greater integration between the different systems, where communication between consumers/producers/flexibility providers and the grid operator is inevitable, it is important to ensure that the systems do not have a degree of technical and financial requirement that makes it difficult for smaller power installations to enter markets (e.g. up to 1 MW). [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; Energy security; Internal Market; I & I & C

KEY INSTRUMENTS

PNI; PDIRD-E/G; PDIRT-E/G

SOURCES OF FUNDING

CEF mechanism; RRP; PITD

ENTITY RESPONSIBLE

SAM; ME; MIH; GRA; GRM; DGEG; ERSE; Network Operators

LINE OF ACTION

4.5. PROMOTE THE APPROPRIATE PLANNING OF THE NATIONAL ENERGY SYSTEM TOWARDS THE ENERGY TRANSITION

DESCRIPTION

Promoting the increase in installed capacity for the production of electricity from renewable energy sources, including distributed generation and self-consumption, as well as the need to promote other renewable energy sources that are currently scarce across sectors, necessarily requires a grid infrastructure response that will not only accommodate this increase in capacity and diversification of sources, but all the challenges that the new paradigm of energy supply and demand bring to the national electricity system. The same challenge lies with the National Gas System, which will see an increasing incorporation of renewable gases into the system and an increasing link with the National Electricity System. Equally important is the coherence of national electricity and gas (including renewable gases) planning alongside Union-wide planning.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote the appropriate planning of the national electricity system and the national gas system, the following action measures are envisaged:

4.5.1. Forming a strategic vision of the national electricity grid and renewable gas networks for 2030 and 2050

This action will take the form of a technical study on the strategic vision, architecture and roadmap for the national electricity grid in the framework of the NECP objectives, and will have as its main objectives: (I) present a strategic vision on networks; (II) reflect on market models for trading energy and system services; (III) assess long-term security of supply. A similar exercise is expected to take place for gas networks, due to the growing need for the incorporation of renewable gases, the repurposing of networks and the definition of dedicated networks specifically for renewable hydrogen. [Scheduled date: 2020-2030]

4.5.2. Planning and fostering integrated and joint management of the network, with a regional and cross-border rationale

In the interests of value for money, it is extremely important that network and energy management also take place on a cross-border basis, and dialogue between national and regional network operators should be promoted and supported. Together with this approach, the interdependence of the electricity and gasist system should also be considered at national and cross-border level, in a *sector coupling* logic, which is in line with the Community approach and policy. Reference should be made to the need for integrated studies, including different energy related sectors, e.g. electricity, gas, mobility. These studies are already progressing at European level (ENTSO-E and ENTSO-G) but there is also a need to carry out regional studies to assess the suitability at country level. [Scheduled date: 2020-2030]

4.5.3. Adapting and encouraging continuous improvement of network planning tools

Existing network planning tools, in the form of Network Development and Investment Plans (PDIR), should take into account the targets and objectives set out in the NECP and RNC2050 as well as the need to adapt grid investments to prepare networks for the challenges of the energy transition (further integration of renewables, decentralisation of production, storage, electric vehicles, flexibility, etc.).

In the preparation and preparation of the Network Development and Investment Plans (PDIR), guidelines will be promoted and strengthened with a view to their continuous improvement.

The same logic should be applied to the planning of gas/$H2_{networks}$, while the interdependence of the electricity system and the gasist system should also be considered in a *sector coupling* logic, providing increasingly integrated planning, which is in line with the Community approach and policy.

Fostering dialogue and cooperation between public entities, operators and other actors involved is also crucial to further improve network planning and management/operation. [Scheduled date: 2020-2030]

4.5.4. Set up network planning mechanisms at local level

The challenge of the adequacy of the grid infrastructure enabling an effective energy transition is in particular the Low Voltage Network (LV), which will no longer be a passive network, but will integrate a whole set of new concepts, ranging from grid intelligence, management support systems, smart meters, storage, energy management, local production, energy communities, electric vehicles, etc., to be taken into account in the construction of the network of the future. In this dimension, it is also necessary to consider the future of the municipal distribution concessions in BT and the concession for the technical management of distribution networks in planning, as provided for in Decree-Law No 15/2022.

To ensure this transformation, mechanisms should be put in place to enable actors to have the necessary tools to plan BT networks efficiently and cost-effectively, ensuring quality of service and security of supply. [Scheduled date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- Network development and investment plans could benefit from the incorporation of*climate proofing*;
- Improved networks (national and local) will benefit from building infrastructure that is more resilient and adapted to the effects of climate change.

KEY INSTRUMENTS

RNC2050; PDIRT-E; PDIRG; PDIRD-E; PDIRD-G; RMSA-E; RMSA-G

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

SAM; GRA; GRM; ERSE; DGEG; System Operators;

LINE OF ACTION

4.6. CARRY OUT THE NECESSARY RISK ASSESSMENTS, PREVENTIVE ACTION AND EMERGENCY PLANS IN THE ENERGY SECTOR

DESCRIPTION

The need to draw up Preventive Action Plans and Emergency Plans is defined in Regulation (EU) 2017/1938 of the European Parliament and of the Council concerning measures to safeguard the security of gas supply. The application of this Regulation also requires risk assessment, security of supply and measures to prevent and take action in regional emergencies. These assessments presuppose a mapping of risks, with the definition of the likelihood and impact of certain events that bring further restrictions and disruptions to national gasist systems. The plans to be defined in this context, based on the information from the risk assessments, define the preventive measures to reduce or eliminate the impacts of such events and the mode of action in the event of an event identified in the risk assessments in the event of an emergency/crisis. More recently, as part of the "Clean Energy for All Europeans" legislative package, Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2009 on risk-preparedness in the electricity sector was published, which broadly follows the procedures defined for the gas sector (included in Regulation (EU) 2017/1938), calling for an identification of risks in the electricity sector and the definition of a Risk Preparedness Plan defining these scenarios and their prevention and crisis measures.) In the oil sector, there are also plans for intervention and mobilisation of emergency oil stocks (PIURS) in order to ensure security of supply in the national oil system (SPN). These plans also present an identification and assessment of the main risks to the SPN, as well as the definition of crisis prevention and management measures to be implemented.

In addition, there is a need to strengthen the resilience of the energy system by integrating the imperative of adaptation to climate change into the energy system, establishing policies and setting clear objectives and measures to address constraints or interruptions in energy supply.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To carry out the necessary risk assessments, preventive action and emergency plans in the energy sector, the following action measures are envisaged:

4.6.1. Promote and foster regional cooperation on risk and emergency

In the natural gas sector, for the definition of national and common (regional) risk assessments and national preventive action plans and emergency plans (which also include a regional component) there is a need for increasing and more effective/efficient

cooperation between national competent authorities and their transmission operators, which are also represented in European fora where security of supply issues are discussed, such as the *Gas Coordination Group* (organised and coordinated by the European Commission).
In the electricity sector, with the definition of the Regulation on risk preparedness in the electricity sector, the approach is identical to that considered for the gas sector, and cooperation should therefore be seen in the same way, giving importance also to interaction with authorities and similar entities in discussion and cooperation forums, such as the *Electricity Coordination Group* (organised and coordinated by the European Commission). [Scheduled date: 2020-2030]

4.6.2. Promoting better links between operators and other actors in the sector

In order to respond to the provisions laid down in the current regulations on security of supply, in particular for the identification and assessment of risks and the drawing up of preventive and emergency response plans, the collection of information is necessary for a precise characterisation of the respective systems (gas, electricity and oil).
In addition to collecting information from operators and other entities and actors operating in their respective systems, they need to cooperate strictly with each other and with the competent authorities in order to obtain assessments and planning that are closer to reality and thus more effective and efficient. [Scheduled date: 2020-2030]

4.6.3. Prepare the Sectoral Plan for Adaptation to Climate Change for the Energy Sector – New Measure

Climate change affects the energy sector in many ways, ranging from changing consumption needs, seasonal, to risks to energy production and supply conditions. There are a number of risks caused by changing climate conditions or extreme events to which different energy sector infrastructures are exposed. Making the energy sector climate resilient is key for the EU's climate action, from a security of supply perspective, but also because of its role in mitigating anthropogenic GHG emissions. This dual role, the integration of adaptation in this sector is of paramount importance. The clean energy transition increases the need for the energy sector to consider climate variability and climate change due to the increasing share of climate-sensitive renewable energy sources (RES) and the stronger role of electricity as an energy carrier.
The energy sector is an important area to be considered in the perspective of integrated planning for adaptation to climate change, as any vulnerabilities could have a multiplier effect, with spill-over effects on other sectors of activity and consumers. This concern is already enshrined in the National Strategy on Adaptation to Climate Change 2020 and the Action Programme on Adaptation to Climate Change, which identify energy as a priority sector.
Subsequently, the Basic Climate Law – Law No 98/2021 of 31 December, calls for the development of the sectoral climate change adaptation plan, which aims to deepen how the sector will contribute to a climate-resilient society by 2030. [Scheduled date: 2024-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

- Regional cooperation and linkages between operators could benefit from the introduction of the climate change adaptation dimension, in particular through:
- Joint emergency response protocols, including sharing of resources and information;
- Joint simulation exercises to respond to extreme climate events;
- Joint advanced technologies to monitor climate conditions and identify potential risks in real time;
- Investment in infrastructure resilient to the impacts of extreme climate events.

KEY INSTRUMENTS

PPA SNG; PE SNG; PPR SEN

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

SAM; DGEG; ENSE; ERSE

LINE OF ACTION

4.7. ADJUSTING THE ROLE OF GAS IN THE ENERGY MIX, FOCUSING ON DECARBONISING THE SECTOR

DESCRIPTION

The path to the energy transition in this decade will be through a combination of technologies and energy carriers, where natural gas will still have a role to play, despite the ban on the use of this fuel for electricity generation from 2040, provided that security of supply, as provided for in the Climate Law, is ensured. With a view to gradually reducing the consumption of fossil fuels, natural gas, being the one with lower GHG emissions, will remain an energy source in the next decade, in particular in the electro-producer sector and industrial consumption, with the increasing integration of renewable gases and the consequent decarbonisation of the gas sector as a priority. The trajectory according to which the role of gas in the energy mix will be adjusted

will be directly linked to the evolution of the electrification of consumption and the introduction of renewable gases, in particular green hydrogen.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To adjust the role of natural gas in the energy mix, the following action measures are envisaged:

4.7.1. Addressing natural gas as an element of flexibility of the electro-producer system, ensuring the transition to renewable gases

Maintaining natural gas electricity generation capacity until 2040 will ensure the *backup* needed to operate the transition to a highly renewable electricity system, allowing time for the development of technological solutions, with a particular focus on storage, to provide the system with the necessary resilience to ensure adequate levels of security of supply. Security of supply by 2040 will be assessed in relation to the need to maintain the capacity of combined natural gas cycles in the ESS, either as a guarantee of baseline capacity to the system or as a means of ensuring inertia and system response to real-time supply/demand disruptions.

To this end, and by promoting the production and increasing integration of renewable gases, in particular green hydrogen and biomethane, a timetable for the gradual decarbonisation of natural gas-fired thermal power plants will be established by incorporating increasing shares of renewable gases, leading to their full decarbonisation by 2040. [Scheduled date: 2020-2030]

4.7.2. Making grid planning fit for the energy transition

The current network planning tools, in the form of Network Development and Investment Plans (PDIR), should take into account the targets and objectives set out in the NECP as well as the need to adapt grid investments to prepare this infrastructure for the challenges of the energy transition (increased electrification, further integration of renewables, in particular new power generation centres and the production and injection of renewable gases, among others). This action measure relates to action measures 3.5.6 and 4.5.3. [Scheduled date: 2020-2030] **CONTRIBUTION TO 5 DIMENSIONS**

Energy security; Internal Market

CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated

— The production of renewable gases can be influenced by the effects of climate change, so diversification of renewable energy sources and investment in storage technologies and greater grid resilience could ensure less disruption of supply.

KEY INSTRUMENTS

RNC2050; PDIRGN; PDIRD-GN; RMSA; PAESC-RAM

SOURCES OF FUNDING

PRR

ENTITY RESPONSIBLE

SAM; GRM; DGEG; ERSE

LINE OF ACTION

4.8. PROMOTING DIVERSIFICATION OF SOURCES AND ROUTES OF SUPPLY OF ENERGY RESOURCES

DESCRIPTION

In a spirit of security of supply, diversification of sources and routes of supply of energy resources becomes crucial, without compromising decarbonisation objectives. Although Portugal has a reasonable diversification, there is still a considerable concentration of these, with preferential routes in energy supply, thus making it important to improve the diversification and/or deconcentration of the origins of energy resources.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote diversification of sources and routes of supply of energy resources, the following action measures are envisaged:

4.8.1. Promoting and strengthening external energy cooperation

In order to allow for a better diversification of sources and routes of energy resources, external cooperation with third countries should be strengthened, including through existing cooperation platforms or the creation of new ones, promoting and encouraging the participation of companies operating in the energy sector with a view to closer trade relations and opening up to new markets. [Scheduled date: 2020-2030]

4.8.2. Enhancing national infrastructure and Portugal's role in European and international energy markets

In the particular case of natural gas, the potential of Portugal to operate as one of the gas entry ports to the European market, in particular Liquefied Natural Gas (LNG), is recognised through the Sines LNG Terminal (one of the main deep water ports in Europe and allowing for greater diversity in the reception of methane ships). The commitment to the production of gases of renewable origin, with a particular focus on renewable hydrogen, could allow for a change of flows in the infrastructure of the Port of Sines. Given the role that gas will have, such as the future role of hydrogen, whether in its liquid state or through green ammonia, it is important to equip the Port of Sines with the capacity to dispose of products based on renewable hydrogen.
It is also important to maintain the national objective of promoting interconnections in this sector and to this end maintain and strengthen cooperation with Spain, France and the European Commission, in particular through high-level groups on interconnections, in particular the High Level Group on Interconnections in South-West Europe set up under the Madrid Declaration of 2015 and its enhanced role with the Lisbon Declaration of 2018. [Scheduled date: 20232030]

4.8.3. Creating a sustainable market for maritime LNG by leveraging the use of LNG in ships

It will be important to consider the creation of a sustainable market for maritime LNG, taking Portugal as a *hub* for LNG (as provided for in Council of Ministers Resolution No 82/2022) and as a service area for LNG ships. Increasing the environmental sustainability of a port can include promoting LNG in the port system.

The Strategy for Increasing the Competitiveness of the Continent Commercial Ports Network foresees a number of infrastructure investments, including bunkering of LNG to ships. It should be noted that on 1 January 2020 the new international regulation (IMO – *International Maritime Organisation* 2020) entered into force, which sets out the type of fuel that can be used in maritime transport and requires a significant reduction in the sulphur content of fuel oil used by ships. In this sense, LNG, as a fuel, is a potential alternative. [Scheduled date: 2020-2030]

4.8.4. Creating a market for alternative fuels by leveraging their use in maritime transport – New measure It will be important to consider the creation of a supply chain linked to new green fuels with a particular focus on distributed generation capacity and subsequent storage in national ports. This will create conditions for their use in maritime transport as well as boost a new market with export potential for these products (such as green methanol, green hydrogen and green ammonia). [Scheduled date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS
Energy Security, Internal Market
CLIMATE RISKS AND VULNERABILITIES Relevance: Elevated
- Promoting cooperation agreements that include contingency plans for extreme climate events, support flexibility and resilience in energy exchanges;
- More resilient infrastructure, diversification of the energy mix and investment in efficient technologies could boost Portugal's role in the markets.

KEY INSTRUMENTS
PNI
SOURCES OF FUNDING
CEF mechanism; EFSI; RRP; AFIR
ENTITY RESPONSIBLE
SAM; ME; GRA; GRM; DGEG, MI

Activity HEADING – New line of action
4.12 PROMOTING FLEXIBILITY IN THE ELECTRICITY SYSTEM

DESCRIPTION
For better management of the national electricity system, it is considered essential to have a flexible supply and demand system through aggregation, with a view to the stability of the national electricity system. The involvement of consumers and small producers in the development of an aggregation market in the provision of services to the system is essential.
SECTOR (ES)
Energy
MEASURES FOR ACTION
To promote flexibility in the electricity system, the following action measures are envisaged:

4.12.1. Promoting demand and supply participation through aggregation, small generation participation and self-consumption – New measure

Encourage the participation of consumers and producers in services, in particular as regards flexibility services to be provided to the system, through the activity of aggregation, building on the already defined in Decree-Law No 15/2022 of 14 January 2009. [Scheduled date: 2023-2026]

4.12.2. Promoting the implementation of a Roadmap for flexibility in Portugal – New measure

The main objective of this roadmap will be to provide a practical, independent and objective analysis of the various possible trajectories for the development of aggregation, anticipating the needs for the provision of local flexibility and system flexibility, aligned with the renewable and decarbonisation objectives, taking into account security of supply. The flexibility needs of the system should be assessed periodically, involving network operators, in line with what has been defined in the new EU electricity market design, with a view to improving the Union's electricity market design. The roadmap should be segmented into two, one for system services under the responsibility of the GGS and one for local flexibility services under the responsibility of distribution system operators, with due articulation between the parties, as these are separate markets with different needs. [Scheduled date: 2024-2025]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency, Energy Security, Internal Market; I & I & C

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— Improving the flexibility of electricity systems could benefit from the inclusion of a climate risk analysis and the integration of*climate proofing*measures under planning.

KEY INSTRUMENTS

n.a.

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE

SAM; GRM; GRA; DGEG; ERSE

ii. Regional cooperation in this area

The previous paragraph provides for action measures to strengthen regional cooperation on interconnections, at the level of new national electricity system management tools and at the level of integrated and joint network planning and management, in a regional and cross-border logic.

iii. Financing measures in this area at national level, including EU support and the use of EU funds

See point 5.3 (iii).

3.4. Internal Energy Market Dimension

3.4.1. Ielectricity bladder

1. Policies and measures to achieve the stipulated level of electricity interconnection

LINE OF ACTION

4.2. PROMOTING THE DEVELOPMENT OF INTERCONNECTIONS

DESCRIPTION

Strengthen electricity interconnections with Spain and explore the creation of alternatives to the current interdependence between the Portuguese and Spanish electricity market, in particular by assessing interconnection with other markets, which would allow for enhanced security of supply and further integration of the electricity market.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote the development of interconnections, the following action measures are envisaged:

4.2.1. Enhancing regional cooperation

Promote close coordination with a view to monitoring interconnection projects, assessing the corresponding financing needs and overseeing their progress, including through action/implementation plans, with a view to their implementation. In particular, it will be important to strengthen regional cooperation through the High Level Group on Interconnections in South-West Europe (both to foster and promote interconnections between Portugal and Spain and between Spain and France), as well as to strengthen cooperation on such platforms. [Scheduled date: 2020-2030]

4.2.2. Delivering on the new interconnections already identified

Implement the electricity interconnection between Portugal (Minho) and Spain (Galicia), which will be achieved through the construction of a new double overhead line of 400 Kv between Beariz (ES) – Fontefria (ES) – Ponte de Lima (PT) – Vila Nova de Famalicão (PT), including the new substations of 400 Kv de Beariz, Fontefria in Spain and Ponte de Lima in Portugal. This project is labelled as a Project of Common Interest (PCI) awarded by the European Commission on the 1th list of Union PCIs and Projects of Mutual Interest (PIM), adopted in Commission Delegated Regulation (EU) 2024/1041 of 28 November 2023, published in the Official Journal of the European Union on 8 April 2024. [Scheduled date: 2023-2024]

4.2.3. Implement new internal network building projects

Some grid reinforcements to be achieved aim to increase interconnection capacity and reduce possible negative impacts caused by energy supply constraints or interruptions. To this end, the implementation of two internal network reinforcement projects will be followed up: (I) Internal line between Pedralva and Sobrado; and (ii) internal line between Vieira do Minho, Ribeira de Pena and Feira (both projects appeared in previous editions of Union PCI lists). The overall objective of these projects is to increase the transmission capacity of the national electricity grid, which is essentially renewable, from the Minho region, in particular electricity from water and wind sources, and are also related to the new Minho-Galicia interconnector, allowing it to dispose of excess generation that may occur under certain operating conditions of the SEN.
[Scheduled date: 2020-2030]

4.2.4. Promote cooperation and identification of new interconnection projects

Considering the forecast of additional electrical power to be installed in Portugal by 2030 due to the needs of new high-consumption projects, it will be important to consider and study new interconnection projects in order to meet the 15 % interconnection target in 2030. This identification and implementation work should be done jointly between the Transmission System Operators (TSOs) of Portugal and Spain, as well as between their respective competent authorities and regulatory authorities. [Scheduled date: 2023-2030]

4.2.5. Promote the interconnection of isolated island electrical systems

Promote studies of inter-island electricity interconnection projects as a tool to optimise production and storage resources and infrastructure, maximise the uptake of renewable energy and improve the resilience and stability of small isolated electricity systems. [Scheduled date: 2020-2030]

4.2.6. Promoting market integration

In order to achieve more integrated markets in the energy sector, it will be important to develop a regulatory and legal framework that promotes such integration on the basis of ensuring competitiveness among market players. This definition of a regulatory and legal framework will also address the challenges of the new Community legislation stemming from the Clean Energy for All Europeans package, in particular the instruments linked to the design and market design theme by incorporating the changes resulting from the 2023 EU electricity market design reform process. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— Promote electricity interconnections with Spain resilient to climate risks by promoting articulation between managing bodies – Transmission System Operators – TSOs.

KEY INSTRUMENTS

PDIRT-E; PAESC-RAM; PNI

SOURCES OF FUNDING

CEF mechanism; EFSI; EIB

ENTITY RESPONSIBLE

SAM; GRM; GRA; DGEG; ERSE; EEM; TSO

Activity HEADING – New line of action

4.10. PROMOTE THE DEVELOPMENT OF ELECTRICITY GRID INFRASTRUCTURE

DESCRIPTION

In order to safeguard security of supply, the increasing electrification of economies combined with increased use of indigenous renewable resources make it possible not only to achieve decarbonisation objectives but also to achieve greater efficiency and competitiveness, energy independence and the development of economic activity linked to the electricity value chain.

Energy networks are a critical public service infrastructure, an Enabler *essential* for the energy transition and for national economic growth and development. This is why the unique opportunity to promote improvements in electricity networks by reducing structural differences with other European countries, improving the service conditions and resilience of a critical infrastructure and limiting tariff impacts for all consumers.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote the development of network infrastructure, the following action measures are envisaged:

4.10.1. Promoting and strengthening the resilience of electricity distribution infrastructure – New measure

In view of the challenges of change that encompass the climate-driven energy transition, with the growing electrification and digitalisation of the economy, it is crucial to step up the approach to the resilience of distribution networks, either through the physical route of converting from aerial to underground networks in the most vulnerable areas or areas of higher environmental risk, or through an increasing commitment to digital infrastructure and services, which are adequately protected against cyber physical risk and allow for greater network observability and sensation. [Scheduled date: 2025-2030]

4.10.2. Promoting energy efficiency in electricity infrastructure – New measure

The increase in electricity demand or consumption, the expected increase in distributed generation, with changes in power flows in the grids, and the obsolescence of the electricity grid with reduced driver-sections, are enablers of technical losses in the grid. These factors will need to be tackled by making investments that enable the networks to be maintained under the appropriate operating conditions and losses at appropriate levels. [Scheduled date: 2025-2030]

4.10.3. Promoting the modernisation of the network – New measure

It is crucial to promote the renewal and modernisation of assets in their lifetime in order to maintain the levels of reliability of the network, managing the risk of failure associated with those assets and ensuring security of supply. [Scheduled date: 2025-2030]

4.10.4. Promoting the strengthening of energy networks by facilitating the electrification of consumption – New measure

Measures to encourage the decarbonisation of transport, reduction of air pollution and energy efficiency drive the growth of the electric vehicle fleet that will impact on electricity distribution networks. In Low-Voltage, given their direct connection to domestic or semi-public charging environments, one of the main challenges is the potential implications in terms of peak capacity, which will put strong pressure on networks. Also self-consumption, in particular collective consumption using the RESP, will be challenging for the electricity grid, as its components will have to be properly sized for the necessary capacity to be made available. [Scheduled date: 2025-2030]

4.10.5. Promoting the digitalisation of public service facilities – New measure

Speeding up administrative processes, including the licensing process for public service facilities associated with concessions, through the digital relationship between the network operators, the licensing authority and other administrative entities is crucial. [Scheduled date: 2023-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Energy Efficiency; Decarbonisation

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— The impact of extreme events – storms, floods, and fire risk could be minimised by investing in more resilient technologies and infrastructure, underground infrastructure and buffer zones.

KEY INSTRUMENTS

PDIRD-E and PDIRT-E

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE

System Operators; SAM; ERSE; DGEG

ii. Regional cooperation in this area

In the context of regional cooperation on energy interconnections, the Lisbon Summit of July 2018 resulted from the commitments between Portugal, Spain and France to:

- Continued close coordination with a view to monitoring interconnection projects, assessing the corresponding financing needs and overseeing their progress in order to define a new roadmap for their implementation;
- Building the infrastructure necessary for the operationalisation of an efficient and decarbonised internal energy market, in particular cross-border interconnections of electricity networks, notably in those Member States that have not yet achieved a minimum level of integration into the internal energy market, such as Spain and Portugal;
- Euro-Mediterranean energy cooperation with partners in the region in developing interconnections, in particular by exploiting the potential for renewable energy production and increased energy efficiency, for the mutual benefit of the economies and peoples of the EU and its Southern and Eastern Mediterranean neighbours.

The IIth Energy Interconnections Summit also resulted in the following planned measures:

- Implement the interconnection projects, including the electricity interconnection through the Bay of Biscay, Cantegrit-Navarra and Marsillon-Aragon (France and Spain) and the interconnection between Portugal and Spain, between Vila Fria-Vila do Conde-Recarei (Portugal) and Beariz-Fontefría (Spain);
- Accelerate work on preparing and identifying funding sources in the European framework to assess and implement new electricity interconnection projects between France and Spain;
- Identify and implement additional reinforcements of existing networks in order to make full use of electricity interconnection capacity.

In November 2018, the Valladolid Declaration was signed between Portugal and Spain, in which the two governments strongly supported the Lisbon Declaration signed on 27 July 2018 and reiterated their objectives of working towards interconnections to achieve a fully operational, secure, competitive and clean European internal energy market.

In order to address the challenge of incorporating renewable energy and the development of the Iberian Electricity Market (MIBEL), both governments affirm the importance of the functioning of MIBEL's internal and external interconnection.

In March 2023, at the XXXIV Luso-Spanish Summit in Lanzarote, Portugal and Spain reiterated their commitment to continue working and further strengthening their electricity interconnections. The next bilateral summit is planned to take place in October 2 024 in Portugal.

iii. Financing measures in this area at national level, including EU support and the use of EU funds

See iii. Point 5.3.

3.4.2. Energy transmission infrastructure

i. Policies and measures to achieve the main infrastructure objectives, including specific measures to enable the realisation of Projects of Common Interest (PCIs) and other important infrastructure projects

The H2Med, associated with internal hydrogen transport axes in Portugal, Spain and France, will boost the development of one of the main hydrogen corridors via the Mediterranean by building a 248 km hydrogen transport interconnector, including the 162 km of the Portuguese section between Celorico da Beira and Vale de Frades, with a transport capacity of 750 000 tons/year.

It is important to ensure a sustained development of infrastructure in order to reduce the impact of such development on consumers. Regional development of hydrogen economies could leverage the use of infrastructure and ensure the full replacement of fossil-based hydrogen with renewable hydrogen, as well as the substitution of fossil natural gas consumed in some hard-to-decarbonise industries.

These geographically distributed areas will take into account production potential and consumption potential as well as their typology. They will also allow for effective system integration, either by diversifying the use of hydrogen in their value chain, by storing them, and finally by reducing potential curtailment *and* increasing flexibility in the system.

Activity HEADING – New line of action

4.11. PROMOTING THE DEVELOPMENT OF HYDROGEN INFRASTRUCTURE

DESCRIPTION

The creation of a green 100 % hydrogen corridor ('H2Med') to connect the Iberian Peninsula with the rest of Europe is the first pillar of the*European Hydrogen Backbone*, which aims to accelerate Europe's decarbonisation by creating the hydrogen infrastructure needed to enable the development of a competitive, liquid and pan-European hydrogen market.

SECTOR (ES)

Energy

MEASURES FOR ACTION

To promote the development of hydrogen infrastructure, the following action measures are envisaged:

4.11.1. Strengthening regional cooperation – New measure

Promote close cooperation with a view to monitoring and coordinating the projects for the creation of the European Green Hydrogen Transport Corridor, including the interconnection between Portugal and Spain, connecting Celorico da Beira with Zamora, the pipeline connecting by sea Barcelona and Marseille, assessing the corresponding financing needs and monitoring their progress. In particular, it will be important to strengthen regional cooperation through the High Level Group on Interconnections in South-West Europe both to foster and promote interconnections between Portugal and Spain and between Spain and France. [Scheduled date: 2023-2030]

4.11.2. Delivering on the new infrastructure already identified – New measure

The National Hydrogen Transport Axis comprises the construction and suitability of the Figueira da Foz pipelines (with the possibility of connection to the Carriço SA) – Celorico da Beira – Monforte.The list of PCIs and MIPs published in April 2024, which in combination will enable the sustained and faster decarbonisation of current gas consumption, while providing means to export green hydrogen to Europe, produced from indigenous renewable energy sources, harnessing the potential for *onshore* and *offshore* energy production in Portugal. [Scheduled date: 20232030]

4.11.3. Promoting the development of H2 Valleys – New measure

The development of viable infrastructure for hydrogen storage and transport will have to be supported by the existence of production and consumption of such gas. To this end, it is essential to promote the creation of geographically dispersed *H2 valleys* taking into account the potential end uses of hydrogen (e.g.: industry sector, transport sector, etc.) and the potential for its production, including, in the analysis of potential, the availability of water for reuse, which makes it possible to produce it without the use of natural water reserves. [Scheduled date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Security

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

— The development/enhancement of hydrogen infrastructure will benefit from the integration of adaptation to climate risks (heat waves, water scarcity, fires, extreme events).

KEY INSTRUMENTS

PDIRT-E; PAESC-RAM; PNI
SOURCES OF FUNDING
CEF mechanism; EFSI; EIB
ENTITY RESPONSIBLE
SAM; GRM; GRA; DGEG; ERSE; EEM; TSO

ii. Regional cooperation in this area

In the context of regional cooperation on energy interconnections, the Lisbon Summit led to a commitment between Portugal, Spain and France to build the infrastructure needed to operationalise an efficient and decarbonised internal energy market, in particular the cross-border interconnections of the gas and electricity networks, notably in those Member States which have not yet achieved a minimum level of integration into the internal energy market, such as Spain and Portugal.

In line with the outcome of the Summit, Portugal, Spain and France agreed to define a common guideline to promote efficient use of networks.

On 20 October 2022, the governments of Spain, France and Portugal signed a commitment they ratified at the Euromed Summit in Alicante on 9 December 2022 to create a green corridor for 100 % hydrogen ('H2Med') to connect the Iberian Peninsula to the rest of Europe by creating the hydrogen infrastructure needed to enable the development of a pan-European hydrogen market.

In March 2023, at the XXXIV Luso-Spanish Summit, Portugal and Spain reiterated their commitment to continue working towards the implementation of the H2Med renewable hydrogen project and specifically the CelZa (Celorico da Beira and Zamora) infrastructure between the two countries, with the aim of making the Iberian Peninsula a net exporter of renewable hydrogen and committed to continue strengthening its electricity interconnections.

Portugal and Spain will continue to work towards the implementation of the H2Med renewable hydrogen project and specifically on the CelZa (Celorico da Beira and Zamora) infrastructure between the two countries, with the aim of making the Iberian Peninsula a net export region for renewable hydrogen. Portugal and Spain undertake to continue strengthening their electricity interconnections. Both countries welcome the agreement recently reached between regulators in Spain and France on the financing of the new electricity interconnector by the Bay of Biscay.

3.4.3. Imarket ntegration

1. Policies and measures relating to market integration objectives

At the Valladolid Summit and its Declaration, Portugal and Spain affirmed the importance of the operation of MIBEL's internal and external interconnection in addressing the challenge of incorporating renewable energy and the development of the Iberian Electricity Market (MIBEL). It was also established that work will continue to be done towards the completion of the Iberian Natural Gas Market (MIBGAS).

The integration of electricity markets aims to provide freedom of choice for all consumers, create business opportunities, ensure efficiency gains, competitive prices and higher standards of service. To achieve these objectives, it is important that there are sufficient physical interconnections with neighbouring countries combined with a high degree of cooperation between system operators, market players and regulators. All consumers should also be able to benefit from direct market participation and awareness of their rights as active consumers.

LINE OF ACTION

4.9. PROMOTING INTEGRATION INTO THE EUROPEAN INTERNAL ENERGY MARKET

DESCRIPTION

Alongside the development of the necessary infrastructure to enhance market integration by creating the necessary technical and operational conditions, it will be important to develop common rules at regional and European level, as well as to define markets and *hubs* in order to standardise the costs associated with the availability of energy (electricity, natural gas and renewable gases), and consequently their prices.

SECTOR (ES)
Energy
MEASURES FOR ACTION
To promote integration into the European internal energy market, the following actions are envisaged:

4.9.1. Adapting regulation to promote redesign and new market design

It will be necessary to adapt national regulations and legislation, based on developments in European regulations and legislation on redesign and market design (created as part of the "Clean Energy for All Europeans" legislative package, which, in the area of*Market Design*and the subject of this measure, is the publication of the new Regulation on the internal market in electricity and the Directive on the rules for the internal market in electricity) and the implementation of the network codes associated with the sectors concerned (electricity, natural gas and renewable gases). This new regulation involves changing the role of some market players and setting tariffs and other costs with implications for energy price setting. [Scheduled date: 2020-2030]

4.9.2. Create conditions for harmonisation and coupling with other European energy markets/hubs

In the particular case of the natural gas and renewable gases sector, in addition to the concern to develop and make increasingly effective the functioning of the Iberian Gas Market (MIBGAS), the operation of this and the other European *hubs* should also be brought closer together so as to improve its liquidity and make Portugal, and the Iberian Peninsula, an important *player* in the European energy market. [Scheduled date: 2020-2030]
CONTRIBUTION TO 5 DIMENSIONS
Energy security; Internal Market
KEY INSTRUMENTS
n.a.

SOURCES OF FUNDING
n.e.c.

ENTITY RESPONSIBLE
SAM; DGEG; ERSE

ii. Measures to make the energy system more flexible in relation to the production of energy from renewable sources, including the development of intraday and cross-border balancing markets coupling

Not applicable.

iii. Measures to ensure non-discriminatory participation of renewable energy, demand response and storage, including through aggregation, in all energy markets

LINE OF ACTION
4.3. PROMOTE THE INTRODUCTION OF NEW MANAGEMENT MECHANISMS FOR THE NATIONAL ELECTRICITY SYSTEM

DESCRIPTION
Given the existence of a number of significant changes, which will lead to a deverticalised and liberalised market model, the responsibility for ensuring security of supply is shared by the various actors and the role of each must be redefined. In this new model, all actors, including producers, operators, suppliers, customers and political and regulatory institutions, are key factors in the process of guaranteeing supply. These changes in the market context lead to the need to rethink the design of the electricity market and some of its instruments.

SECTOR (ES)
Energy; Industry

MEASURES FOR ACTION
To promote the introduction of new management tools for the national electricity system, the following action measures are envisaged:

4.3.1. Regulating the figure of the Market Agregator – Measure achieved

This new figure that will act within the ESS aims to fill gaps in the market supply of the aggregation service. The market aggregator will be obliged to purchase the energy produced by the electricity generating centres under the special scheme covered by the general remuneration scheme, which wish to sell that energy to it, and will also be obliged to place it on the market. It will also be able to purchase energy produced by the power generating centres under the special scheme covered by the guaranteed remuneration scheme, as well as the energy produced by the units covered under the small distributed generation.
This measure was implemented by the publication of Decree-Law No 15/2022, in particular the provisions of Article 145 thereof [Date: 2022]

4.3.2. Review the regulatory and market environment for system services

At European level, the whole process associated with system services is fundamentally changing with a view to harmonising current national markets for markets operating on European Single Windows, for each of the different types of reservation. Incentives to secure power that contribute to maintaining the availability of electricity generation capacity and to investments in new generation capacity (investment incentive), in terms of ensuring security of supply levels, should also be reviewed under the new EU electricity market design (currently under negotiation). [Scheduled date: 2019-2024]

4.3.3. Study and promote the introduction of the Aregador da Procura

This new figure that will act within the ESS aims to fill gaps in the market supply of the aggregation service. The demand aggregator will aim to group together different actors/entities, such as final consumers, small producers, storage, electric vehicle recharging points or any combination thereof, and act as a single entity and participate in the electricity market and provide system services. This mechanism promotes the flexibility of the system, improves the management of the system in a spirit of security of supply and promotes greater participation of market players. [Scheduled date: 2020-2025]

4.3.4. Promoting adaptation to the new European regulatory framework

As part of the 'Clean Energy for All Europeans' legislative package, new legislation has been adopted under the*Market Design*, in particular in the new Internal Electricity Market Regulation, which states that all new requirements for new producers who may have direct or indirect responsibilities, for the scheduling carried out through the production forecasts of the production facilities, which need to be adopted in the Portuguese electricity system. [Scheduled date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

KEY INSTRUMENTS

n.a.

SOURCES OF FUNDING

PR

ENTITY RESPONSIBLE

SAM; GRA; GRM; DGEG; ERSE

The operating model for the European intraday market, based on a continuous intraday market, will enable energy trading between actors located in the various countries/price areas with implicit capacity allocation.

In order to achieve this objective, a number of European market operators and system operators implement the*Cross-Border Intraday Market Project*(XBID), which provides the basic contractual infrastructure of systems and procedures on which this pan-European continuous intraday market will be implemented. This market will make it possible to trade electricity up to 60 minutes before its delivery, thereby enabling the integration of renewables.

Portugal will be integrated into this new mechanism since its entry into operation (2018).

With the publication of Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, it is necessary to promote the coordination of the markets for system services managed by European system operators. In order to implement these standards, European system operators are cooperating together to implement them:

- Imbalance Neeting–a process that makes it possible, during real-time operation, to offset the real time imbalances of the various European electrical systems. Portugal's integration into this mechanism is expected to take place in the course of 2019;
- Replacement*Reserves*– Based on the TSO-TSO model, its main objective is to establish and operate a

centralised platform capable of collecting all offers of *Replacement Reserves* (RR) from the different national markets operated by each TSO and to perform an optimised allocation of bids and interconnection capacity in order to meet, up to 30 minutes before real time, the differences between the scheduled daily and intraday markets and generation and consumption forecasts. Portugal has been integrated into this new mechanism since its entry into operation in 2019;

- Manual *Frequency Restoration Reserves*process – Based on the TSO-TSO model, its main objective is to establish and operate a centralised platform capable of collecting all the offers of the *Frequency Replacement Reserves* (mFRR) manual from the various national markets operated by each TSO and to carry out an optimised allocation to meet their needs both before real time and in real time. Portugal is expected to comply with the deadlines laid down in Regulation (EU) 2017/2195 of 23 November 2017, i.e. that Portugal will be integrated into this new mechanism in 2024;
- Automatic*Frequency Restoration Reserves*process – Based on the TSO-TSO model, its main objective is to establish and operate a centralised platform capable of mobilising balancing energy bids for *automatic Frequency Replacement Reserves* (aFRR) in a coordinated and cost-effective manner from the various national markets operated by each TSO and to optimise the allocation of cross-zonal capacity in order to meet the needs of each TSO in real time. Portugal is expected to comply with the deadlines laid down in Regulation (EU) 2017/2195 of 23 November 2017, i.e. that Portugal will be integrated into this new mechanism in 2024.

The expected benefits of implementing these processes are:

- Increasing the efficiency and competition of the system services markets of the various systems;
- Greater coordination of the various system services markets and promoting the possibility of exchanging system services thereby optimising the operational security of the systems involved;
- Facilitate the integration of renewable energy sources.

In addition, mechanisms should continue to be put in place to encourage the participation of new participants in the system services market and thereby increase efficiency, competition and operational security.

iv. Policies and measures to protect consumers, especially vulnerable and consumers in energy poverty, and to improve the competitiveness and contestability of the energy retail market

To promote competitiveness in energy markets and improve consumer empowerment, a multi-faceted approach is needed. Transparency and access to information are key, through online platforms that allow comparison of tariffs and the provision of clear information on products and contract conditions, consumer education and empowerment through energy literacy campaigns and access to new technologies that increase energy efficiency and offer innovative solutions, encourages consumers to negotiate better conditions with suppliers, promotes the active participation of consumers as energy producers/consumers and as agents for behavioural change and empowers the consumer to participate in energy sector decisions.

A better informed citizen represents better, more efficient and sustainable choices. On the other hand, a citizen at the heart of decision-making represents a more active consumer in the transition to a carbon-neutral society, and more willing to participate in the structural changes that are needed to achieve this challenge. Technological developments itself can provide the practical tools needed for this involvement. With the citizen as an informed and active player in the market, and with the most vulnerable consumer protection tools, and a strong commitment to physical and digital one-stop-shops to support decision-making geared towards the climate transition, another of the 2030 policy priorities will be addressed by tackling energy poverty and consumer vulnerability.

Decree-Law No 15/2022 evolved the ESS model into a more decentralised system, with a focus on a more active role for consumers, production and storage for their own consumption and possible sale of surpluses for the provision of flexibility and aggregation services, based on the premise that better informed consumers make better choices. The changes that have already been implemented in the sector reflect an effort to adapt, but the revision of the directive and regulation on the functioning of the internal market underlines the need for further changes. To ensure that the sector continues to evolve in line with current dynamics and needs, it is imperative to further

develop policies that protect consumers, especially the most vulnerable and those in energy poverty, and strengthen competitiveness and competition in the retail energy market.

Among the various lines of action that make up the National Energy and Climate Plan, there is a national commitment to this issue, in particular some of the action measures set out in Action 8.2 to combat energy poverty and improve the tools for protecting vulnerable customers; 8.4 promoting information to consumers and businesses by contributing to better energy literacy and simplifying interaction with the market; 8.5 promoting dialogue platforms for sustainable development and leveraging capacity at national, regional and local level; 4.12 promoting flexibility in the electricity system and 3.2 Fostering distributed generation and self-consumption and energy Communities.Council Implementing Decision 13351/23 of 10 October 2023 amending the Implementing Decision of 13 July 2021 on the approval of the assessment of the recovery and resilience plan of Portugal provides for the establishment of one-stop-shops for citizens on energy efficiency – Citizen Energy Spaces (RP-C21-r44), which have as their main objective to support citizens in preparing and implementing energy efficiency and renewable energy measures and adopting sustainable energy use behaviours through increased energy literacy.

Building on the pilot project developed in the framework of investment TC-C13-i01, the reform aims to establish one-stop shops for energy efficiency for citizens (Citizen Energy Spaces) set up by local or regional authorities or other local entities, which should be included in the Municipal Climate Action Plans under Law 98/2021. Capacity-building actions should be undertaken to ensure that at least three hundred people are trained to operate the Citizen Energy Spaces, with the aim of these desks to offer a range of services to citizens, such as:

Provision of information and technical support, from the interpretation of energy bills to sustainable energy use and consumer rights;

Advice, including for the procurement of energy, purchase of equipment, selection of energy efficiency and renewable energy solutions, selection of commercial offers for the implementation of solutions;

Energy assessment of dwellings and proposals of investment with a view to increasing thermal comfort and reducing energy bills;

Advice on access to incentives and financing instruments, public and private, national and local;

Collect data about users to be shared with the National Energy Poverty Observatory.

The creation of these desks, which should work as a network, with the benefit of a common digital platform and qualified professionals, is framed by ELEPP, notably in its Strategic Axis 3 – Promoting action, integrated territorial, Strategic Objective 3.1 – Strengthening the action of local structures in support of the citizen, Measure 3.1.1 – Promoting an integrated network of Citizen Energy Spaces.

v. Description of measures to enable and develop demand response including those addressing tariffs to support dynamic pricing

The pilot project to improve the tariff for access to networks in MAT, AT and MT took place between 2018 and 2019, in accordance with the rules adopted under Directive 6/2018 of the Energy Services Regulatory Authority (ERSE) of 27 February, with a total of 82 participants. The purpose of the pilot was to test changes to make network access tariffs more cost-friendly, thus promoting a more efficient use of electricity grids. The changes included the introduction of locational signals through time periods differentiated by network area and the signalling of a super peak period with an aggravated price signal, as well as other changes. This initiative is a complementary tool in promoting the energy transition as it can improve short- and long-term economic signals for efficient use of the electricity grid, thus contributing to an energy transition at a lower cost.

The analysis of the results identified, on average, an additional 2.2 % shift of consumption out of the super peak period by participants. Extrapolating this effect to a 23-year horizon (2018 to 2040), the benefit-cost analysis determined a net benefit of EUR 50.9 million, mainly due to the deferral of new investments for the expansion of the electricity grid in a context of growing overall electricity consumption. Further information can be found in ERSE

Public Consultation No 101, in particular Annexes 1 and 2 to the process of opening the Public Consultation.

Following ERSE Public Consultation No 101 of May 2021, ERSE included in the Electricity Tariff Regulation a new tariff option for network access, known as the tariff for access to optional networks in MAT, AT and MT for mainland Portugal. The tariff option is characterised by the specification of time periods for three different geographical groups in mainland Portugal (North, Central, South) and by the differentiation of the power price in peak hours for three seasons (Upper, Medium, Lower). As network access tariffs show negative prices in 2022 and 2023, it has not yet been possible to implement the new tariff option.

The pilot project on demand participation in system services and the development of flexibility service projects is in operation.

Based on the results of the pilot projects, ERSE will carry out a benefit-cost analysis to assess merit for the electricity system. The targets for the completion of the roll-out of smart meters, expected by 2024, facilitate demand participation.

3.4.4. PEnergy Poverty

It must be ensured that the process of decarbonisation and energy transition is carried out in a fair, cohesive and inclusive way, so that the way forward in the next decade cannot exacerbate energy poverty, on the contrary, it must seek solutions to mitigate this problem. Situations of energy poverty should be identified and addressed through various measures, including urban regeneration, the promotion of energy efficiency and renewable energy.

It is also necessary to look at the economic and social aspects of this transition, including the possibility of creating new clusters and assessing the sectors most affected, and to develop policies to respectively create the conditions for their development and anticipate appropriate territorial or social responses in education, training and re-skilling to ensure a just transition.

LINE OF ACTION

8.1. ENSURING A JUST TRANSITION

DESCRIPTION

The aim is to anticipate potential positive and negative social, economic and environmental impacts linked to decarbonisation and energy transition in the medium and long term, boosting the creation of new jobs and clusters, and planning specific measures to ensure a just transition for businesses, workers and communities in general, focusing on new business models, education, vocational training and reskilling.

SECTOR (ES)

Transversal

MEASURES FOR ACTION

To ensure the just transition, the following actions are foreseen:

8.1.1. Developing a Just Transition Strategy

Develop a Just Transition Strategy, identifying and addressing the opportunities and risks associated with decarbonisation and the energy transition towards carbon neutrality in 2050, as well as identifying possible sources of financing that ensure a just transition in its different economic, social and environmental dimensions.

This Strategy, which will be developed together with the relevant entities, will include, inter alia, representatives of central and local government entities, representatives of the energy sector, the environment, industry, transport, the economy, employment and academia, and should be developed in line with developments at Community and international level on just transition. The Strategy is also intended to cover all sectors of activity, taking into account the interests of businesses, workers and the communities in which they are part, as well as the interests of society as a whole which are interested in a necessary transition, but which are intended to be just, inclusive and promote national competitiveness.

This strategy will thus be the basis for the development of specific Action Plans, such as the Action Plan for ending coal-fired electricity generation under Objective 1 – decarbonising NATIONAL ECONOMIA [Dedicated date: 2020-2030]

8.1.2. Implementing Territorial Just Transition Plans – New Measure

Implement the measures envisaged for Territorial Just Transition Plans and covered by the Just Transition Fund, as part of the Regional Operational Programmes of the Central, North and Alentejo Region. [Scheduled date: 2021-2027]

8.1.3. Implementing the Just Transition Compensation Mechanism – New Measure

The "Just Transition Compensation Mechanism", supported by the Environmental Fund, aims to ensure that the income of workers directly and indirectly affected by the cessation of coal-fired electricity production at the Pego Termoelectric Power Plant, and its consequent closure, is maintained during a transition phase until they find employment. [Scheduled date: 2021-2024]

8.1.4. Continuing Economic Diversification for a Just Transition – New Measure

To mitigate the socio-economic impacts of the closure of the Pego and Sines coal-fired thermal power plants, additional measures have been adopted, including the launch of warnings for "Economic diversification for a just transition" in the Middle Tejo and the Alentejo Litoral that should be continued. [Scheduled date: 2022-2023]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

CLIMATE RISKS AND VULNERABILITIES Relevance: Average

- The most vulnerable communities are exposed to multiple climate risks, a process to be considered when drafting the Just Transition Strategy;
- Territorial Just Transition Plans will become more robust if adjusted to the main climate risks affecting the territory;
- The Just Transition Compensation Mechanism will become more robust by taking into account the social impacts caused by climate change (climate displaced, climate migrants, unemployed due to extreme events, etc.);
- Water scarcity could interfere with economic diversification towards a just transition in agriculture and others that are dependent on water or other natural resources.

KEY INSTRUMENTS

RNC2050

SOURCES OF FUNDING

FA; OP Norte 2030, OP Centro 2030; PO Alentejo 2030; JTF

ENTITY RESPONSIBLE

SAM; ME; MTSS; MCT; MIH

LINE OF ACTION

8.2. TACKLING ENERGY POVERTY AND IMPROVING TOOLS TO PROTECT VULNERABLE CUSTOMERS

DESCRIPTION

The National Long-Term Strategy for Combating Energy Poverty 2023-2050 (ELEPP), published in 2024, adopted the definition of energy poverty in the Energy Efficiency Directive, Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September, as "a household's lack of access to essential energy services, where such services provide basic and decent living and health levels, including adequate heating, hot water, cooling and lighting, and the energy needed for household appliances. taking into account the national context in question, existing national social policy and other relevant national policies, caused by a combination of factors, including at least the lack of affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of housing'

Energy poverty has an impact on the well-being and comfort of citizens, health, mortality, educational attainment, adult earnings, social isolation of families and young people, etc. It is therefore important to design and develop inclusive strategies to combat energy poverty and increase efficient energy consumption among the population in poorer socio-economic conditions and info-exclusion, by promoting actions of a varied nature, including actions on the ground close to the citizens concerned.

In order to combat effectively, more detailed knowledge of the national situation is needed in order to target measures more effectively, such as the rehabilitation of buildings, the promotion of renewable energies and communication and education campaigns. An informed and active consumer in the market, and the availability of tools to protect the most vulnerable consumers, will address one of the strategic priorities for 2030, which is tackling energy poverty and the vulnerability of energy consumers.

SECTOR (ES)

Domestic

MEASURES FOR ACTION

To address energy poverty and improve the tools to protect vulnerable customers and consumers, the following action measures are foreseen:

8.2.1. Delivering on the long-term strategy to combat energy poverty

With the publication of Council of Ministers Resolution No 11/2024 of 8 January 2024, in the Diário da República, the National Long-term Strategy for Combating Energy Poverty 2023-2050 was approved. The aim of its implementation is to improve knowledge of this issue by seeking the best response to the problem and to create a structural change to mitigate it.
This strategy, drawn up together with the relevant entities for its implementation, will include, inter alia, representatives of central and local government entities, consumer associations, representatives of the energy sector and academia. It aims to obtain a diagnosis and characterisation of the problem, to develop indicators to monitor its evolution, monitoring strategies, to set medium and long-term energy poverty reduction targets at national, regional and local level, and to propose specific measures to achieve these objectives, as well as ways of financing.
The National Long-Term Strategy for Combating Energy Poverty 2023-2050 was in public consultation from 20/01/2023 until 03/03/2023 and its publication established the National Energy Poverty Observatory (NEPP-PT), which is expected to present the first Action Plan to Combat Energy Poverty for the period 2024-2030 (PACPE 20242030).

In the 1th quarter of 2024, the first PACPE 2024-2030 was prepared and submitted to the Government, it should be noted that its implementation will take into account the 4 strategic axes (EE) of ELPPE 2023-2050:

- Promoting the energy and environmental sustainability of housing (EE1);
- Promoting universal access to essential energy services (EE2);
- Promoting integrated territorial action (EE3);
- Promote knowledge and informed action (EE4).

Where action lines are defined to achieve the following Strategic Objectives (SO):

- Increase the energy performance of housing (SO 1.1);
- Decarbonise energy consumption in housing (SO 1.2);
- Reduce the number of households struggling to pay for essential energy services (SO 2.1);
- Ensure the protection of vulnerable consumers in energy poverty (SO 2.2);
- Strengthen the action of local structures in supporting citizens (SO 3.1);
- Strengthen the supply of high energy performance public housing (SO 3.2);
- Increase the capacity to identify households in energy poverty (SO 4.1);
- Increasing energy literacy (SO 4.2);
- Stimulating research and innovation (SO 4.3);
- Stimulate the training of professionals (SO 4.4).

The implementation of this strategy, throughout its lifetime, will be monitored through a multidisciplinary working group set up for this purpose. [Scheduled date: 2023-2024]

8.2.2. Establish a national system for assessing and monitoring energy poverty, including the number of households in energy poverty

Recognition of the drivers of energy poverty is essential for understanding the causes that have triggered or influenced, structurally or conjunturally, energy poverty. Coupled with the recognition of these factors, there is a need for clear methods for measuring energy poverty, providing a starting point tool for the implementation of a concerted and successful strategy for the protection of vulnerable consumers.
In order to ensure effective monitoring of the progress of actions to combat energy poverty and in particular of citizens in this situation, it is important to know the number of households in energy poverty, as well as their main characteristics (composition, income levels, etc.) and their geographical concentration in order to establish an effective and robust national energy poverty assessment and monitoring system.

RCM No 11/2024 of 8 January, which establishes ELPPE 2023-2050, also establishes the National Energy Poverty Observatory (ONPE-PT), whose main task is to monitor the evolution of energy poverty at national level.
Order No 1335/2024 of 2 February 2013, which determines the composition and functioning of the ONPE-PT, lays down the following powers:

a) Define new strategic indicators with territorial disaggregation to assist the design, implementation and evaluation of public policies;
b) Propose public policies for the eradication of energy poverty;
c) Promote the articulation between different public policy areas contributing to the objectives of the ELEPP, in particular in the fields of energy, housing, solidarity and social security, economy, health, education, territorial cohesion and finance;
d) To promote decentralised territorial action by linking entities directly and autonomously administered by the State, in particular local authorities, and by networking with other local actors, including energy agencies and private social solidarity institutions;
e) Promote, in conjunction with the National Statistical Institute (INE), the improvement of basic information and the development of new statistics through the integration of different data sources;
f) Draw up and propose to the Government the ten-year action plans to combat energy poverty (PACPE) (horizons 2030, 2040 and 2050), revised every three years;
g) Assess the progress of the implementation of the ELEPP every year from the date of entry into force of Council of Ministers Resolution No 11/2024 of 8 January 2012, the result of which should be published on the websites of ONPE -PT, the Directorate-General for Energy and Geology (DGEG) and the ADENE (Energy Agency);
h) Submit to the government a proposal for a revision of the ELEPP every five years or whenever it considers it necessary;
i) Promote and implement capacity-building actions for national, regional and local actors, public and private, involved in the implementation of the ELEPP;
j) Propose financial instruments, fiscal and/or financing, public or private, of energy efficiency measures appropriate to the profile of identified households in energy poverty, as well as the methods for their adoption, where applicable;
k) Develop materials and campaigns to increase energy literacy appropriate to the profile of identified households in energy poverty;
l) Promote, valorise and disseminate work related to the phenomenon of energy poverty.

The ONPE-PT will be composed of a Management Unit, assisted by a Strategic Commission and an Advisory Commission, which will be composed of relevant government areas and representatives of different areas of civil society knowledge, ensuring territorial and sectoral representativeness.
Alongside the Citizen Energy Spaces, the aim is to analyse the impact of the problem on national territory and on the different "areas" that create an impact: housing, income, living conditions and health.

This action measure will also be promoted through the implementation of ELEPP, in particular Action Line 4.1.2. Develop knowledge on energy poverty within Strategic Axis 4. Promote knowledge and information with a view to achieving the strategic objective.

It is also of high importance to establish an interconnection system with the *Energy Poverty Advisory Hub* for the presentation of indicators. [Scheduled date: 2023-2030]

8.2.3. Continue with the mechanisms to protect vulnerable consumers and explore the introduction of new ones

Continue the implementation of mechanisms to reduce the energy burden on household consumers, helping to ensure that the price of energy is not an exclusionary factor in access to these services, regardless of the economic, social or geographical situation of consumers, while serving the purpose of ensuring universal access to quality services at affordable prices. Among these mechanisms, emphasis is placed on the Social Energy Tariff, which has had a very substantial impact on the promotion of affordability.

In addition, consumer protection measures, in particular vulnerable consumers or consumers with serious health problems, consisting of the inability of suppliers to disconnect in the event of late payment of bills, are important in protecting vulnerable customers in Portugal given the current levels of energy poverty and increasingly extreme climatic events.

This action measure will also be promoted through the implementation of the ELEPP, in particular the action lines of the following Strategic Objectives (SOs):

- Reduce the number of households struggling to pay for essential energy services (SO 2.1);
- Ensure the protection of vulnerable consumers in energy poverty (SO 2.2).

Through measures such as:

- Promote the reduction of energy bills (2.1.1);

- Promoting self-consumption and sharing of renewable electricity involving vulnerable consumers (2.1.2);
- Prevent interruptions at critical times (2.2.1);
- Ensure minimum services (2.2.2).

The "Valley Efficiency" programme is ongoing and the notice of the second phase of the programme was published in October 2023.
Forms of support for the participation of vulnerable consumers in energy communities and collective self-consumption will also be promoted. [Scheduled date: 2023-2030]

8.2.4. Develop programmes to promote and support energy efficiency and integration of renewable energy to mitigate energy poverty

Promote more structural programmes, actions and support mechanisms to combat energy poverty, such as incentives for changes in consumption patterns, targeted interventions to implement investments in energy efficiency, renovation of buildings and programmes aimed at the integration of renewable energy (e.g.: efficiency Valley Programme and Buildings + Sustainable Programme).

The "Valley Efficiency" programme, with a first phase of the programme between August 2021 and May 2023, is currently in the second phase of the programme, the notice of which was published in October 2023 and the deadline for submission of applications on 20 November 2023. It is an instrument to finance (up to EUR 3.900 + VAT – equivalent to a maximum of 3 cheques of EUR 1.300 + VAT per household) for the investment of economically vulnerable households in improving the thermal comfort of their housing, either through interventions in the environment or through the replacement or purchase of energy-efficient equipment and solutions. The second phase of the programme also includes the establishment of a facilitator grant to support the submission of applications to beneficiaries (administrative facilitators) and applications for measures (technical facilitators).

This action measure will also be promoted through the implementation of the ELEPP, in particular the action lines of the following Strategic Objectives (SOs):

- Increase the energy performance of housing (SO 1.1);
- Decarbonise energy consumption in housing (SO 1.2);
- Strengthen the supply of high energy performance public housing (SO 3.2).

These support mechanisms will be developed together with municipalities to better match reality and promote closer proximity to energy poor consumers. [Scheduled date: 2020-2030]

8.2.5. Promote and support local strategies to combat energy poverty

Local energy strategies aimed at combating energy poverty should be supported and encouraged in a sense of proximity and outreach to policies to mitigate energy poverty (e.g.: Citizen Energy Space), in line with municipal and regional climate action plans, which should address the just transition dimension, alongside climate change mitigation and adaptation.
This measure is also promoted through the implementation of the ELEPP, in particular the action lines of the following Strategic Objectives (SOs):

- Strengthen the action of local structures in supporting citizens (SO 3.1);
- Strengthen the supply of high energy performance public housing (SO 3.2).

As regards the specific measures included in each of these strategic axes, the following can be highlighted, which are more focused on local strategies: M 3.1.1 Promoting an integrated network of Citizen Energy Spaces; M 3.1.2 Promoting the integration of combating energy poverty into local public policies and M 3.1.3 Facilitating the development of municipal renewable energy communities.

However, there are other measures that could be integrated into the action lines of the Action Plan to Combat Energy Poverty (PACPE) 2024-2030 (under preparation), leading to the promotion and support of local strategies to combat energy poverty.

In this context, and in accordance with Article 3(2) (1) and (d) of Order No 1335/2024 of 2 February determining the composition and functioning of the National Energy Poverty Observatory, the ONPE – PT is responsible for strengthening the territorial information base on energy poverty; contribute to the design, implementation and evaluation of public policies, to the

eradication of energy poverty in Portugal by ensuring links with the National Energy and Climate Plan 2030, the Social Climate Plan and the Action Plan to Combat Poverty; ensure decentralised action, in close coordination with local actors; and to promote energy literacy throughout the territory, as well as to promote decentralised territorial action by linking entities of the direct and autonomous administration of the State, in particular local authorities, and by networking with other local actors, including energy agencies and private social solidarity institutions. [Scheduled date: 2020-2030]

8.2.6. Disseminate information to mitigate energy poverty

The complementary measures include structural measures aimed at promoting awareness and access to relevant information to support decision-making. The dissemination of relevant information makes it possible to increase consumers' knowledge of their rights/obligations and to provide all available information on energy tariffs and social support available on the market. In this regard, the provision of information and tools for price comparison between different operators and the existence of campaigns to disseminate relevant information about the energy market are of particular importance. Despite being a form of indirect intervention, full consumer knowledge of energy markets and all available support tools plays a key role in changing consumption patterns and can be a measure in minimising energy poverty.
The Strategic Axis 4. Promoting the ELEPP's knowledge and informed action envisages measures and lines of action that meet the objectives of this NECP action measure, in particular: Increase energy literacy (O.E.4.2).

Through measures such as:

- Promoting the energy literacy of children and young people (M 4.2.1);
- Promote the energy literacy of consumers in severe energy poverty and/or at risk of exclusion (M 4.2.2);
- Promote energy literacy among consumers in general (M 4.2.3).

The ONPE-PT, which, in accordance with Article 3(2) and (1) (d) of Order No 1335/2024 of 2 February determining the composition and functioning of the National Energy Poverty Observatory, is responsible for strengthening the territorial information base on energy poverty; contribute to the design, implementation and evaluation of public policies, to the eradication of energy poverty in Portugal by ensuring links with the National Energy and Climate Plan 2030, the Social Climate Plan and the Action Plan to Combat Poverty; ensure decentralised action, in close coordination with local actors; and promoting energy literacy throughout the territory, as well as developing materials and campaigns to increase energy literacy appropriate to the profile of identified households in energy poverty and the Citizen Energy Spaces (ELEPP Measure 3.1.1) are intended to be two tools for collecting, processing and disseminating information.

[Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy efficiency
CLIMATE RISKS AND VULNERABILITIES Relevance: Average
- The increased frequency and intensity of extreme climate events such as heat/cold waves exacerbates energy poverty as it increases the need for cooling or heating for people in vulnerable conditions;
- Local strategies to tackle energy poverty could be undermined by extreme climate events requiring resource mobilisation for urgent/emerging responses;
- The information disseminated should be constantly updated to new scientific evidence on the impacts of climate change on energy poverty.

KEY INSTRUMENTS
n.a.

SOURCES OF FUNDING
UPS; FA, PPEC; RRP; FSAC
ENTITY RESPONSIBLE
SAM; ME; MTSS; GRA; GRM; DGEG; RNAE; Energy agencies; MIH, IHRU, ERSE; ADENE; AREAM

3.5. Research, Innovation and Competitiveness Dimension

i. **Policies and measures related to the elements set out in point 2.5**

LINE OF ACTION

1.9. Promote R &Dprojects supporting the transition to a carbon-neutral economy

DESCRIPTION

The aim is to support the development of carbon-neutral technologies, practices, products and services in all sectors of activity, to support the participation of national companies and bodies in research and innovation programmes contributing to the decarbonisation of the Portuguese economy and to ensure targeted guidance and support for innovative start-ups and scale-ups, through dedicated forums and by promoting synergies that support their growth in the market.

SECTOR (ES)

All sectors

MEASURES FOR ACTION

To promote R & D & I projects supporting the transition to a carbon-neutral economy, the following action measures are envisaged:

1.9.1 Promote links with European, national and regional R & I strategies

R & D & I is key to achieving the transition to a carbon-neutral economy and covers several key sectors: I. Accelerate the implementation of EU and national policy and support its long-term policy objectives;

ii. Increase national competitiveness;

iii. Address the human, societal and social aspects of the green and digital transition.

Synergies between the R & I Framework Programme, cohesion programmes and national programmes can maximise the amount, quality and impact of R & I investment for the energy transition, with strategic plans complementing and using different funding instruments. A systemic and complementary approach has the potential to increase returns from European energy and climate change programmes by aligning national priorities with EU policy lines.

Smart specialisation strategies (S3) as well as the RTD Thematic Agendas of the Foundation for Science and Technology (FCT) are crucial tools for aligning national priorities. The FCT Agendas mobilised experts from R & D institutions, companies and public entities in identifying challenges and opportunities at national scientific and technological system level in a medium and long term perspective, contributing to the development of R & I.

address problems or needs of different sectors of society. To support R & I projects contributing to the decarbonisation of the economy, the following TCF Thematic Agendas should be highlighted: Climate Change, Sustainable Energy Systems, Circular Economy, Urban Science and Cities for the Future (in addition to all others identified in the remaining objectives). This link extends to Collaborative Laboratories, as they aim to implement the research and innovation agendas. [Scheduled date: 2020-2030]

As mentioned in Section 2.5 for the RIC dimension, on the 15 planned Thematic Agendas, two of them were identified as having a particular impact on the 2030 NECP which were not concluded: 'Sustainable Energy Systems', and 'Urban Science and Cities for the Future'

1.9.2. Innovation and development of carbon-neutral technologies, practices, products and services across all sectors of activity

Promote eco-innovation projects in low-carbon technologies and R &Dprojects to support the transition to a carbon-neutral economy by reducing transition costs. Support the development of innovative and low-carbon products and services, the creation of *living labs* for decarbonisation, including by supporting initiatives involving research centres, academia and businesses.

Different actions should be highlighted:

- Collaborative Laboratories (CoLAB): Of the 41 entities recognised as CoLAB and active, at least 17 are active in areas of particular interest to the 2030 NECP: 'Energy and Sustainability', 'Materials, Circular Economy, and Urban Sustainability', 'Climate, Space and Ocean', and 'Biodiversity and Forest'.

With a commitment of EUR 96.6 million to finance CoLABs between 2022 and 2026, Portugal has already implemented EUR 12 million (12 %) to finance the 41 active entities, of which at least 17 are active in areas of particular interest to the PNEC2030: BIBERF, HYLAB, Net4Co2, Smart Energy LAB and VG CoLAB in 'Energy and Sustainability', AlmaScience, BUILT CoLAB, C5LAB, CECOLAB and CEiiA-S2ul in 'Materials, Circular Economy, and Urban Sustainability', + Atlatinc B2E, Green CoLAB and S2AQUAcoLAB in 'Climate, Space and Ocean' and ForestWISE, InnovPlantProtect and MORE in 'Biodiversity and Forest' (2023 CoLAB Annual Report).

- National participation of the 2th IPCEI Batteries – EuBatIn (state of play as of 21 March 2024), with national entities involved in the project as associated partners.

[Scheduled date: 2020-2030]

1.9.3. Continued support for participation in the Innovation Fund and LIFE

Promote this programme and create the conditions for national companies to participate in it. [Scheduled date: 20202027]

1.9.4. Continued support for participation in Horizon Europe programmes

Promote the excellent European R &I programme and create the conditions for increasing the participation of companies from the national science and technology system in it. [Scheduled date: 2021-2027]

Coordination of Horizon Europe Pillars II and III is the responsibility of ANI, and the coordination of Pillars I and IV under the responsibility of the FCT.

Portugal has received a total of EUR 821 million in the first three years (2021-2023) of Horizon Europe, with 1411 approved projects and 2329 participations from national entities, corresponding to 10 % of the total projects funded by the Framework Programme in all countries eligible for this European funding.
Portugal's participation in areas of particular interest to the PNEC2030 for the period 2021-2023 amounts to approximately EUR 92 million, with 131 projects approved (25 of which were coordinated by national authorities) and 276 national contributions. Around 1/3 of the national participation in the funded projects is from private entities (large companies and small and medium-sized enterprises), demonstrating the critical role they play in driving collaborative innovation and the scientific and technological advance of the energy transition in Europe.

1.9.5. Support innovation projects for the recirculation of carbon dioxide and the generation of synthetic gates – New measure in order to reduce emissions, increase the shares of renewable and endogenous energy and circularity, will promote and support projects addressing the capture of carbon dioxide emissions from the purification of biogas from anaerobic digestion and gasification plants, with a view to its valorisation and use as a raw material – raw material for synthetic gas-production or use in chemical, construction and/or food industries (use in greenhouses). [Scheduled date: 2023-2030]

1.9.6. Support innovation projects promoting dynamic management of renewable gases in gas networks – New measure will promote R & D projects to address the growing and imminent need to accommodate different qualities in the gas network (NG, H_2, biomethane), as well as the management between production and injection and consumption in each geographical area. The accommodation of different gases shall be carried out using gas quality tracking systems. It shall be possible to send the gas produced and injected into a network without sufficient consumption to other systems where such consumption exists, via the transmission system, with a view to maximising the use of all generation capacity. [Scheduled date: 2023-2030]

1.9.7. Creation of Technological Free Areas – New measure

Creation of technology-free areas promoting and facilitating research, demonstration and testing, in a real-world environment, of technologies, products, services, processes, innovative models, concepts, business models, specific regulatory frameworks, as part of production, storage, promotion of electric mobility and self-consumption of electricity activities. These areas should be coordinated with the various market players, opening up the possibility of identifying concrete use cases by network operators or market players, which could be covered by the LFAs. [Scheduled date: 2023-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; Energy Efficiency; I & D & I

KEY INSTRUMENTS

RNC2050; FCT Agendas; ENEI/EREIs

SOURCES OF FUNDING

FA; LIFE; Horizon Europe; Innovation Fund; PRR

ENTITY RESPONSIBLE

MECI; MAP; SAM; GRA; GRM; LNEG; AREAM

LINE OF ACTION

2.6. Encouraging R & I in the field of energy efficiency

DESCRIPTION

The aim is to support the development of technologies, practices, products and services to promote more and better energy efficiency in the various strands (buildings, transport, industry, etc.), as well as to support the participation of national companies and bodies in research and innovation programmes contributing to the promotion of energy efficiency.

SECTOR (ES)

Industry Services; Buildings; Residential

MEASURES FOR ACTION
To encourage R & I in the field of energy efficiency, the following action measures are envisaged:

2.6.1. Encouraging Research and Innovation in Energy Efficiency

Promote energy efficiency projects in new residential buildings and thermal and energy rehabilitation (encourage the uptake of sustainable solutions, local resources, innovative materials), solutions and strategies for the integration of renewable energy systems, storage and management of consumption and information. [Scheduled date: 2020-2030]

2.6.2. Promote links with national, regional and European R & I strategies

The national and regional smart specialisation strategies (S3) and the FCT RTD Thematic Agendas aim to mobilise experts from R & D institutions, companies and public entities in identifying challenges and opportunities at national scientific and technological system level in a medium and long term perspective, contributing to the development of R & I addressing problems or needs in different sectors of society. This link extends to Collaborative Laboratories, as they aim to implement the research and innovation agendas. It is important to ensure alignment with European strategies in this area. In this context, the action could explore synergies with European R & I funding instruments in the field of energy efficiency in buildings, such as the Built4People European Partnership under Horizon Europe. [Scheduled date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS
Decarbonisation; Energy Efficiency; I & I & C
KEY INSTRUMENTS
n.a.
SOURCES OF FUNDING
FEE; FCT; Community funds; PRR
ENTITY RESPONSIBLE
MECI; GRA; GRM; DGEG; LNEG; IAPMEI; DGEG; APA; Environmental Fund

LINE OF ACTION

3.8. Encourage R & I in renewable energy, storage, hydrogen, advanced biofuels and other 100 % renewable fuels

DESCRIPTION
The aim is to support the development of technologies for the development of new solutions for the exploitation of renewable energy sources and to support the participation of national companies and bodies in research and innovation programmes contributing to the promotion of renewable energy.

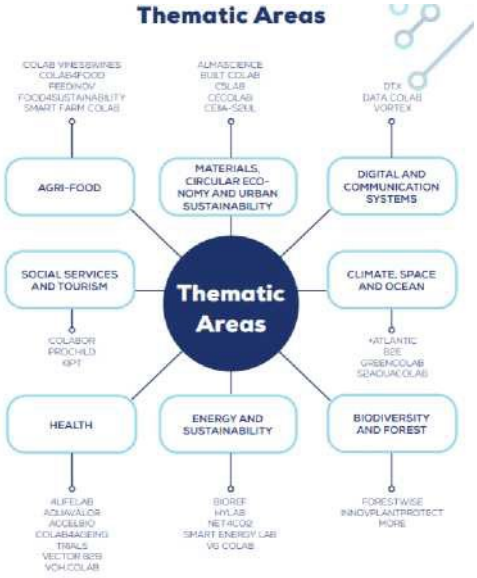
SECTOR (ES)
Energy; Transportation

MEASURES FOR ACTION
To incentivise R & I in renewable energy, storage, hydrogen, advanced biofuels and other 100 % renewable fuels, the following action measures are envisaged:

3.8.1. Promote links with national and regional R & I strategies, Thematic Agendas for Research and Innovation of the Foundation for Science and Technology

The National and Regional Smart Specialisation Strategies (S3) and the TCF Agendas aim to mobilise experts from R & I institutions, companies and public entities in identifying challenges and opportunities at national science and technology system level in a medium and long term perspective, contributing to the development of R & I addressing problems or needs of different sectors of society. To support R & I projects that contribute to the promotion of renewable energy, the following Agendas should be highlighted: Sustainable Energy Systems and Urban Science and Cities for the Future. This link extends to Collaborative Laboratories, as they aim to implement the research and innovation agendas.

- Thematic Agendas: A large majority has been achieved (with the exception of the sustainable energy systems agenda).
- Collaborative Laboratories (related/online to what is defined in Action Measure 1.9.2).:



(In: https-//www.ani.pt/media/7080/en_brochura_colab_2022.pdf)

It is important to ensure alignment with European strategies in this area. In this context, the action could explore synergies with European R & I funding instruments, such as the Clean Hydrogen Joint Undertaking and Batteries4Europe European Partnerships under Horizon Europe.

[Scheduled date: 2020-2030]

3.8.2. Promote national R & I programmes in support of technological development

Among the programmes to be developed, focus on: Pre-competitive low-carbon technologies such as Solar Concentrated (CSP), Profunded Geothermal Energy and Ocean Energy such as the Only; floating wind and floating solar Photovoltaic; Energy storage; Hydrogen as an energy carrier; solar thermal, heat pumps, grids and STL, in line with the NZIA Regulation; Renewable fuels and bioenergy; Sustainable transport; Renewable Energy Conversion Technologies; Improving Performance, Cost Reduction, New Materials and Optimisation of O & M.

- Recovery and Resilience Plan – Component 5 (PRR-C5): Mobilisation Agendas and Green Agendas for Business Innovation; Coordination: IAPMEI (MEM); 53 project proposals pre-selected; total investment: EUR 7 675.19 MILLION; investment in R &D; EUR 2 939.72 MILLION. Specifically in the fields of 'Energy' and 'Production technologies and product industries', which involved different promoters operating in the energy sector, the investment represented 27 % and 25 % respectively of the total.

- Recovery and Resilience Plan – Component 11 (PRR-C11): Support for Decarbonisation in Industry; Coordination: IAPMEI (MEM); It involved a 1th call with a support volume of EUR 965 million, with EUR 715 million contracted.

- Recovery and Resilience Plan – Component 13 (PRR-C13): Support for Residential Buildings; Coordination: IAPMEI (MEM); Contracts concluded for a total of EUR 610 million.

- Recovery and Resilience Plan – Component 14 (PRR-C14): Hydrogen production and other renewable gases; Coordination: Environmental Fund; involved a 1th call with a support volume of EUR 102 million; the top 25 projects supported.

- Portugal 2020 – In the framework of the Partnership Agreement between Portugal and the European Commission PT2020, around EUR 160 million of funds were approved to support more than 180 projects with an eligible investment of EUR 272 million and 390 entities in areas of particular interest for the PNEC2030, including renewable energy, decarbonisation, greenhouse gas emissions reduction, energy transition, bioenergy, circular economy, sustainable mobility, among others. In detail, EUR 100.2 million of funds were approved to support 304 companies participating in more than 166 different projects, EUR 34.9 million of funds to support 30 higher education institutions, EUR 21.2 million of funds to support 76 CTI/CoLAB and more than EUR 7 million to support other entities (including associations, private non-profit institution, state laboratories, etc.).

Projects will also be promoted to develop studies to characterise the potential of exploiting and integrating renewable energy into the urban environment, low-carbon solutions, strategies and technologies at different scales (building, neighbourhood, city, region) and for various typologies.

Measures should also be promoted to support:

-) The development of C & T – supported by life-cycle strategy (from raw material to end-of-life management), and the competitiveness of value chains associated with 'Net-Zero' strategic technologies (under Delegated Regulation 'NZIA' – (EU) 2024/1735 of 13 June), in the following areas: Electrolysers, gasifiers; Wind turbines/foundations (onshore; offshore); Solar photovoltaic panels; RFNBO fuels; Alternative fuels; Capture and storage of CO_2.
-) The protection of **industrial property** and innovation in the areas defined above. In the period 2020-2022, the number of patent applications submitted to INPI may have a large margin for progression, taking into account the applications registered in 5 areas, as reported in 'ReportENER'.

[Scheduled date: 2020-2030]

3.8.3. Promote a collaborative laboratory for renewable gases.

In the area of renewable gases, Portugal is active both for hydrogen and biomethane. In this context, the creation of two Collaborative Laboratories was promoted; HyLab in the area of hydrogen and BIBERF active in the area of biomethane.

Aiming to create a world-leading Research, Development and Innovation (R & D + I) cluster with a strategic agenda focusing on enhancing hydrogen competitiveness and creating new products and services, the HyLab Green Hydrogen Collaborative Laboratory was set up in 2021 and will foster innovation by addressing the relevant components of the supply chain to enable a hydrogen-driven economy and promote the creation of skilled and value-added jobs.

HyLab is a private-law association consisting of national and international R & D institutes, universities, industrial companies, small and medium-sized enterprises (SMEs), start-ups and hydrogen-related technology manufacturing industries. This comprehensiveness of the value chain and the experience of each partner increases the concentration of efforts and resources to help national efforts in the area of hydrogen to enter a global market of enormous competitiveness.

As there is high productive potential, there is a clear and urgent need to set up an entity dedicated to the promotion of biomethane in order to actively support, investigate and develop the biomethane *cluster* in Portugal, both at the level of *brownfield*, *greenfield*, or consultancy and R & D projects. Therefore, enterprises in the sector, research centres and universities will be involved in a collaborative laboratory that contributes to the creation of national scientific and technological knowledge that promotes the specialisation of the Portuguese economy in this segment of great economic potential and technological value.

In particular, CoLAB BI-F – the Collaborative Laboratory for Biorrefineries – is a private, non-profit association whose main objective is the valorisation and transfer of scientific knowledge, technologies and innovation in the development of biorefineries. BI-F (R & I) research and innovation practices point to the development of a variety of technological activities considered essential to promote the implementation of advanced biorefineries as well as to improve the competitiveness of the biorefinery sector and contribute to a low carbon economy. These activities aim to generate new value chains, create jobs and boost the bioeconomy through an integrated biorefinery approach. [Scheduled date: 2020-2025]

3.8.4. Promote the training of specialised technicians

The development of activities associated with renewable energy, storage, hydrogen, biogas and biomethane, synthetic gas, advanced biofuels and other 100 % renewable fuels will require the provision of specialised training needs covering various levels of training and, therefore, in partnership with education and vocational training authorities, training needs should be identified on the basis of expectations for the development of the sector. [Scheduled date: 2020-2025]

3.8.5. Promoting links between research centres and between them and industry in the framework of an integrated technological development policy – New measure

Ensure an observatory of R & Iactivities in renewable energy, storage, hydrogen, advanced biofuels and other 100 % renewable fuels, and their socio-economic and environmental impacts.

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; I & I & C

KEY INSTRUMENTS

PAESC-RAM;

SOURCES OF FUNDING

FCT; Horizon Europe; Innovation Fund; The Structural Funds; InnovFin Energy Demo Projects; PRR

ENTITY RESPONSIBLE

MECI; GRM; GRA; GRM; EEM

LINE OF ACTION

6.8. Promote R & I projects supporting sustainable agricultural and forestry management

DESCRIPTION
Support the development of resource efficient and low-carbon technologies, processes, practices, products and services in the agricultural and forestry sector and promote the collection of more and better basic information enabling better knowledge and management of the country's agroforestry territory.
SECTOR (ES)
Agriculture; Forests; Circular Economy
MEASURES FOR ACTION
To promote R & I projects supporting sustainable agroforestry management, the following action measures are envisaged:

6.8.1. Promote links with national and regional R & I strategies, Thematic Agendas for Research and Innovation of the Foundation for Science and Technology

The national and regional Smart Specialisation Strategies (SI3) and the TCF Agendas aim to mobilise experts from R & I institutions, companies and public entities in identifying challenges and opportunities at national science and technology system level in a medium and long-term perspective, contributing to the development of R & I that addresses problems or needs of different sectors of society. To support R & I projects contributing to the decarbonisation of the agricultural and forestry sector, the Agro-Food, Forestry and Biodiversity Agenda should be highlighted. This link extends to Collaborative Laboratories, as they aim to implement the research and innovation agendas. [Scheduled date: 2020-2030]

6.8.2. Systematically collect, process and make available information from the agricultural and forestry sector

The lack of information on some key aspects is recognised, which increases uncertainties and risks and makes it difficult to develop and implement policies for the sector and to monitor and evaluate them. In a globalised world, quality information is a process that creates a key value for the development and competitiveness of any sector, and there is a need for strong investment in production-availability and use of information. [Scheduled date: 2020-2030]

6.8.3. Implement a permanent system of National Forest Inventory

The forest inventory is one of the main sources of information for monitoring sequestration and GHG emissions, but also the information base for informed forest policies, and should therefore migrate to a permanent system that allows frequent updates, with close monitoring not possible at present every 10 years. [Scheduled date: 2020-2030]

6.8.4. Implement a system for updating land use and land use change – Measure achieved

A mapping system to track land use developments and identify key land-use change dynamics is one of the key components for proper monitoring and calculation of sequestration and emissions, but it is also an information base for informed spatial planning policies and targeted and effective monitoring. [Date: 2022]

6.8.5. Improve information on structure and ownership of ownership

The implementation of agricultural and forestry policies, including incentive and penalty systems, needs information about the owners and size of plots of land, so it is crucial to create and improve information, particularly in those areas of the country where it is missing or deeply outdated. It is necessary to promote the extension of the simplified register to the entire national territory, the updating and vectoring of the geometric register, and the rapid updating of the land register information whenever the ownership or size of the property changes. [Scheduled date: 2020-2030]

6.8.6. Developing innovation and agricultural and forestry research

Promote the implementation of the Innovation Agenda for Agriculture 2020-2030 (Terra Futura), approved by Resolution of the Council of Ministers No 86/2020, in the most mitigation components. Strengthen the horizontal and vertical integration of the sectors and sub-sectors by promoting the link between industries, research and production. The production process and funding of research, development and demonstration should increase the capacity of agricultural and forestry actors to influence the topics investigated and thus respond more effectively to their needs. It is therefore necessary to continue the development of R & I & D lines aimed at improving agricultural practices and forest stand management and exploitation (including through genetic improvement, forestry techniques/models, experimentation of new species, biotic and abiotic agents, invasive), especially in the context of adaptation to climate change, as well as those that can lead to innovation and diversification of uses of woody and non-woody products through a commitment to advanced technologies, new production technologies in highly efficient processes.

These lines should be supported by research, experimental development, extension and innovation programmes, which take

advantage of and guide the various instruments available at EU and national level. PEPAC support to Operational Innovation Groups, support from the national CAP Network for activities to build and boost agricultural demonstration networks (Agridem Network), technical visits between national producers and from several MS, activities connecting actors of the National Agricultural Knowledge and Innovation System (AKIS National) to combine organisational and knowledge flows between people, organisations and institutions that use and produce knowledge for the agricultural and related fields. The Competence Centres and Collaborative Laboratories should also be noted. Component 5 – Business Capitalisation and Innovation, as part of the Resilience Dimension of the RRP, supports a number of projects targeting climate change mitigation and adaptation. Component 5 – Business Capitalisation and Innovation, as part of the Resilience Dimension of the RRP, promotes the reduction of GHG emissions in the agricultural sector, as well as the increase of carbon sequestration in soil by using digital technologies for precision management, including fertilisers, water and energy, exploiting the potential of remote and proximity detection (sensors) and launching an enabling programme in agriculture 4.0 and digital literacy. [Scheduled date: 2020-2030]

6.8.7. Encourage Research and Innovation in the field of decarbonisation and energy efficiency of the agro-forestry sector
Promote R & I projects to develop tools for monitoring the effects of good agricultural and forestry practices, using digital technologies (remote detection, satellites, sensors, models, software, etc.) and projects to develop/adapt cultural practices for CA mitigation (carbon sequestration, emission reduction). [Scheduled date: 2020-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP
Decarbonisation; Energy Efficiency; I & I & C

KEY INSTRUMENTS
RNC2050; ENF; RDP 2020; PEPAC; PNPOT

SOURCES OF FUNDING
FCT; EAGF; EAFRD; ERDF; Horizon Europe; PRR

ENTITY RESPONSIBLE
MECI; MAP; SAM; GRA; GRM;

Activity HEADING – New line of action

6.9. PROMOTING A LOW CARBON DIET

DESCRIPTION
Promoting a diversified diet, including reducing the consumption of animal proteins and promoting the consumption of plant-based protein alternatives, not only reduces GHG emissions from the agricultural sector, but also promotes healthier nutrition.

SECTOR (ES)
Agriculture; Health; Circular Economy

MEASURES FOR ACTION
To promote a low carbon diet, the following action measures are envisaged:

6.9.1. Create a national strategy to promote the consumption of plant protein – New measure

This strategy should include concrete measures to encourage the production and consumption of plant protein, including leguminous crops, as an integrative approach to ensure protein crop self-sufficiency and food sovereignty.
It should also include measures to promote the training and strengthening of the supply of plant-based meals in public canteens and promote dissemination campaigns about the benefits of plant protein consumption.
[Scheduled date: 2024-2030]

6.9.2. Promoting the implementation of short agri-food chains – New measure

Rethinking the food chain involves not only changing the diet, reducing food waste and changing production methods, but also replicating good examples of marketing in short agri-food circuits, which reduce energy consumption and pollutant emissions due to lower packaging, transport and cooling needs.
[Scheduled date: 2024-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP
Decarbonisation;

KEY INSTRUMENTS
PEPAC

SOURCES OF FUNDING

ENTITY RESPONSIBLE
MAP; MS

LINE OF ACTION

7.5. Promote R & I projects supporting an innovative and competitive low-carbon industry

DESCRIPTION

Support the development of research and innovation for industry and manufacturing in view of the development and uptake of advanced technology materials and processes.

SECTOR (ES)

Energy; Industry

MEASURES FOR ACTION

To promote R & I projects supporting the transition to a more innovative, competitive and using clean and/or low-carbon energy industry, the following action measure is foreseen:

7.5.1. Promote links with national and regional R & I strategies and Thematic Agendas for Research and Innovation of the Foundation for Science and Technology

The national and regional Smart Specialisation Strategies (SI3) and the TCF Agendas aim to mobilise experts from R & D institutions, companies and public entities in identifying challenges and opportunities at national science and technology system level in a medium and long-term perspective, contributing to the development of R & I that addresses problems or needs of different sectors of society. To support R & I projects contributing to the decarbonisation of the industrial sector, emphasis should be placed on the Industry and Manufacturing Agenda, which focuses on the following topics: Advanced materials; Advanced technological processes; Efficient management of resources and processes; Robotics and intelligent manufacturing systems; Development of collaborative networks and human-centric industrial production. This link extends to Collaborative Laboratories, as they aim to implement the research and innovation agendas. The need to update the Industry and Manufacturing Agenda, the latest version of which is from 2019, will be assessed to reflect the current context, aligning it with European objectives in the light of the Green Deal Industrial Plan and the future Green Industrial Deal, and aiming at strengthening national production capacity.

[Scheduled date: 2020-2030]

CONTRIBUTION TO THE DIMENSIONS OF THE NECP

Decarbonisation; Energy Efficiency; I & I & C

KEY INSTRUMENTS

RNC2050

SOURCES OF FUNDING

PRR

ENTITY RESPONSIBLE

MECI; GRA; GRM; SAM; ME; IAPMEI

Activity HEADING – New line of action

1.13 PROMOTING AND HARNESSING NATIONAL MINERAL RESOURCE POTENTIAL FOR THE ENERGY TRANSITION

DESCRIPTION

Portugal has a complex and diverse geology, which gives it huge potential in metallic and non-metallic mineral resources and is able to make a positive contribution to the objectives of the NECP 2030 and to securing supplies of raw materials in Europe and can thus significantly leverage the economy and the energy transition. Mineral resources form the basis of all value chains, highlighting the energy transition, renewable energy, hydrogen, electrification and zero-emission technologies.

It should also be noted that the European Critical Raw Materials Act (EUCPMR) has been published, the key objective of which is to establish a framework to ensure a secure and sustainable supply of mineral raw materials needed by technologies for the energy transition and for the defence and aerospace sectors, among others. It aims to strengthen the EU's capacities on critical raw materials along all stages of the value chain and increase the EU's resilience by reducing dependencies, increasing readiness and promoting the sustainability and circularity of the supply chain.

SECTOR (ES)

Energy; Mineral resources; Industry

MEASURES FOR ACTION

To promote the disclosure and exploitation of the national mineral resource potential for the energy transition, together with the provisions of the EUCPMR legislative act, the following action measures are foreseen:

1.13.1. Develop national mineral resource prospection programmes – New measure

Portugal stands out, despite its size, because it has considerable resources in its territory in various mineral resources currently under exploitation. The high potential for other events with economic value of those substances, as well as resources in critical and strategic mineral raw materials, is also known. Increasing knowledge of the occurrence of mineral resources on national territory could contribute to business investment in the disclosure of mineral deposits of economic value, helping to support the critical raw material requirements required for the energy transition, provided that the environmental sustainability of these activities is properly assessed.

This measure also complies with the provisions of the EUCPN, Article 19 of which provides for the drawing up of national survey programmes, the implementation of which will make it possible to increase knowledge of the national geological potential, and in particular its mineral occurrences, by making it possible, through the application of various survey methodologies, to draw up predictive maps with demarcation of target areas for the development of research work (Dedicated date: 2024-2030]

1.13.2. Preparing the National Strategy for Geological Resources – New Measure

Regardless of the existing knowledge of the national territory's potential for mineral resources, in particular critical raw materials, their possible exploitation depends on a wide range of constraints, the conditions for access to the territory play a key role.

The drawing up of the National Geological Resources Strategy, including a sectoral programme, is provided for under Article 73 of Decree-Law No 30/2021 of 7 May and follows on from the measure for drawing up a sectoral plan for mineral resources previously proposed in Law No 99 of 5 September 2019 (National Programme for Regional Planning Policy). The importance of mineral resources for the country justifies its management being underpinned by a national strategy which ensures, inter alia, access to the territory for this sector and develops in a competitive manner, with the greatest possible economic return to the country, in line with the planning of raw material supply needs and, at the same time, in conjunction with other public policies, in particular those promoting the energy transition, and with national strategic instruments particularly relevant to sustainable development, such as the NECP 2030 and RNC 2050 and the PNPOT. It is in this context that the National Geological Resources Strategy ensures that the activity of revealing and exploiting mineral resources can only be carried out in accordance with strict principles of environmental sustainability. [Scheduled date: 2024-2030]

1.13.3. Creating an industrial and knowledge development cluster – New measure

The possibility for the transformation of the ore to take place on national territory, ensures a substantial increase in the value of the finished product and makes a significant contribution to the development of new technologies and/or an industrial research and development cluster, with the potential to stimulate the vocational or advanced training of local populations, attract skilled workers and high added value enterprises to these territories, thereby enhancing the effectiveness of public policies such as inland development, employment, development and research. [Scheduled date: 2024-2030]

1.13.4. Know the potential of lithium-containing mineral resources – New measure

The national potential for lithium mineral resources, which is well described in the report of the Litium Working Group, and the objective of promoting investments that enhance their exploitation and valorisation, justify the definition of an integrated strategy involving the whole sector, translated into strategic guidelines, in accordance with the provisions of MCR 11/2018 of 31 January. In this context, the potential areas on the national territory have been defined, which have been subject to a Strategic Environmental Assessment procedure, resulting in an Environmental Report and 6 potential areas for the prospection and exploration of lithium-containing mineral resources. These areas will be the subject of an international call for tenders with the aim of promoting prospection and exploration activities to properly determine the stocks of mineral deposits with a view to their exploitation and valorisation. [Scheduled date: 2024-2030]

1.13.5. Uncovering and harnessing critical mineral resources – New measure

The national potential of critical mineral resources in Portugal is very relevant and it is therefore appropriate and appropriate to further promote the development of actions for the disclosure and exploitation of mineral resources which are indispensable for the energy transition and to complement the various industrial sectors downstream of the value chain.

In addition to the national prospection and exploration programmes already provided for in the REMPC at regional and national level, it is also important to implement prospection and exploration projects at local level, which will be instrumental in detecting mineral deposits with potential for exploitation and processing.

In addition, through the so-called "Strategic Projects", as provided for in the EUCPN, it is envisaged to boost not only projects for the exploitation of critical mineral resources in Portugal, but also processing/processing and recycling of raw materials.

[Scheduled date: 2024-2030]

1.13.6. Monitoring of the internal market and mineral raw materials value chains – New measure

In line with the EUCPMR, it is envisaged to monitor the national internal market for raw materials and their value chains, as well as to provide information to the European Commission to carry out stress tests of these value chains in the Member States in order to foster their resilience in Europe. [Scheduled date: 20242030].

1.13.7. Promoting circularity through national circularity programmes – New measure

As set out in the EUCPN, the development of additional national circularity programmes is foreseen, with regard to critical mineral resources, the recovery of critical mineral resources from extractive waste, through the "Strategic Projects" and other actions to be developed by concessionaires, and the establishment of a national database of closed or abandoned waste facilities containing critical raw materials for recovery potential. [Scheduled date: 2024-2030].

1.13.8. Streamlining permitting procedures – New measure

Streamlining permitting procedures for 'Strategic Projects', as set out in the EUCPMR, by indicating single point (s) of contact and by processing the entire online permitting process *on dedicated web platform*. [Scheduled date: 2024-2026].

CONTRIBUTION TO THE DIMENSIONS OF THE NECP
Decarbonisation; Energy Security and R & I & C
KEY INSTRUMENTS
National Geological Resources Strategy and European Critical Raw Materials Regulation.
SOURCES OF FUNDING
PRR
ENTITY RESPONSIBLE
SAM; ME; DGEG; LNEG; IAPMEI; AICEP; NSA; APA; EDM

II. Cooperation with other Member States in this area, including information on how the SET Plan objectives and policies are being translated to a national context

ANI (MECI/ME) is responsible for the monitoring of the Horizon Europe Framework Programme, namely Pillars II (Global Challenges and Competitiveness of European Industry) and III (Innovative Europe). Horizon Europ47 isthe main R & I funding programme to support the European strategy and, under Pillar II, dedicated a budget of EUR 15.3 million for Cluster 5 – Climate, Energy and Mobility for the period 2021-2027. In the first three years of the European programme (2021-2023), around EUR 391 billion was allocated to climate areas and EUR 2 371 million to energy under Cluster 5.

The main objective of Cluster 5 – Climate, Energy and Mobility is to contribute to a just transition towards climate neutrality and build resilience in the European Union (EU) by 2050. This transition implies the development and implementation of low-emission technologies and systems in the energy and mobility sectors by 2050. Having regard to the latest findings of the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), actions will support the implementation of the Paris Agreement on a science-based basis and contribute to the EU's policy priorities in the areas of climate, energy and mobility (e.g. European Climate Law, European Green Deal, Fitfor55, REPowerEU, EU Strategy on Adaptation to Climate Change, European Skills Agenda, Europe's Digital Decade, Digitalisation of the Energy System – EU Action Plan)

circular Economy Action Plan, Zero Pollution Action Plan, Sustainable and Smart Mobility Strategy, Net-Zero Industry Act, Critical Raw Materials Act and Long-term Vision for EU Rural Areas).

Given the scale of the challenges addressed by Cluster 5, as well as the multitude of complementary initiatives at various levels, it will be crucial to explore synergies between relevant partnerships, clusters, missions and pillars of Horizon Europe and also other EU programmes and activities at national level (e.g. through the SET Plan) along the value chain.

ANI and FCT (MECI) monitor the implementation of the European Research Area (ERA) Policy Agenda. To this end, 2022 actions of the European Research Area (ERA) for strengthening and working together between Member States

47https-//ec.europa.eu/info/designing-next-research-and-innovation-framework-programme/what-shapes-next-framework- programme en

and the Commission have been defined in 18-2024. The ERA actions most relevant to climate and energy are:

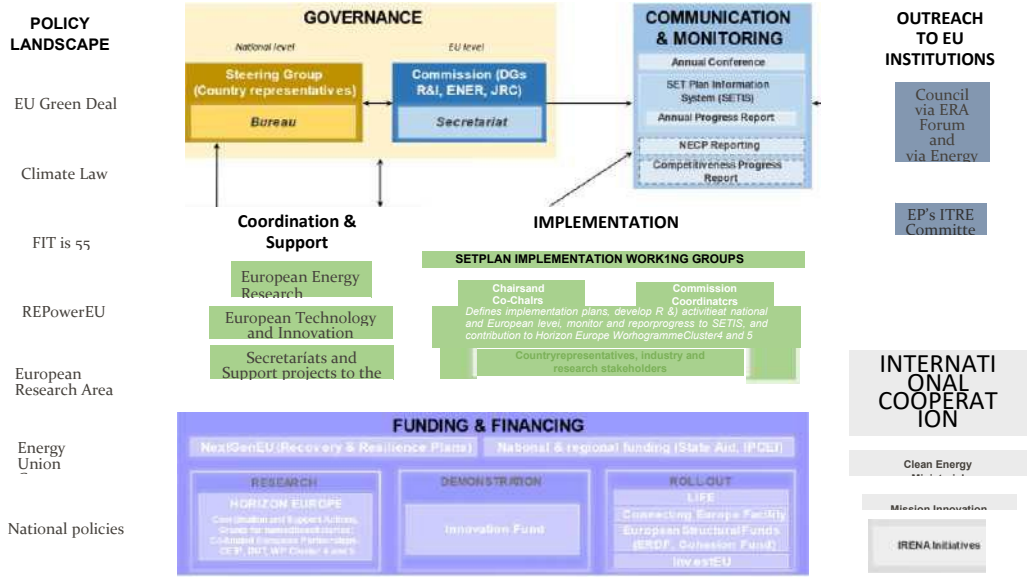
- Action 10. Elevating EU R & I missions and partnerships to ERA crucial contributors: this action boosts a discussion forum dedicated to European Partnerships – 'Partnership Knowledge Hub' (PKH), where ANI and FCT represent Portugal. This action also promotes a 'Mutual Learning Exercise' dedicated to European Missions, in which ANI is involved.
- Action 11. An ERA for green transformation: this action includes the work of the SET Plan, in which ANI and DGEG are involved, as well as the creation of a renewable hydrogen pilot ('ERA Pilot on green hydrogen'), with the participation of DGEG and LNEG.
- Action 12. Accelerating the green/digital transition of Europe's main industrial ecosystems: under this action DGAE (ME) and ANI participated in the 'Mutual Learning Exercise' promoted by the European Commission in 'Integrated low-carbon technologies roadmap and sector specific programmes for industrial decarbonisation'. This action also provides for the creation of a working group dedicated to technology infrastructure, to which ANI contributed with the publication of the mapping of technological infrastructure in Portugal, which identified more than a hundred entities organised according to different typologies. In addition, a mapping of infrastructure, skills and results is being developed, focusing on the networks of Collaborative Laboratories (CoLabs) and Technology and Innovation Centres (STI), with a focus on the areas of intervention of ENEI 2030.

Currently, the European Commission and Member States and *stakeholder* organisations are discussing the ERA Policy Agenda 2025-27 where decarbonisation remains one of the focal points.

The European R & I Strategy for Energy is also supported by the *European Strategic Energy Technology Plan (SET-Plan*)48, which is the forum for discussion and support for the development of low-carbon energy technologies in the EU and associated countries. The SET Plan coordinates national research and innovation activities, supports cooperation between stakeholders and monitors progress towards the European Green Deal on energy R & D for the time horizon 2020-2030.

As a Member State and member of the SET Plan, through a combined effort between the DGEG (MAE) and ANI (MCTES/MEM), Portugal actively participates at different levels, namely:

a) Cluster 5 Programme Committee for Horizon Europe Climate, Energy and Mobility, as well as the Thematic European Partnerships (Clean Energy Transition, Driving Urban Transition, Batteries4Europe, Clean Hydrogen Joint Undertaking and Built4People) and the European Missions (including the Mission on Adaptation to Climate Change, Smart and Climate-Neutral Cities, Soil Health and Food and the Mission Healthy Oceans, Seas, Coastal and Inland Waters, where it represents the country in discussions with the European Commission and the other Member States and Associated Countries to prioritise R & I funding.
b) The implementation of the IWG (*Implementation Working Groups*), where collaboration between expert groups in the framework of implementation plans (IPS) is developed;
c) In two governance bodies: the Steering Group *and* the Bureau.



Participation and cooperation within the SET Plan has proven to be very important at national level, as well as in European collaboration and cooperation to combine efforts between teams for common objectives in particular in the development of C & T in renewable energy generation, the production of renewable energy carriers, and energy efficiency in end-use sectors to the benefit of meeting the ambitious targets by 2030, as well as in the formation of value chains in the different energy sub-sectors where Portugal has a strategy and competitiveness factors.

III. Financing measures in this area at national level, including EU support and the use of EU funds

See paragraph 5.3 (iii).

4. STATE OF PLAY OF EXISTING POLICIES AND MEASURES AND PROJECTIONS

The strategic objectives of the NECP are to ensure a pathway to reduce national GHG emissions in order to achieve

48https-//ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan#

the 2045 carbon neutrality objective by promoting the energy transition through a strong commitment to renewable energy and energy efficiency, as well as the integration of mitigation objectives into sectoral policies (*mainstreaming*). However, while it is a priority to decarbonise the national economy, it should be stressed that alongside emission reductions, it will also be necessary to increase carbon sequestration in view of the commitment to neutrality, which translates into a neutral balance between GHG emissions and sequestration of these gases by different sinks – as set out in the Climate Law.

The scenarios analysed and the modelling carried out make it possible to confirm the existence of trajectories consistent with the country's objectives and to infer a set of guidelines and lines of action for sectoral policies contributing to the GHG emission reduction, renewable energy and energy efficiency targets set out in this plan.

In this review of the NECP, further modelling of the national energy system has been carried out with a view to studying various scenarios of GHG emission reduction, renewable energy production, primary and final energy consumption in the economy, evolution of the energy mix and associated key technologies. This document provides results for an existing policy and measure scenario (WEM) and an additional policy and measures scenario (WAM).

The contribution of the remaining sectors has also been reviewed, notably with regard to projections of emissions from the waste sector, agriculture (non-energy component), and land use, land use change and forestry (LULUCF) activities, resulting in new scenarios reflecting existing and additional policies and measures, as well as the revision of the historical GHG emissions taking into account the methodological reviews carried out in the meantime under the National Emission Inventory in certain sectors.

This new modelling exercise was mainly supported by the Academy, namely the Faculty of Science and Technology of the NOVA University of Lisbon (FCT-NOVA/CENSE), the Instituto Superior de Agronomia (ISA) and Lasting Values, in this case through the study "Evolution of emissions from the waste and waste water sector" supported by POSEUR, and the collaboration of the LNEG should also be highlighted.

4.1. Projected evolution of main exogenous factors influencing energy system and GHG emission developments

i. Macroeconomic forecasts (GDP and population growth)

The narratives and the respective macroeconomic and demographic variables presented have been updated, taking into account the latest data available in terms of GDP and resident population, and in view of the relevant changes stemming from the effects of the COVID-19 pandemic and the economic crisis that has occurred.

The GDP projections used follow the best information available at the time, namely the (provisional) GDP value of 2021 according to data from the National Statistical Institute (INE) and projections of the state budget for 2022 and 2023. The state budget projections incorporate the impacts of inflation, monetary policy in the euro area and the conflict in Ukraine on the Portuguese economy. According to the Public Finance Council report of September 20249, as a small open economy, Portugal is particularly exposed to the economic consequences of the Russian invasion of Ukraine, which continue to manifest itself in the price of energy and food goods, as well as the adverse effects on inflation.

From 2025 onwards, the harmonised values recommended by the European Commission for this purpose have been considered in accordance with Part 2 of Annex I to Regulation (EU) 2018/1999 on the Governance of the Energy Union. These figures are based on GDP per capita of last Ageing[Repor t 53] and Eurostat population growth (EUROPOP2019). Based on these data, the GDP growth potential in the EU and the Euro area is assumed to be on average 1.3 % per year over the whole projection period, differing by MS, considering their specificities including the labour force in Portugal that is expected to decline taking into account population projections. The figures provided by the European Commission do not take into account the current effects of the war in Ukraine and

49 Available for consultation at: https-//www.cfp.pt/uploads/publicacoes_ficheiros/cfp-rel-8-2022.pdf

inflation, but it is the only available study with long-term projections thus justifying the decision on their use.

With regard to population growth, the figures recommended by the European Commission on population projections have also been used. The data are derived from Eurostat population projections EUROPOP2019 and include updated values for historical data (2020-2021) from the latest publication of Eurostat's demographic dataset.

Table 39 – Main assumptions used in the modelling of the national energy system (GDP and population)

	2020	2025	2030
GDP (rate of change)	0.4 % (' 15- '20)	3.1 % (' 20- '25)	0.8 % (' 25- '30)
Population (million)	10,29	10,27	10,13

ii. Sectoral changes expected to impact the energy system and GHG emissions

With regard to sectoral changes likely to have an impact on the energy system and GHG emissions, for the 2030 horizon, the structure of the GVA is considered to remain broadly unchanged, compared to the base year 2016, in the various industries concerned.

Nevertheless, economic growth is expected to be led by traditional industries, in a context of much greater integration of Portugal into international circuits, in line with what has been the case in recent years, and by some new services integrated into the global economy. However, as mentioned above, economic growth does not lead to significant changes in the production structure of goods, and logistics associated with the production, distribution and consumption of goods essentially retain the current characteristics.

Table 40 – Main assumptions used in the modelling of the national energy system (GVA)

	2020	2025	2030
GVA Construction and Public Works (% of total GVA)	4,7	4,2	
GVA Agriculture, Forestry and Fisheries (% of total GVA)	2,7	2,6	
GVA Extractive industry (% of total GVA)	0,3	0,3	
GVA Manufacturing (% of total GVA)	12,0	13,8	
GVA Services (% of total GVA)	65	78,8	

[53] available for consultation at: https-//economy-finance.ec.europa.eu/system/files/2021-10/ip148_en.pdf

Contrary to the WEM scenario, a significant restructuring of the national industrial fabric with the emergence of new mainly energy-related industries, notably green hydrogen, and a sharp growth of economic activities linked to digitalisation and data storage was considered in the WAM scenario (*With additional measures*). Although the impact of these projects on national growth and economic structure was not analysed, their demand for energy services was taken into account in the modelling exercise and is subsequently reflected in the increase in primary energy consumption and consequent influence on other components of the national energy system.

iii. Global energy trends, international fossil fuel prices, carbon price in the European Emissions Trading System (ETS)

As regards the value of CO_2 allowances, two approaches have been taken: I. up to 2025 the figures recommended by the European Commission for this purpose were considered; II. After that date, no upfront carbon price was imposed, resulting from a 'shadow price' generated by modelling when a compatible restriction was imposed as a -

55 % reduction in GHG emissions in 2030 compared to 2005, in order to meet national mitigation objectives and in line with carbon neutrality.

The past two years have seen a high degree of volatility in energy prices, largely driven by global instability linked to the war in Ukraine and the ongoing global economic recovery after the pandemic and its impact on supply chains. This will necessarily have to be reflected in the fossil-fuel import price projections, as well as the fact that the degree of uncertainty about future developments in international fuel prices in the coming years remains.

Table 41 – Main assumptions used in the modelling of the national energy system (Prices) [European Commission recommendations for reporting projections in 2023]

	2025	2030	2040
CO2 allowances (EUR/ton) [a, b]	80	— —	— —
Oil (EUR/GJ) [a]	12,4	13,9	15,8
Coal (EUR/GJ) [a]	4,1	4,0	3,8
Natural Gas (EUR/GJ) [a]	9,4	9,0	10,1

[a] Values made available in 2024 to Member States by the European Commission as part of the preparation of their Climate Energy Plans

[b] As Portugal incorporates the CO_2 tax through its petroleum product tax, a CO2 rate of $EUR_{78/t}$ was also considered in the non-ETS sectors in 2025. The value of the carbon levy in the ISP is recalculated each year on the basis of the values of the EU ETS allowances of the previous two years (Law No 71/2018, Article 92a).

iv. Technology cost developments

As regards the evolution of technological costs, a wide range of technologies and their investment costs, fixed and variable costs have been taken into account, according to the best information available at national, European and international level. Annex I shows the costs considered in modelling for the main technologies as well as their sources of information.

4.2. Dimension Decarbonisation

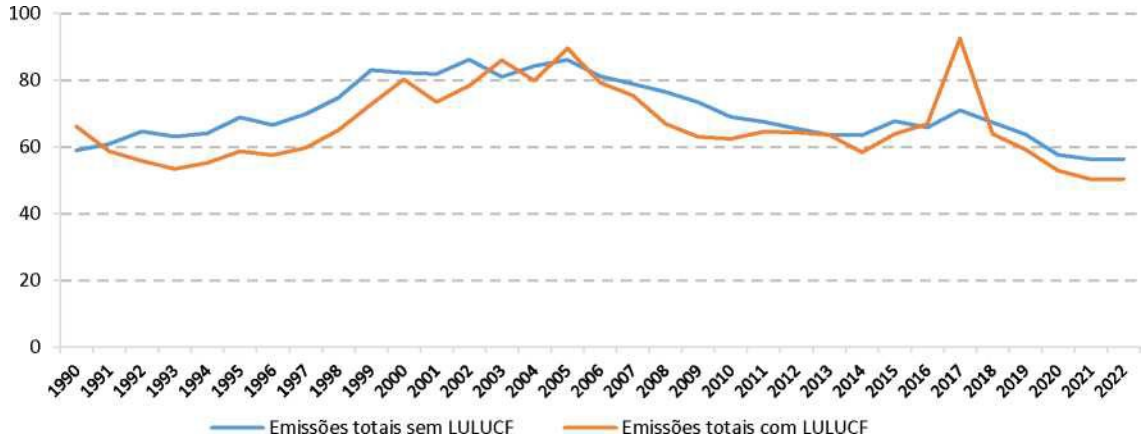
4.2.1. GHG emissions and removals

4.2.1.1. Total greenhouse gas emissions in Portugal

After rapid growth in GHG emissions during the 90s, Portugal reached its peak in national emissions in 2005, after which it has seen a significant and sustained decrease, consolidating a decarbonisation pathway for the national economy since then. In fact, 2005 saw an increase in emissions of around 46 % compared to 1990 levels. According to the latest update of the 2024 National Emissions Inventory (for the year 2022), GHG emissions, without accounting for LULUCF and no indirect emissions, are estimated at around 56.25 Mt CO_{2eq}, representing a decrease of 4.4 % compared to 1990 and an increase of 0.1 % compared to 2021.

Considering the LULUCF sector, total emissions in 2022 are estimated at 50.33 Mt CO_{2eq}, a decrease of 23.7 % compared to 1990 and an increase of 0.3 % compared to 2021.

Figure 24 – Evolution of national GHG emissions 1990-2022 (Mt CO_{2eq}), with no indirect emissions [Source: APA]



Under the European Effort Sharing Agreement to reduce emissions for 2013 and 2020, Portugal has set itself the objective of limiting the growth of its GHG emissions by + 1 % by 2020 (compared to 2005) for non-ETSsectors50, while annual emission limits were also set for the non-ETS sectors in that period. Total emissions in 2020 confirmed both the achievement of the national targets under the European Effort Sharing Agreement and the range of the target set in the National Climate Change Programme (PNAC 2020 – 2030) for 2020, in this case a reduction in national GHG emissions of between -18 % and -23 % compared to 2005 levels.

Non-ETS (non-ETS)50 sectors include emission sources such as: small industry; transport; residential sector and services; agriculture; waste.

The figure below reflects the evolution of national emissions between 1990 and 2022, identifying, from 2005 onwards, the contribution of the ETS and non-ETS sectors.

Figure 25 – Evolution of national GHG emissions (Mt CO_{2eq}) by ETS and non-ETS sector, with no indirect emissions (Source: APA]

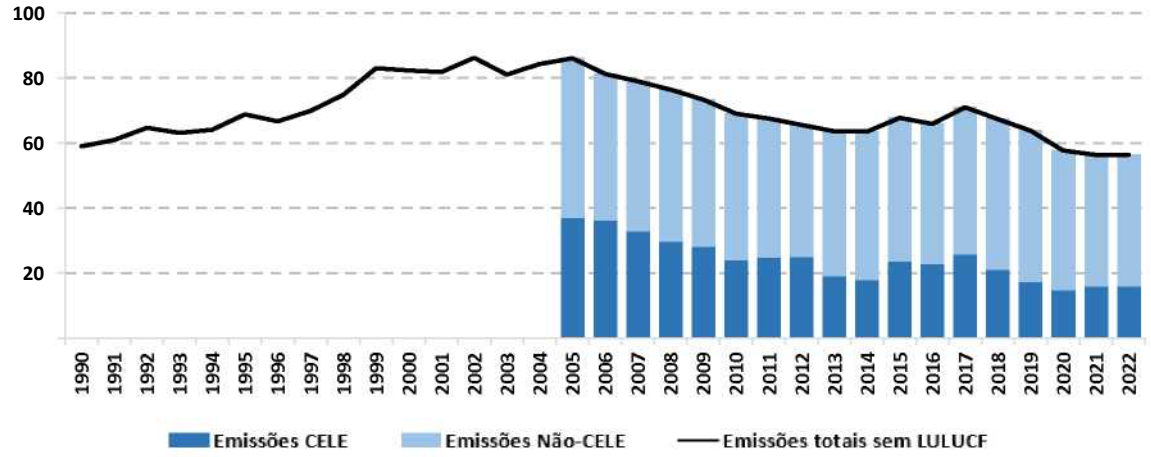
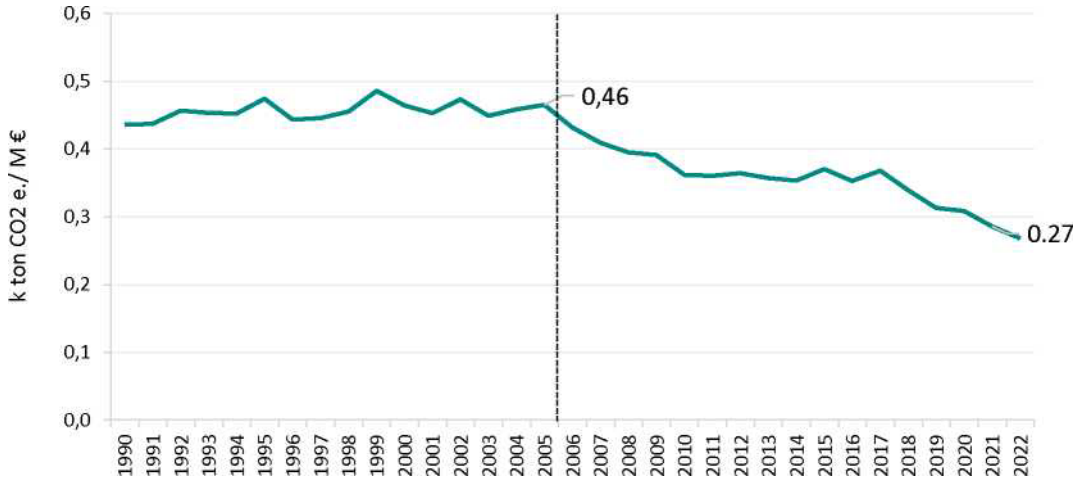


Figure 26 – Evolution of GHG emissions/GDP (kt CO_{2eq}/M EUR) [Source: APA;



An analysis of GHG emissions per unit of GDP shows that a decoupling process between GDP and emissions started in 2005, resulting from the decarbonisation of the economy, i.e. an economy with less carbon emitted per unit of wealth produced.

Several factors underpin this trend, such as the growth of less polluting energy sources such as natural gas (compared to coal), the construction of more efficient combined cycle plants and cogeneration units.

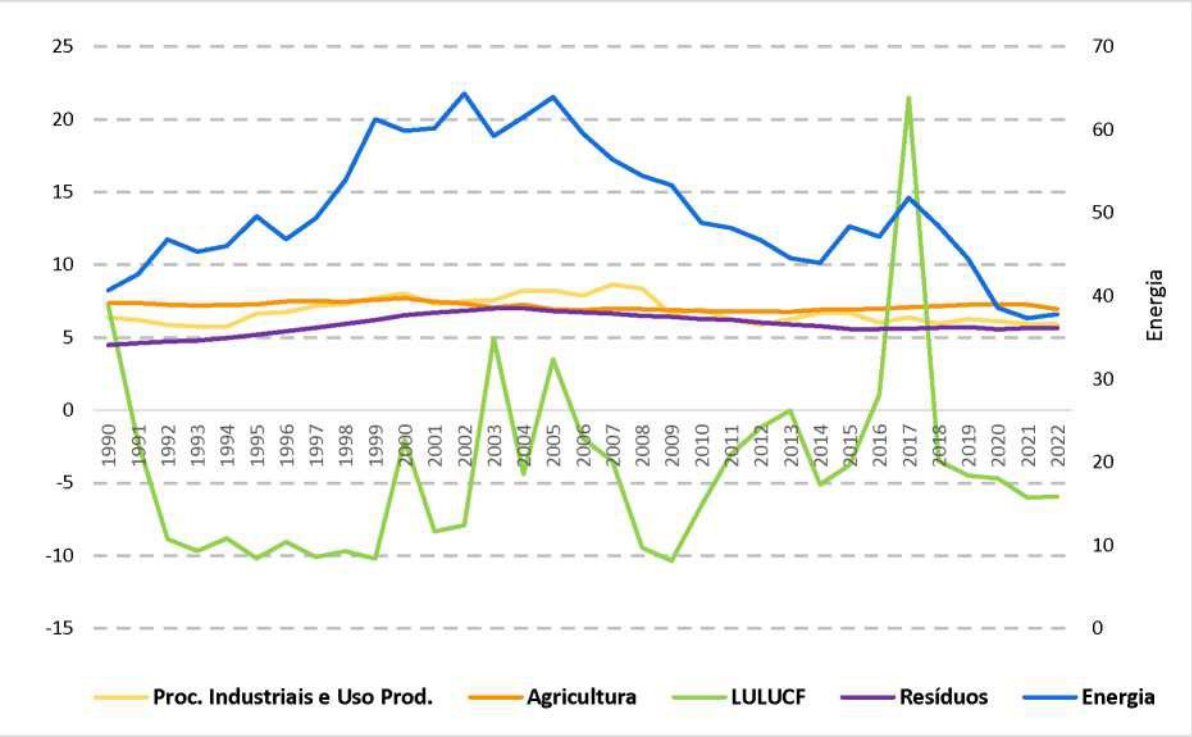
Other causes, such as the very significant growth of electricity produced from renewable energy sources (mainly wind and water, and more recently photovoltaic), and the implementation of energy efficiency measures are also to be identified. Improving efficiency in the transport sector (through the renovation of the car fleet) and in the housing and services sector (through energy certification of buildings and increasing the energy performance of their equipment, plus a recent trend of electrification of consumption), as well as the adoption of more efficient technologies in the industry sector, could also explain these trends.

The use of coal for electricity generation, which was significantly reduced after 2018 (-79 % in 2020 compared to

2018 and -55 % compared to 2019), and which ended definitively at the end of 2021, was another factor contributing to the decrease in carbon intensity.

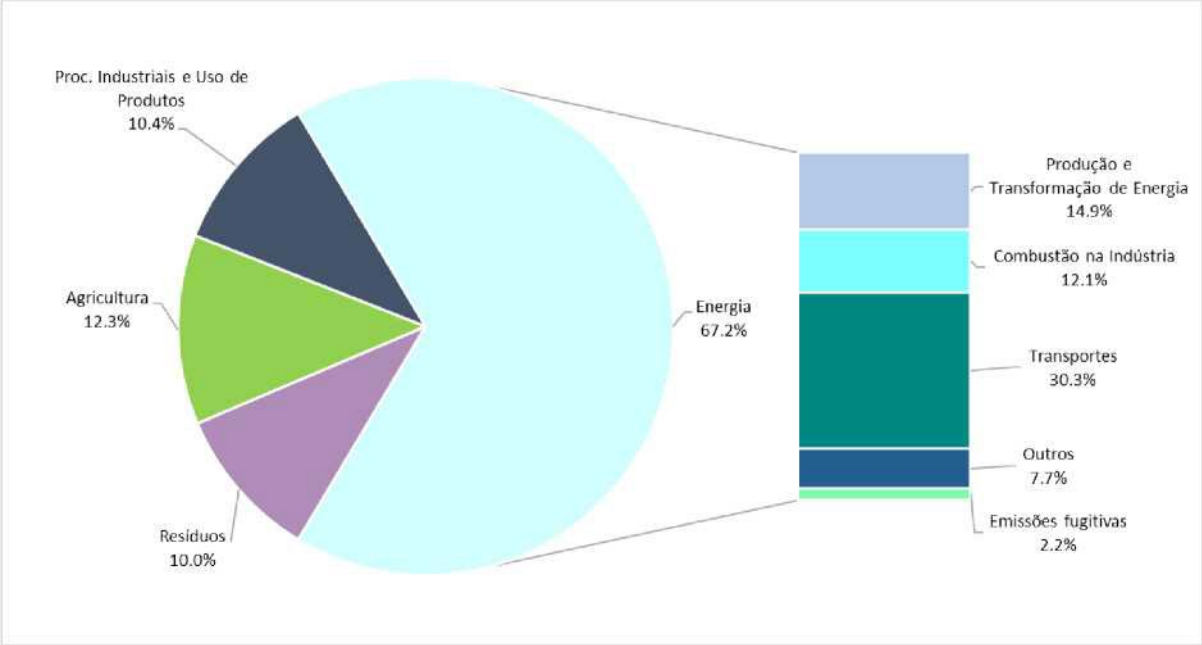
Public policies on climate change are now an integral part of a set of sectoral policies in Portugal. Indeed, in areas such as energy and industry covered by the ETS, the "carbon dimension" is part of the strategic and economic considerations of companies. In agriculture and forestry there is also a growing awareness of the important contribution that the sector can make in terms of GHG emissions mitigation, and the sink potential of some activities is seen as an economic, social and environmental value. In areas with major challenges such as transport, steps have been taken towards the decarbonisation of vehicle fleets and the network for electric mobility has been developed and electric vehicle support schemes have been introduced with the aim of enhancing incentives for electric vehicle penetration.

Figure 27 – Evolution of sectoral emissions 1990-2022 (Mt CO_{2eq}), with no indirect emissions [Source: APA]



The energysector, which includes transport, accounted for 67 % of national emissions in 2022, with an increase of 1.3 % compared to 2021. In this sector, transport and energy production are the most important sources accounting respectively for around 30 % and 15 % of total emissions.

Figure 28 – Sectoral CO_{2eq} emissions in 2022 [Source: APA]

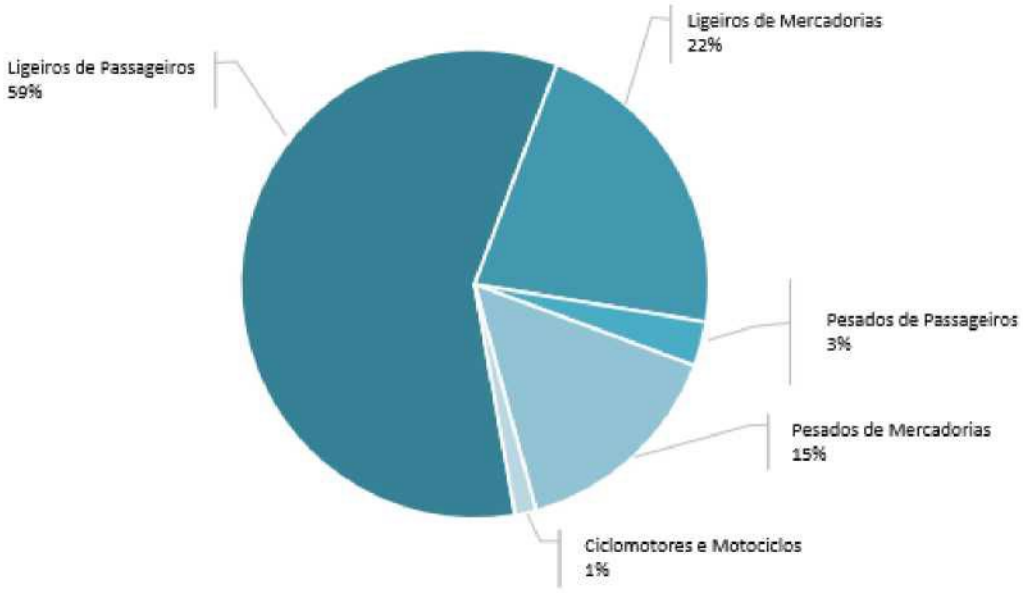


After the steady growth in emissions up to the early 2000s, followed by a stabilisation period, there was a decline in transport emissions after 2005, which is largely dominated by road traffic. After 2013, however, this trend reversed, with increased GHG emissions from transport only interrupted in 2020 due to the strong impact of COVID-19 response measures. Emissions from this sector have grown since then, but in 2022 they have not yet reached pre-pandemic values.

Figure 29 – Emissions from the transport sector 1990-2022 [Source: APA]

Light passenger transport accounts for the largest share of emissions in the road transport sector, which has remained almost constant in recent decades.

Figure 30 – Emissions from road transport by vehicle type in 2022 [Source: APA]



Combustion in industry, which accounts for around 12 % of national emissions, decreased by 10 % in 2022 compared to 2021. Fugitive emissions, which account for 2 % of total emissions in 2022, increase by 22 % compared to 2021.

The sectors of agriculture and industrial processes and product use (IPPU) account for around 12 % and 10 % of emissions respectively. Waste totalled 10 % of national emissions in 2022. Compared to 2021 agriculture varies by -4.2 %, IPPU by -0.9 % for waste of + 0.2 %.

For industrial processes, emissions increased until 2007 as a result of inter alia developments in the mineral and chemical industry. In the following years, emissions decreased significantly mainly due to the cessation of ammonia production in the country, with a decrease of approximately 8 % since 1990. On the other hand, the use of products as substitutes for ozone depleting substances (ODS) has become increasingly important in this sector, accounting for around 34 % of total emissions in 2022.

In this sector, it should be noted that a major methodological review was carried out in 2022 with regard to the estimation of emissions from the use of F-gases in stationary air conditioning systems.

The reduction of emissions from the waste sector from 2005 onwards is mainly linked to the entry into operation of a set of infrastructures for the biological treatment of municipal waste which had two opposite movements, but very different consequences in terms of GHG emissions evolution. On the one hand, the very substantial reduction of methane emissions in landfills (in the order of 25 % between 2005 and 2020, i.e. an absolute reduction of more than 1.3 Mt CO_2 e), as a result of the deviation of relevant amounts of bio-waste from landfills. On the other hand, the exponential increase in GHG emissions from biological treatment of municipal waste (above 350 % for the same period, however corresponding to less than 0.1 Mt $CO_2$and in terms of absolute increase), as well as incineration without energy recovery (growth approximately 40 %, although representing only around 0.02 Mt CO_2e).

As far as the waste water treatment sector is concerned, the change in the period 2005-2020 seems to have been almost insignificant, illustrating two opposite movements in terms of GHG emissions: the very significant increase in the proportion of the population covered by public sanitation systems, as a result of the strong investment in waste water collection infrastructure and centralised treatment systems, and the systematic transition from centralised treatment facilities to secondary and tertiary treatment units, from a scenario where quantities of untreated or primary treated waste water were still relevant.

This combination of measures produced reverse effects, which were ultimately annulled: the significant reduction of GHG emissions in the case of increased population coverage with sanitation systems and the consequent increase in emissions through the preferential use of aerobic systems, penalised by significant N2O emissions compared to

non-treatment or primary treatment.

As regards sludge treatment, the expected investment effort in anaerobic digestion infrastructure with biogas recovery and energy recovery will have a relatively positive effect in terms of GHG emissions.

In this sector, it should be noted that a major methodological review with an impact on the total data series was carried out in 2022.

As regards the agriculture sector, it accounted for 12 % of national emissions in 2022, corresponding to a decrease of 5.4 % since 1990. This is linked to the reduction of livestock production for some categories of animals (sheep and pigs) and, more recently, dairy cattle. In addition, the intensification of cattle production (non-dairy cattle) and the decrease in fertiliser consumption, which is to some extent linked to the conversion of arable crops to pastures, also contribute to this trend. However, between 2011 and 2022, this downward trend reversed, with a growing trend since then (+ 7 % change in emissions from 2011-2021), mainly supported by a significant increase in the population of cattle for fattening, sheep and birds.

From 2021 to 2022 emissions decreased by 4.2 %, mainly due to the sharp decrease in the use of inorganic N fertilisers, the number of dairy flocks and non-dairy cattle flocks, as well as the rate of application of organic improver to rice cultivation.

The change in the estimation methodology and the consideration of some emission factors changed the level of emissions associated with this sub-sector compared to previous national inventory submissions.

Estimates from the land use and forestry (LULUCF) sector show that this category changed from a net emitter in 1990 (7.1 Mt CO_2eq.) to a CO2 sink in 1991. This situation was reversed again in the years 2003 and 2005 due to the severe forest fires recorded in those years. In 2016 and in particular in 2017, this sector was again a net emitter, with a total of 21,5 Mt$CO_2$and in 2017, accounting for 23 % of the country's total emissions in that year. This was due to the forest fires that occurred in 2017, aggravated by a particularly dry year, coupled with high temperatures and unusually strong winds, such as the Hurricane Ofélia which hit the coast of the Iberian Peninsula in October 2017. Since 2018, the sector is estimated again with a sink.

4.2.1.2. Projections of sectorial developments with existing national and EU policies and measures at least until 2040 (including for the year 2030)

The work to revise the NECP 2030 and RNC2050 took place in parallel, ensuring that the short-term trajectories are consistent with the long-term perspective towards carbon neutrality. The GHG emission projections review exercise focused in a first phase on the review of the sectors of activity corresponding to the energy system, including the power generation sector, the transport sector, industry and buildings. In a second phase, GHG emission projections for the remaining sectors, agriculture, forests and other land uses and waste and wastewater were reviewed. This exercise has also made it possible to infer the implications associated with the frontloading of the 2045 climate neutrality target, in line with the guidance provided in the Climate Law.

The new modelling exercise foresees, as was the previous one that supported the development of the NECP 2030 and RNC 2050, some of the expected impacts of climate change by 2050, including changes in technology efficiency, demand for services and availability of resources (such as reduced water availability or increased cooling needs).

The results of this exercise allowed the review of the national emission reduction potential, confirming the technical and economic feasibility of pursuing a decarbonisation pathway towards 2030 towards carbon neutrality in 2045.

Sectoral analysis of emission trajectories confirms that all sectors have significant GHG emission reduction potential, although reduction rates can be differentiated.

The analysis of the behaviour of different sectors under the conditions set out in the existing policy scenario as well as in the additional policy scenario helped to identify critical factors, trends and behaviour of these sectors within the time horizon considered.

The methodologies for the estimation of GHG emissions are those in the*National Inventory Report*(NIR). A specific methodology for projecting the respective activity variables has been adopted for each of the sectors of activity, but is based on the same socio-economic reference framework to ensure the consistency of the projections obtained and to infer the critical factors determining the differences between scenarios. It should also be noted that in the energy sector, for the purposes of the projections presented in the existing policy scenario, the policy instruments and measures adopted and published by 30 June 2022 have been taken into account. In the case of Waste and Waste Water, Agriculture and Forestry, Existing Measures were considered as existing measures until the end of 2023.

The preliminary results obtained in terms of sectoral GHG emissions by 2030 and 2040 under the existing policies scenario without considering indirect CO2 emissions are summarised below.

Table 42 – Projection of GHG emissions by sector (no indirect CO2 emissions) – Existing policy scenario (kt CO_{2eq})

		Existing policy scenario	
	2005	**2030**	**2040**
1. Energy	62 555	25 973	14 328
Energy industries, including electricity and heat production and refining (1A1)	25 503	2 306	1 462
Manufacturing and construction industries (1A2)	10 579	4 985	991
Fugitive emissions (1B)	631	892	557
Transport (1A3)	19 947	15 580	10 621
Services (1A4a)	3 037	515	3
Residential (1A4b)	2 784	1444	456
2. Industrial Processes and Use of Products (2)	8 211	3 885	3 306
F-gases (2F)	783	1 520	876
3. Agriculture (3 and 1A4c)	8 288	7 875	7 430
4. Waste and UWWTD (5)	6 806	4 972	3 551
Total	**85 860**	**42 703**	**28 377**
Total ETS	**36 426**	**9 548**	**4 905**
Total non-ETS	**49 434**	**33 155**	**23 471**
Capture CO2 (CCU)	**0**	**0**	**— 238**

The Portuguese Government undertook in 2016 to ensure that its emissions are neutral by the end of 2050, and until then adopted intermediate reduction targets of at least 55 % in 2030 and between 65 and 75 % in 2040 compared to 2005, resulting in even greater reductions for the energy system. In this sense, the existing policy scenario (WEM – *With Existing Measures*) already incorporates a number of measures to achieve these objectives.

As can be seen even under an existing policy scenario, a steep reduction in GHG emissions is already expected in the coming decades and there is a cost-effective potential for Portugal to achieve total emission reductions of around 50 % compared to 2 005 in 2030 (no LULUCF). It should be noted that this development takes into account a contribution from carbon sequestration by technology (Carbon Capture and Use – CCU) in post 2030, although more significant effects are expected only in the medium to long term.

In 2030 this reduction is largely due to the closure of coal-fired power plants and the increased role of renewables in the national energy *mix*, with a stronger boost in solar PV. Thus, in 2030 the energy sector, where the energy component associated with the agricultural sector is not being included, has a GHG emission reduction potential of around 58 % compared to 2005 (and around 77 % reduction in 2040).

In the transport and mobility sector an emission reduction potential of around 21 % and 47 % is expected in 2030 and 2040, due to a moderate uptake profile of electric vehicles and changes in mobility demand through reduced travel and modal shift. Other forms of low-carbon energy will be phased in in shipping and aviation.

As regards the services sector, there is a strong GHG emission reduction potential, contributing to reductions of

83 % and almost 100 % in 2030 and 2040 respectively as a result of increased energy efficiency. The trend of reducing the consumption of fossil forms of energy in this sector continues until 2030, with the start of the massive introduction of heat pumps demonstrating their cost-effectiveness in providing energy services such as space heating and cooling.

The residential and manufacturing and construction sectors have a lower decarbonisation potential over this time horizon, still pointing to a reduction of 51 % in 2030 (around 84 % in 2040) and 52 % (around 91 % in 2040) respectively.

For the agriculture sector (non-energy component), a small reduction in emissions is expected by 2030 (-5 %), taking into account the measures and targets set in the context of the PEPAC. Although still not significant, this reduction is expected to double by 2040 (-10 %), based on the productive developments in the sector and assuming a continuation of the PEPAC measures along with the consolidation of their scope.

Based on the modelling exercise carried out in the Waste and Waste Water sector, and despite the specific characteristics of this sector, the reduction potential is relatively important and mainly based on the evolution of the waste sector in relation to that of waste water. The projection for the sector as a whole in the WEM scenario shows an expected reduction in GHG emissions of around 27 % between 2005 and 2030, which is increasing towards 2040 (48 %).

In terms of F-Gases, the emission relevance of which has been increasing in recent years, emissions are expected to increase by 94 % by 2030 compared to 2005 levels by 2040, taking into account compliance with Regulation (EU) No 517/2014 on fluorinated gases and Directive 2006/40/EU relating to emissions from air conditioning systems in motor vehicles. Despite the generally positive results on GHG emission reduction potential, there is a need to consider a set of additional policy measures in order to pursue a more ambitious GHG emission reduction trajectory aligned with the 2030 targets and the 2045 carbon neutrality target.

4.2.2. Renewable energy

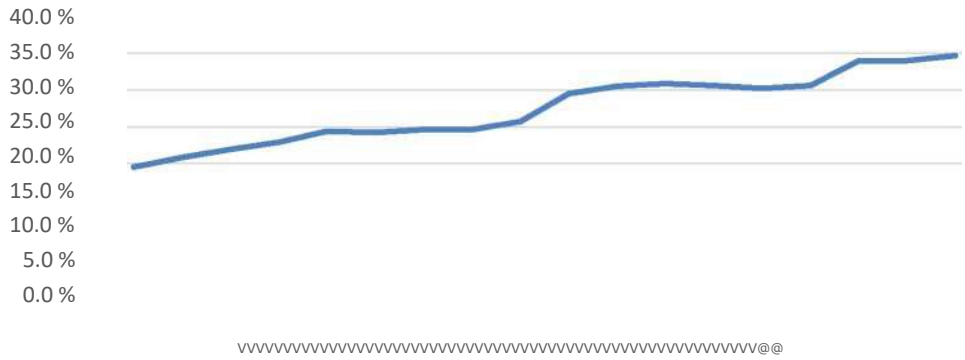
i. Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as by technology in each of these sectors

In the framework of Directive 2009/28/EC of the European Parliament and of the Council of 23 April, which introduced an obligation for EU Member States to submit a plan to promote the use of energy from renewable sources, Portugal prepared and presented its first National Renewable Energy Action Plan (PNAER) in 2010, in which it committed itself to achieving the objectives set out in the Directive, namely the overall target of 31.0 % of renewable energy sources in gross final energy consumption, the 5th most ambitious EU-28 target.

In 2020, the incorporation of RES in gross final energy consumption stood at 33.9 %, 3,3 percentage points (pps) higher than in the previous year, resulting in Portugal largely exceeding its 2020 target. This significant increase appears to have been strongly influenced by the reduction in final energy consumption due to the context of the COVID-19 pandemic.

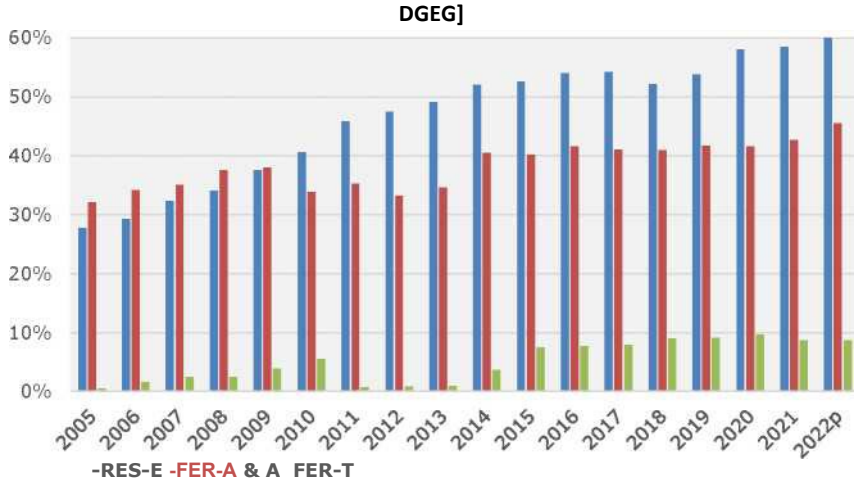
The figure below illustrates the evolution of the share of renewable energy sources in gross final energy consumption between 2005 and 2022.

Figure 31 – Evolution of the incorporation of renewable sources in gross final energy consumption in Portugal [Source: DGEG]



At sectoral level, the incorporation of renewables in the electricity sector (RES-E) was 61 % in 2022, an increase of 2,6 pps compared to 2021, in the heating and clothing sector (FER-A & A) by 45.5 %, with an increase of 2,8 pps compared to 2021, and in the transport sector (RES-T) by 8.7 %, an increase of 0,1 pps compared to 2021. The figure below illustrates the evolution of the share of renewable energy sources in gross final energy consumption by sector between 2005 and 2022.

Figure 32 – Evolution of the share of renewable energy in gross final energy consumption in Portugal by sector [Source: DGEG]



ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

The following table shows the projections of developments based on existing policies and measures in gross final energy consumption in Portugal.

Table 43 – Development projections based on existing policies and measures (WEM Scenario) in Portugal's gross final energy consumption

	2025	2030	2035	2040
RES-E	77 %	91 %	95 %	97 %
EF-A & A	45 %	50 %	71 %	89 %
RES-T	18 %	22 %	30 %	48 %
Overall RES share	44 %	51 %	65 %	81 %

The following table shows the projections of developments based on existing policies and measures of the contribution of renewable energy in each sector to final energy consumption.

Table 44 – Development projections based on existing policies and measures (WEM Scenario) of the contribution of renewable energy in each sector to final energy consumption (ktoe)

	2025	2030	2035	2040
Gross final consumption of electricity from RES	3688	4945	6199	7324
Gross final consumption of RES for heating and cooling	2510	2827	3595	4066
Gross final consumption of energy from RES in transport	462	581	932	1626
Total gross RES consumption	6660	8352	10725	13016
Transfer of RES to other Member States	0	0	0	0

	2025	2030	2035	2040
Transfer of RES from other Member States and 3 rd countries	0	0	0	0
Target adjusted RES consumption	6660	8352	10725	13016

The breakdown in the following table is given at the level of the heating and repair sector.

Table 45 – Development projections based on existing policies and measures (WEM Scenario) of total contribution actual (final energy consumption) of each renewable energy technology in Portugal in the heating sector and Cooling (ktoe)

	2025	2030	2035	2040
Biomass	935	958	1090	1259
Heat pumps	868	1013	1231	1170
Heat by solar thermal	150	164	215	223
Heat from cogeneration	541	531	786	984
Renewable gases	7	121	238	430
TOTAL 51 52	2501	2787	3561	4066

At the level of the transport sector, the breakdown is shown in the following table.

Table 46 – Development projections based on existing policies and measures (WEM Scenario) of total contribution actual (final energy consumption) of each renewable energy technology in Portugal in the transport sector (ktoe)

	2025	2030	2035	2040
Biofuels 1st generation *	53	57	0	0
Advanced biofuels * *	357	392	516	835
Renewable hydrogen	0	3	29	72
Electricity	105	182	357	647
TOTAL[456]	515	634	902	1554

* Recital *Non-Compliant biofuels and compliant biofuels – From food and feed crops*

* * biofuels classified in Annex IX

51The difference between the values in the table with the renewable energy contribution in each sector (Table 44) for final energy consumption and the sum of the values of the tables broken down by sector and technology is due to different calculation rules (the RES contribution for each sector considers the SHARES calculation rules defined by Eurostat).

52The difference between the values in the table with the contribution of renewable energy in each sector (Table 44) to final energy consumption and the sum of the figures in the tables broken down by sector and technology is due to different calculation rules, namely the use of multipliers (the RES contribution for each sector considers the SHARES calculation rules defined by Eurostat).

4.3. Energy efficiency dimension

I. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Energy consumption during 2022 continued to be influenced by the COVID-19 pandemic, which led to changes in Portuguese habits in all sectors of activity, in general consumption and consequently in energy consumption.

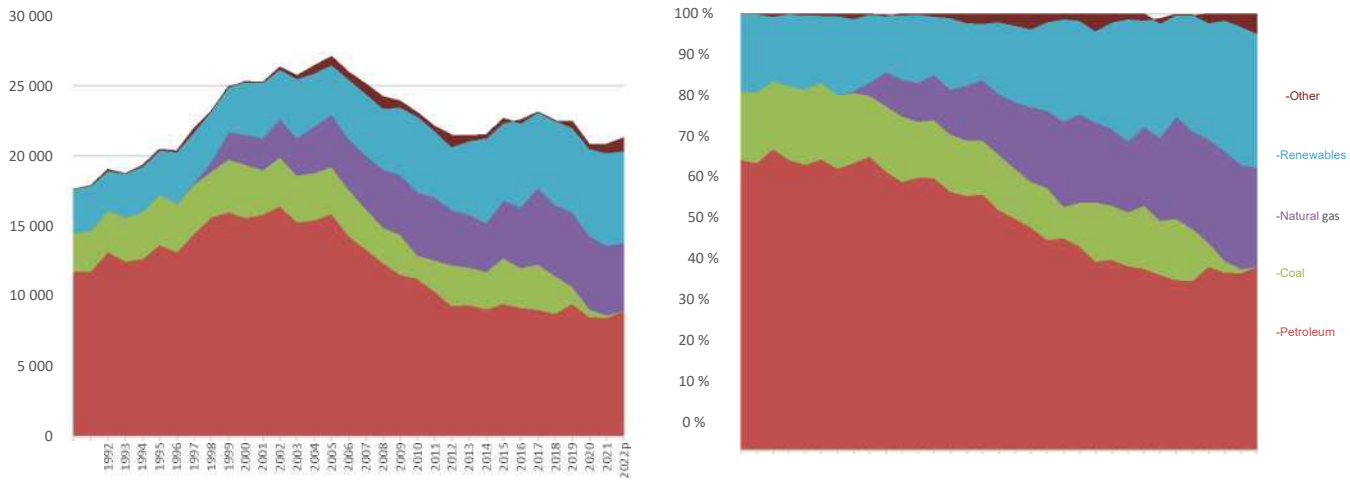
Primary Energy Consumption (CEP) in 2022 increased by 2.4 % compared to 2021 and stood at 21 315 ktoe.

At the level of primary energy consumption, Petroleum plays the main role in the energy consumption mix in Portugal, with a contribution of 42.0 % from CEP in 2022, followed by Renewables with 30.8 % and Natural Gas with 22.6 %. With the introduction of Natural Gas in 1997 and the increase and diversification of renewable energy sources, the share of oil in CEP has been decreasing in recent years, despite a slight increase of around 5.9 % from 2021 to 2022.

In 2022, PESCO for fossil coal decreased by 96.5 % compared to the previous year, accounting for only 0.03 % of PESCO, due to coal-fired electricity production ending in November 2021.

The figure below illustrates the evolution of total primary energy consumption by source type between 1990 and 2022.

Figure 33 – Evolution of total primary energy consumption (ktoe) by source type in Portugal 1990-2022 (Source: DGEG]

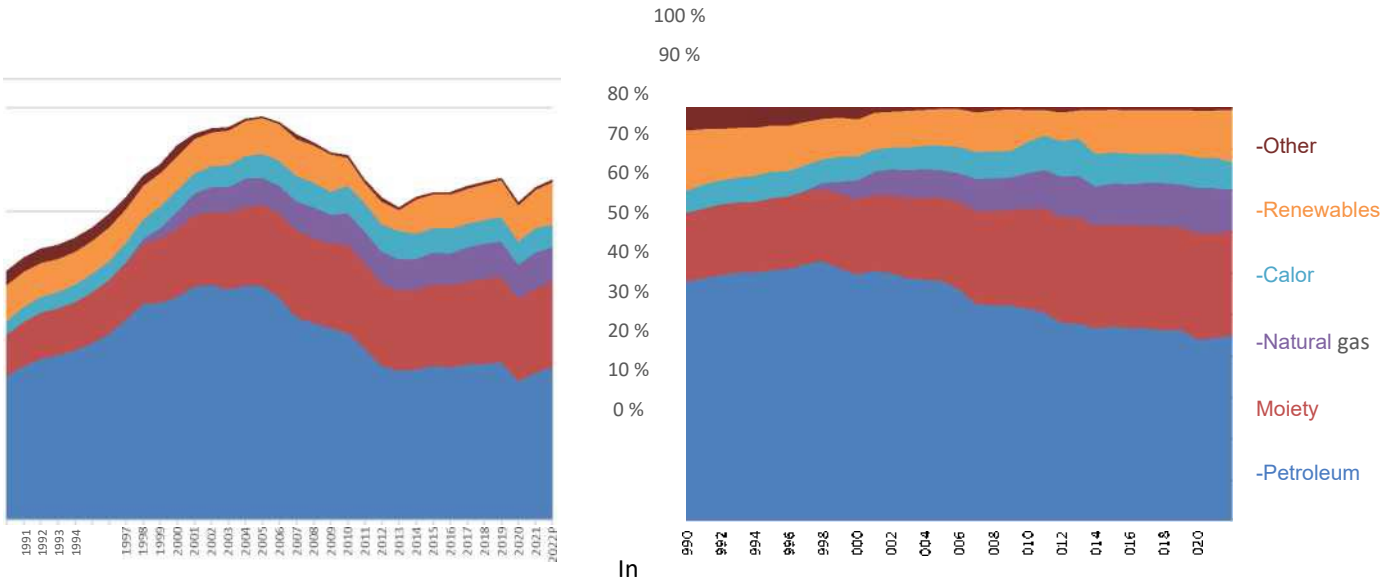


Asregards Final Energy Consumption (CEF), Portugal recorded a consumption of 16 521 ktoe in 2022, with an increase of 2.3 % compared to 2021, mainly due to an increase in consumption of road fuels and air transport, compared to the recovery from previous years due to the COVID-19 pandemic, approaching the 2019 figure. In 2020, the CEF decreased by 7.2 % compared to 2019. In the period 2010-2022, the EFC recorded a tcma of -0.6 %. Among the factors contributing to the reduction of the CEF in recent years is the promotion of energy efficiency with a particular focus on the industrial and residential sectors through the adoption of more efficient solutions, as well as the slowdown in the economy which has generally affected consumption in the various sectors of the economy.[57]

[57] provisional figures for 2022. Data from 2014 onwards already include the contribution of heat pumps

As regards final energy consumption by type of source, and as already mentioned above, Petroleum plays the main role in the energy consumption mix in Portugal, with a contribution of 45.0 % of final consumption in 2022, followed by Electricity with 25.3 %, Natural Gas with 9.9 %, Calor with 6.6 %, Renewables with 12.6 % including the consumption of wood and waste plants, Solar Thermic, Biogas, Calor Bombas and other renewables, and other energy sources which accounted for less than 1 %. In recent years there has been a gradual reduction in the share of oil in final energy consumption (despite a slight increase of around 3.8 % from 2021 to 2022), while natural gas and electricity have seen an increase in the final energy consumption mix. The following figure illustrates the evolution of final energy consumption by source type between 1990 and 2022.

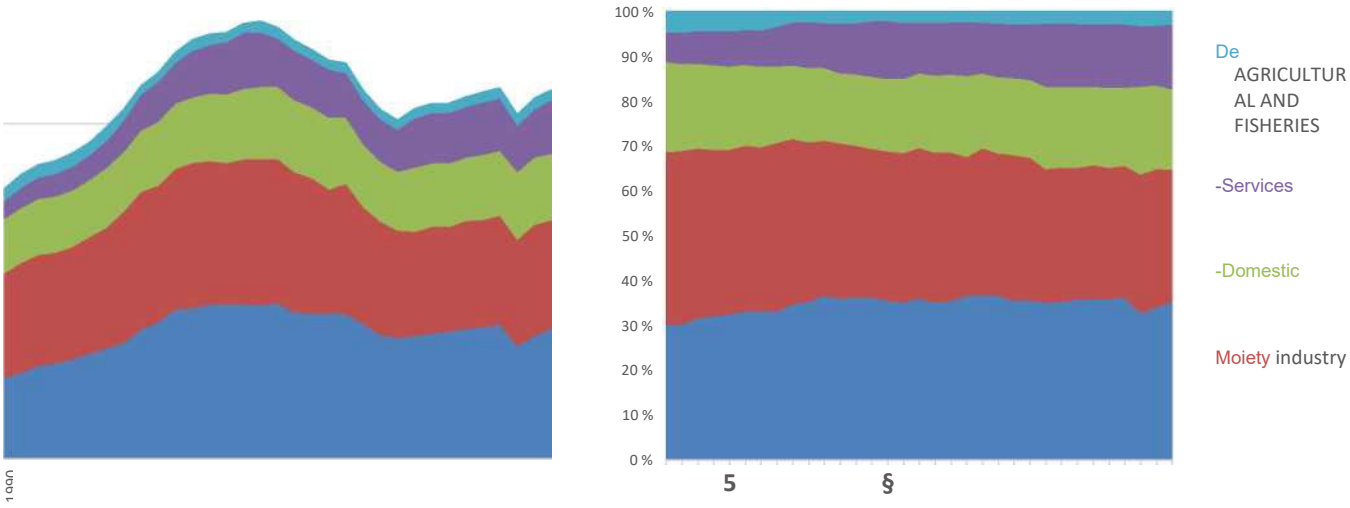
Figure 34 – Evolution of Total Final Energy Consumption by type of source in Portugal (ktoe) (Source: DGEG]



In sectoral terms, in 2022 it is the transport sector that consumes the most energy in Portugal accounting for 35 % of final energy consumption, followed by Industry (29 %), Domestic (18 %), Services (14 %) and finally Agriculture and Fisheries (3 %). The structure of consumption by sector of activity has remained broadly unchanged over the last decade, with only slight fluctuations from year to year, as shown in Figure[58] below.

[57] provisional figures for 2022. Data from 2014 onwards already include the contribution of heat pumps

Figure 35 – Evolution of total final energy consumption by sector of activity in Portugal (ktoe) [Source: DGEG]



Directive (EU) 2023/1791 on Energy Efficiency requires Member States to set an indicative national energy efficiency contribution based on final energy consumption in order to meet collectively the Union's binding final energy consumption target of 11.7 % reduction in final energy consumption compared to the 2020 Reference Scenario, and shall endeavour to contribute collectively to the Union's indicative primary energy consumption target referred to in Article 4 EED. When submitting updates of their NECPs, Member States should also express their contributions in terms of the absolute level of primary energy consumption in 2030.

Just as Portugal demonstrates a high level of ambition and determination to be at the forefront of the energy transition through a strong commitment to renewable energy, energy efficiency also plays an important role by 2030, which is the cornerstone of European energy policy – 'energy efficiency first'.

Table 47 – Indicative national energy efficiency contribution to the Union's 2030 energy efficiency target (in non-energy use primary energy consumption)

	Baseline 2020 (Updated 2020 EU Reference Scenario)	**Target 2030** (Considering the updated 2020 EU Reference Scenario) **56**
Primary energy consumption target (ktoe) 57	19 444 ktoe	16 711 ktoe

56 Percentage of energy consumption reduction and target value (ktoe) calculated according to the methodology provided by the European Commission and identified in Directive (EU) 2023/1791 on Energy Efficiency

57Excluding non-energy uses

Figure 36 – Indicative outline for the indicative national energy efficiency contribution to the achievement of the Union's 2030 energy efficiency target (in non-used primary energy consumption) energy) [Source: DGEG]

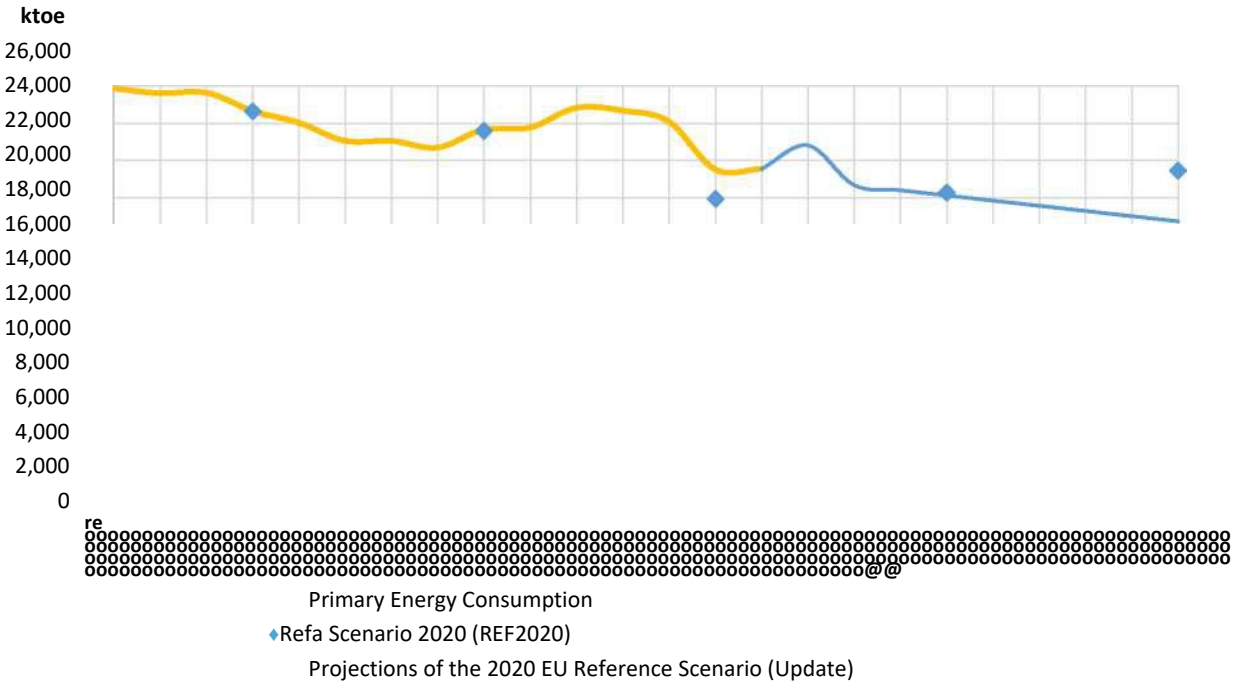


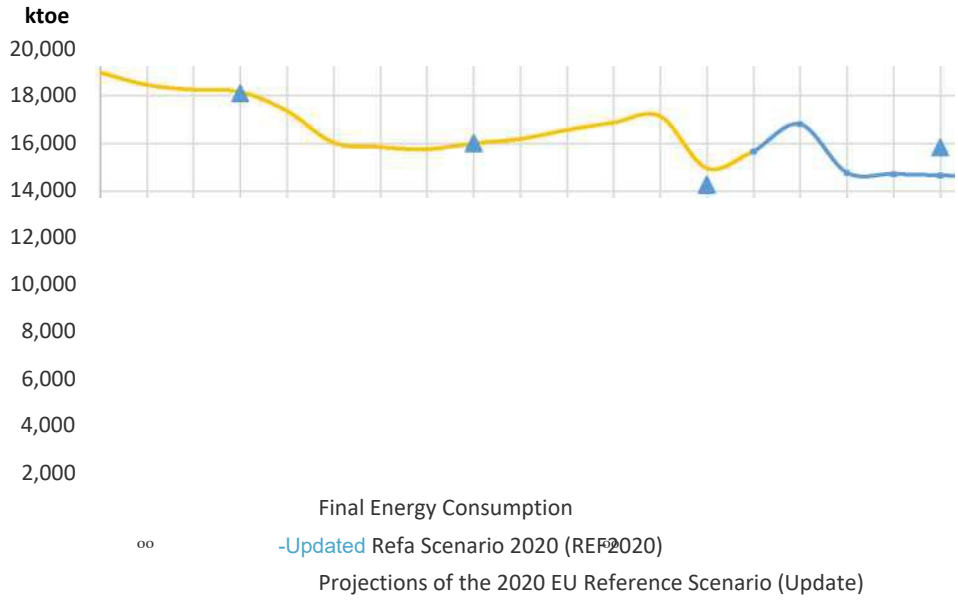
Table 48 – Indicative national energy efficiency contribution to the achievement of the efficiency target energy in the Union in 2030 (in final energy consumption without energy use)

	Baseline 2020 (Updated 2020 EU Reference Scenario)	**Target 2030** (Whereas the updated 2020 EU Reference Scenario) **58**
Final energy consumption target (ktoe) 59	16 262 ktoe	14 371 ktoe

Figure 37 – Indicative path for the indicative national energy efficiency contribution to the Union's 2030 energy efficiency target (in non-energy final energy consumption) [Source: DGEG]

58 Percentage of energy consumption reduction and target value (ktoe) calculated according to the methodology provided by the European Commission and identified in Directive (EU) 2023/1791 on Energy Efficiency

59Excluding non-energy uses



The Energy Intensity of the Primary Energy Economy in 2022 was 101 toe/MEUR' 2016, with a reduction of 3.8 % compared to 2021 and a 30.8 % reduction compared to 2005, the highest energy intensity in recent years (146 toe/MEUR' 2016). From 2006 onwards, there has been a decoupling of primary energy consumption from Gross Domestic Product (GDP).

Figure 38 – Evolution of the Energy Intensity of the Economy in Primary Energy in Portugal (toe/MEUR' 2016) (Source: DGEG, INE]

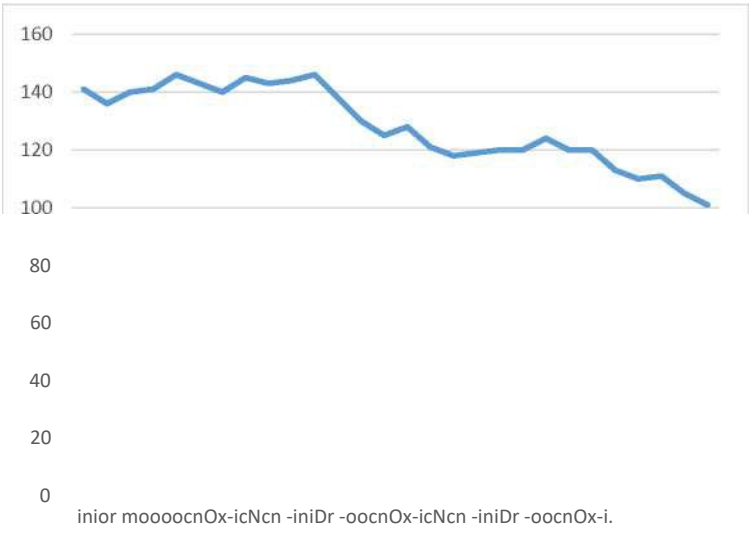
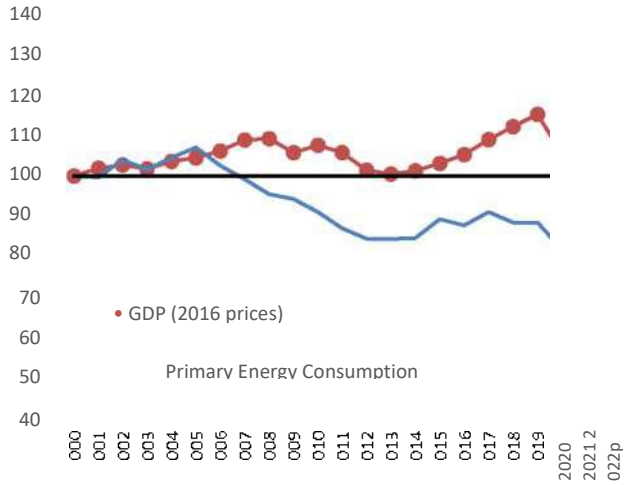


Figure 39 – Evolution of Primary Energy Consumption of GDP and Portugal (2000 = 100) (Source: DGEG,



Asregards the energy intensity of the final energy savings, in 2022 it stood at 78 toe/MEUR' 2016, with a reduction of 3.8 % compared to 2021 and a 26.4 % reduction compared to 2003-2005, when energy intensity reached the highest level in recent years (106 toe/MEUR' 2016). Similarly, from 2006 onwards there is a decoupling of final energy consumption from GDP.

Figure 40 – Evolution of the Energy Intensity of the Final Energy Economy in Portugal (toe/MEUR' 2016) (Source: DGEG, INE]

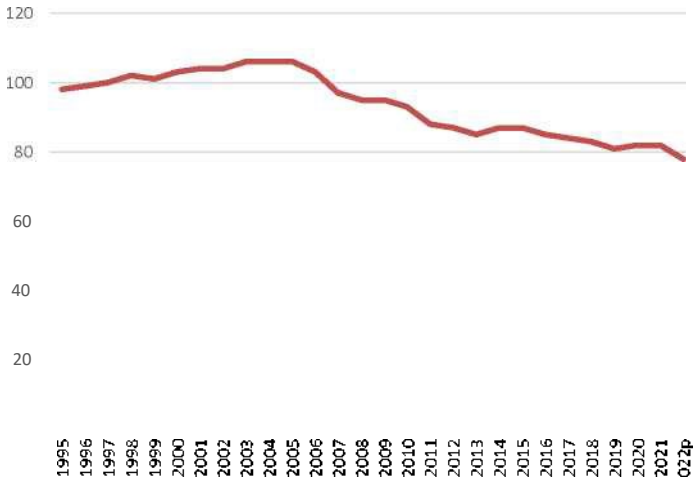
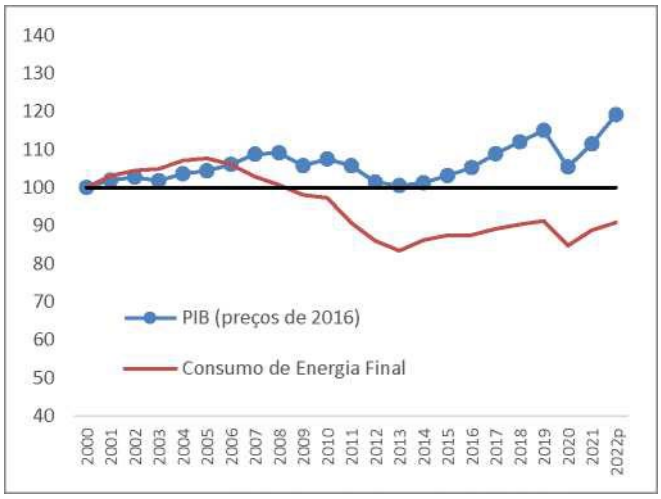


Figure 41 – Evolution of Final Energy Consumption and GDP in Portugal (2000 = 100) (Source: DGEG, INE]



ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

Pursuant to Article 14 of Directive 2012/27/EU of 25 October 2012 on energy efficiency, Portugal carried out in December 2016 a study to identify the potential for high-efficiency cogeneration and energy efficient heating and cooling, taking into account the assumptions set out in Annex VIII to that Directive, for a time horizon of 10 years after the reference year used, which in the case of Portugal is 2014.

The study thus analysed the main energy sources in each sector in order to adequately characterise energy needs, in particular heating and cooling demand, and thus to have a detailed assessment of each sector. On the basis of the assessments carried out, the maps indicated in Annex VIII to the Directive have been created and a critical analysis of them has been drawn up.

On the basis of a brief description of the current situation of cogeneration in Portugal, an analysis of the technical potential of cogeneration and efficient heating and cooling systems, as well as an analysis of the economic potential and an estimate of the evolution of that potential, have been carried out.

With the publication of Directive 2018/2002, work started to carry out a study similar to that referred to above, based on the new provisions on energy efficiency, in particular those applied to high-efficiency cogeneration.

11.1 Energy needs – heating and cooling demand

The heating and cooling demand has been determined taking into account the average values for the needs of each sector, thus defining the heat replaceable by high-efficiency cogeneration.

Agriculture and Fisheriessector:

The energy consumption associated with this sector is very heterogeneous. Diesel consumption is predominant for both agricultural machinery and forestry work, as well as for fishing navigation. Electricity plays an important role in the processing and preservation of products.

Agricultural production will have as preferred areas of greatest activity those where both climate and soil are most conducive to such activity and fisheries-related activities are limited to the coastline.

Industry Sector:

The industry sector is not considered to be dependent on climatic variations from region to region, as most of the thermal needs are due to the manufacturing process and production itself and therefore the energy consumption patterns of the different sub-sectors of the industry should be considered.

Unlike the agriculture and fisheries sector, heat in the industry weighs more than cold. Most of the production processes require or produce heat, so there is a large share of consumption spent on the production of the same heat that can be replaced by cogeneration.

Services Sector:

The services sector is quite heterogeneous, ranging from small retail units to large shopping centres, large hospital centres, office buildings, schools, sports facilities, hotels, etc. While in size (area, number of people) or in hours of use, there is a wide spectrum of variation that makes it difficult to measure standard thermal needs by sub-sector. Air-conditioning consumption is also heavily influenced by the climatic zone and the activity for which the building is intended.

The energy consumption associated with this sector is very diverse and usually associated with large population centres where there is a greater concentration of businesses and services. Overall, thermal demand for cooling predominates in this sector, with very low heating needs.

Residential sector:

The consumption of the residential sector in Portugal is very low compared to the consumption of the other European countries, with particular relevance for consumption for heating and even space cooling. This is due to the fact that the Portuguese climate is more mild and in many situations thermal comfort conditions are not provided, but there are asymmetries throughout the national territory.

In terms of final use consumption, kitchens contribute the largest share, with around 39 % of final consumption, followed by water heating with 23 %. However, in the former case electricity is the main source, while water heating is predominantly made with LPG. The parcel dedicated to lighting is small, with only 4.5 % of consumption and consumption for space cooling is negligible.

The low duration and importance of hot seasons, coupled with financial constraints, will also explain the low number of central heating dwellings, as well as the significant number of dwellings for which no heating system is registered in any of the regions. Other relevant information concerns the energy source used in existing heating systems, and the importance of electric heating systems, particularly in the Lisbon Region, is well known. Except for new high-density developments, or in the vicinity of already cogeneration service buildings, which are expected to be minor cases, there is insufficient demand to justify the installation of residential heating and cooling networks.

It should be noted that the evolution of consumption in the residential sector has been towards a sharp decrease, at an average rate of -4.4 % per year since 2009, linked to increased energy efficiency resulting from multiple measures implemented and improvements in equipment, as well as higher energy rates and prices. The efficiency improvement appears to be greatest with regard to space heating, with a reduction of around 31.7 % from 2000 to 2013, and about 28.8 % reduction in kitchen and sanitary Quick Waters (AQS).

However, the rebound in economic activity, the growth in housing needs, and the growth in the number of electrical equipment are expected to further boost energy demand in buildings.

Technical potential of high-efficiency cogeneration

The cogeneration units in operation in 2014 totalled 1 759 MW of installed electrical capacity and 4 631 MW of thermal input, producing a total of 7 484 GWh of electrical energy and 19 249 GWh of thermal energy, thus corresponding to a T/E ratio of 2,57. They also showed an overall yield of 79 % and an average number of hours of power utilisation of 4 349. The application of the assumptions and reference values associated with the Directive, taking into account the fuels used by each unit, and the grid losses associated with the location voltage level, results in an estimated overall saving of 30 740 TJ (0,73 Mtoe) of primary energy, corresponding to a saving of 33.5 %.

The following table shows the technical potential of cogeneration for heat production (estimated from the maximum replacement percentages and replaceable heat consumption values) of approximately 2,7 Mtoe of potentially usable heat. Estimates of cold consumption in industry, residential and services are presented in the same table, resulting in 0,5 Mtoe of final energy, corresponding to between 1,1 Mtoe and 2,2 Mtoe of additional heat to feed absorption *chillers*, resulting in between 3,8 and 4,9 Mtoe of thermal production of the co-generations.

Assuming the average T/E ratio and the average number of operating hours in the existing cogenerations in 2014 (2,57 and 4 349 h respectively), the electrical energy generated and the installed electrical power would correspond to 12 TWh (2.8 GW) to meet heat needs alone and 17.3 TWh to 22 TWh (4.0 GW to 5.1 GW) to also meet cold needs.

However, realising this potential is unrealistic as it does not take into account the operating regimes of cogeneration units, stopping needs for maintenance, or basic aspects such as minimum operating powers. Thus, the technical potential will certainly exceed the achievable potential.

Table 49 – Calculation of the potential for heat and cold to be provided by cogenerations [Source: DGEG, Study on the potential for high-efficiency cogeneration in Portugal, 2016]

Sector	General Total	Total replaceable thermal energy	Potential for substitution		Cold consumption (estimate)
	toe	toe	(%)	toe	toe
Final consumption	**15 166 780**	**3 930 121**	**66.21 %**	**2 602 023**	**520 053**
Agriculture and Pecas	**427 875**	15 124			
Agriculture	*338 172*	11 485	100.00 %	11 485	
Fisheries	*89 703*	3 639			
Extractive industries	**111 645**	28 503			
Manufacturing industries	**4 361 269**	2 811 963			174 451
Food, beverages and tobacco	*445 139*	234 813	100.00 %	234 813	
Textiles	*254 984*	161 532	81.00 %	130 841	
Paper and Paper Articles	*1 366 239*	1 062 925	100.00 %	1 062 925	
Chemicals and Plastics	*432 372*	227 840	100.00 %	227 840	
Ceramics	*268 395*	217 841	7.00 %	15 249	
Glass and Glass	*242 745*	197 882	7.00 %	13 852	
Cement and Cal	*645 081*	493 032	10.00 %	49 303	
Metallurgical	*46 394*	25 222	19.00 %	4 792	
Steel	*165 875*	54 540	30.00 %	16 362	
Articles of apparel, footwear and leather	*45 625*	18 499	81.00 %	14 984	
Wood and Wood Articles	*99 951*	21 818	81.00 %	17 673	
Rubber	*35 171*	14 275	100.00 %	14 275	
Metalo-electro-mechanical	*243 859*	69 488	69.00 %	47 947	
Other manufacturing industries	*69 439*	12 256	81.00 %	9 927	
Construction and Public Works	**260 285**	30 593	81.00 %	24 780	
Domestic	**5 511 592**	0	0 %	0	
Services	**2 552 909**	669 592	60.00 %	401 755	2 009
Agriculture and fisheries	**1 941 205**	374 346	81.00 %	303 220	343 593

Therefore, for the purpose of identifying the potential for satisfaction by cogeneration, the following sub-sectors are considered:

- The manufacturing sub-sectors with the highest potential for satisfaction, either by heat consumption values or by the replaceable heat plot: Food, Drinks and Tobacco, Textiles, Paper and Paper Articles, Chemistry and Plastics, Madeira and Wood Articles, Rubber.
- The services sub-sectors where the use of cogeneration is already significant, accounting for around 40 % of electricity and thermal energy consumption (without road fuels) in this sector.

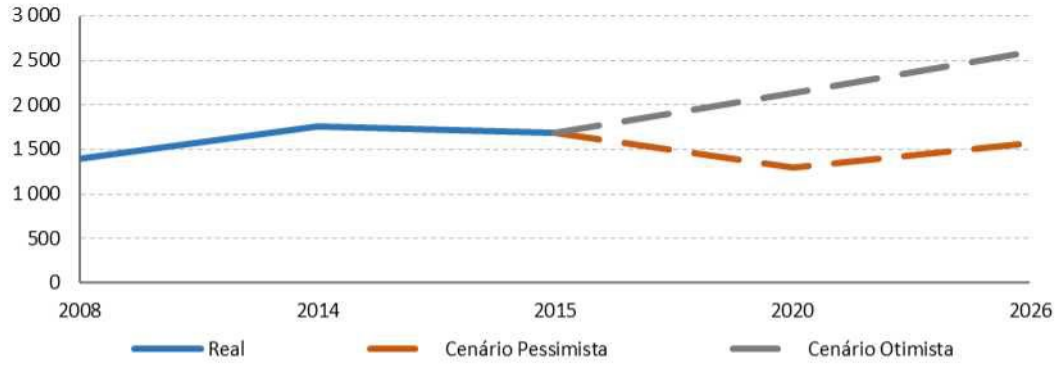
The resulting consumption is around 1,8 Mtoe of potentially usable heat and 0,25 Mtoe of consumption for cold, corresponding to between 2,4 Mtoe and 2,9 Mtoe of thermal production of the co-generations, or, under the same assumptions, 11 TWh to 13 TWh generation (29 % of national consumption) and 2.4 GW to 3.0 GW of installed capacity, thus representing an increase of 700 MW to 1 300 MW capacity compared to the current installed capacity of 1 759 MW.

Some future evolution of this potential can still be expected to decrease slightly, due to the projected sharp decline in consumption in the pulp and paper industries (-7.3 %) and the Textile industry (-19.4 %), the two most relevant sub-sectors in the context of cogeneration, and also a decrease in air-conditioning consumption in the services sector (-10.9 %), despite a slight growth in overall consumption in that sector (1.7 %). Thus, in 2025 the achievable potential will be 2,2 Mtoe to 2,7 Mtoe of thermal production of the co-generations, or 10 TWh to 12 TWh of electricity generation and 2.3 GW to 2.8 GW of installed electrical capacity.

Economic potential of high-efficiency cogeneration

The following figure shows the evolution of economic potential for the period 2008-2026.

Figure 42 – Scenarios of evolution of the economic potential of cogeneration up to 2026 (MWe) [Source: Study of the potential for high-efficiency cogeneration in Portugal, 2016]



Given that cogeneration units in operation in 2014 totalled 1 759 MW of installed electrical capacity, based on the framework of existing policies and measures, the evolution of cogeneration should be closer to the pessimistic scenario of the previous graph.

iii. Projections considering existing energy efficiency policies, measures and programmes as described under 1.2. ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)

With regard to projections for the evolution of total primary energy consumption for 2030, it would be expected that, in view of the planned policies and measures to be implemented by 2020-2030, in particular the

commitment to renewable energy and the decommissioning of coal, consumption would continue on a downward path. However, the estimated increasing evolution of primary energy consumption reflects, on the one hand, the decarbonisation of the existing electricity generation system, and on the other hand, the electricity needs arising from the development of the green industry in Portugal.

In terms of energy carriers, and through the decommissioning of coal-fired thermal power stations, this energy carrier will no longer be present in the primary energy consumption mix, contributing significantly to the reduction of energy bills. By 2030, renewables will have the highest weight in the energy mix, with more than 50 %.

Figure 43 – Estimated evolution of primary energy consumption towards 2040 (ktoe) [Source: DGEG]

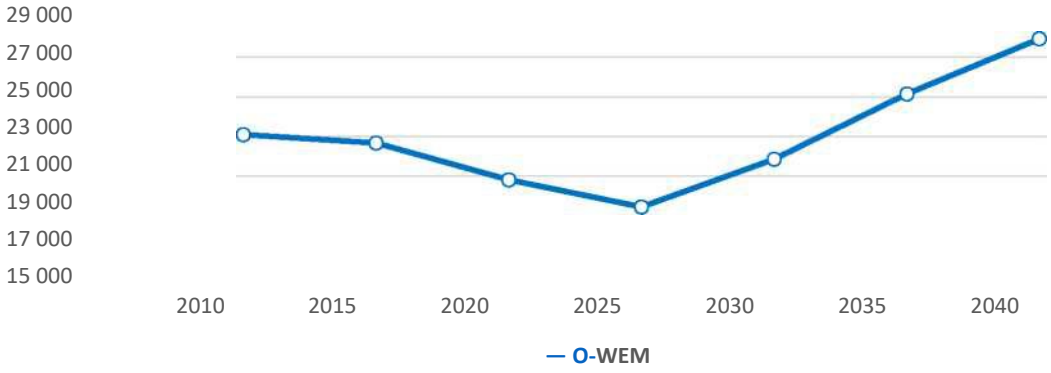


Figure 44 – Estimated evolution of primary energy consumption by type of source in 2040 (ktoe) (Source: DGEG]

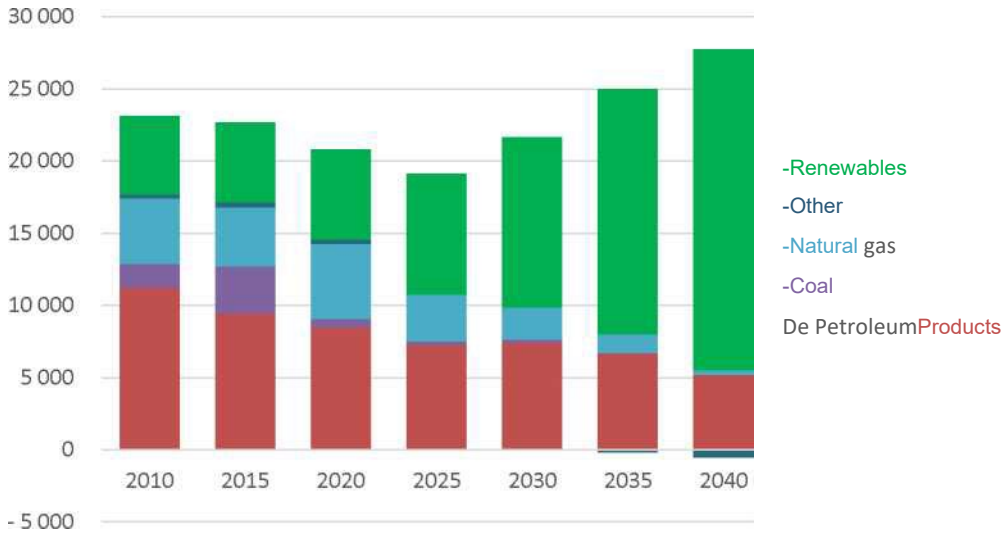
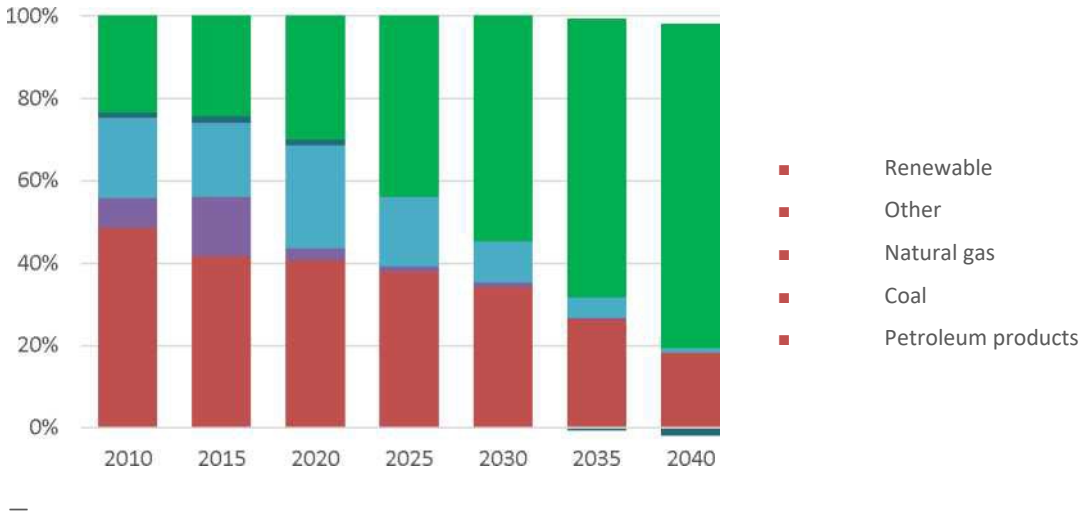


Figure 45 – Estimated evolution of primary energy consumption by type of source in 2040 [Source: DGEG]



IV. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, according to Article 5 of Directive 2010/31/EU

Directive 2010/31/EU on the energy performance of buildings, known as the EPBD*(Energy Performance of Buildings Directive*), requires Member States to apply a comparative methodology for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements in order to keep national regulatory requirements up to date. In particular, the regulatory requirements on the energy performance of the reference buildings should not be more than 15 % lower than the results of the cost-optimal performance calculations.

In its Annex I, Delegated Regulation (EU) No 244/2012 supplementing the EPBD requires Member States to define reference buildings for single-family buildings, multi-apartment blocks and multi-family buildings, office buildings, as well as for the other categories of non-residential buildings listed in points 5 (d) to (i) of Annex I to the EPBD, for which specific energy performance requirements exist.

In Portugal, the regulatory requirements for the energy performance of buildings are laid down in various Orders and Orders linked to Decree-Law No 101-D/2020 of 7 December 2009, which lays down the requirements applicable to buildings for the improvement of their energy performance and regulates the Energy Certification System for Buildings (SCE).

In order to satisfy the EPBD on cost-optimal issues, a number of studies on residential, office and hotel buildings were promoted.

It was generally concluded that:

- Cooling needs are always higher than heating needs;
- The application of thermal insulation, while representing improvements in the performance of constructive solutions, does not translate into benefits for the overall cost of optimal solutions;
- The cost-optimal solutions found are solutions with lower thermal insulation indices than those recommended by the legislation;
- Glass solutions with more demanding solar factor, shading externally correspond to the lowest energy consumption;
- However, the most efficient cost-optimal solutions are double glazing with colourless glass and external shading;
- Cooling needs are significantly reduced when LED lamps are used, as well as the part related to lighting consumption;
- The low-energy air-conditioning system is S5 (VRV) (EV3 and EV18). This is because the initial cost for this system is higher; thus, while the corresponding COP and EER values are more efficient, energy savings cannot recoup this investment;

- Ventilation solutions without heat recovery are those of lower energy consumption.

It should be noted that the reference building was constructed on the basis of analysed certificates from hotels built before 1990. It therefore involved a more compact shape of a smaller shape factor (area/volume ratio of the envelope). This may have an impact on the fact that uninsulated solutions are cost-optimal.

It is believed that the result that the heat recovery solution does not have an optimal cost advantage is due to two key factors:

- Increased air-conditioning needs for the cooling season;
- Heightened design of the building, which leads to higher load losses in the exhaust and consequent increase in fan consumption.

On the basis of the methodology used, for average energy cost scenarios, discount rate of 3 %, and an economic lifecycle of 20 years, the overall cost results were determined for the selected variants. The cost-optimal variant has an overall financial cost between EUR 388/m² in Faro and EUR 425/m² in Porto.

From the comparative analysis between cost-optimal levels and regulatory requirements, it was concluded that the reduction of primary energy consumption of the cost-optimised variant compared to the reference building is 33 % to 35 %. This indicates that a review of constructive solutions and minimum requirements for deep hotel renovations built before 1990 is appropriate and there is room to increase the regulatory requirements of the Buildings Certification System (SCE) for substantial hotel renovations.

The Energy Performance of Buildings Directive (EPBD) has been revised as part of the Fit-for 55 package and aims to accelerate building renovation rates, reduce greenhouse gas emissions and energy consumption and promote the use of renewable energy in buildings. The built environment actively contributes to the EU's target of at least a 55 % reduction in greenhouse gas (GHG) emissions by 2030 compared to 1990, which aims to put the EU on a path to climate neutrality by 2050.

4.4. Energy Security Dimension

1. Current energy mix, domestic energy resources, import dependency, including relevant risks

1.1. Current energy mix and domestic energy resources

Portugal does not exploit or produce coal, crude oil or natural gas. This means that the supply of these energy sources to the Portuguese market is made exclusively through imports from third countries.

After a period of continuous decline between 2017 and 2020, the Balance of Import of Energy in Portugal increased in the years 2021 and 2022. It should be noted, however, that in the 20-year period between 2003 and 2022 the Balance of Import of Energy in the country decreased by approximately 27 %. This reduction, which has a positive impact on the reduction of external energy dependency and as a result of a reduction in Portugal's energy bill, was driven by the increase in domestic energy production, in particular from indigenous renewable sources, which led to a reduction in imports of coal (up to 2021, year of closure of coal-fired power plants) and natural gas for electricity production. The increase in production capacity of national refineries, which made it possible to respond more to domestic consumption, also contributed to the reduction of imports of oil products, and consequently reduced the import balance.

Despite the increasing incorporation of renewable energy sources into the energy system and the decrease in the use of non-renewable sources, in the medium to long term crude oil and oil products will continue to be necessary to ensure the efficient functioning of the economy, in particular because of its significant weight in the transport sector. In this context, Portugal has and maintains efforts to continue to have a diversified portfolio of suppliers and origins of crude oil and oil products, avoiding significant dependencies (concentration) on suppliers, which contributes to a high level of security of supply.

Despite the above, increasing reliance on indigenous resources (particularly in the transport sector) will also reduce the dependence of the national economy on crude oil and its derivatives and thus reduce its energy dependency, with a view to achieving the 65 % target by 2030.

Despite the closure of the Matosinhos refinery activity in 2021, the oil product storage activity was maintained using part of the storage capacity of the former refinery. In order to continue to secure supply to the regional market, access to the maritime terminal and to existing storage and shipment facilities in Matosinhos (Matosinhos Logstic Park and Perafita Park) has also been maintained. After the closure of the plant in Matosinhos, the Sines refinery became the only refinery in Portugal. However, its high conversion capacity, as well as its strategic advantage in terms of location and the deep water port infrastructure that serves it, both for the supply of crude oil and for the export of oil products, make the refinery highly competitive.

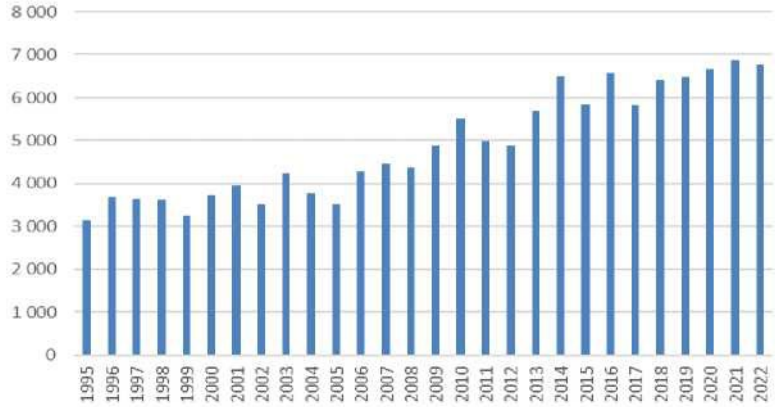
Within the legislative framework applicable to the oil sector in Portugal, the Directorate-General for Energy and Geology (DGEG) is responsible for monitoring the market and security of supply of the National Petroleum System (SPN).For this purpose, the 'Report on Monitoring the Market and Supply Security of the SPN' is published annually. This report considers current and forecast demand data for crude oil and oil products and also takes into account developments in supply and storage infrastructure, including decommissioning, construction or construction forecasts, as well as the need to meet the requirements for emergency stocks of crude oil and oil products.

Figure 46 – Evolution of the Energy Import Balance in Portugal (ktoe) [Source: DGEG]

Domestic energy production has been increasing in recent years, with a tcma of 2.0 % in the period 2013-2022, confirming growth in the previous decade (tcma of 1.6 % in 2003-2012). The increase in domestic energy production has had a positive impact on reducing external energy dependency by reducing imports of coal and natural gas for electricity production.

In 2022, domestic energy production was 6 778 ktoe, with a decrease of 1.5 % compared to 2021, mainly due to the lower contribution of production from renewable sources, in particular water. Domestic energy production in 2022 accounted for around 32 % of primary energy consumption (-1 pps compared to 2021), with domestic production averaging around 29 % of primary energy consumption in the last decade, 2013-2022, compared with an average of 18 % in 2003-2012.

Figure 47 – Evolution of Domestic Energy Production in Portugal (ktoe) (Source: DGEG]



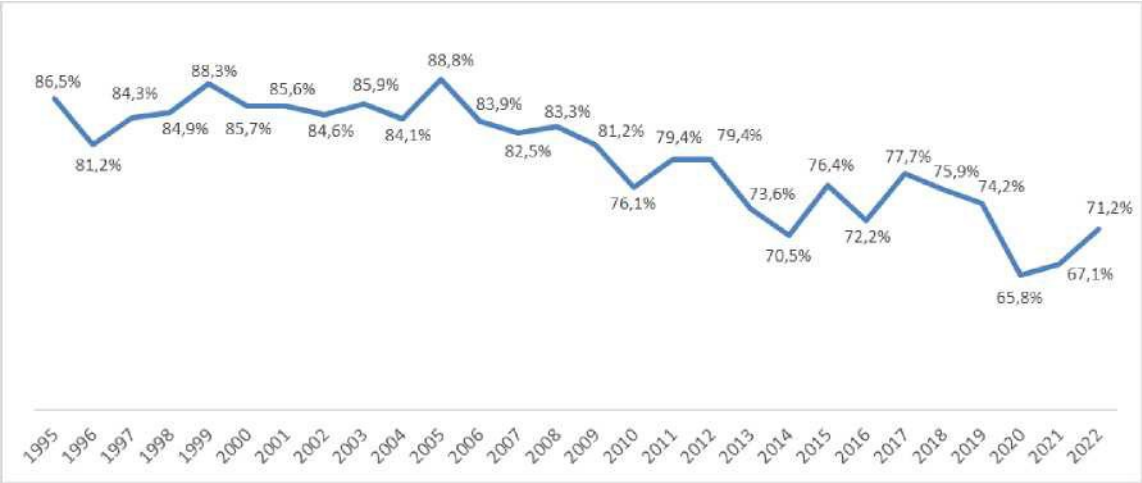
1.2. Energy dependence

One of the main challenges and objectives of the current national energy policy is to reduce energy dependence on the outside world. Historically, Portugal has a high energy dependency, with an average of 83.0 % in the decade between 2003 and 2012, due to the lack of domestic production of fossil energy sources such as oil or natural gas, which have a very significant share of final energy consumption. The focus on renewable energy and energy efficiency, with a greater focus in recent years, has allowed Portugal to reduce its energy dependency to levels below 80 %, with an average of 73 % over the ten-year period from 2013 to 2022. However, the variability of the hydrological regime, coupled with a large water component in the national electro-producer system, negatively influences energy dependency in dry years, as was the case in 2012, 2015, 2017 or 2022.

In 2020, Portugal's energy dependency reached 65.8 %, historically lower, with a decrease of 8,4 pps compared to 2019. This reduction was mainly due to the drop in final energy consumption due to the impact of the COVID-19 pandemic, reduced imports of coal for electricity production and increased domestic renewable energy production. In 2022, energy dependency was 71.2 % and the increase compared to 2021 was mainly due to the increase in the import

balance.

Figure 48 – Evolution of Portugal's external energy deficit [Source: DGEG]



1.3. Relevant risks for energy supply in Portugal

In accordance with Article 7 of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply, the DGEG, as the national competent authority, conducts a National Risk Assessment of the risks affecting the security of supply of the National Gas System, with the cooperation of the Operator of the National Gas Transmission Network. This assessment shall be carried out every four years, unless circumstances require more frequent updates, and take into account relevant national and regional circumstances, such as market size, network configuration, Member State entry and exit flows, storage presence and the role of gas in the energy mix, in particular with regard to electricity generation and the operation of industry, and where scenarios with exceptionally high demand and gas supply disruption contexts due to the failure of key supply infrastructures are developed.

The national risk scenarios identified in the most recent National Risk Assessment, submitted to the European Commission in September 2022, are as follows:

1. Failure of the Sines LNG Terminal infrastructure;
2. Failure at the Campo Maior interconnection;
3. Failure of Valença do Minho interconnection;
4. Failure of the Carriço Underground Storage infrastructure;
5. Disruption of supply by third country suppliers;
6. Disruption of the main pipeline of the National Gas Transmission Network;
7. Disruption caused by cyber-attacks on the infrastructure of the National Transport Network, Storage Infrastructure and LNG Terminals;
8. Regional risk scenarios;
9. Control of infrastructure relevant to security of supply by third country entities;
10. Pandemic.

Following the National Risk Assessment, a Preventive Action Plan is drawn up, which aims to define the appropriate measures to eliminate or mitigate the risks identified in the risk scenarios of the National Risk Assessment, as well as an Emergency Plan, detailing action measures for various crisis levels, giving responsibility to the actors of the National Gas System to deal with the identified risk events and safeguard supply. The most recent versions of these Plans were submitted to the European Commission in March 2023. According to this Regulation, a common risk assessment of a regional dimension is prepared to identify and study the main risks affecting the security of gas supply of certain EU regions, referred to as risk groups, with Portugal being part of the risk groups for gas supply from Algeria and Norway.

In accordance with Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector, the DGEG established the Risk Preparedness Plan in the electricity sector (PPR), which sets out the measures to prevent, prepare for and mitigate electricity crises resulting from the risks identified for the sector at national and EU level, as well as defining and characterising crisis levels as well as information flows and obligations imposed on the various actors in the system. based on regional electricity crisis scenarios identified by the European Network of Transmission System Operators for Electricity and national electricity crisis scenarios identified by the DGEG, in collaboration with the Electricity Transmission System Operator, after consulting the Electricity Distribution Network Operator, the National Regulatory Authority and the relevant electricity producers.

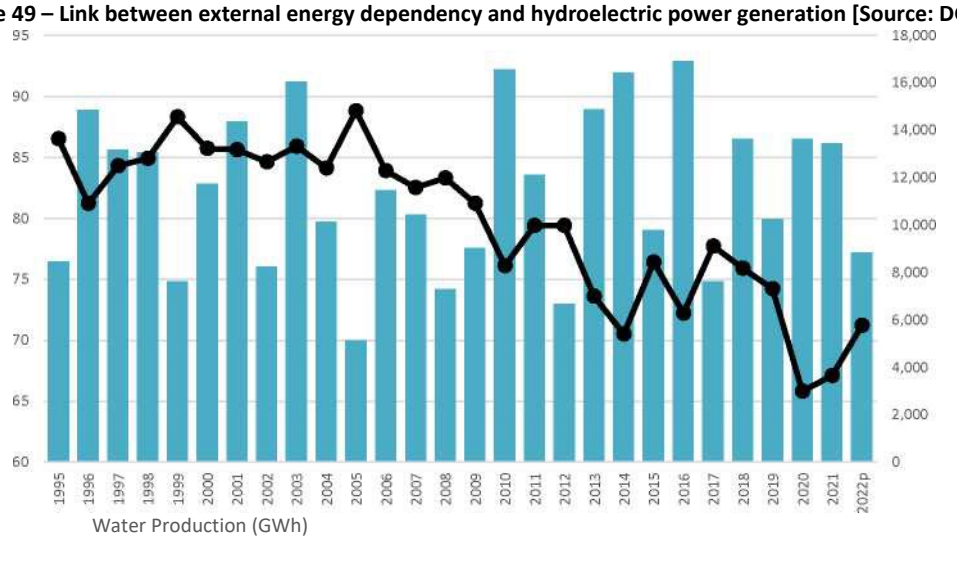
The national electricity crisis scenarios identified in the RPP, revised and submitted to the European Commission in January 2023, are as follows:

1. Failure of the Sines LNG Terminal;
2. Prolonged international gas supply failure;
3. Strong wind, with a strong impact on the coastline;
4. Severe forest fires in the North and Centre regions;
5. Cyber attack;
6. Earthquake affecting the west coast;
7. Pandemic;
8. Physical attack against critical assets;
9. Physical attack on control centres;
10. Heavy precipitation and flooding;
11. Heat wave and extreme drought (long periods);
12. Prolonged interruption of critical supply chains (except gas).

Electricitygeneration in Portugal has historically a high contribution from hydropower plants. In 2022, the share of water in gross electricity production was 29.6 %, with a reduction of 34.3 % compared to 2021, as a result of the reduction in the hydryality index for 0,63. Thus, as identified in the RPP, drought represents one of the most relevant risks for the national electricity system. In general, in years of increased availability of water resources for electricity production, Portugal has a lower energy dependency as it uses lower imports of natural gas (and coal until 2021) for electricity production, also resulting in a reduction in the energy bill. Diversification of renewable sources for electricity production, in particular wind power generation, as well as the construction of new reversible hydroelectric plants, i.e. equipped with equipment

pumping. These facilities make it possible to use surplus renewable production in hours of lower consumption to store energy for later use, which has made it possible to partially mitigate the impact of drought on the electro-producer system. The figure below illustrates the evolution of energy dependency compared to gross hydropower generation.

Figure 49 – Link between external energy dependency and hydroelectric power generation [Source: DGEG]



I.4. National Electroproducer System

In 2022, the national electricity generation system recorded gross electricity production of 48.8 TWh, with a decrease of approximately 4.3 % compared to 2021. Of the total electricity production, in 2022 around 61.3 % came from renewable energy sources (-3,6 pps compared to 2021), with a higher focus on hydro and wind, which together accounted for around 45.2 % of all national electricity production, followed by non-renewable thermal, with approximately 38.7 % of national production. Following the trend from 2019 onwards, Portugal recorded a positive importer balance of approximately 2 022 TWh in 9,3.

In the renewable component of electricity generation, in 2022 wind contributed around 44.3 % of total renewable production, followed by water with 29.6 %, biomass60 with13,8 %, solar photovoltaic with 11.8 % and geothermal production, which is produced only in the Autonomous Region of the Azores at 0.7 %.

60Includes plant/forest residues, sulphite liqueurs, biogas and municipal waste (renewable fraction)

Figure 50 – Evolution of Gross Electricity Production and of Import balance in Portugal (GWh) [Source: DGEG]

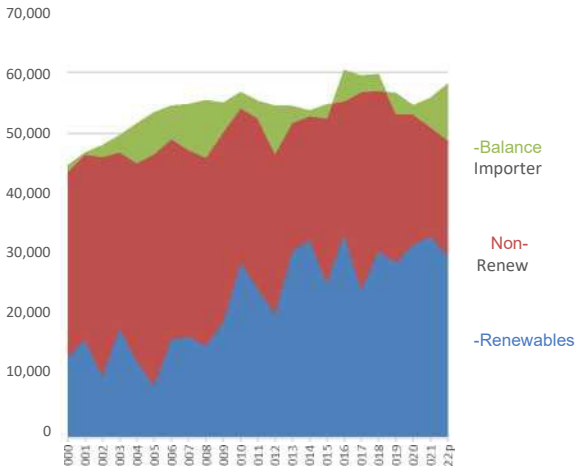
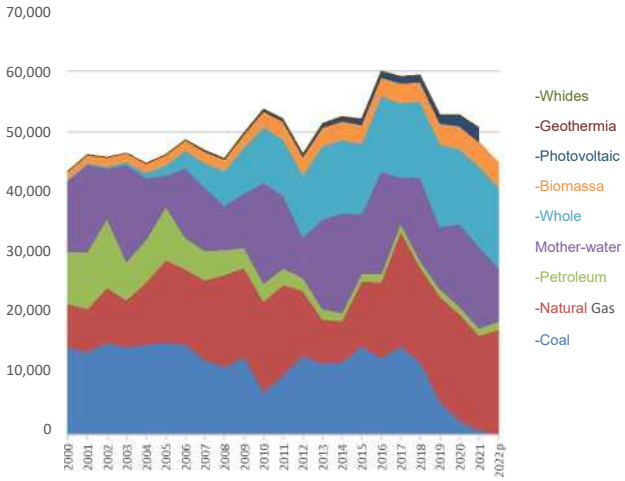


Figure 51 – Evolution of Gross Electricity Production in Portugal (GWh) [Source: DGEG]

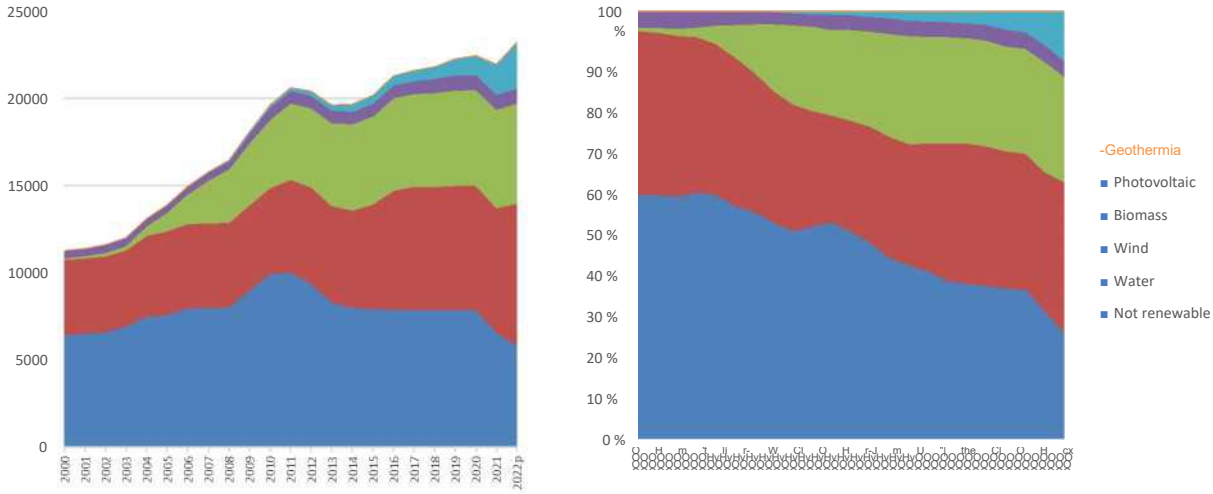


As regards installed capacity for electricity generation, Portugal recorded a total of around 23 GW in 2022, of which approximately 17 GW, or around 75 %, relate to renewable based technologies. There was an increase of approximately 5.9 % compared to 2021, equivalent to around 1.3 GW, mainly as a result of the entry into operation of new solar photovoltaic and water capacity. Of the total installed capacity, around 35 % (8 142 MW) corresponds to hydropower plants, which include a relevant reversible pumping component, which allows to absorb excess electricity production in times of lower consumption and store renewable energy and which represents around 45 % of total water capacity. Wind accounts for around 25 % of installed capacity (5 730 MW), natural gas around 21 % (4 918 MW), solar photovoltaic approximately 11 % (2 659 MW),biomass 61 at around 3 % (861 MW), others notrenovated 62 approximately 4 % (905 MW) andothers 63 renovated around 0.1 % (34 MW).

In the 2013-2022's total installed capacity for electricity generation in Portugal increased by around 3 624 MW, resulting from an increase of around 6.1 GW of renewable capacity and a decrease of approximately 2.5 GW of non-renewable capacity.

61Includes plant/forest waste, sulphite liqueurs, biogas and municipal waste
62Includes fuel oil, refinery gas, diesel, industrial waste and propane
63Includes Geotermia and Whides

Figure 52 – Evolution of installed capacity for electricity generation in Portugal by type of source (MW) [Source: DGEG]



II. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

In view of the scenario envisaged for the evolution of the electricity production sector in Portugal, the following table shows the expected evolution of installed capacity, broken down by technology, for the 2040 horizon for the purpose of meeting the targets set for this sector and with impacts on other sectors.

Table 50 – Prospects of changes in installed capacity for electricity production by technology in Portugal by 2040

(GW)	**2025**	**2030**	**2035**	**2040**
Water	8,1	8,1	8,1	8,1
of which pumped	3,6	3,6	3,6	3,6
Wind	5,8	9,4	12,3	14.1
Onshore wind (includes for prod. (H_2)	5,8	9,1	10,4	12,2
For prod H_2	0,05	0,39	0,39	0,39
Offshore wind (includes for prod. (H_2)	0,0	0,3	1,9	1,9
For prod H_2	0,00	0,22	1,84	1,84
Solar Photovoltaic	8,1	12,9	19.2	27.1
centralised (includes for prod. (H_2)	5,3	9.4	13,8	18,8
For prod H_2	0,0	0,69	1,79	6,07
decentralised	2,8	3,5	5,4	8,3
Concentrated Thermal Solar	0,0	0,0	0,0	0,0
Biomass/Biogas and Waste	1,2	1,2	1,3	1,6
Other renewable	0,1	0,3	0.3	0.3
Geothermal	0,1	0,1	0,1	0,1
Waves	0,0	0,2	0,2	0,2
Coal	0,0	0,0	0,0	0,0
Natural Gas	4,8	3,8	2,9	1,8
Petroleum products	0,6	0,5	0,3	0,3
Batteries	0	0	0,0	1,1
TOTAL	**29**	**36**	**44**	**54**

4.5. Internal Energy Market Dimension

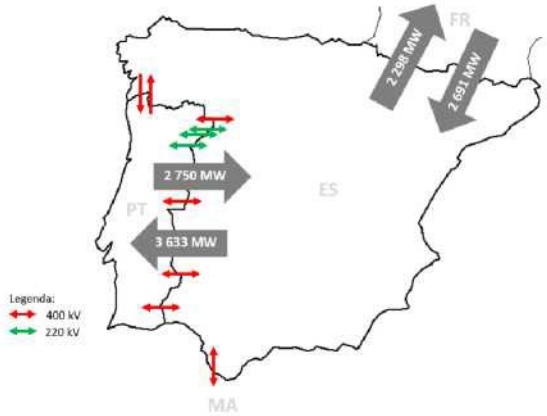
4.5.1. Electricity interconnections

1. Current interconnection level and main interconnectors

As regards the electricity interconnections between Portugal and Spain, there are currently 6 lines at 400 kV and 3 lines at 220 kV. Interconnection capacity between the two countries has evolved favourably in recent years to meet the demands of the Iberian Electricity Market (MIBEL), resulting in increased cross-zonal capacity available for commercial purposes. In 2022 there was an average value of commercial interconnection capacity in the order of 2 750 MW in Portugal-Spain (exporter) direction and in the order of 3 633 MW in the Spanish – Portugal (importer) direction, as shown in the graph below.

Figure 53 – Evolution of the average annual value of the Portugal-Spain Commercial Interconnection capacity (MW) [Source: REN]

Figure 54 – Electrical interconnections in the Iberian Peninsula in 2022 [Source: REN, REE]



To meet the European Commission's common target of 10 % electricity interconnections in 2020 and 15 % in 2030, Portugal has seen a positive development. However, the same is not true of the level of interconnection between the Iberian Peninsula and France, which fell far short of the 10 % target in 2022, as shown in the graph below. The ambition of Portugal and Spain to ensure an effective and robust connection to the European energy market is undermined by the continuing bottleneck in the interconnection between Spain and France via the Pyrenees, which leads to an operation of the Peninsula in 'electric island' mode, with the technical difficulties and challenges inherent in a large penetration of renewable generation and, consequently, the ultimate objectives of the NECP, which this situation gives.

Figure 55 – Ratio between interconnection capacity and installed capacity in the electricity generation system between Portugal – Spain and the Iberian Peninsula – France [Source: REN, REE, DGEG analysis][67]

According to Article 16(8) of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity, electricity transmission system operators shall not limit the volume of cross-zonal capacity to be made available to market participants in order to resolve congestion in their own bidding zones, or as a means to manage flows resulting from transactions within bidding zones, and minimum levels of capacity available for cross-zonal trade are established. Pursuant to paragraph 9 of the same Article, the national Transmission System Operator for Electricity has requested ERSE to derogate from paragraph 8 as it is necessary to maintain operational security and the derogation has been approved by that regulatory authority.

11. Projections of interconnector expansion requirements at least until 2040 (including for the year 2030)

As defined in RMSA-E 2023, taking into account the expected developments in the network and others still to be identified, the following evolution of commercial interconnection capacity (in MW) is envisaged:

Table 51 – Forecast of indicative minimum values of commercial interconnection capacity [Source: REN]

	Portugal – > Spain	Spain – > Portugal
2024	2 700 MW	2 700 MW
2025	3 500 MW	4 200 MW
2030	3 500 MW	4 200 MW
2035	3 500 MW	4 200 MW
2040	4 000* MW	4 700* MW

* The capacities indicated for 2040 correspond to values identified as *Target Capacities* for the Portugal-Spain border in studies TYNDP 2022 – *Ten Year Network Develpoment Plan*. However, the network reinforcements needed in Portugal and Spain to reach these capacity values are not yet identified.

67. The ratio Portugal – Spain was calculated according to the ENTSO-E methodology based on the SOAF report ("For system adequacy purposes, Simultaneous Interconnection Transmission Capacity is based on 80 % of expected NTC between Portugal – Spain"). The Iberian Peninsula – France ratio includes installed capacity from Portugal and Spain and also considers 100 % of the commercial interconnection capacity (NTC).

4.5.2. Energy transmission infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

1.1. Electricity

The National Electricity Transmission Network (RNT) comprises the installations implemented on mainland national

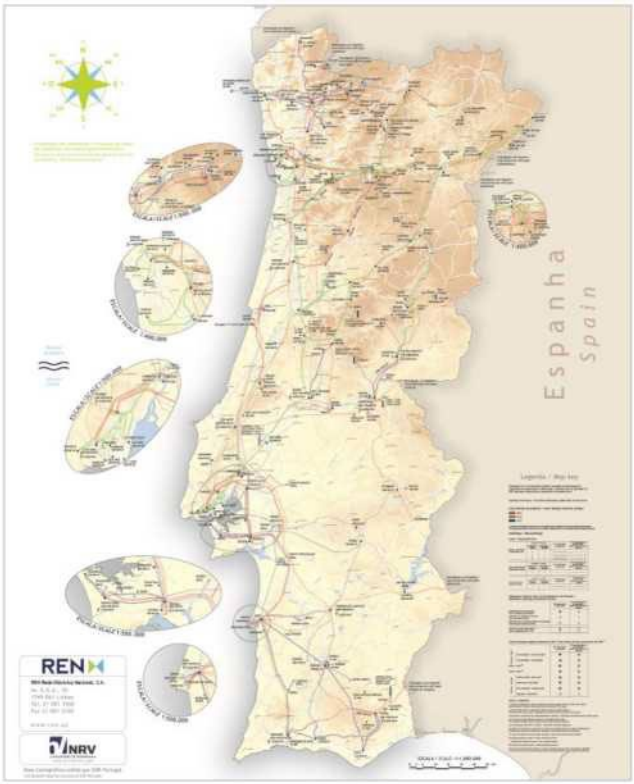
territory which ensure the transmission of energy from the power generating centres with considerable installed power to locations with high consumption density, as well as interconnections with Spain, via very high voltage lines as well as installations and equipment that adjust voltage levels and enable energy flows to be controlled. At present, RNT has a total of 9 424 km of network, a transformation power of 39 517 AMM, and has 70 substations, 14 shutters, 2 sectioning stations and 1 switchover stations in operation. The evolution of the NTS is illustrated in the following table and figure.

Table 52 – Main characteristics of the National Electricity Transmission Network [Source: REN]

	2021	2022	Variation
Length of Lines (km)	9 348	9 424	0.8 %
400 kV	3 051	3 075	0.8 %
220 kV	3 848	3 848	— —
150 kV	2 449	2 501	2.1 %
Transformation Power (MVA)	39 221	39 517	0.8 %
Self-processing (MAT/MAT)	14 920	14 920	— —
Processing (MAT/AT)	23 981	24 277	1.2 %
Processing (MAT/MT)	320	320	— —

The figure below illustrates the map of the NTS.

Figure 56 – Map of the National Electricity Transmission Network in 2022 [Source: https-//datahub.ren.pt/pt/redes/]



1.2. Natural gas

The National Network of Transmission, Infrastructure for Storage and Liquefied Natural Gas Terminals (RNTIAT) consists of all the infrastructure for the reception and transport of gas by pipeline, underground storage and the reception, storage and re-gasification of liquefied natural gas (LNG). RNTIAT consists of the public service infrastructure forming

part of the National Gas Transmission Network (RNTG), Carriço Underground Storage (AS) infrastructure at Pombal and the Liquent Natural Gas Terminal (LNGT) in Sines, as well as the respective infrastructure connecting to the transmission network.

The RNTG is the infrastructure used to transport and deliver high pressure gas in Portugal, from entry points to exit points, consisting of two main axes: a South-North axis linking the Sines LNG Terminal to the Valença do Minho interconnector, ensuring that gas is supplied to Portugal's coastline, where the most densely populated localities are located, and with a bypass for Mangualde; and an East-West axis between the Campo Maior interconnection and the Carriço AS, with a bypass for Guard. In 2013, the link between the derivations of the two axes was concluded, linking Mangualde to Guarda, which made it possible to increase demand satisfaction in the central and northern parts of the country. The total RNTG *Gas Regulation and Metering Station*has an output capacity of 707 GWh/day, equivalent to 2 470 km^3(n)/h. 1 375 km of main pipeline and high-pressure branches intended for the transport of gas; 85 gas setting and measuring stations at delivery points, (Grms); 66 junction stations for bypass (*JCT)*; 45 *Block Valve Station*(BV) stations, 5 T-interconnection stations (ICJCT – *T Interconnection Station*); 2 *Custody Transfer Station*(CTS).

Gas may be delivered directly to customers connected at high pressure, to the distribution networks forming the national gas distribution network, to the interconnected system of the Spanish gasist system and to the Carriço AS for injection into the cavities of that infrastructure.

The most recent developments of the RNTG focused on connecting new delivery points and remodelling some pressure reduction and measurement stations to adapt them to new operating conditions and gas flows to be delivered.

There are two interconnections between the RNTG and Spain's transmission network: Camp Maior – Badajoz and Valença do Minho – Tuy. Both interconnection points have entry and exit capacity, while in total the aggregate capacity of the VIP (Campo Maior + Valença do Minho) has an import value of 144 GWh/day and export value of 80 GWh/day announced by September 2027.

Table 53 – Capacities of gas interconnections between Portugal and Spain [Source: REN]

Interconnection	Daily capacity
Field Large	Input Capacity: 134 GWh/day, equivalent to 470 km^3(n)/h Output Capacity: 55 GWh/day, equivalent to 193 km^3(n)/h
Valença do Minho	Input Capacity: 10 GWh/day, equivalent to 35 km^3(n)/h Output Capacity: 25 GWh/day, equivalent to 88 km^3(n)/h

The Sines Liquent Natural Gas Terminal (LNG Terminal) is strategically located on the European Atlantic coast and integrates all the infrastructure for the reception and dispatch of methane ships, storage and regasification of LNG to the transport network, as well as the loading of LNG in tankers. The main features of the Sines LNG Terminal include:

1.3. Reception and unloading of methane ships: The installation includes a ship berth, articulated discharge arms and LNG vapour discharge, recirculation and return lines. The discharge capacity is 10 000 m 3^{per}hour LNG for LNG ships with volumes between 40 000 and 216 000^{m} 3 LNG.

1.4. LNG storage: After unloading, LNG is stored in tanks. The storage capacity is 2 569 GWh, corresponding to^{two} LNG tanks of 120 000 m 3 and a 150 000 m^3 LNG tank.

1.5. Regasification for RNTG: Regasification is a physical LNG vaporisation process that uses the thermal exchange of gas with seawater in atmospheric vaporisers. For the performance of this process, the infrastructure has seven (7) atmospheric vaporisers with a unit capacity of 64 GWh/day (equivalent to 225 000 m^3(n)/h). The nominal emission capacity is 321 GWh/day (equivalent to 1 125 000 m^3(n)/h) with an hourly peak capacity of 1 350 000 m^3(n)/h).

1.6. LNG filling bays: The Sines LNG terminal allows LNG tanker trucks to be loaded, which transport gas to autonomous regasification units (UAG) in areas of Portugal which cannot be supplied by the high-pressure natural gas network. For this activity, the LNG Terminal has three filling bays, with a total LNG capacity of 175 m^{3}per hour.

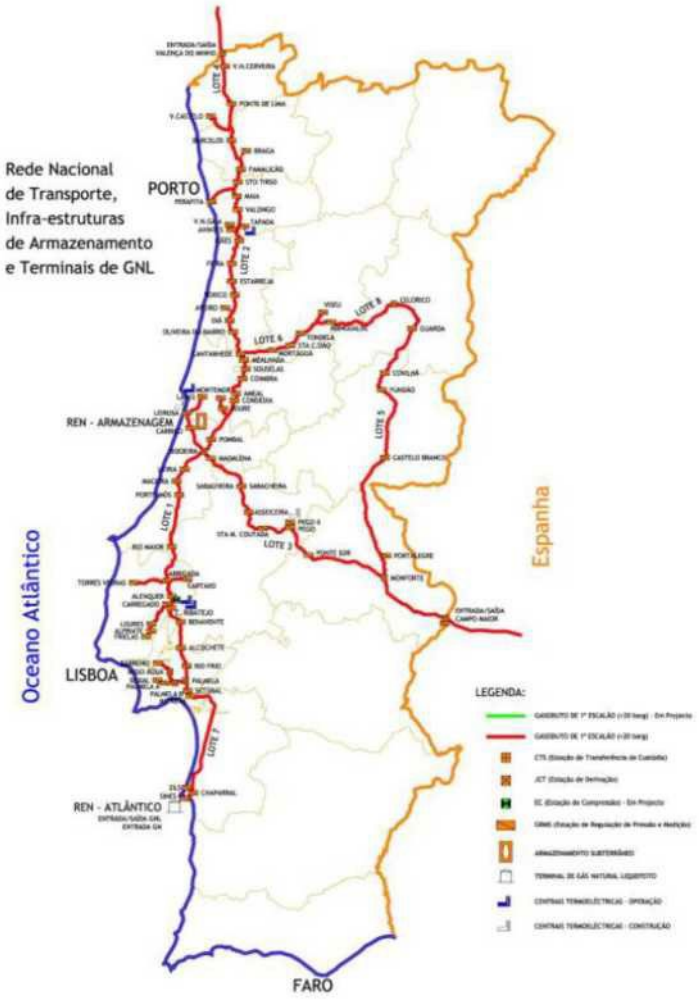
1.7. Loading of Methane Ships: The LNG TNGT infrastructure also enables *Gas-in*, cooling and the full or partial loading of methane ships, using the same port facility and ship unloading equipment. The capacity for this activity is 1 500 m^3per hour LNG.

The expansion of the Sines LNG Terminal, completed in July 2012, led to an increase in the useful storage capacity by 62.5 % to 390 000 m 3^m LNG, an increase in the capacity to emit gas to the grid by 50 % to 1 350 000 m 3 per^{hour}, the adaptation of the*Jetty*for the reception of large capacity methane ships, as well as the implementation of a set of procedural reinforcements aimed at maximising the availability of the infrastructure and a high operational safety standard. As a result, the Sines Terminal now offers favourable conditions for access to more agents, providing more flexibility in the management of imported volumes, and creating unique conditions for the reception of LNG ships from more remote and diversified sources, contributing to the competitiveness of the sector in Portugal and to the security of supply to the SNG.

For Carriço Underground Storage, the gas is stored at high pressure in cavities created inside a saline massif at depths of more than 1 000 metres. There are currently 6 cavities in operation, with a total storage capacity of 3 839 GWh (322.6 Mm^3), using the same surface gas station, which allows bi-directional flow movement, i.e. gas injection from the transport network into the cavities and gas extraction from caverns to the transport network. Carriço AS currently has injection capacity of 24 GWh/day (83 km^3(n)/h) and extraction capacity of 129 GWh/day (450 km^3(n)/h) with an operating volume of gas in the cavities of more than 60 % of the storage capacity of the Carriço AS and 71 GWh/day (250 km^3(n)/h), with an operating volume of gas in the cavities of less than 60 % of the storage capacity of the Carriço US storage facility. This infrastructure is key to building up the necessary security stocks to guarantee supplies to the country in the event of a supply crisis, and it also provides conditions for logistics and commercial optimisation of commercial agents active in the sector at national and also Iberian level.

The figure below illustrates the RNTIAT map.

Figure 57 – Map of the National Transport Network, Storage Infrastructure and Natural Gas Terminals Liquefied [Source: REN]



ii. Projections of network expansion requirements at least until 2040 (including for the year 2030)

11.1. Electricity

In order to meet the Community requirements on electricity interconnections, a wide range of network expansion actions and projects are planned, including:

- 'Ribeira de Pena – Vieira do Minho – Feira' axis, consisting of two lines at 400 kV, associated with the Tâmega hydroelectric complex, which will play an important role in the electricity flow associated with the future 'Minho-Galicia' interconnector. This project had PIC status on the 5th PCI list (in 2021). 65. The Ribeira da Pena substation and the section Vieira do Minho – Ribeira de Pena were commissioned in 2021;
- In 2024, the new interconnection between Portugal and Spain is planned to be implemented through a 400 kV line between Ponte de Lima (Minho) and Fontefría (Galicia), a project recognised by the European Commission as PCIs, in the 1th list of Union Projects of Common Interest (PCI) and Projects of Mutual Interest (PIM), adopted in Commission Delegated Regulation (EU) 2024/1041 of 28 November 2023, published in the Official Journal of the European Union on 8 April 202 4.66 The Ponte de Lima- Vila Nova de Famalicão section was commissioned in 2021.
- The commissioning of a 400 kV line to be established between the current Pedralva substation and the future Sobrado substation, previously recognised as the European Commission's PIC is foreseen by 2029, which, in addition to increasing interconnection capacity values, will facilitate the flow of renewable electricity;is foreseen by 2029, which, in addition to increasing interconnection capacity values, will facilitate the flow of

65Previous PIC 2.16.3 – Internal line between Vieira do Minho, Ribeira de Pena and Feira

66PIC 1.1 in the 1th list of PCIs and MIPs (Prior PIC 2.17) – Portugal-Spain Interconnection: Beariz-Fontefría (ES), Fontefría (ES) – Ponte de Lima (PT) and Ponte de Limão-Vila Nova de Famalicão (PT)

renewable electricity;

- For 2030, a series of very long-term analyses have already been carried out by the transmission system operators of Portugal and Spain (REN and REE) under the *Ten-Year Network Development Plan 2016* (TYNDP), which have led to an estimate of interconnection capacity values of 3 500 MW in the sense of Portugal→Spain and 4 200 MW in the sense of Spain→Portugal;
- From a longer-term perspective, 2040 commercial interconnection capacities could be between 4 000 MW in Portugal→Spain and 4 700 MW in the sense of Spain→Portugal, values identified as "*Target Capacities"* for the Portugal-Spain border in studies carried out under the TYNDP 2018, the possible grid reinforcements or new interconnections needed to achieve these values of interconnection capacity are not yet identified.

In the electricity sector, there are also other projects linked to the strengthening of internal networks, both transmission and distribution, to integrate and accommodate renewable electricity generation, and to meet the needs of large consumers, in particular the following:

- 2025-2026: 400 kV RNT reinforcement in the Minho area;
- 2026-2027: Reception of offshore energy from V. Castelo – Phase 2;
- 2026-2028: 220 kV connection Vila Pouca de Aguiar-Carrapatelo;
- 2027-2029: 400 kV connection Ribeira de Pena – Lagoaça;
- 2029-2030: Reception of offshore energy from V. Castelo – Phase 3.

11.2. Natural gas and renewable gases

In order to meet the commitments set at European level and based on national energy policy, in particular in terms of internal market integration and security of supply, and on the demand for a more robust, efficient and interconnected national gas system, Portugal is seeking to develop its transmission and distribution system, with projects contributing to this objective at that time.

Portugal, in the development of the National Gas System, intends to implement a set of projects that will address short- and medium-term needs by preparing and equipping itself with infrastructure that will subsequently enable the national gasist system to be fully decarbonised, maximising the use of assets.

This includes a wide range of actions and projects from which they stand out (some of them already indicated in point 2.4.2 of this plan):

- The strengthening of the Carriço US storage capacity in two cavities with an additional capacity of 1.2 TWh. These additional cavities are expected to be in operation in 2027 and 2028 and will be adapted for storage of 100 % H_2;
- Investments in the Sines LNG Terminal which will allow LNG to be transferred between ships, allowing for the return of up to 8 bcm/year of this fuel (from 2023 onwards) and the improvement of mooring conditions, allowing on the one hand to reduce berthing limitations in more adverse sea conditions and on the other hand to increase the geometry of ships (expected in 2026);

Investments in existing infrastructure, be it at the level of the gas transmission or distribution network, enabling the reception of renewable gases and the conveyance of natural gas and renewable gases, especially biomethane, as well as increasing blends of H2; Insorted in the set of Projects of Common Interest (PCI), the latest list of which was published in April 2024, concerning hydrogen interconnection infrastructure in Western Europe (Group 9), is the Corridor Portugal – Spain – France – Germany (9.1), composed of the following projects (together referred to as 'H2Med'):

9.1.1 Internal hydrogen infrastructure in Portugal (referred to as "PT Backbone");

9.1.2 Hydrogen interconnector between Portugal and Spain (referred to as 'CelZa');

9.1.3 Internal hydrogen infrastructure in Spain;

9.1.4 Hydrogen interconnector between Spain and France (referred to as 'Barmar');

9.1.5 Internal hydrogen infrastructure in France connected to Germany (so-called "HyFen");

9.1.6 Internal hydrogen infrastructure in Germany connected to France (referred to as 'H2Hercules South').

This corridor provides for the construction of two new sections of the RNTG between Figueira da Foz and Cantanhede,

with connection to the Carriço AS (50 km), and the Portuguese section of the CelZa interconnection project (162 km). At the same time, the current 100 % H2 sailing pipelines on the Cantanhede – Celorico da Beira – Monforte axis (341 km) will be suitable.

4.5.3. Electricity and gas markets, energy prices

i. Current situation of electricity and gas markets, including energy prices

The Report on Retail Electricity and Gas Markets in 2022, published by the National Regulatory Authority (ERSE) in August 2023, provides a cross-cutting overview of the retail markets in electricity and gas, in particular as regards competitive dynamics, the characterisation of commercial offers and consumer protection. At the end of 2022 there were 775 commercial offers on the electricity and gas markets. The number of offers per supplier was 25, with 7 341 consumers per offer.

In the electricity sector at the end of 2022, in addition to the SRB, 33 suppliers were operating in the liberalised market, the same value as in the previous year. The number of active suppliers has risen sharply since 2013 from ten to 33.

The gas market saw the number of active suppliers in 2022 rising from 19 to 20, already close to the historical peak of 21 active suppliers at the end of 2020.

1.1. Electricity market

In Portugal, since September 2006, all electricity customers in mainland Portugal have effectively been able to choose their electricity supplier. In 2022, the Free Market (ML) represented 5.5 million customers, corresponding to 85 % of the total customers on the market, while the remaining customers belong to the Regulated Market (MR) which are supplied by the Last Appeal Trader (SRB) and represent around 974 thousand customers. Household customers have a large share of customers who are still in the MRM. Pursuant to Ministerial Implementing Order No 83/2020 of 1 April, household consumers still supplied by a supplier of last resort have until 31 December 2025 to seek to ensure the supply of electricity by a supplier on the market. Under Regulation No 951/2021 of 2 November 2009, supplementary supply may be applied by transferring customers in the portfolio of a supplier on a market basis into the portfolio of a supplier of last resort, given the atypical context of market conditions.

Table 54 – Number of customers in the national electricity market by voltage level in 2022 (estimated) (Source: ERSE]

	Free Market	Regulated market
MAT and AT	412	5
MT	24 887	1 002
BTE	37 409	1 625
BTN	5 387 682	971 797
Total	**5 450 390**	**974 429**

There has also been a gradual increase in the number of suppliers active in the different market segments and in the number of offers on the retail market, and the benefits of more competition, in terms of greater choice, better prices and more competition between players, are also expected to be increasingly exploited by industrial and residential consumers.

As part of the latest legislative amendments, the Government set 31 December 2020 as the deadline for the abolition of the transitional tariffs for the supply of electricity in MT and BT.

In the meantime, in the State Budget Law for 2020, the deadline for abolishing the transitional tariffs for the supply of electricity in BTN is extended to 31 December 2025.

The following table shows the six-monthly trend in average electricity prices for Portugal in the household sector and industry in the most representative consumption band, DC and IB respectively.

As regards electricity prices (Prices inclusive of all taxes) in Portugal in 2022, and for the domestic sector, the average annual price was EUR 0,2210/kWh (DC band) – an increase of 3.8 % compared to 2021. In the industry sector the

average annual price was EUR 0,1841/kWh (IB band) and increased by 3.3 % compared to 2021.

Table 55 – Electricity prices by sector in Portugal (EUR/kWh) [Source: DGEG]

		Domestic (DC band67)			Industry (band IB68)		
		Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices inclusive of all taxes	Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices inclusive of all taxes
2021	1° without	0,1131	0,1732	0,2089	0,0955	0,1400	0,1706
	2° without	0,1164	0,1810	0,2170	0,1071	0,1518	0,1844
2022	1° without	0,1688	0,1831	0,2199	0,1446	0,1415	0,1725
	2° without	0,1972	0,1860	0,2222	0,1755	0,1599	0,1956

1.2. Natural Gas Market

In Portugal, since the beginning of 2010, all consumers have the right to freely choose their supplier of NG. The process of liberalising the NG market has already enabled all large consumers (annual consumption of more than 1 million m^3 of GN) to join the free market. Also, the vast majority of industrial consumers (annual consumption between 10 000 m^3 and 1 million^m NG 3) opted for the most favourable terms offered by market suppliers. Similarly, the evolution of the residential customer segment demonstrates a significant and increasing uptake of market offers.

In the overall retail market with around 1.5 million customers, the free market had around 1.2 million consumers at the end of 2022, representing around 76 % of the total customers in the NG market in Portugal.

Table 56 – Number of customers on the national market for NG by type of customer in ten. 2022 [source: ERSE]

	Free Market	Regulated market
Large Consumers	350	0
Industrial	4 428	428
SMES	67 802	33 724
Residential	1 118 656	335 819
Total	**1 191 236**	**369 971**

There has also been a gradual increase in the number of suppliers active in the different market segments and in the number of offers on the retail market, and the benefits of more competition, in terms of greater choice, better prices and more competition between players, are also expected to be increasingly exploited by industrial and residential consumers.

Ministerial Implementing Order No 144/2017 of 24 April amending Ministerial Implementing Order No 59/2013 of 11 February set 31 December 2020 as the deadline for mandatory supply of NG by suppliers of last resort to final customers with annual consumption less than or equal to 10 000 m^3 who do not exercise the right to switch to a free market supplier.

Currently, the SRB now applies the transitional tariffs for sale to end customers to natural gas consumers who are still being supplied on the regulated market and have not chosen a new supplier. These tariffs are planned to apply until 31 December 2025, the date on which the transitional period ends (Order No 83/2020 of 1 April).

In order to combat price increases, the Government adopted exceptional measures and, by Decree-Law No 57 – B/2022 of 6 December, allowed final customers with annual consumption of less than or equal to 10 000 $m^{3\ \text{to return}}$ to regulated

67Consumptions defined in the following range: 2 500 kWh < Consumption < 5 000 kWh
68Consumptions defined in the following range: 20 MWh < Consumption < 500 MWh

tariffs for the sale of natural gas on the regulated market.

The following table shows the six-monthly trend in average prices of NG for Portugal in the household sector and industry in the most representative consumption band D1 and I4 respectively.

As regards the prices of NG (Prices inclusive of all taxes) in Portugal in 2022, and in the case of the domestic sector, the average annual price was EUR 34,9491/GJ (band D1), with an increase of 34.6 % compared to 2021. In the industry sector the average annual price was EUR 26,8547/GJ (band I4), with an atypical increase of 194 % compared to 2021, mainly due to the increase in the price of natural gas in the main gross markets.

Table 57 – Natural gas prices by sector in Portugal (EUR/GJ) [Source: DGEG]

		Domestic (Banda D169)			Industry (Banda I470)		
		Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices inclusive of all taxes	Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices inclusive of all taxes
2021	1st Semester	18,4701	20,9654	25,4854	5,4613	5,6273	6,9101
	2st Semester	19,4511	21,8519	26,5296	9,0635	9,2729	11,3908
2022	1st Semester	20,3194	22,8518	27,8210	17,9524	18,2175	22,4358
	2st Semester	33,0852	35,6323	43,3893	25,4727	25,6302	31,5080

1.3. Prices of main fuels

As regards the prices of the main energy products in Portugal, the average Sales to the Public Price (PMVP) for road single oil was EUR 1,796/litre in 2022, with an increase of 26 % compared to 2021. The PMVP of simple Gasolina 95 was EUR 1,850/litre, an increase of 14 % compared to 2021.

Table 58 – Price of single road diesel in Portugal (EUR/litre) [Source: DGEG]

	2020	2021	2022	*VaR% 2021/2020*	*VaR% 2022/2021*
Price without fees (PST)	0,503	0,646	1,077	28.5 %	66.7 %
VAT	0,233	0,266	0,336	14.4 %	26.2 %
ISP +Other 71	0,509	0,511	0,384	0.4 %	— 25.0 %
PMVP	1,244	1,423	1,796	14.4 %	26.2 %

Table 59 – Single Gasoline Price 95 in Portugal (EUR/litre) [Source: DGEG]

	2020	2021	2022	*VaR% 2021/2020*	*VaR% 2022/2021*
Price without fees (PST)	0,463	0,653	0,974	40.9 %	49.1 %
VAT	0,259	0,303	0,346	16.8 %	14.3 %
ISP +Other 72	0,664	0,663	0,530	— 0.1 %	— 20.0 %
PMVP	1,387	1,619	1,850	16.8 %	14.3 %

69Consumptions defined in the following range: 20 GJ < Consumption < 200 GJ
70Consumptions defined in the following range: 100 000 GJ < Consumption < 1 000 000 GJ
Oil Product71 Tax (ISP), Road Service Contribution (CSR) and Carbon Tax
72Road Service Contribution and CO_2 Value

Within the framework of mitigation measures approved by the Government, to address the extraordinary context of rising fuel prices, a mechanism was established for the extraordinary and temporary reduction of the unit rates of the ISP on the mainland for unleaded petrol and diesel over the period under review.

1.4. Social Energy Tariff

In 2010, the social tariff for the supply of electricity to economically vulnerable end customers was established, approved by Decree-Law No 138-A/2010 of 28 December, the aim of which was, as part of the process of liberalisation of the energy sector and consumer protection, to ensure that all consumers had access to the essential electricity supply service, irrespective of their provider. That guarantee has led to the need to secure supplies, in particular to economically vulnerable customers. The situation of increasing and volatile international energy costs and the intention to further harmonise the electricity market have also justified the establishment of concrete measures to protect these economically vulnerable consumers, in line with the European guidelines on the internal market in electricity and natural gas. The existence of a social tariff protects the interests of families and other groups of consumers who are economically more vulnerable by means of a tariff model that guarantees them a stable tariff, including through the use of discounts.

In 2014, there was a concern to ensure effective access for customers considered to be most deprived among final consumers of electricity at low normal voltage, the aim was to extend the number of beneficiaries of the social electricity tariff to around 500 holders of electricity supply contracts and to create the conditions for the discount applied to beneficiaries to be higher than was the case. With a view to extending the number of beneficial owners of the Tarifa Social de Energia, the social discounts for access to the essential service of supplying electricity and natural gas, implemented by Decree-Law No 138-A/2010 of 28 December, as amended by Decree-Law No 172/2014 of 14 November, for electricity, and Decree-Law No 101/2011 of 30 September for natural gas, were automatically granted to economically more vulnerable final customers as from the legislative redesign applicable to Law No 7-A/201673of 30 March. This procedure helped the number of beneficiaries, according to data made available by ERSE to date, from 154 648 in March 2016 to 820 527 in September 2017. This measure, initially launched on 28 December 2010 by Decree-Law No 138-A/2010, is, from 1 July 2016, automatically awarded to customers who meet the criteria of economic and/or social vulnerability, as proven by the Tax and Customs Authority and/or the Social Security, in accordance with Law No 7-A/2016 of 30 March.

With the entry into force of Decree-Law No 100/2020 of 26 November 2010, the conditions for access to the social tariff for electricity and natural gas were extended to address the critical situation of the most vulnerable consumers, in particular by extending eligibility to all unemployment situations.

With the publication of Decree-Law No 15/2022 of 14 January 2009 (establishing the organisation and operation of the National Electricity System), the social tariff for electricity is now incorporated into this Decree-Law.

With the publication of Decree-Law No 104/2023 of 17 November 2009, the financing model for the Social Tarifa was amended. This new model extends the scope and number of entities that will contribute to the social tariff for electricity to cover not only producers but also electricity suppliers and other market players in the consumption function.

The automatic recognition system for the allocation of the social energy tariff deprives the customer of the obligation to apply for recognition of such a condition. Indeed, the creation of this automatic tool allows economically vulnerable customers with the necessary energy conditions to access this tool without administrative and financial effort, thus resulting in a procedure of greater social justice. It should also be noted that for many households this discount translates into a saving of tens of euros per year. The automatic recognition mechanism is carried out by means of a computer system of the DGEG, which cross-checks data in accordance with the protocols concluded governing the access and transmission of information between the various agents in the energy sector and the public administration bodies holding the computer data to be processed, in particular the Tax and Customs Authority and the Social Security Authority.

As regards electric energy, the discount to be applied to tariffs for access to electricity networks, applicable from 1

State Budget73 Law for 2016

January 2023, provided for in Order No 12461/2022 of 25 October, must correspond to a value allowing a 33.8 % discount on the transitional tariffs for the sale of electricity to final customers, excluding VAT, other applicable taxes, levies, fees and default interest. As regards Natural Gas, the discount to be applied to tariffs for access to natural gas networks, applicable from 1 October 2022 for the gas year 2022-2023, provided for in Order No 4049/2022 of 7 April, must correspond to a 31.2 % discount on the transitional tariffs for the sale of natural gas to final customers, excluding VAT, other applicable taxes, levies, fees and interest on late payments, and its application is not taken into account for the purposes of other support currently in force.

On an annual basis, the amount of the discount referred to in the preceding paragraph shall be determined by order of the member of government responsible for energy, after consulting ERSE.

Table 60 – Number of consumers with Tarifa Social de Energia in Portugal [Source: DGEG]

	2016	2017	2018	2019*	2020*	2021*	2022*	2023 *
Electricity	786 598	777 085	770 094	776 805	752 956	762 325	757 232	759 561
Natural Gas	36 819	34 403	35 412	34 502	34 709	52 344	50 541	49 638
Total	**823 417**	**811 488**	**805 506**	**811 307**	**787 665**	**814 669**	**807 773**	**809 199**

* data from the DGEG Social Tarifa IT system, referring to automatic processing in December.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

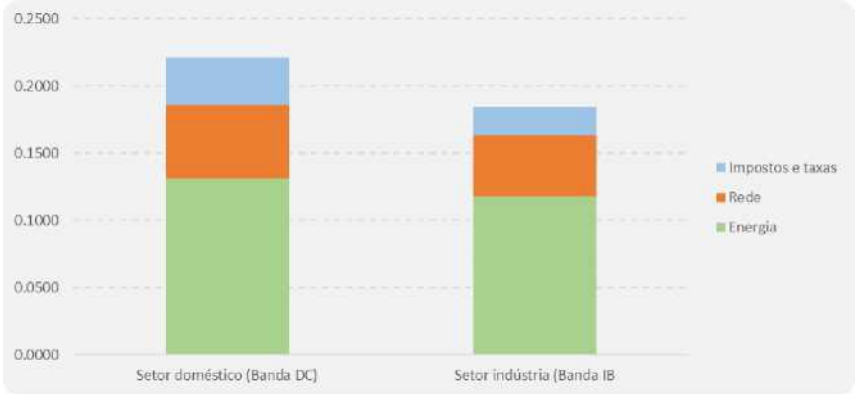
Not available.

iii. Breakdown of the current price elements that make up the three main price components (energy, network, taxes/levies)

The final consumer price of electricity per consumption band is the sum of three main components: the energy and supply component, the network component (transmission and distribution) and the component comprising taxes, fees, levies and charges. The latter component includes taxes such as VAT, excise duty and costs of general economic interest (CIEG). For Portugal, in the household sector and taking into account the DC band, in 2022 the weight of the energy price was 59.4 %, that of the network represented 24.6 % and, finally, that of levies and taxes represented 15.9 % in the sales value to the final consumer (-30,2 pps compared to 2021), as a result of the significant reduction in CIEG.

In the case of Industry and taking into account the IB band, the weight of the energy price was 64.0 %, that of the network represented 24.6 % and finally that of levies and taxes represented 11.4 % in the sales value to the final consumer (-31,5 pps compared to 2021), again as a consequence of the significant reduction in CIEG.

Figure 58 – Electricity price structure in Portugal by sector (EUR/kWh) [Source: DGEG]



iv. Description of energy subsidies, including for fossil fuels

Although a number of taxes are levied directly or indirectly on energy, taxes on petroleum and energy products are

emphasised and is therefore highlighted in this analysis.

Tax on petroleum and energy products (ISP)

At national level, the taxation of petroleum and energy products and electricity is governed by the Excise Duty Code (CIEC), approved by Decree-Law No 73/2010 of 21 June, which transposed Council Directives 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty (the 'Horizontal Directive') and the (Vertical) Directives on the harmonisation of excise duties, which provide for excise duty on petroleum and energy products (ISP).

The following shall be subject to the tax on petroleum and energy products:

-Any other products intended for use, offered for sale or used as motor fuel;
-Otherhydrocarbons, other than peat, intended for use, offered for sale or used as fuel;
-Electricity falling within CN code 2716.

The CIEC also lays down the products benefiting from total or partial exemption and the products taxed at a reduced rate of tax. Thus, in addition to the exemptions provided for in the General Part of the CIEC, applicable under Council Directive 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty and repealing Directive 92/12/EEC ('the Horizontal Directive'), which apply to petroleum and energy products and electricity, and which are set out in Article 6 of the CIEC, exemptions and reduced rates of taxation are provided for.

Addition on CO2 emissions ('carbon tax')

In 2015, a 'carbon tax' (through an addition to the ISP) 74 was introduced through the 'Green Taxation Act', which applies to sectors not covered by the European Emissions Trading System (ETS).

This addition, which has been included in the ICCS, by adding a new Article 92a, aims to promote a low-carbon economy, combating climate change and reducing energy dependency from outside the world.

For this purpose, in addition to the rate applicable in terms of PSI, the following products are also subject to addiction resulting from the application of a fee and according to addictive factors, which reflect the emission factor of each product, provided that they are subject to and not exempted from ISP:

-Gasoline;
-Oil and coloured and marked petroleum;
-Diesel (includes road gas oil, coloured and marked diesel and heating gas oil);
-LPG (methane and petroleum gases) used as fuel and motor fuel;
-Natural gas used as fuel and motor fuel;
Moiety oil;
-Petroleum coke;
-Coal and coke.

The ISP exemption of a given product automatically determines that it is not subject to an addition to CO_2 emissions (Article 92a (4)).

In accordance with the current calculation formula laid down in Article 92a (2) of the CIEC, the value of the rate to be applied in each year (n), to which the addiction factor provided for in paragraph 1 of that Article will be applied, is calculated in the previous year (n-1) as the arithmetic average of the price resulting from the auctions of GHG allowances, conducted under the European Emissions Trading System, between 1 October of year n-2 and 30 September of year n-1.

The addiction factors, the evolution of the carbon rate (reference price of CO_2) and the values of additions by fuel type are the ones reflected in the following table.

Table 61 – Advertising factors, evolution of carbon rate and values of additions by fuel type

Value of additions in each year

74Law No 82-D/2014 of 31 December 2007

Fuel	Unit	Addiction factor	2015	2016	2017	2018	2019	2020	2021	2022
Gasoline	EUR/1000	2,27165	11,56	15,15	15,56	15,56	28,94	53,66	54,34	54,34
Petroleum	EUR/1000	2,45365	12,49	16,37	16,81	16,81	31,26	57,96	58,69	58,69
Diesel	EUR/1000	2,47486	12,60	16,51	16,95	16,95	31,53	58,46	59,20	59,20
GPL	EUR/1000	2,9026	14,77	19,36	19,88	19,88	36,98	68,56	69,43	69,43
Natural Gas	EUR/GJ	0,0561	0,29	0,37	0,38	0,38	0,71	1,33	1,34	1,34
Fuel oil	EUR/1000	3,096	15,76	20,65	21,21	21,21	39,44	73,13	74,06	74,06
Petroleum coke	EUR/1000	2,6961	13,72	17,98	18,47	18,47	34,35	63,68	64,49	64,49
Coal and Coke	EUR/1000	2,26567	11,53	15,11	15,52	15,52	28,86	53,52	54,19	54,19
Reference price CO2	EUR/t CO2		5.09	6.67	6.85	6.85	12.74	23.6	23.92	23.9

In 2022, as an inflation mitigation measure and alongside other tax measures aimed at containing the increase in fuel prices, fuel taxes, notably the ISP, were reduced and the update of the carbon rate suspended, a measure which lasted until May 2023, when the gradual unfreeze of the carbon rate update started. However, during September, the Government introduced an additional measure to mitigate the price of fuels returning the additional VAT revenue through the ISP which allowed for a reduction in the price of diesel and petrol (Order No 288 – A/2023 of 25 September).

Analysis of tax expenditure on PSI exemptions

Tax expenditure constitutes a transfer of public resources by reducing the tax liability in relation to the tax-rule system which reflects the political priorities of a particular MemberState75. This advantage conferred on the use of fossil fuels constitutes a subsidy.

The tax expenditure on Petroleum and Energy Products Tax in 2017 amounted to EUR 441 million, of which approximately EUR 256 million corresponds to tax expenditure on ISP and approximately EUR 186 million corresponds to the tax expenditure associated with the ISP addition, that is to say the carbon tax, by virtue of the ISP exemptions.

In 2020 this figure reached EUR 413.5 million, EUR 275.5 million in 2021 and EUR 324.3 million in 2022, according to the 2022 Tax Expenditure Report, dated July 2023.

Environmentally relevant taxes and levies

According to the National Statistical Institute (INE), in 2022 the value of environmentally relevant taxes to around EUR 4.6 billion, corresponding to 5.3 % of total revenue from taxes and social contributions collected (7.3 % in 2019, 6.8 % in 2020 and 6.6 % in 2021). This represented a decrease of 7.5 % compared to 2021 (as opposed to an increase of 6.3 % between 2021/2020), compared with the 14.8 % increase observed for total revenue from taxes and social contributions. The decrease in 2022 mainly reflects the decrease in revenue from PSI as a result of the policy of mitigating the increase in fuel prices. These include the introduction of the mechanism for revising the values of the unit rates of the ISP applicable on the mainland to unleaded petrol and diesel and the mechanism for reducing the tax burden equivalent to that which would result from the reduction of the VAT rate from 23 % to 13 % in the unit rates of the ISP.to around EUR 4.6 billion, corresponding to 5.3 % of total revenue from taxes and social contributions collected (7.3 % in 2019, 6.8 % in 2020 and 6.6 % in 2021). This represented a decrease of 7.5 % compared to 2021 (as opposed to an increase of 6.3 % between 2021/2020), compared with the 14.8 % increase observed for total revenue from taxes and social contributions. The decrease in 2022 mainly reflects the decrease in revenue from PSI as a result of the policy of mitigating the increase in fuel prices. These include the introduction of the mechanism for revising the values of the unit rates of the ISP applicable on the mainland to unleaded petrol and diesel and the mechanism for reducing the tax burden equivalent to that which would result from the reduction of the VAT rate from 23 % to 13 % in the unit rates of the ISP.

Between 2021 and 2022, the tax on oil and energy products lost relative importance in environmentally relevant taxes, from 70.7 % to 60.1 %. This substantial reduction in revenue from the ISP

The Tax75 Benefits in Portugal. Prepared by the Working Group on Tax Benefits (2019)

in 2022 positively affected the relative importance of the remaining environmentally relevant taxes. Thus, the share of other energy taxes, which include greenhouse gas emission allowances, has risen from 5.9 % to 12 %.

As regards transport taxes, the vehicle tax in 2022 reached 9.8 % of total environmental taxes (8.6 % in 2021), while the single circulation tax reached 16.3 %, compared to 13.8 % in 2021.

In 2022, the set of taxes on the purchase and use of motor vehicles (oil and energy tax, vehicle tax and single circulation tax) accounted for around 86.2 % of total environmental taxes, much lower than in 2021 (93.1 %).

Revenue from greenhouse gas emission allowances continued to increase, exceeding EUR 500 million in 2022. Mention should also be made of the new carbon tax on air and sea travel, which in 2022, the first full year of collection, reached EUR 38.8 million.

By category, in 2022, energy taxes accounted for 72.1 % of total revenue from environmentally relevant taxes. Transport taxes had a weight of 26.1 %, while pollution and resource taxes were insignificant (1.3 % and 0.5 % respectively).

Figure 59 – Evolution of environmentally relevant taxes in absolute value [Source: INE – Tax revenue statistics]

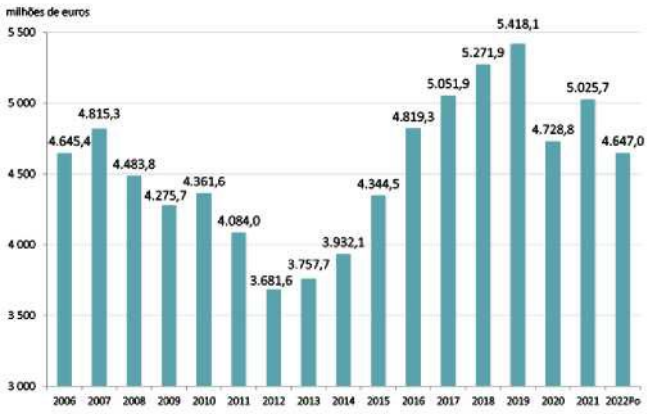
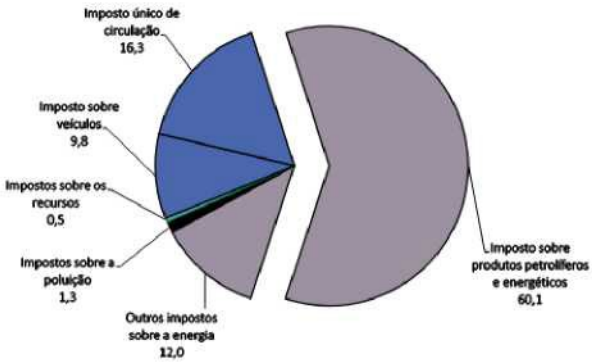


Figure 60 – Environmental taxes by category in 2022 [Source:



According to the information available for 2021, the share of these taxes in total tax revenue including social contributions was higher in Portugal (6.6 %) compared to the European Union average (5.5 %). In the same year, the share of environmentally relevant taxes in Portugal (2.3 %) was higher than the EU27 average (2.2 %).

Estimating environmental tax revenue by type of taxpayer, in 2021, 45.6 % of revenues from environmental taxes originated from households and 52.1 % came from the various branches of economic activity. By disaggregating this information by category of taxes, households contributed more to revenue from taxes on pollution (78.5 %) and on resources (61.2 %). By contrast, it was the industries that contributed the most to revenue from taxes on transport (50.6 %) and energy (52.9 %), compared with 49.4 % and 44.1 % in households respectively.

As regards environmentally relevant rates in 2021, the last year for which this information is available, it reached EUR 1.74 billion (0.8 % of GDP), rising by 5.1 % compared to 2020, mainly reflecting an increase in the collection and treatment of solid waste (+ 4.0 %), health and sanitation rates (+ 2.8 %) and the rate of waste management (+ 34.8 %). Revenues from the recycling system for glass, paper, plastic, metal and wood packaging increased by 9.1 %, reflecting the full entry into operation of the three waste collection systems.in 2021, the last year for which this information is available, it reached EUR 1.74 billion (0.8 % of GDP), rising by 5.1 % compared to 2020, mainly reflecting an increase in the collection and treatment of solid waste (+ 4.0 %), health and sanitation rates (+ 2.8 %) and the rate of waste management (+ 34.8 %). Revenues from the recycling system for glass, paper, plastic, metal and wood packaging increased by 9.1 %, reflecting the full entry into operation of the three waste collection systems.

Solid waste collection and treatment and sanitation rates continue to account for a large share (86.8 %) of the total revenue collected from environmentally relevant rates.

In 2021, the last year for which this information is available, environmentally relevant rates reached EUR 1.74 billion (0.8 % of GDP), rising by 5.1 % compared to 2020, mainly reflecting the increase in the collection and treatment of solid waste (4.0 %), health and sanitation rates (2.8 %) and the waste management rate (34.8 %).

4.6. Research, Innovation and Competitiveness Dimension

i. Current situation of the low-carbon-technologies sector and, to the extent possible, its position on the global market (that analysis is to be carried out at Union or global level)

Portugal has made considerable efforts to implement neutral and/or low-carbon technologies in its energy *mix*, in particular as regards European commitments, in particular in the areas of environmental sustainability, renewable energy and energy efficiency. Investment in energy infrastructure, in particular in strengthening energy interconnections, plays a key role in security of supply, promoting integration into new energy markets, and promoting cooperation between countries allowing for resource sharing.

In the last decade Portugal has pursued a policy of promoting renewable energy as part of its commitments at EU level, focusing in particular on water, wind, biomass, solar and geothermal energy, conscious of the need to respond to the challenges created by climate change and to reduce its dependence on fossil fuels, which has enabled Portugal to position itself in one of the top places in the ranking of renewable energy production.

This transition process required a mandatory paradigm shift in energy production, making it essential to develop policies and measures to support decentralised renewable energy generation, establishing research, innovation and competitiveness strategies to facilitate investment in neutral and/or low-carbon technologies and smart grids that enable development and cooperation between all market players, making the most of transnational competition, supporting the creation of innovative energy service companies.

This was a driver for the development of the national economy. It created a new industrial and business sector generating jobs, promoting regional development, boosting exports of goods and services, driving innovation and research, capable of attracting international investment and stimulating the internationalisation of domestic businesses. It has also significantly reduced external energy dependency.

In the European research and innovation framework, Portugal has received around EUR 92 million in the first three years (20212023) of Horizon Europe (the European framework programme for R &I), with 131 projects approved (25 of which are coordinated by national authorities), in areas of particular interest for the 2030 NECP. The approved projects involve 276 national entities, 32 % of which are private entities (large companies and SMEs), demonstrating the critical role they play in driving collaborative innovation for Europe's scientific and technological advance.

Under the Partnership Agreement between Portugal and the European Commission PT2020, some EUR 160 million of funds were approved to support more than 180 projects with an eligible investment of EUR 272 million and 390 entities in areas of particular interest to the PNEC2030.

Under Component 5 'Business Capitalisation and Innovation' of the RRP, the Interface Mission aims to ensure basic public funding to strengthen the network of interface institutions, including alignment with the Smart Specialisation Strategies' priority areas and, in a cross-cutting way, monitoring the focus on decarbonisation and circular economy and digital technologies. With a commitment of EUR 96.6 million to finance CoLABs between 2022 and 2026, Portugal has already implemented EUR 12 million (12 %) to finance the 41 active entities, of which at least 17 are active in areas of particular interest to the PNEC2030: 5 CoLAB in 'Energy and Sustainability', 5 CoLAB in 'Materials, Circular Economy, and Urban Sustainability', 4 CoLAB in 'Climate, Space and Ocean', and 3 CoLAB in 'Biodiversity and Forest'. In addition, Portugal has made a commitment of EUR 92.8 million to finance ITCs in the period from 2022 to 2026. Portugal has already implemented EUR 8 million (9 %) to finance the 31 active entities, of which at least 9 are active in areas of particular interest to the PNEC2030: 2 STI in Agro-Food, Biodiversity and Forest, 4 in Circular Economy and Urban Sustainability and 3 in Space, Ocean, Energy and Sustainability (June 2023 data).

The implementation of international groups under the Strategic Energy Technology Plan (*SET Plan*) in areas of carbon-neutral and/or low-carbon technology is also underlined with a view to applying technologies that enable

effective decarbonisation at low cost, including: ocean energy, geothermal energy, solar energy focusing on solar thermal concentration (CSP), energy efficiency in industry and buildings, energy systems, smart communities and smart solutions with a focus on consumers, biofuels and bioenergy. The underlying vision is also aligned with the Multi-level Strategy of Portugal where activity structured by themes and involvement of different *stakeholders* has been promoted, notably in the following areas: decarbonisation, renewable energy, energy efficiency, bioenergy (biomethane, biofuels), hydrogen and energy derivatives and storage, to address the various societal challenges, as well as to foster inter-institutional cooperation and collaborative work.

However, further technological efforts, notably in the field of solar and ocean energy and the development of a broad portfolio of cost-effective renewable technologies, will need to be pursued for further success. It will be necessary to go beyond mature technologies and use resources to support more innovative technologies that deliver substantial savings in terms of greenhouse gas emissions and lower costs. In this context, in particular renewable energy, it is important to highlight the creation of a legal framework for technology-free zones, as provided for in Decree-Law No 15/2022, in particular the one defined in Article 216 thereof.

ii. Current level of public and private spending on research and innovation on neutral and/or low-carbon technologies, current number of patents and current number of researchers

In Portugal, investment in Research and Innovation (R & I) over the past few years has been buoyant and residual. The evolution of expenditure by predefined thematic areas over the period 20142021 is shown in Table 62, with total national expenditure amounting to 1.68 % of GDP in 2021 with energy expenditure accounting for 0.1 % of GDP.

Table 62 – National expenditure on R & I by thematic area (2014 – 2021) [Source: DGEEC, 2022. Potential Survey National Science and Technology 2021]

			Thematic Area				
Year	Indicator	Total National	Energy	Raw materials & Materials	Technology Productions &D; Industry Process	Prod technology &D; Product	Water & Environment
2014	kEUR	2 232 249	99 779	81 328	165 563	145 144	73 460
	% Total National	100	4	4	7	7	3
	% GDP (ref. 2016; current costs)	1,29	0,06	0,05	0,1	0,08	0,04
2015	kEUR	2 234 370	103 209	82 241	165 233	164 029	96 904
	% Total National	100	5	4	7	7	4
	% GDP (ref. 2016; current costs)	1,24	0,06	0,05	0,09	0,09	0,05
2016	kEUR	2 388 467	105 667	97 570	179 372	187 702	95 642
	% Total National	100	4	4	8	8	4
	% GDP (ref. 2016; current costs)	1,28	0,06	0,05	0,10	0,10	0,05
2017	kEUR	2585 100	112 681	104 848	180 863	206 062	97 642
	% Total National	100	4	4	7	8	4
	% GDP (ref. 2016; current costs)	1,32	0,06	0,05	0,09	0,11	0,05
2018	kEUR	2 769 602	121 046	113 379	184 713	215 354	108 001
	% Total National	100	4	4	7	8	4
	% GDP (ref. 2016; current costs)	1,35	0,06	0,06	0,09	0,10	0,05
2019	kEUR	2 991 864	143 789	128 204	210 201	226 173	121 345
	% Total National	100	5	4	7	8	4
	% GDP (ref. 2016; current costs)	1,40	0,07	0,06	0,1	0,11	0,06
2020	kEUR	3 236 212	160 316	130 690	231 628	244 776	123 372
	% Total National	100	5	4	7	8	4
	% GDP (ref. 2016; current costs)	1,62	0,08	0,07	0,12	0,12	0,06
2021	kEUR	3 609 191	198 764	138 041	252 472	279 691	136 984
	% Total National	100	6	4	7	8	4
	% GDP (ref. 2016; current costs)	1,68	0,1	0,07	0,12	0,13	0,06

Also overall, Table 63 illustrates the levels of expenditure by sector of implementation and thematic area for the period 2019-2021, demonstrating the increasing effort at business and university level in spending on research and innovation in different complementary areas of direct and indirect energy interest.

Table 63 – National expenditure on R & I by sector of implementation and thematic area (2019 – 2021) [Source: DGEEC, 2022. Inquiry the National Scientific and Technological Potential 2021]

Year	Sector of Implementation	Indicator	Total National	Energy	Raw materials & Materials	Technology Productions & Industry Process	Prod technology &D; Product	Water & Environment
2019	companies	kEUR	1 570 510	73 490	68 069	155 043	174 732	26 804
		% Total National	100	5	4	10	11	2
	Universities	kEUR	1 210 653	60 557	53 797	53 580	49 690	85 277
		% Total National	100	5	4	4	4	7
	Government	kEUR	153 569	9 446	6 152	1 476	1 613	9 165
		% Total National	100	6	4	1	1	6
	IPSFL	kEUR	57 132	296	186	102	138	98
		% Total National	100	1	0	0	0	0
2020	companies	kEUR	1 843 559	87 118	73 963	176 653	200 422	29 484
		% Total National	100	5	4	10	11	2
	Universities	kEUR	1 165 112	62 080	50 432	52 339	41 443	82 875
		% Total National	100	5	4	4	4	7

2021	companies	kEUR	2 153 582	119 721	82 621	198 152	235 976	37 451
		% Total National	100	6	4	9	11	2
	Universities	kEUR	1 202 363	66 907	48 417	50 395	40 626	86 896
		% Total National	100	6	4	4	3	7
	Government	kEUR	169 850	9 661	5 338	1 499	1 859	10 056
		% Total National	100	6	3	1	1	6
	IPSFL	kEUR	83 417	2 474	1 665	2 427	1 230	2 579
		% Total National	100	3	2	3	1	3

The R & I effort and patenting in Portugal demonstrates that there is national competence in technologies associated with renewable energy, but of modest expression in the registration of intellectual property resulting from R & I. In this type of accounting technologies linked to nuclear fusion and fission are excluded because they are not considered in the context of current and future national energy policy. The registration of patents prior to 2020 is shown in the following table:

Table 64 – Patent registration in Portugal, prior to 2020 [Source: INPI]

Technology Area/Registered Units													
Wind	**NO**	**Solar**	**NO**	**Waves**	**NO**	**Biomass**	**NO**	**Water**	**NO**	**Geothermal**	**NO**	**Other**	**NO**
Wind	**30**	Solar	**94**	Wave energy	**45**	Biomass	**3**	Water	**5**	Geothermal	**2**	Hydrogen Production	**21**
Wind generator	**3**	Solar collector	**25**	Tidal energy	**8**	Bio fuel	**6**	Hydraulic energy	**8**	— —	— —	Store lens from Energy	**27**
Wind turbine	**18**	Solar panel	**26**	Ocean energy	**1**	Biodiesel	**8**	— —	— —	— —	— —	— —	— —
— —	— —	Solar thermal	**16**	Maritime currents	**4**	Bioethanol	**4**	— —	— —	— —	— —	— —	— —
— —	— —	Solar photovoltaic	**4**	Hydraulic turbine	**3**	Biogas	**6**	— —	— —	— —	— —	— —	— —
— —	— —	Solar from concentrace o	**5**	Column from oscillating water	**3**	Biomethane	**2**	— —	— —	— —	— —	— —	— —

In the period 2020-2022, INPI had the following patenting by renewable energy source (incl. utility models):

Table 65 – Patents registered by renewable energy source (2020-22) [Source: INPI, 2023]

Renewable energy source	Number of registered patents
E. solar	4
E. Wind	2
Biomass	7
E. Water	1
E. geothermal	0

Note the growing importance of human resources in R & I activity, which can be seen in the different implementation sectors. The following table shows the breakdown of research staff by implementing sector in Full Time Equivalent Units (FTE).

Table 66 – Breakdown of research staff by sector of implementation, over the period: 2014-2021 [source: DGEEC, 2022. National Science and Technology Potential Survey 2021]

Total	Companies		State		Higher Education		IPSFL	
TSI	**TSI**	**%**	**TSI**	**%**	**TSI**	**%**	**TSI**	**%**

2014	46 878	17 348	37 %	2 037	4 %	26 870	57 %	622	1 %
2015	47 999	18 283	38 %	2 066	4 %	27 001	56 %	649	1 %
2016	50 406	19 367	38 %	2 098	4 %	28 265	56 %	676	1 %
2017	54 995	22 022	40 %	2 212	4 %	30 078	55 %	683	1 %
2018	58 154	23 662	41 %	2 283	4 %	31 451	54 %	759	1 %
2019	61 455	26 793	44 %	2 315	4 %	31 556	51 %	791	1 %
2020	66 044	30 872	47 %	2 571	4 %	31 505	48 %	1 096	2 %
2021	69 769	34 663	50 %	2 732	4 %	31 097	45 %	1 277	2 %

5. ASSESSMENT OF THE IMPACT OF POLICIES AND MEASURES PLANNED

5.1. Impacts of planned policies and measures on the energy system and GHG emissions and removals, including comparison with projections based on existing policies and measures

I. Projections on the evolution of the energy system and GHG emissions and removals, as well as, where relevant, emissions of air pollutants according to Directive (EU) 2016/2284 in the framework of planned policies and measures

With regard to projections for the evolution of total primary energy consumption for 2030, it would be expected that, in view of the planned policies and measures to be implemented by 2020-2030, in particular the commitment to renewable energy and the decommissioning of coal, consumption would continue on a downward path. However, the estimated increasing evolution of primary energy consumption reflects, on the one hand, the decarbonisation of existing consumption through electrification, and on the other hand, the electricity needs arising from the development of the green industry in Portugal.

In terms of energy carriers, and through the decommissioning of coal-fired thermal power stations, this energy carrier will no longer be present in the primary energy consumption mix, contributing significantly to the reduction of energy bills. By 2030, renewables will have the highest weight in the energy mix, with more than 50 %.

Figure 61 – Estimated evolution of primary energy consumption by 2030 (ktoe)

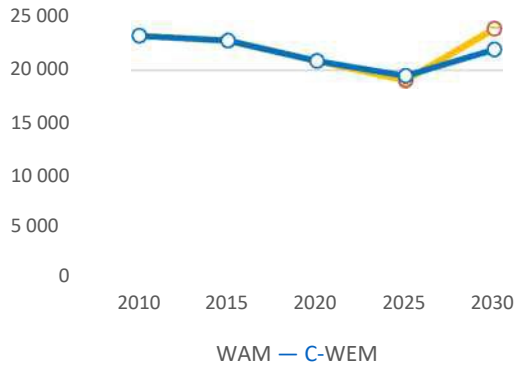


Figure 62 – Estimated evolution of energy consumption primary by source type in 2030 (ktoe)

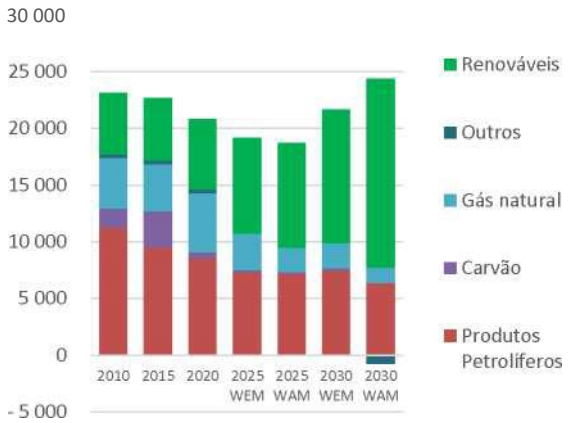
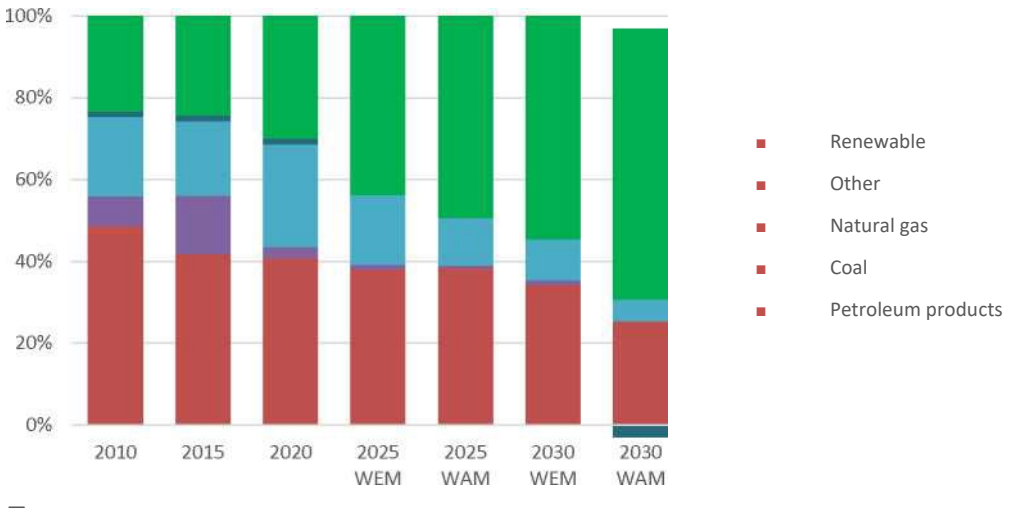


Figure 63 – Estimated evolution of primary energy consumption by source type by 2030



As regards the projections for the evolution of total final energy consumption for 2030, it is expected that, in view of the planned policies and measures to implement this horizon, the consumption of electricity dedicated to the new green industry is expected to increase. In addition to the above, this estimate of the increasing evolution of energy consumption also reflects the electrification of consumption for the overall decarbonisation of the existing system.

In terms of energy carriers, electricity will continue to gain relevance in the final energy consumption mix, with projections showing that electricity will be the main energy carrier in 2030. Renewable hydrogen, biogas and biomethane will gain expression by 2030 as new energy carriers, and heat consumption is expected to remain stable in the coming years. Oil products and natural gas will be on the opposite path, which will see their weight in the energy mix reduced in the current decade in line with the electrification of the economy and the penetration of renewable gases such as hydrogen.

It is worth mentioning that the growing importance of renewable gases, in particular hydrogen, is starting to gain significant expression in the scenarios studied, as a result of the country's strong commitment to this energy carrier.

Figure 64 – Estimated evolution of

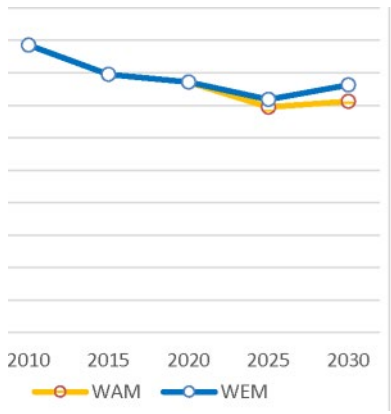


Figure 65 – Estimated evolution of final energy consumption by type of source in 2030 (ktoe)

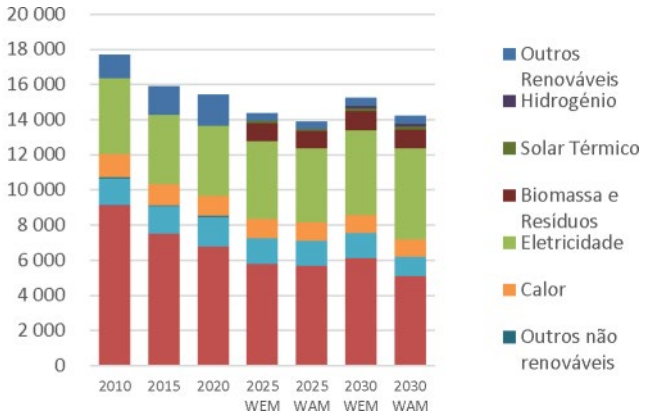
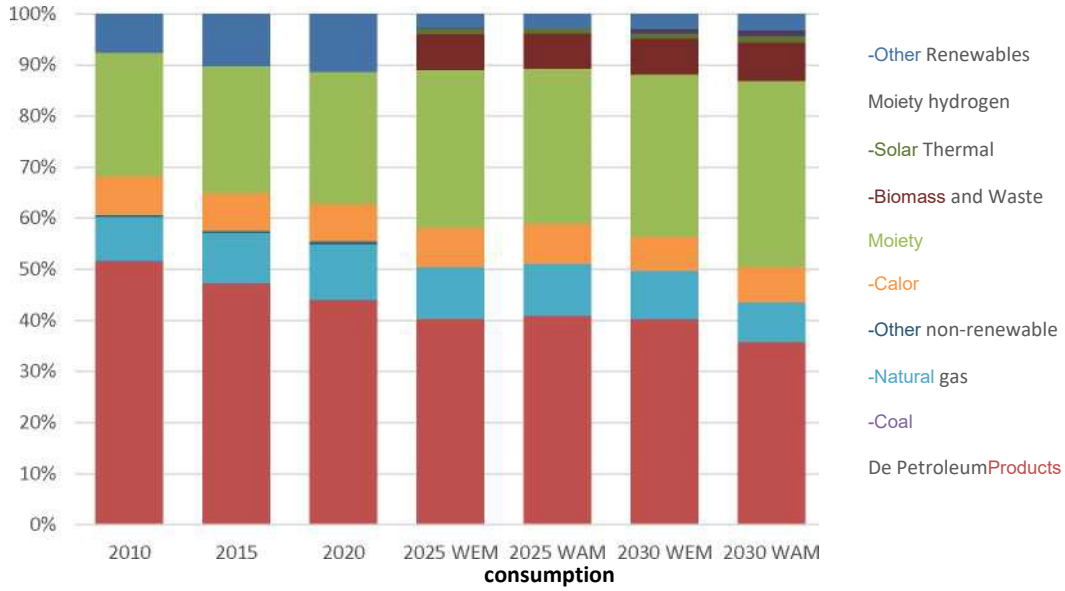


Figure 66 – Estimated evolution of final energy consumption by type of source by 2030



consumption
final energy for 2030 (ktoe)

20 000
18 000
16 000
14 000
12 000
10 000
8 000
6 000
4 000
2 000
0

The revision of the NECP 2030 was in parallel with the revision of the NCR2050, ensuring that the short-term trajectories are consistent with the long-term perspective towards climate neutrality. The GHG emission projections review exercise focused in a first phase on the review of the sectors of activity corresponding to the

energy system, including the electro-producer and refining sector, the transport sector, industry, buildings and agriculture (in the energy component). In the second phase, the GHG emission projections of the remaining sectors, agriculture, forests and other land uses and waste and wastewater were reviewed, allowing to infer, together with the results obtained on the energy sector, the implications associated with the frontloading of the 2045 climate neutrality target, in line with the guidance provided in the Climate Law.
This new modelling exercise foresees, like the previous one which supported the development of the NECP 2030 and RNC 2050, some of the expected impacts of climate change towards 2045/2050, including changes in technology efficiency, demand for services and availability of resources (such as reduced water availability or increased space cooling needs).

The results of this exercise allowed the review of the national emission reduction potential, confirming the technical and economic feasibility of pursuing a decarbonisation pathway towards 2030 towards climate neutrality in 2045. Sectoral analysis of emission trajectories confirms that all sectors have significant GHG emission reduction potential, although reduction rates can be differentiated.

The analysis of the behaviour of different sectors under the conditions set out in the existing policy scenario (WEM), as well as in the With Additional Measures (WAM) scenario, has made it possible to identify critical factors, trends and behaviour of these sectors within the time horizon considered.

Below is an overview of the sectoral GHG emissions results achieved by 2030 and 2040 under the additional policies scenario.

Table 67 – Projection of GHG emissions by sector (no indirect CO2 emissions) – Additional policy scenario (kt CO_{2eq})

		Additional policy scenario	
	2005	**2030**	**2040**
1. Energy	62 555	20 604	13 721
Energy industries, including electricity and heat production and refining (1A1)	25 503	1 979	871
Manufacturing and construction industries (1A2)	10 579	2 652	1 514
Fugitive emissions (1B)	631	644	213
Transport (1A3)	19 947	14 049	6 933
Services (1A4a)	3 037	216	0
Residential (1A4b)	2 784	970	337
2. Industrial Processes and Use of Products (2)	8 211	3 885	1 654
F-gases (2F)	783	84	64
3. Agriculture (3 and 1A4c)	8 288	7 791	6 919
4. Waste and UWWTD (5)	6 806	4 872	3 427
Total	**85 860**	**37 057**	**21 867**
Total ETS	**36 426**	**7 567**	**7 077**
Total non-ETS	**49 434**	**29 491**	**14 791**
Capture CO2 (CCU)	**0**	**— 95**	**— 3 853**

Table 68 – Potential GHG emission reductions compared to 2005 (%)

	EXISTING POLICY SCENARIO		ADDITIONAL POLICY SCENARIO	
	2030	**2040**	**2030**	**2040**
1. Energy	— 58 %	— 77 %	— 67 %	— 78 %
Energy industries, including electricity and heat production and refining (1A1)	— 91 %	— 94 %	— 92 %	— 97 %
Manufacturing and construction industries (1A2)	— 52 %	— 91 %	— 75 %	— 86 %
Fugitive emissions (1B)	42 %	— 12 %	2 %	— 66 %
Transport (1A3)	— 21 %	— 47 %	— 30 %	— 65 %
Services (1A4a)	— 83 %	— 100 %	— 93 %	— 100 %
Residential (1A4b)	— 51 %	— 84 %	— 65 %	— 88 %
2. Industrial Processes and Use of Products (2)	— 53 %	— 60 %	— 53 %	— 80 %
F-gases (2F)	94 %	12 %	— 89 %	— 92 %
3. Agriculture (3 and 1A4c)	— 5 %	— 10 %	— 6 %	— 17 %
4. Waste and UWWTD (5)	— 27 %	— 48 %	— 28 %	— 50 %
Total	— 50 %	— 67 %	— 57 %	— 75 %
Total ETS	— 71 %	— 88 %	— 57 %	— 89 %
Total non-ETS	— 42 %	— 69 %	— 59 %	— 70 %

Additional Policy Scenario (WAM)

As regards the additional policy scenario and as mentioned above, all policies and measures adopted or planned after 30 June 2022 for the energy sector and the forestry sector were considered. In the Waste and Waste Water and Agriculture sectors, all policies and measures adopted or planned by the end of 2023 were considered in this scenario.

It should also be noted that the scenario of additional policies also took into account the frontloading of the 2045 climate neutrality target.

It should be noted, however, that this scenario of additional policies is associated with a very significant increase in energy demand resulting from a number of green and other industrial projects planned to be implemented in Portugal this decade. Thus, the results in terms of reducing GHG emissions from the energy system reflect the achievement of these projects. It should be noted, however, that these projects are based on the use of renewable energy and offer significant gains in terms of diversification of energy carriers towards the *phase* out of fossil fuel use.

In this scenario, GHG emission reduction potential of around 57 % compared to 2005 is envisaged, amounting to 75 % in 2040 (no LULUCF), in line with the targets of the Climate Law, implying virtually full decarbonisation of electricity generation, and a strong reduction in emissions from mobility and transport, buildings and services by the end of the next decade.

As mentioned, in the case of the electricity generation sector, its transformation by 2040 is very similar between the two scenarios, as despite higher renewable installed capacity, electricity demand is also higher in the WAM scenario, which constrains the most significant benefits of such penetration.

For the manufacturing and construction industry, reductions of around 75 % in 2030 to 86 % are expected in 2040, compared to expected improvements in process efficiency and the use of cleaner fuels, incorporating more CDR and biomass, electrification and renewable gases including green hydrogen and synthetic and/or bio-based methane. In this scenario, competition for electricity in this sector is envisaged, as there are also others with

major needs, such as transport or new projects producing green steel and *data centres*.

In the case of transport, in this scenario, GHG emissions reductions of 30 % and 65 % for 2030 and 2040, respectively, are projected to be significant and realistic given the current state of play. Against this background, the transport and mobility sector requires a more significant change in passenger and freight mobility patterns, notably through reduced travel needs in private vehicles (due to increased support conditions, e.g. teleworking), and increased transfer/use of collective transport and soft mobility. A more optimistic introduction of both passenger and freight electric vehicles is also considered. In the case of shipping and aviation, significant introduction of low-carbon forms of energy is expected in line with compliance with European legislation such as ReFuelEU Aviation and **ReFuelEU Maritime**. Against this background, it appears that the sector is accelerating towards decarbonisation in the decade 2030-2040. The essence of reducing energy consumption, electrification and wider uptake of technologies such as hydrogen in goods comes from 2035 onwards, reflecting a very rapid and more disruptive decarbonisation in the long term. It should also be noted that the rail component is essential in optimising decarbonisation in the WAM scenario.

As regards the services sector, there is almost total electrification of energy consumption in this scenario, supported by major energy efficiency gains through enhanced insulation of buildings, solar thermal (mostly for water heating) and heat pumps for space conditioning. The consumption of LPG and other petroleum products reduces their contribution to consumption in this sector as early as 2030 and only the contribution of natural gas consumption in combination with renewable gases is maintained. However, in view of the need to decarbonise the sector as a contribution to the 2045 climate neutrality objectives, the consumption of natural gas blends with renewable gases is not a cost-effective solution in 2040.

In the case of the residential sector, the reduction in consumption of natural gas and other petroleum products is more pronounced as early as 2030 compared to the WEM scenario, in contrast to a more significant introduction of heat pumps, a difference which is mitigated in 2040 by higher electricity demand in other sectors.

As regards the industrial process and product use sector (IPPU), in both scenarios there is a significant reduction in process emissions, in particular in the cement and pulp industry, where there are already operational industrial pilots, but this reduction is expected to be more significant between 2030 and 2 040 in the WAM scenario due to the prospect of incorporating alternative fuels into cement production processes.

Also following recent developments at European level and the contribution that technology sequestration technologies could make in a climate neutral context, with particular emphasis on the Hard-to-slaughter*sectors*, and also taking into account the CO2 demand for the production of renewable fuels of non-biological origin (RFNBO, which include synthetic fuels – efuels *and* hydrogen), Carbon Capture and Use (CCU) technologies are expected to be cost-effective as of 2030 and grow significantly by 2040. Contrary to the WEM scenario, this contribution is envisaged in the already significant WAM scenario in 2035, with an impact on emissions from the manufacturing and construction industry sub-sector (1A2) and Industrial processes and product uses (2), relating to combustion and process emissions from industry respectively. Carbon capture is more representative in the cement industry in the short term, progressively covering also glass, chemistry and pulp and paper sectors (e.g. Bioenergy with Carbon Capture and Storage – Becc). The captured CO_2 is transported by pipeline and is destined for cost-efficient use as feedstock in the production of synthetic fuels, namely *jet fuels*. It is important to note that the model used does not have spatial detail to measure capture and sequestration sites and/or to detail competitiveness between forms of CO_2 transport.

Thus, for an overall reading of the evolution of these two sectors, the expected catch value for each year should be taken into account, resulting in net emissions. In terms of F-Gases, this scenario projects the impact of the new F-gas Regulation, Regulation (EU) 2024/573, with, for example, a more significant reduction in emissions from commercial and industrial refrigeration in 2030. Overall, and given the large projected reduction of around -89 % for 2030, only a slight development is expected in the next decade, reaching -92 % in 2040.For the waste sector, the consideration of additional measures compared to the existing measures scenario does not materialise in a particularly relevant emission reduction. The specific characteristics of the sector and the borderline circumstances of the situation in Portugal do not allow for a high reduction potential, which amounts to 28 % and

50 % respectively for the years 2030 and 2040.

For the agriculture sector (non-energy component), the revised figures for 2030 are the same as in the WEM scenario, taking into account the view that the assumptions considered in that scenario do not change, in this case the maintenance of the PEPAC measures that started in 2023 and end only in 2027. Nevertheless, the contribution of this sector is expected to grow slightly from a medium-term perspective, reaching emission reduction values of -17 %, assuming a reinforcement of the targets foreseen for each PEPAC measure, based for example on candidate areas in 2023.

As regards projections on biomass supply for the energy sector, both scenarios demonstrate the need to import biomass at around 11 % to 13 % respectively in 2030. In 2040, external supply needs reduce in the WEM scenario to 6.2 % and in the WAM scenario to 7.5 %. For other forms of bioenergy, the WAM scenario presents a need for imports of used cooking oil at around 70 %, after using the full national potential of this raw material. For biomethane, the results are similar, with the progressive use of the national potential of this resource, but with the need for import levels of around 20 % in the decade 2030-2040. It should be noted that in both scenarios the preference for the consumption of endogenous biomass and with prioritisation for the use of national biomass potential for residues from forest and/or agricultural processes, and always in line with the cascading principles and sustainability criteria of RED III, is highlighted.

ii. Assessment of policy interactions (between existing and planned policies and measures in a strategic dimension and between existing and planned policies and measures of different dimensions), at least until the last year of the period covered by the plan, in particular to provide a good understanding of the impact of energy efficiency and savings policies on the dimensioning of the energy system and to reduce the risk of paralysing investment in energy supply

Not applicable.

iii. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures

Resilience and adaptability to climate change

The special report of the Intergovernmental Panel on Climate Change indicates that limiting the increase in the global average temperature by 1,5°C will have the practical consequence of significantly reducing the risks and impacts of climate change.

In Portugal, the negative effects of climate change have been observed in recent years, with the highest intensity and frequency of extreme weather events, such as intense weather events, frequent droughts, large-scale rural fires, heat waves and coastal erosion.

Knowledge on climate vulnerabilities in Portugal was recently updated by the National Adaptation Roadmap 2100 (RNA 2100)76, finalised in April 2024. This project updated the baseline climate scenarios for Portugal and carried out a climate risk assessment with a particular focus on modelling impacts on coastal areas, water resources, agroforestry and fire. RNA 2100 also explored the economic component of adaptation and the costs/impacts of inaction, and envisaged the production of a guide to guidelines and best practices on integrating climate change adaptation into territorial planning tools at municipal level.

The results generally point to increased frequency and intensity of extreme precipitation and temperature events, such as very hot days and tropical nights, with direct impacts on public health.

The adaptation narratives produced for the five regions (NUTS2) of Portugal – Norte, Centro, Zona Metropolitana de Lisboa, Alentejo and Algarve – highlight the reduction in water availability in most Portuguese river basin districts. Climate change could affect both irrigation needs and the productivity of the main crops grown on the national territory, which could result in significant overall economic losses. With regard to fires, the results show an increase in the number of days with extreme weather hazards, with global projections in the middle of the

76 Available for consultation at: https-//rna2100.apambiente.pt/en

century and the end of the century of particular concern. For coastal areas, the impact on coastal erosion and flooding processes occurs mainly due to changes in water levels, driven by rising average sea levels, but also by their combination with tides, weather upgrades and sea unrest. These phenomena put people and property at risk and several municipalities have been identified with a high incidence of buildings and vulnerable people. The results obtained provide a basis for highlighting potential losses related to inaction (or misadaptation), highlighting the benefits of adaptation to the effects of future climate change.

In terms of macroeconomic impacts, the incorporation or non-incorporation of adaptation policies produces quantitatively different results. Under an optimised adaptation policy scenario, the economic damage could amount to 1.3 % and 1.9 % of GDP in 2100, respectively for the RCP 4.5 and RCP 8.5 scenarios, while in a scenario without adaptation measures this could amount to 1.9 % and 3.3 % of GDP. In addition, the lower impact on GDP shows that in a scenario with adaptation policies total consumption gains can still be achieved. This result shows that adaptation is a powerful tool to compensate for possible shortfalls in mitigation, which is only effective if there are policies at global level. Taking these results together, it is concluded that the greater the mitigation effort will be the lower the need for local adaptation will be.

In order to implement adaptation to these effects in an integrated manner and to prepare the country for possible more severe future scenarios, since 2010 Portugal has had a National Adaptation Strategy (ENAAC), based on a solid scientific basis, focusing mainly on improving the links between areas, particularly those of a cross-cutting nature, on integration into sectoral policies, and on the implementation of adaptation measures. Based on the latest results achieved in RNA 2100, ENAAC will be reviewed by the end of 2025.

In particular, the energy sector is an important area to be considered in the perspective of integrated planning for adaptation to climate change, as any vulnerabilities could have a multiplier effect, with spill-over effects on other sectors of activity and consumers. This concern and integrated vision is already enshrined in the National Strategy on Adaptation to Climate Change 2020, which identifies energy with one of the priority sectors. Subsequently, the Basic Climate Law – Law No 98/2021 of 31 December, calls for the development of the sectoral climate change adaptation plan, which aims to deepen how the sector will contribute to a climate-resilient society by 2030.

It should also be noted that, while it is recognised that the impacts of climate change have a strong territorial component, it follows that the implementation of adaptation must be carried out by local actors, which was one of the central aspects leading to the establishment of the AdaPT Programme. Funded by the EEA Grants and the Environmental Fund, the Programme was an important milestone in the national adaptation process, boosting structural projects such as Climadapt.local, which resulted in 27 municipal adaptation strategies, the Climate Portal, a climate census information base for Portugal and the establishment of an association of Portuguese municipalities dedicated to local climate change adaptation – Adapt.local77. The AdaPT Programme was also responsible for boosting many other projects, supported by European and national financial instruments, both at the level of municipal and inter-municipal planning and in the implementation of adaptation measures, in particular in the areas of coastal protection, efficient water use, prevention of rural fires and nature conservation. Portugal currently has more than 95 % of its territory covered by inter-municipal and/or municipal adaptation plans, with the role of the Mission on Adaptation to Climate Change being highlightedhere78.

With a view to focusing on the implementation of adaptation measures, mobilising the various current financial instruments and defining the framework for the future, the Programme of Action on Adaptation to Climate Change (P-3AC) was adopted in 2019 with a view to 2030, which defines priority areas for action in response to the main vulnerabilities and impacts to climate change identified for the national territory:

1. Increasing the frequency and intensity of rural fires;
2. Increase from frequency and intensity from waves from heat;
3. Increase from frequency and intensity from periods from droughts which exacerbate water scarcity;

77 Available for consultation at: https-//www.adapt-local.pt/
78Available for consultation at: https-//climate-adapt.eea.europa.eu/en/mission

4. Increase from susceptibility to desertification;
5. Increase from maximum temperature;
6. Increased frequency and intensity of extreme precipitation events;
7. Rising sea levels;
8. Increased frequency and intensity of extreme events causing coastal seaweed and erosion.

To counter these impacts and vulnerabilities of the national territory, the set of measures with a direct impact on the territory was listed in 8 action lines and 1 line dedicated to supporting instruments, as well as the entities involved, monitoring indicators and potential sources of funding. The action lines were organised as follows:

1. Prevention of rural fires – structural interventions in agricultural and forestry areas;
2. Implementation of conservation techniques and improved soil fertility;
3. Implementation of good water management practices in agriculture, industry and the urban sector to prevent impacts from drought and scarcity;
4. Increasing the resilience of ecosystems, species and habitats to the effects of climate change;
5. Reducing the vulnerability of urban areas to heat waves and increasing maximum temperature;
6. Prevention of the installation and expansion of invasive alien species of vector-borne diseases and of agricultural and forestry diseases and pests;
7. Reducing or minimising the risks associated with flooding and flooding;
8. Increasing coastal resilience and protection in areas at high risk of erosion and seaweed and flooding;
9. Development of decision support tools, capacity-building and awareness-raising.

To address the challenge of monitoring the effectiveness of adaptation measures in Portugal, the P-3AC set quantitative targets for a set of indicators.

It should also be noted as relevant under this programme that there is a set of decarbonisation measures and options with clear synergies with adaptation to the effects of climate change, such as measures contributing to forest and agricultural sequestration (increasing soil organic matter and its water retention capacity, combating desertification), natural based solutions (urban green infrastructure, renaturalisation of sealed areas, etc.) but also energy and water efficiency measures, as they contribute to reductions in total energy and water consumption and thereby reduce vulnerability to pressures from extreme events.

On the other hand, the impacts of climate change have also been taken into account in the projections made and thus in mitigation options, in particular as regards future water availability, heating and cooling needs and the risk of rural fires. Thus, projections for GHG emission reductions and renewable energy take into account the decreasing availability of water for electricity generation expected in the RCP 4.5 climate scenario, which is considered likely in the current context.

It has thus been estimated that water production will be reduced in combination with a decline in the average hydranting rate of around 20***%.***

The higher cooling needs have also been taken into account in energy demand scenarios, in particular in the residential and service sectors.

In this respect, it is also particularly relevant to note that the determining factor in the sink capacity of the forest – the decrease in the average annual burnt area – will be hampered in a context of worsening climate change effects.

It is thus undeniable that the implementation of adaptation measures becomes one of the critical factors for decarbonisation objectives, both in terms of emission reduction and sequestration capacity.

Similarly, carbon neutrality is one of the guarantors of adaptive capacity, as it will only be possible if levels of GHG in the atmosphere do not exceed a certain threshold, beyond which adaptation is no longer possible and society as we know it will no longer exist. The synergies between mitigation and adaptation in a variety of measures are yet another sign that integrated action between the two strands is needed in all parts of society.

National potential in mineral resources, in particular critical raw materials

Portugal has a complex and diverse geology, which gives it great potential in metallic and non-metallic mineral resources and is able to make a positive contribution to the objectives of the NECP 2030 and to securing the supply of raw materials in Europe and can thus significantly leverage the economy and the energy transition. Mineral resources form the basis of all value chains, highlighting the energy transition, renewable energy, hydrogen and electrification.

As regards critical and strategic raw materials, recently included in the European Critical Raw Materials Act, published by the European Commission (hereinafter referred to as REMPC), Portugal stands out, despite its size, for having considerable reserves on its territory, namely lithium, tungsten, copper and feldspar. Increasing knowledge of the occurrence of mineral resources in Portugal encourages the development of technologies and products that contribute to the decarbonisation of Portuguese territory, i.e. companies investing in this sector will tend to look for more Portugal the more geological knowledge of their mineral reserves and resources is available.

Knowledge of the potential of the country's geological resources is a key factor in the planning and sustainable development of the national territory and becomes a unique asset to avoid compromising the needs of future generations.

The EUCPN includes the development of regional national prospection and exploration programmes, which will increase geological knowledge, map mineral occurrences and contribute to an estimate of resources. Mineral resources must be qualified by their potential, because of their local, regional, national or global relevance, in the economic and technological context of the sectors in which they form part.

The LNEG has on its website a map of mainland Portugal containing the location of some of the mineral deposits of critical raw materials, which is constantly being updated.

Article 73 of Decree-Law No 30/2021 of 7 May provides for the drawing up of the National Geological Resources Strategy, with the nature of a sectoral programme. The importance of these resources for the country, and more specifically those of what the legislation designates as mineral deposits, justifies their management being underpinned by a national strategy ensuring that the extractive sector develops in a competitive manner, with the greatest possible economic return to the country, in line with the planning of raw material supply needs and, at the same time, in conjunction with other public policies, in particular those promoting the energy transition, and with national strategic instruments that are particularly relevant for sustainable development, such as this Plan and the Roadmap for Carbon Neutrality.

With regard to enhancing synergies with other public policies, the possibility of imposing the transformation of the ore on national territory ensures a substantial increase in the value of the finished product and makes a significant contribution to the development of new technologies and/or an industrial research and exploitation cluster, with the potential to stimulate the vocational or advanced training of local populations, attract skilled workers and high added value enterprises to these territories, thereby enhancing the effectiveness of public policies for the enhancement of inland, employment and research.

This activity also represents, in the same context, a very important vector for achieving the public policy objectives of the energy transition, not only in the supply of an essential raw material, such as lithium, but also in the area of individual or collective self-consumption projects for renewable energy and energy communities, as well as the possibility of contributing to the cluster of renewable gases, in which Portugal wishes to play a prominent role.

A report has already been prepared containing the results developed by the Working Group (WG) set up by Order No 8364/2021 of 24 August 2012 of the Deputy Secretary of State and Energy, with the aim of identifying the actions to be taken to prepare the National Strategy for Geological Resources – Mineral Depósitos, in view of the objectives set out in Article 73 of Decree-Law No 30/2021 of 7 May 2006, as amended by Law No 10/2022 of 12 January 2012, and in conjunction with the applicable rules of the legal regime for territorial management instruments, approved by Decree-Law No 80/2015 of 14 May 2012, as amended. In this context, a set of measures covering the economic, environmental and social pillars has been proposed.

With regard to lithium-containing mineral resources, it appears that the market for lithium and its compounds covers its application in a wide and diverse spectrum of industries, including ceramics and glass, industrial lubricants, medical applications, lithium batteries, aluminium steelworks, among many others. The national potential for lithium mineral resources, as set out in the report of the Litium Working Group, and the objective of promoting investments that make them harnessed and exploited, justify the definition of an integrated strategy involving the whole sector, translated into strategic guidelines, in accordance with the provisions of Resolution of the Council of Ministers No 11/2018 of 31 January 2009. In this context, the potential areas on the national territory have been defined, which have been subject to a Strategic Environmental Assessment procedure, resulting in an Environmental Report and 6 potential areas for the prospection and exploration of lithium-containing mineral resources. These areas will be the subject of an international call for tenders with the aim of promoting prospection and exploration activities to properly determine the existence of mineral deposits with a view to their exploitation and valorisation.

Role of the Circular Economy

The role of the circular economy, which is a key and structuring element of the transition underpinning the decarbonisation pathways of the Portuguese economy, deserves relevance. Thus, the circular economy was considered an integral part of the narrative of the developed socio-economic scenario and was reflected in the sectoral assumptions that supported the modelling of GHG emissions, notably with regard to mobility or the increasing uptake of secondary materials in the manufacturing process such as in the paper, glass and cement sectors, or the use of waste to generate energy sources.

The role of the circular economy and the various related strategies will be further analysed within the value chain of a number of sectors considered to be important for the success of the objectives of this Plan and the 2045 climate neutrality objective, for which a significant impact of circularity is envisaged, particularly in the mobility, construction, agri-food, forestry and waste sectors, including mining waste.

Previous studies under RNC2050 show that in the mobility sector the circular economy-induced transitions point to lower use of individual transport, an increase in shared and multimodal mobility services (both public and private transport) and an increase in the occupancy rate of light-duty vehicles.

This creates new business models that replace the supply of goods (vehicles) with the provision of services and ownership for use.

On the other hand, the increase in the digitalisation of supply chains (more online purchases, more reverse logistics) increases demand for goods mobility and also increases the pressure on this sector and is counterbalanced by increasing the load factor of heavy and light goods vehicles, fleet autonomy and the rate of technological replacement thereof, thereby achieving improvements in the efficiency of vehicles (passenger and freight, light and heavy goods). These concerns allow for more competitive business models, with lower operating costs and lower impact on GHG emissions.

These changes, which are still barely expressed, are starting to gain space mainly after 2030.

Previous modelling has shown that in the agri-food sector, the uptake of more resource-efficient and regenerative farming practices such as water and energy, and new food consumption habits and lifestyles benefit from the reduction of waste generation and its organic fraction (through reduction of food waste), as well as reducing emissions.

Expanding organic, conservation and precision farming, as well as permanent pasture, will reduce emissions associated with the use of synthetic fertilisers and animal effluents, and increase carbon sequestration resulting from increases in organic matter content in soils (the use of compost to replace the use of synthetic nitrogen fertilisers is a circularity measure).

Also in the forestry sector, the increase in active afforestation, the promotion of more resource-efficient forestry practices and risk management and the valorisation of ecosystem services leverage and sustain an increasing role for the bioeconomy, impacting carbon retention and net emissions. Future productivity gains could result from

better forest management practices and fewer fire losses.

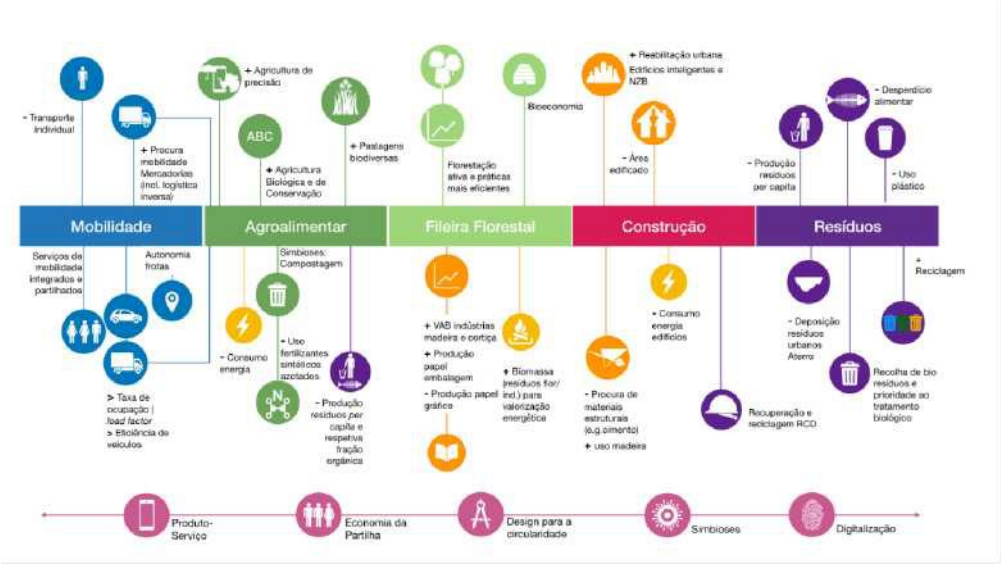
The forestry sector is a value chain that already has a high degree of circularity, with forests playing an indispensable role in the decarbonisation process.

In construction, increased urban regeneration, with reuse of building components, recovered or recycled materials, and use of 'empty' public space, NZEB buildings, multi-functional and shared buildings with reduced building area, as well as the use of new, more sophisticated, more efficient (energy) and durability materials, and renewable materials with lower carbon footprint (e.g.: wood and cork) are circularity strategies to be pursued.

In the waste sector, which is closely linked to circularity strategies, they make it possible to stabilise the generation of municipal waste *per capita* and its organic fraction, in particular by reducing food waste and reducing the use of plastic, with the prospect of increasing separate collection of bio-waste, increasing multi-material separate collection, increasing the number of separately collected streams and developing recycling chains, as well as minimising landfilling of municipal waste.

In mining waste, it is also planned to increase the use of critical raw materials in extractive waste, as provided for in the EUCPN.

Figure 67 – Circular economy-induced transitions [Source: RNC2050]



Role of the Bioeconomy

The main objective of the Bioeconomy is to replace the use of fossil resources with bio-based resources, which is important from a circular economy perspective, and these two areas are conceptually interconnected. In addition to boosting the circular economy, it can contribute to decarbonisation, territorial valorisation and the promotion of energy efficiency and the efficient use of natural resources at the same time.

The emission reduction, renewable incorporation and energy efficiency targets represent a clear opportunity for the conventional industry sector, boost alternative sectors such as the Sustainable Bioeconomy, where significant gains can be made both in promoting decarbonisation and in boosting the circular economy in industry.

"Encouraging the role of the Bioeconomy for Decarbonisation" in conjunction with "Promoting the Circular Economy in Industry" are two lines of action of the NECP 2030 which, while respecting the principle of the cascading use of biomass, stand out in the contribution to two objectives of this Plan, namely Goal 6 (Promote sustainable agriculture and forestry and leverage natural carbon sequestration) and Goal 7 (Develop an innovative and competitive industry).

Recognising the important role that a commitment to the sustainable bioeconomy has in achieving national and European climate action objectives and supporting the recovery of the economy, Portugal adopted in 2021 the Sustainable Bioeconomy Action Plan – Horizon 2025 (PABS), supported by the six Guiding Principles of the

European Bioeconomy Strategy.

The PABS vision focuses on the processing and recovery of biological raw materials, as well as the establishment of new value chains involving the more traditional sectors. The PABS provides for macro and sectoral actions, including a wide range of measures to be implemented by 2025.

The main pillars of the PABS are the promotion of the sustainable use of biological resources in all sectors. This approach has as its guiding principles the contribution to reducing dependence on fossil resources and achieving carbon neutrality.

In order to achieve the objectives set for each action axis, the PABS provides for a set of measures, including:

- Promote the use of bio-based secondary raw materials by boosting material markets and improving management systems, including the development of biomass availability inventories;
- Develop sustainable transport and logistics solutions along the entire value chain in order to reduce the environmental impact of emissions; e
- Promote the development of bio-based products as an alternative to fossil-based products by fostering research lines to design new products through the cascading use of bio-based resources, for example in the textile and footwear industry and construction materials.

5.2. Macroeconomic and, to the extent feasible, health, environment, employment, education, skills and social impacts, including transitionalaspects 79

The transformation of the energy system will have implications for the rest of the economy, either by investing in new technologies, or by changing energy costs or economic flows between different sectors. The impacts of decarbonisation on key economic indicators such as production, private consumption, investment and employment have been assessed by linking the TIMES-PT model to the GEM-E3 PT model.

The modelling of both WEM and WAM scenarios, compared to a BAU scenario80, has a positive effect on GDP above 2.5 % in 2030 and 2040 (Table 69), due, among other factors, to the significant increase in energy efficiency, which is economically positive in the cost of production. This outcome illustrates that the decarbonisation path of the national energy system has a positive impact in terms of economic growth, which is in line with the state of the art.

Table 69 – The impact on GDP in 2030 and 2040 of the WAM and WEM scenario against a BAU scenario

	2030	2040
WEM	2.8 %	2.5 %
WAM	2.7 %	2.8 %

The results of the macroeconomic analysis under the WEM and WAM scenarios (Table 70) show that the impact of a scenario of additional measures in line with the -55 % reduction in 2030 (WAM) compared to 2005 compared

79In terms of costs and benefits and cost-effectiveness of the planned policies and measures described in section 3, at least until the last year of the period covered by the plan, including comparison with projections based on existing policies and measures

80The BAU (Business As Usual) scenario is a scenario modelled only on the GEM-E3-PT model that reflects a stagnant future evolution of the energy system in terms of its structure and without any emission reduction target. In view of the characteristics of the general equilibrium models (with no technological detail with the exception of the power generation sector), this scenario thus assumes the current weight of each of the energy *commodities* and the structure of the electricity sector (e.g. continuity of electricity generation using natural gas and no growth of renewables), as well as energy efficiency growth (exogenous factor to the GEM-E3-PT model) of around 0.1 % per year. It should be noted that the BAU scenario is only a working scenario that serves the purpose of illustrating the impact of alternative scenarios considered for the energy system on the economy.

to a -45 % scenario (WEM) has a negligible impact on GDP (between + 0.1 % to -0.3 % in 2030 and 2040 respectively), as well as on employment and private consumption and a positive impact on investment, i.e. an increase of around 2,0 and 1.2 % on investment in a more ambitious mitigation scenario. These results and their order of magnitude are in line with results observed in similar exercises such as those carried out by the European Commission (EU, 2024)81.

Table 70 – Macroeconomic impact on the main indicators aggregated in 2030 and 2040 of the WAM scenario versus the WEM scenario

	Wem vs WAM	
	2030	2040
GDP	0.1 %	0.3 %
Employment	0.0 %	0.0 %
Private consumption	0.8 %	0.1 %
Investment	2.0 %	1.2 %

As regards employment, there are no changes when viewed in aggregate form, however, there are minor sectoral changes. For example, employment in the power generation sector increased in 2030, with the installation of renewable energy and less energy-intensive sectors such as services. By contrast, manufacturing and other energy supply industries such as refining, the negative impacts will be more marked in the short term, however, new energy supply sectors such as green hydrogen and e-fuels may reverse the expected negative impact on the refining and natural gas sector in the medium/long term.

It should be noted that sectoral analysis results in very conservative indicators, since, in view of their nature, general equilibrium models accommodate very limited new energy clusters and all the associated impacts on the macro-economy.

It should also be noted that the impact on GDP does not take into account the positive economic impacts associated with mitigating changes and the cost of inaction. Indeed, it is estimated that the impacts of climate change could amount to up to 1 % of EU GDP already in the coming years, reaching up to 2.3 % by mid-century (EU, 2024)[6].

In addition, it should also be noted that the macroeconomic impacts presented only reflect the inherent changes in the energy system, and there are a number of factors which may affect the evolution of the economy and which are not accommodated in this exercise, such as:

i) Creation of clusters/productive sectors (e.g. blue biotechnology);

ii) Significant changes in productivity of existing sectors due to disruptions technology;

iii) Changes in global economic development. In addition, the exercise does not consider: I) additional investments in transport infrastructure, e.g. rail, airport structures;

iv) Investments linked to the expansion of the national electricity grid and international infrastructure for export of energy products, e.g. pipeline for export of green hydrogen.

v) Negative or positive externalities associated with the energy transition, such as impacts on the use

81 Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society SWD (2024) 63 final – httpsque //eur-lex.europa.eu/resource.html?uri=cellar:6c154426-c5a6-11ee-95d9-01aa75ed71a1.0001.02/DOC_1&format=PDF

of soil.

Therefore, and notwithstanding due caution that the results achieved, which should be understood as indicators of the pathway in the short/medium term, should be taken into account, overall, it is expected that there will be a positive effect on GDP, resulting from a significant increase in energy efficiency and the almost total decarbonisation of the national energy system, leveraged by significant growth in investment and moderate private consumption, and there are still great opportunities for the emergence of new business models and the creation of new clusters with net potential for more jobs, in particular in:

vi) Renewable energy generation; storage technologies and batteries; smart grids;
vii) Electric vehicle value chain (including production, batteries, charging network; logistics and related services associated with shared and autonomous mobility);
viii) The value chain of the green hydrogen economy and other renewable gases;
ix) Urban regeneration and technologies associated with improving the thermal comfort of buildings;
x) Automation engineering;
xi) Value chain in agricultural production, including new technologies and precision farming;
xii) Research, innovation and development linked to all areas of decarbonisation and energy transition.

This new vision also boosts the acquisition of new skills and imposes the need for reskilling and training in sectors and activities that suffer the greatest impacts, in particular those linked to fossil fuels. In this sense, it will be necessary to create the necessary conditions and skills for a just transition, and the work that has been developed will continue either through the implementation of the Just Transition Fund, such as through support for research and innovation in small and medium-sized enterprises (SMEs) in the renewable energy, agri-food, tourism and sustainable mobility sector, or through initiatives such as the *Green Skills and Work Programme,*which aims at reskilling of workers and qualification of unemployed people, for the areas of renewable energy and energy efficiency. It should also be noted that the estimates obtained do not include quantified impacts on the co-benefits achieved through avoided damage, for example on health and biodiversity, and the associated costs of adapting to climate change.

Co-benefits of decarbonisation and energy transition for air quality and public health

Many of the processes that emit GHGs are also responsible for the emission of other air pollutants that cause environmental problems such as air quality degradation, acidification and eutrophication, causing damage to ecosystems resulting in biodiversity loss and human health problems, in particular respiratory and cardiovascular problems. Air pollution also has considerable economic impacts, reducing average life expectancy, increasing medical costs and reducing productivity with an impact on the economy as a whole.

Air pollution is already identified as the main environmental cause of death in Europe, with the World Health Organisation identifying particulate matter (PM), nitrogen oxides (NO and NO_2), sulphur dioxide (SO_2) and ground-level ozone (O_3) as the most harmful air pollutants. Ozone, unlike other pollutants, is not emitted directly, but is a pollutant that forms into the atmosphere in the presence of other pollutants, such as nitrogen oxides.

As regards particulate matter, it originates from various sources, but mainly from the combustion of fossil fuels and biomass, and is the group of pollutants most harmful to health. The smaller these particles, the more likely they are profoundly penetrating the respiratory system and the greater the risk of causing negative health effects. The smallest inhalable particles (PM10 and PM2.5) reach the lungs and the thinner PM2.5 even enter the bloodstream.

It should be noted that sulphur oxides do not currently represent a serious problem for air quality as a result of various measures such as sulphur reduction levies in fossil fuels.

On the other hand, nitrogen oxides come mainly from road traffic by combustion vehicles, and in large cities is a major contributor to poor air quality. The implementation of spatial planning, road traffic management measures and especially those promoting sustainable mobility (as foreseen in Chapter 3) have the potential to minimise the impacts of these pollutants.

Climate change by affecting weather conditions, such as the frequency of heat waves and episodes of high atmospheric stability, tend to prolong periods when ozone levels are high and may also lead to increased concentrations of particulate matter, contributing to the degradation of air quality and increasing the risk of diseases associated with air pollution.

In 2021, Portugal saw a 3.3 % decrease in days with the 'Very Good' and 'Good' air quality index compared to the previous year and a 0.9 % decrease in the percentage of days classified as 'Fraco' and 'Mau', indicating a slight deterioration in the state of air quality compared to 2020, due to the situation of returning society and the economy to levels closer to normal after the COVID-19 pandemic had stopped.

The analysis for the period 2002-2021 shows a decreasing trend in the percentage of days classified as 'Fraco' and 'Mau', falling from around 17 % in 2005 to 1.9 % in 2021.

Estimates of health impacts attributable to exposure to pollution of ther 82 indicate that PM2.5 concentrations in 2021 were responsible for around 2 110 premature deaths from long-term exposure in Portugal. The estimated impacts of exposure to NO_2 and O_3 concentrations in Portugal were respectively around 550 and 460 premature deaths in 2021.

In the European Union (EU), in the last 20 years, important progress has been achieved in the field of anthropogenic air emissions and air quality, in particular through specific policies, notably the Thematic Strategy on Air Pollution and legal instruments limiting total annual emissions of air pollutants in the Member States.

However, there are still significant negative impacts and risks to human health and the environment, and new national emission reduction commitments have therefore been established for the periods from 2020 to 2029 and from 2030 onwards, published in Directive 2016/2284 of the European Parliament and of the Council (of 14 December 2016) on the reduction of national emissions of certain atmospheric pollutants, transposed into national law by Decree-Law No 84/2018 (of 23 October 2018). Portugal, like the other EU countries, has undertaken to reduce its total air emissions of the pollutants sulphur dioxide (SO2), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC), ammonia (NH3) and fine particulate matter (PM2,5).

The emission reduction obligation for each pollutant and for each period (2020 to 2030 and beyond 2030) is set against the value recorded in the reference year 2005, so that for each pollutant there is a mandatory percentage reduction to be complied with. In this way, emission reductions should be progressive while contributing to the objectives of improving air quality.

In Portugal, despite the positive trend over the past two decades, air quality problems still persist in some locations. These occur mainly in densely populated urban areas, where concentrations exceeding the limit values for human health, in particular nitrogen dioxide (NO_2), are still observed. There are also areas where values are often higher than the long-term objective for Ozono[83].

Air pollutants and GHGs interconnect in different ways, especially with regard to common emission sources, in particular those associated with the combustion of fossil fuels in stationary and mobile sources.

The projection of national transformation to a carbon-neutral economy has shown overall positive effects on emissions of key air pollutants in the scenarios tested under the Carbon Neutrality Roadmap 2050 – RNC2050. Following the work to revise the NECP 2030 and RNC2050 (the latter still ongoing), the emission estimates of other air pollutants are also revised, based on the same energy demand scenarios and some common measures

82 "Portugal – air pollution country fact sheet" – Data from the European Environment Agency, November 2023, available at: https-//www.eea.europa.eu/themes/air/country-fact-sheets/2023-country-fact-sheets/portugal-air-pollution-country

83Although ozone is a secondary pollutant and is not directly emitted from sources into the atmosphere, it is ultimately formed in the troposphere, according to complex chemical regimes, from precursor pollutants which are also covered by that set of legislation.

for sectoral initiatives for air emissions.

Although preliminary figures are not yet available at this stage, it is expected that, under the current revised NECP 2030, the carbon neutrality trajectories will also show significant emission reduction potential, mainly for pollutants such as nitrogen and sulphur oxides (NOx and SOx) and, to a lesser extent, ammonia (NH3).

The sectors of energy production and transport are those with the highest GHG reduction potential, as well as those that ensure the greatest reduction of air pollutant emissions. These sectors are examples of the synergy of solutions for both aspects of the atmospheric environment. However, this depends on the measures and implementation conditions. For example, the progressive incorporation of biofuels provides GHG savings, but could contribute to the increase of PM2,5 emissions. Similarly, in the electro-generating sector the use of biomass for electricity generation contributes to the reduction of non-biogenic GHG emissions but could mean an increase in air pollutant emissions if the incorporation of control/end-of-line technologies is not ensured.

The crucial vector, which has been identified as the most cost-effective for the decarbonisation of the national economy, is the combination of the electrification of final and renewable base consumption, and is cross-cutting across all end-use sectors. This also leads to more significant reductions in emissions of some air pollutants. The decarbonisation of the transport sector is of particular importance here and no longer contributes significantly to the emission of air pollutants in the long term. This effect will be particularly relevant in cities, due to the expected transformation in terms of mobility, with increased collective public transport and intermodality, decarbonising fleets by promoting electric mobility and increasing active and shared mobility.

The decarbonisation envisaged with the NECP 2030 is therefore expected to bring benefits towards the generic reduction of air pollutant emissions, and consequent improvements in ambient air quality and reduction of damage to human health, in particular for respiratory diseases, and ecosystems, where pressures from air pollution damage vegetation growth and cause damage to agriculture and biodiversity.

Despite the overall positive effects of decarbonisation pathways, there may be conflicting effects in certain situations, such as the uptake of fuels such as biomass (e.g. in the industrial and residential sector), which translates into increases in particulate matter emissions. The use of this fuel is in some cases transition and can cause significant emissions at intermediate time horizons. This may jeopardise the achievement of national PM2,5 emission reduction targets, which are particularly demanding in the period from 2030 onwards (i.e. -53 % of emissions compared to 2005).

The use of alternative fuels for combustion, such as biomethane and biofuels, could also lead to an increase in air pollutant emissions. The impact of emerging fuels, such as synthetic ammonia, which, for example, appears as an alternative for use in the maritime transport sector, may have negative impacts on air quality, as it promotes the formation of secondary particles, which should be monitored and quantified.

The identification of these cases is relevant in the selection and enhancement of measures to mitigate air emissions.

The identification of additional air emission reduction and control measures, with an emphasis on the agricultural, industrial and residential sector, in order to ensure compliance with national emission reduction commitments, should be further analysed in the context of the preparation of the so-called National Air Pollution Control Programmes (NAPPs).

The projection of NH3 and NMVOC emissions will also be analysed in detail, as in previous years in the context of RNC 2050 emission reduction commitments indicated low margin of compliance.

On the other hand, the implementation of end-of-line measures to reduce air pollutants can lead to increases in energy consumption and contribute to increased GHG, and this analysis should be carried out with caution in an integrated approach.

Overall, the results to be achieved should translate into a reduction in air pollutant emissions and an expected improvement in ambient air quality. It confirms the importance of combining the transition of the national economy to a low-carbon economy, and the need for additional measures targeting certain pollutants and sectors

to ensure that the national air pollutant reduction commitments for 2030 are also met.

Thus, while GHGs do not have a direct effect on human or ecosystem health, policies promoting their reduction are expected to also contribute to the reduction of other air pollutants, in the face of convergence in their source sources.

5.3. Overview of investment needs

i. Existing investment flows and forward investment assumptions with regards to the planned policies and measures

Decarbonisation and the energy transition represent a unique opportunity for the country to consolidate an inclusive and sustainable development model, people-centred and based on innovation, knowledge and competitiveness, while contributing to improving the health and well-being of people and ecosystems.

This vision is necessarily reflected in the present work to revise the 2030 NECP and should also be reflected in the various sectoral policy plans and instruments in the specific areas of transport, industry, trade, services, waste, agriculture and forestry.

Further investment in GHG emission reduction, energy transition and climate resilience will therefore be needed over the 2030 horizon, taking into account the targets taken at Community and national level. This investment will have a wide impact and return on all sectors of activity and the co-benefits will be cross-cutting across society.

The Portuguese transition strategy towards a carbon-neutral economy relies, in the medium term, on a combination of the various policy options and measures identified above, as well as modelled cost-effective technological options, seeking synergies between the various options.

Projections show that the decarbonisation and energy transition envisaged can be achieved with current technologies, and the development of new technologies in the future will make it possible to achieve the objectives set more quickly and effectively compared to what is estimated today.

Decarbonisation and the energy transition will encourage a deep and rapid transformation of society, focusing more on the least emitting technologies, with consequences on multiple aspects of the economy, the daytime of citizens and social organisation.

Depending on their type, investments will be shared between households (e.g. insulation in homes, more efficient household appliances, electric cars, etc.), companies (e.g. in renewable energy, hydrogen trucks, electric furnaces and boilers, etc.) and the State (e.g. electric public transport, decarbonisation of public buildings and fleet as well as the development of infrastructure essential to the national energy transition, etc.).

The State will play a role in defining the regulatory, fiscal and incentive system that provides clear long-term signals in order to facilitate and target the investments needed for the upcoming transition and to avoid stranded assets and the maintenance of environmentally harmful subsidies.

In general, in the power generation sector, the gradual reduction in the use of fossil fuels and the increased demand caused by the increasing electrification of the economy are expected to lead to significant investments in increasing renewable capacity (also considering that existing capacity will also reach its lifetime and need to be replaced). This anticipates in this sector that much of the necessary investment will take place in the installation of solar capacity and energy communities.

In addition to solar capacity, there are also investments in wind production, with a strong focus on *onshore* wind in the first phase, also through repowering and overequipping, and then in *offshore* systems, seeking to exploit the existing resource in the national coastal zone with potential for this type of technology.

The mobility and transport sector will be one of the most technologically substitutable, and this will be the case with much of the investment needs, mainly in the current decade, linked mainly to the replacement of both passenger and freight vehicles. This high level of investment occurs both because of the imperative to reduce emissions by focusing on new energy carriers, such as electricity and green hydrogen, and by the relatively short

lifetime of the assets involved.

In the residential and service buildings sector, most of the investment is related to the energy renovation of the national stock of existing buildings and the decarbonisation of energy consumption, including through increased electrification, increased energy efficiency of installed equipment and the use of renewable energy sources. Investments in building insulation are of crucial importance, while at the same time increasing thermal comfort and reducing the need for heating in winter and cooling in summer, reducing energy poverty rates.

The importance of investing in water efficiency and resilience in buildings reflecting the level of energy and water bills, as well as in mitigating the growing problem of water scarcity as a result of increasingly frequent droughts, is not negligible.

In the case of industry, where one of the main hubs of innovation needs lies, investments will be linked to the energy transition, with a focus on energy efficiency, renewable gases such as green hydrogen and electrification, as well as on circular and sustainable processes and practices.

As far as the investments identified as necessary in the energy system are concerned, investments to be made in agriculture and forestry and waste and waste water sectors still need to be taken into account, which are however more difficult to count in view of the dispersion of factors to be taken into account, such as the values needed to combat rural fires, mitigation measures such as improving animal digestibility, or even the implementation of circular economy measures and the reduction of organic load generation.

The development of new technologies and the improvement of existing low-carbon technologies will also require a significant boost in investment and research in innovation, to be achieved through the adoption of an ambitious and broad-based agenda covering all stages of the technology development cycle up to their commercialisation.

It is also important to stress that linked to this energy and climate transition are significant savings in terms of fossil fuel imports, and a significant improvement in the country's energy independence.

ii. Sector or market risk factors or barriers in the national or regional context

See iii.

iii. Analysis of additional public finance support or resources to fill the gaps identified in the previous point

The Carbon Neutrality Roadmap 2050 identifies, as one of its lines of action towards a carbon-neutral society, the need to "redirect financial flows towards the promotion of carbon neutrality, in particular by fostering the development of an enabling framework for sustainable finance and greater involvement of and monitoring of the financial system".

Moving towards a carbon-neutral society, based on a circularity model, and making the associated energy transition happen, means boosting investment in the various sectors of activity, ensuring social fairness in the way such investment is implemented and financed. Investment in these areas will generate greater economic momentum and boost the creation of new jobs.

At international level, it appears that, in order to comply with the Paris Agreement, the size of the investment required means that it necessarily has different sources. Despite the public support available for climate action, and as recognised by the European Commission, the vast majority of investments will be made by the private sector and households. ECOFIN also recognised the importance of making financial flows consistent with low-carbon development, valuing the importance of the private financial sector, as there are not enough public funds for investment needs.

In this context, the Action Plan on Financing Sustainable Growth, proposed by the European Commission in 2018 (COM (2018) 97 final), is worth highlighting to redirect capital flows towards sustainable investments, manage the financial risks arising from climate change and promote transparency and long-term vision in economic and financial activities. European states are gradually embarking on the issuance of Green Bonds, as they are a clear

signal of the country's commitment to environmental sustainability.

At European level, the Multiannual Financial Framework 2021-2027, worth more than EUR 1.07 billion, is one of the main sources of funding for the decarbonisation of the economy, which sets out the commitment to allocate 25 % of the overall spending budget to climate action. In this sense, the preparation of the financing framework for the period 2021-2027 should reflect the guidelines established at European level and be one of the main sources of funding for this plan.

Alongside the Multiannual Financial Framework 2021-2027, the NextGenerationEU investment programme, dedicated to the EU's economic recovery from the COVID-19 pandemic, is a key source of funding for pursuing the targets set in the European Green Deal, as around one third of the total value of EUR 1.8 billion aims at further decarbonisation of economic activities by 2050 as well as fair economic growth, which is decoupled from the intensive use of natural resources and in which no region is left behind.

The RRP also reiterates the commitment to sustainable development towards a carbon-neutral economy by 2050 – in line with the European Green Deal and the spirit of the legislative initiative for the European Climate Law, where 41.2 % (where the Recovery and Resilience Facility Regulation requires 37 %) of the overall value of the investment is expected to be allocated to reforms and investments that contribute to tackling climate change. An example was the publication of Order No 160/2024/1 of 7 June 2009 approving the Incentive System Regulation entitled 'Support for the Development of an Ecological Industry', drawn from the RRP allocation, annexed to that Order.

At national level, the National Investment Plan (NIP) 2030, which enshrines decarbonisation of the economy as one of the structuring areas, covering more than 60 % of investment in areas contributing to these objectives, including transport and mobility, environment and energy, is also worth highlighting.

At the same time, the Climate Law (Law No o98/2021 of 31 December 2012) recognises that it is crucial to boost sustainable finance, given the importance of the financial sector, including through private investment, for achieving the climate transition. Thus, it is stated in the above-mentioned Law that fiscal and fiscal policies at national level should phase out by 2030 subsidies set out in national legislation, directly or through tax advantages, related to fossil fuels or their use, such as allocating green tax revenues for decarbonisation, just transition and increased resilience and adaptive capacity to climate change and enhancing the application of the carbon rate and applying higher taxation on resource use.

Tax policy also plays a prominent role in the expected transition, which should be designed to reflect real costs, address the main social and environmental costs, internalising externalities, and influence behavioural change, as a determining factor for fair and sustainable competition.

Particular emphasis is also placed on the allocation of public funding. In this framework, tax policy should be aligned with the objectives of energy transition and decarbonisation of the economy, introducing the right signals to the economy, while enabling the generation of public revenues that can be applied in decarbonisation measures and ensuring a just and fair transition. Green taxation should therefore be pursued in order to achieve fiscal neutrality and a threefold dividend, protect the environment and reduce energy dependence from outside the world, foster growth and employment, and contribute to fiscal responsibility and the reduction of external imbalances.

The Green Tax Reform was enshrined in Law No 82-D/2014 of 31 December 2009, amending a set of fiscal and environmental rules in the energy and emissions sectors, transport, water, waste, spatial planning, forests and biodiversity, and introducing a system for the taxation of plastic bags.

The principle that revenues from climate policies are channelled to finance the transition to a carbon-neutral economy is a cornerstone. It should be noted that the decarbonisation of the economy benefits from a range of relevant revenues generated by climate policy, with a focus on auctioning revenues under the ETS scheme and allocated to the Environmental Fund, allowing to recycle revenues, for example for financing the Public Transport Tariff Reduction Support Programme (PART), the Programme to Support the Densification and Strengthening of Public Transport Offer (PROTransP) and to reduce the tariff deficit through transfers to the National Electricity

System.

In this context, the Environmental Fund, and more recently the RRP, play a prominent role as the main instruments of the Portuguese State for financing climate action, in the adaptation and mitigation dimensions, including the energy transition.

The financial sector should also incorporate, in its investment policies and in the supply of new financial products, the right incentives for the objectives of this plan, so that the private sector can access the financing needed to make investments and purchases for a society that tends to decarbonise.

Portugal is committed to redirecting financial flows towards the promotion of decarbonisation and energy transition, in particular by fostering the development of a favourable framework for sustainable finance and a greater involvement of the financial system in these themes in this decade. In this context, it is important to highlight the contribution of the Reflection Group on Sustainable Finance, set up in 2019, coordinated by the Ministry of Environment and Climate Action, in partnership with the Ministry of Finance and the Ministry of Economy and the Sea, and which includes the main public and private actors in the financial sector in Portugal, with the support of the Bank of Portugal.

The Reflection Group identified the key areas and a set of recommendations in the "Guidelines for accelerating sustainable finance in Portugal", which identifies key areas and recommendations in this area, with different time frames, so that the national financial sector can contribute to accelerating this transition process. The active participation and consensus reached between the 20 institutions of the Reflection Group led to the signature of the "Charter of Commitment for Sustainable Finance in Portugal" which includes the adoption of specific commitments for financing that promotes the decarbonisation of the economy and sustainable development by the signatories.in the "Guidelines for accelerating sustainable finance in Portugal", which identifies key areas and recommendations in this area, with different time frames, so that the national financial sector can contribute to accelerating this transition process. The active participation and consensus reached between the 20 institutions of the Reflection Group led to the signature of the "Charter of Commitment for Sustainable Finance in Portugal" which includes the adoption of specific commitments for financing that promotes the decarbonisation of the economy and sustainable development by the signatories.

In addition to continuing to monitor and participate in the future work of the Reflection Group, the signatory financial institutions and Euronext Lisbon have also made the following commitments:

- Promote the debate on sustainability and on environmental, social and governance risks and opportunities at the level of its boards, with a view to taking those risks and opportunities into account when defining their strategies;
- Promote sustainable finance training for its staff at the different levels of the organisation (including the Board of Directors), with a focus on the area of credit risk analysis, financial, commercial and/or production products;
- Monitor the revision of the SME Leader and SME Excellence criteria in order to gradually incorporate sustainability topics into those criteria and accept the possibility of creating a category of Green or Sustainable SMEs;
- Promote the gradual integration of environmental, social and governance criteria into financing and investment reviews.

In addition to these commitments, other commitments of equal importance have also been made and will contribute much to the success of sustainable finance in Portugal, notably by the Bank of Portugal, the Securities Market Commission, the Authority for Supervision of Insurance and Pension Funds, the Portuguese Association of Banks, the Portuguese Insurance Association, the Association of Enterprises Emitentes de Values Covered in Market, the Portuguese Association of Investment Funds, Pensions and Patrimonies and the Ministry of Environment and Climate Action, the Ministry of the Economy and Digital Transition and the Ministry of Finance. Finally, for investment potential and hence growth to materialise, it is crucial that public policy gives clear and long-term signals to investors. With the revision of the Carbon Neutrality Roadmap 2050 and this revision of the NECP 2030, the vision, objectives, targets and main lines of action that will determine the evolution of the national

economy in the medium and long term are strengthened.

Thus, in order to achieve the objectives set out in this plan and to align the economy with a path towards carbon neutrality, the following guidelines are laid down:

- Make full use of the current Multiannual Financial Framework 2021-2027 and other sources of funding at European Union level to steer the next funding cycle towards the decarbonisation of society and the energy transition, not supporting investments that are not in line with this objective and/or do not comply with the Do No Significant Harm (DNSH) principle;
- Align national public funds with the objectives set out in this plan by integrating criteria related to the objectives of this plan into the different funding lines;
- Steer Foreign Direct Investment towards the economy of the future, aligned with decarbonisation and energy transition objectives;
- Making taxation a tool for the transition to a carbon-neutral society;
- Align the financial system with decarbonisation objectives, in line with ongoing work at European and national level to integrate sustainable finance into the activity of financial institutions.

EUROPEAN FUNDING

The EU's long-term budget, the Multiannual Financial Framework 2021-2027, adopted on 17 December 2020, sets out the annual amounts that can be spent on European public policies, setting out the Union's priorities for a seven-year period. Under this new budget, EU funding will target new priorities, reinforced in all EU policy areas, including the green and digital transitions, enabling the EU to meet its long-term objectives.

In this context, a number of instruments are highlighted, highlighting the centrality of climate policy and the energy transition.

Life Programme – Programme for the Environment and Climate Action

Programme for the Environment and Climate Action, focusing on developing and implementing innovative ways to address environmental and climate challenges, such as clean energy transition and mitigation and adaptation to climate change. The Commission has increased LIFE funding, thus being among the EU funding programmes for which the Commission has proposed the largest proportional increase for the period 2021-2027, so in the next Multiannual Financial Framework the area for climate action is worth over EUR 1.9 billion, of which EUR 947 million are expected to support projects in the area of Mitigation and Adaptation to Climate Change and 997 million will support Clean Energy Transition projects. In addition to its direct achievements, LIFE will also act as a catalyst for other funds.

The funding will mainly target environmental protection and climate change mitigation, support the clean energy transition to increase energy efficiency and renewable energy in the energy mix. It is one of the instruments that will support the EU in meeting its climate targets, aiming for climate neutrality by 2050.

The main elements of the new LIFE programme (2021-2027) include:

- **Continued support for the transition to a circular economy and for enhancing climate change mitigation**: the programme notably focuses on the funding needed to achieve the key policy objectives in line with the EU's strategic long-term vision for a prosperous, modern, competitive and climate neutral economy by 2050. Actions will support the full transition to a circular economy, protecting and improving the quality of the EU's air and water, implementing EU's 2030 energy and climate policy framework and meeting the Union's commitments under the Paris Agreement on Climate Change;
- **An increased focus on supporting the clean energy transition**: a new specific sub-programme will stimulate investment and support activities focused on energy efficiency and renewable energy, especially towards sectors and European regions lagging behind in the transition towards clean energy;
- **A stronger focus on nature protection and biodiversity**: traditional elements of the LIFE Programme, the new strategic nature protection projects specialised and aimed at all Member States will contribute

to integrating the strategic objectives of nature protection and biodiversity into other policy areas and funding programmes, such as agriculture and rural development, ensuring a more coherent approach across sectors;

- **A simple and flexible** approach, with focus on developing and implementing innovative ways to respond to environment and climate challenges.

Cohesion Policy

With an overall indicative budget of EUR 273 billion, it supports sustainable development through investments in climate change adaptation and risk prevention, as well as environmental protection measures and infrastructure. Sustainable development objectives are enshrined in the regulations establishing the funds and should be promoted at all stages of their preparation and implementation. In this context, and under the Partnership Agreement between the Commission and Portugal, EUR 23 billion will be made available to support economic, social and territorial cohesion in Portugal by the end of the decade. In this context, Portugal and the other Member States should invest between 30 % and 50 % of their share of the European Regional Development Fund (ERDF), one of the main cohesion policy financial instruments, in innovation-related projects, and at least 30 % in projects tackling climate change and contributing to the circular economy. Between 6 % and 10 % of the national ERDF should also be allocated to the area of sustainable urban development. Thus, Portugal will invest around 5.5 million from ERDF, Cohesion Fund and European Maritime, Fisheries and Aquaculture Fund (EMFAF) to implement the European Green Deal through the development of a circular and sustainable economy and a zero-emissions transport system, and the preservation of biodiversity.

InvestEU

The InvestEU programme (2021-2027) aims to mobilise public and private financing to pursue strategic investments under European policies. It also assumes compliance with investment sustainability requirements and helps steer capital flows towards sustainable investment.

This programme will bring together under the same roof a multitude of EU financial instruments currently available, expanding the model of the Juncker Plan. The InvestEU Fund will mobilise public and private investments through an EU budget guarantee of EUR 38 billion that will support investment projects by financial partners such as the European Investment Bank (EIB) Group and others, strengthening their risk-bearing capacity. The financial partners are expected to contribute at least EUR 9.5 billion in risk-bearing capacity. It is expected that, together with the banking sector, at least EUR 650 billion of investment can be leveraged. The guarantee should have a provision of 40 %, which means that a reserve of EUR 15.2 billion is set aside from the EU budget should the guarantee be called on.

This budgetary guarantee is divided between the policy areas as follows:

- Sustainable infrastructure with EUR 11.5 billion;
- Research, innovation and digitalisation, with EUR 11.25 billion;
- Small and medium-sized enterprises with EUR 11.25 billion;
- Social investment and skills in EUR 4 billion.

The EIB will remain the Commission's main financial partner under InvestEU. In addition, Member States' national and regional promotional banks and other institutions which can offer specific expertise and experience may become financial partners, subject to conditions.

The decision to extend the possibility to benefit from the EU guarantee to other institutions is due to the fact that there are other potential experienced financial partners in the EU with specific sectoral or financial expertise, excellent knowledge of the local market or increased risk-sharing capacity with the EU in certain sectors. This approach will enlarge and diversify the pipeline of projects and increase the potential pool of final beneficiaries.

Connecting *Europe Facility* (CEF)

The Connecting Europe Facility (CEF), established by Regulation (EU) 2021/1153 of the European Parliament and

of the Council of 7 July 2021, repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014, is considered a key financing instrument for delivering the European Green Deal and an important enabler for the achievement of the Union's decarbonisation objectives for 2030 and 2050.

The objective of this instrument is to build, develop, modernise and complete trans-European networks in the transport and energy sectors and in the digital sector, as well as to facilitate cross-border cooperation in the field of renewable energy, taking into account the long-term decarbonisation commitments and the objectives of strengthening European competitiveness, smart, sustainable and inclusive growth, territorial, social and economic cohesion and access to and integration of the internal market, with an emphasis on facilitating synergies between the transport and energy sectors and the digital sector.

With a financial envelope for the period from 1 January 2021 to 31 December 2027 of EUR 33.7 billion, and in line with the Union's commitments under the Paris Agreement and the United Nations Sustainable Development Goals, the CEF should contribute 60 % of its overall allocation to climate objectives through its actions, taking into account the following coefficients:

i) 100 % of expenditure on railway infrastructure, recharging infrastructure, alternative and sustainable fuels, clean urban transport, electricity transport and its storage, smart grids, CO_2 transport and renewable energy;
ii) 40 % for inland waterways and multimodal transport, and gas infrastructure – if enabling increased use of renewable hydrogen or bio-methane.

The Common Agricultural Policy (CAP)

The Common Agricultural Policy (CAP) reform, valid for the period 2023-2027, entered into force on 1 January 2023, paving the way for a fairer and greener CAP, seeking a sustainable future for European farmers, in line with the ambitions of the European Green Deal, the Farm to Fork Strategy and the Biodiversity Strategy. The agreement reached results in a set of three regulations, namely:

- Regulation (EU) 2021/2115 establishing rules on support for national CAP Strategic Plans and repealing Regulations (EU) 1305/2013 and 1307/2013;
- Regulation (EU) 2021/2116 repealing Regulation (EU) No 1306/2013 on the financing, management and monitoring of the CAP;
- Regulation (EU) 2021/2117 amending Regulation (EU) No 1308/2013 establishing the common organisation of agricultural markets; Regulation (EU) No 1151/2012 on agricultural product quality schemes; Regulation (EU) No 251/2014 on geographical indications for aromatised wine products; and Regulation (EU) No 228/2013 laying down measures for agriculture in the outermost regions of the EU.

The new CAP approach, based on performance and results, is more flexible and takes into account local conditions and needs, while increasing the EU's sustainability ambitions. It has an overall budget of EUR 386.6 billion, divided into two funds (often referred to as the "two pillars" of the CAP), in this case the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD).

The CAP is built around ten specific objectives, which also form the basis for MS to design their national strategies – the CAP Strategic Plans 2023-2027 (PEPAC), namely: ensure a fair income for farmers; increase competitiveness; to improve the position of farmers in the food chain; action against climate change; environmental protection; preserve landscapes and biodiversity; support generational renewal; promoting vibrant rural areas; to protect food and health quality; and promoting knowledge and innovation.

Portugal's strategy in the national PEPAC, approved by the Commission on 31 August 2022 – C (2022) 6019 final, which combines regional and national elements, is based on the active management of the entire territory, based on innovative and sustainable agricultural and forestry production. This strategy materialises through a regulatory framework such as cross-compliance and CAP instruments financed by the EU through the EAGF and the EAFRD, through direct payments, including eco-schemes, sectoral measures for fruit and vegetables, vineyards and beekeeping, and rural development instruments, including agri-environment-climate measures.

In the case of direct payments the great novelty is the establishment of eco-schemes that through incentives promote the uptake of annual commitments with environmental and climate objectives. An extended set of support measures have been defined with commitments that have a potential impact on decarbonisation either through sequestration or emission reduction, namely 'Organic farming', 'Integrated production – agricultural crops', 'Maneio of permanent pasture', 'Promotion of organic fertilisation', 'Improving animal feed efficiency for GHG reduction', 'Animal welfare and rational use of antimicrobials'. Under rural development, agri-environment-climate measures have been established to promote the uptake of multiannual commitments with decarbonising potential, such as 'Direct seed', 'Crop of permanent crops', 'Biodiverse grassland', 'Montés e lameiros' and 'Management of the Montado by results'.

Also in the case of rural development, the PEPAC provides for a number of measures to support investments, in particular to improve the environmental performance of agricultural holdings (which is financed by: precision agriculture, livestock effluent management), with a direct and significant impact on the decarbonisation of the sector.

Horizon Europe

Horizon Europe – the Framework Programme for Research and Innovation for the duration of the MFF 2021-2027, established by Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021, repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013, is the main EU funding programme for research and innovation and a promoter of economic growth and jobs.

This programme, with a budget of EUR 95.5 billion, aims to deliver a scientific, technological, economic and societal impact from the Union's investments in R & I in order to strengthen the scientific and technological bases and foster the competitiveness of the Union in all Member States, including that of its industry, deliver on strategic priorities and contribute to the achievement of the Union's objectives and policies, address global challenges, including the SDGs, following the principles of Agenda 2030 and the Paris Agreement, and strengthen the European Research Area.

The Fund is structured in three pillars, in particular Pillar 2 – Global Challenges and Industrial Competitiveness (EUR 53.52 billion), which directly supports research on societal challenges, strengthens technological and industrial capacities and establishes missions at EU level with the ambitious aim of addressing some of the EU's biggest problems, including, among the selected clusters, Digital and Industry, Climate, Energy and Mobility and Food, Bioeconomy and Natural Resources, and Agriculture and Environment.

The Innovation Fund

The Innovation Fund is one of the largest funding programmes for innovative low-carbon technology demonstration projects, with its focus on:

- Innovative low-carbon technologies and processes in carbon-intensive industries, including the replacement of carbon-intensive products;
- Carbon Capture and Utilisation (CCU);
- Construction and maintenance of carbon capture and geological storage;
- Innovative renewable electricity generation;
- Energy storage.

The revenues from this fund originate from the auctioning of allowances under the EU ETS, with 450 million allowances allocated for this purpose between 2020 and 2030, including in addition the amounts not used by the NER 300 programme.

It is estimated that the Innovation Fund could amount to EUR 38 billion, depending on the carbon price at the time of monetisation of allowances.

The Innovation Fund is a key part to achieve the goal of a carbon-neutral Europe in 2050 and to deliver on the Paris Agreement.

Modernisation Fund (MF)

Following the revision of the ETS Directive as part of the *Fit for 55* package, Portugal will become one of the new Member States benefiting from this fund, which aims to support the modernisation of energy systems and the improvement of energy efficiency in MS with lower GDP *per capita*. This will make it possible to finance investments in renewable energy, energy efficiency, storage and energy grids, as well as in promoting the just transition in territories where the former economy was based on industrial or other high-carbon emitting activities. To operationalise this Fund, Portugal will need to submit investment proposals to the European Investment Bank and an Investment Committee, which will be assessed with a view to disbursing the proceeds of this Fund, which will always be subject to State aid authorisation. In terms of distribution of support, Portugal will benefit from 8.8 % of the total value of this fund between 2030 and 17, corresponding to around EUR 2 024 million.

Social Climate Fund

The Social Climate Fund will support households, micro-enterprises and public transport users that are most vulnerable to the expected rise in energy and public transport prices following the extension of the ETS scheme to the transport and buildings sector (ETS BRT). The implementation of this fund will take place between 2026-2032, with Portugal being able to access approximately EUR 1.22 million by presenting a social climate plan containing the measures and investments it intends to implement to mitigate the social impacts caused. This concerns measures and investments aimed at reducing dependence on fossil fuels by increasing the energy efficiency of buildings, decarbonising their heating and cooling systems and promoting low-emission or even zero emission mobility solutions.

InnovFin Energy Demo Projects

This financing facility consists of loans, loan guarantees or wealth financing, typically between EUR 7.5 million and EUR 75 million for innovative energy system transformation projects, including but not limited to: renewable energy technologies, smart energy systems, energy storage, carbon capture and storage or carbon capture and use. This financing mechanism is complemented by the European Investment Bank.

Just Transition Fund

Under the Just Transition Fund Portugal has a total of 223.8 million in 2021-2027 to ensure that the transition to a climate-neutral economy takes place in a fair, equitable and cohesive manner, i.e. leaving no one behind, especially in those regions that have until then economically dependent on industries associated with coal- or oil-based energy production. In view of the cessation of coal-fired electricity production in the two largest CO2 emitting plants in the country –the Sines power plant (in the Alentejo Litoral region) and the Pêgo power plant (in the Middle Tagus region), both in 2021, and the closure of the oil refinery in Matosinhos in 2020, it is crucial to promote the economic development of these three regions and the diversification of existing economic activities in these three regions.

Thus, in the Alentejo Litoral and Medium Tejo, this fund will diversify the local economy by supporting research and innovation in small and medium-sized enterprises (SMEs) in the renewable energy, agri-food and tourism and sustainable mobility sector. As such, the Fund is expected to create around 200 new jobs and support the reorientation of workers in the region affected by the shutdown of coal-fired power plants through training and re-skilling. In Matosinhos, the Just Transition Fund will support the creation of a new innovation centre with a particular focus on sustainable mobility, clean energy, advanced manufacturing and the maritime economy. In this region, this fund will create 150 new jobs in supported SMEs and reskill 170 long-term unemployed.

REPowerEU

In parallel with the negotiation of the Fit for 55 package, the European Commission launched in 2022 the REPowerEU Plan, with a budget of EUR 20 billion, to support the reduction of the EU's energy dependence on Russia by 2027. To this end, MS added a dedicated REPowerEU chapter to their RRPs to identify how they will channel investments to the areas identified as priorities under REPowerEU, such as energy imports, energy

savings, fossil fuel substitution and clean energy transition. This programme will thus allow Portugal to accelerate the implementation of measures targeting the green and energy transition as well as security of energy supply and storage, with a value of 704.4 million. The REPowerEU chapter aims to support Portugal's energy independence and green transition targets, considering new geopolitical and energy market dynamics. The chapter includes 6 reforms, 16 investments, 23 milestones and 20 targets, with a total planned allocation of EUR 855 million.

Bank, European investment

The European Investment Bank (EIB) is the largest multilateral financial institution in the world, being the most important entities in climate finance. The EIB is the Bank of the European Union which focuses on lending and aims to finance projects which contribute to the achievement of the objectives of the European Union. The EIB has recently assumed itself as the European Climate Bank, following the approval of an energy lending policy that explicitly assumed the end of financing for fossil fuel infrastructure from 2021 onwards. The EIB is also the largest shareholder in the*European Fund for Strategic Investments*(EFSI), which finances investments in small and medium-sized enterprises.

EFSI is one of the three pillars of the Investment Plan for Europe and aims to overcome current market failures by addressing market gaps and mobilising private investment. It helps finance strategic investments in key areas such as infrastructure, research and innovation, education, renewable energy and energy efficiency, as well as risk finance for small and medium-sized enterprises (SMEs).

EEA Grants

The EEA Grants correspond to a multiannual financial mechanism through which Iceland, Liechtenstein and Norway financially support the Member States of the European Union with the largest deviations from the European average GDP *per capita*, including Portugal. With an overall allocation of EUR 102.7 million for the period 20142021, the EEA Grants aim to reduce economic and social disparities within the European Economic Area and to strengthen bilateral relations between Portugal, Iceland, Liechtenstein and Norway through direct support to five programmes: Blue Growth, Environment, Reconciliation and Gender Equality, Culture and Citizens Ativ@s. As regards the Environment Programme, the EEA Grants have supported programmes in the field of Climate Change Mitigation and Adaptation with a view to promoting energy efficiency in buildings and reducing GHG emissions and water management and developing adaptation plans respectively. In the period 20212022, the EEA Grants supported EUR 1.008 million for climate change mitigation projects in Portugal and EUR 1.9 million for climate change adaptation projects.

NATIONAL PUBLIC FUNDING

At the level of public funding, there are currently targeted national funds to support the decarbonisation of the economy and the energy transition, offering some funding possibilities that are available to the public and private sector.

The implementation of this plan will involve stepping up the action of the funds identified with a focus on the objectives set, together with a close link between the different sources of funding, also with a view to increasing the use of European funds.

Environmental Fund (FA)

The purpose of the Environmental Fund is to support environmental policies in pursuit of the objectives of sustainable development, contributing to the fulfilment of national and international objectives and commitments, in particular those relating to climate change, water resources, waste and nature conservation and biodiversity.

This instrument provides non-repayable funding for projects contributing to environmental public policies through applications that are carried out in the light of the notices. The beneficiaries of this fund may be:

companies, NGOs, public authorities, municipalities, foundations, etc. In each reminder, beneficiaries are identified.

The FA has played an important role in supporting projects to decarbonise the economy, with the main source of revenue being the auctioning of allowances under the EU ETS. Projects supporting the decarbonisation of the economy include Mobility Support Programmes such as the Public Transport Tariff Reduction Support Programme (PART), which, through a co-financing rate of 100 % of the applicant projects, provided more than EUR 141 million in 2021, the Programme to Support the Densification and Strengthening of Public Transport Offer (PROTransP), which provided a co-financing rate of 100 % of the applicant projects. in 2021, a total of EUR 15 million, the support programme in the public passenger transport sector, which also made available in 2021 some EUR 10.3 million, the programme to support cycling mobility – the construction of cycle lanes within the framework of the cycle PT, which, through a co-financing rate of 75 %, made available EUR 3.5 million, the programme to support electric mobility in the public administration, as part of the ECO.mob programme, which provided around EUR 3.09 million and finally the Incentive Programme for the purchase of light emission vehicles with a total amount of support for the years 2022 and 2023 of EUR 20 million. In the area of Just Transition, the FA has launched warnings under the Just Transition Compensation Mechanism for the year 2021 and 2022, dedicated exclusively to the closure of the Pego coal plant, totalling EUR 3.5 million. In addition, the FA also provides for aid measures under the Climate Change Mitigation scheme for installations covered by the EU ETS, with a total value of EUR 25 million in 2021, with a co-financing rate of 75 %.

It should be noted that, in the context of Decree-Law No 114/2021 of 15 December, existing energy funds such as the Energy Efficiency Fund, the Energy Sector Systemic Sustainability Fund, the Innovation Support Fund (ISF) and other financing mechanisms such as the Energy Efficiency Credit Line and the 2020 Efficient House Programme were included in the FA by making it a “Superfund” for the Climate and Energy Transition.

Innovation, Technology and Circular Economy Fund (FITEC)

The Fund was set up by Decree-Law No 86-C/2016 of 29 December 2009 and aims to support policies to enhance scientific and technological knowledge and its transformation into innovation, to stimulate cooperation between higher education institutions, technology interface centres (CIT) and the business fabric and to empower them to use resources more efficiently, in particular through material and energy efficiency. Since its creation in 2016 and until 2021, FITEC has supported material and energy efficiency by EUR 55.12 million.

Blue Fund

The Blue Fund, established by Decree-Law No 16/2016 of 9 March 2009, as amended by Decree-Laws No 123/2021 of 30 December 2009 and No 84/2019 of 28 June 2009, is intended to develop the economy of the sea, to carry out scientific and technological research, to protect and monitor the marine environment and to ensure maritime safety, by setting up or strengthening funding mechanisms for entities, activities or projects meeting the objectives set out in the respective creation law.

National Building Rehabilitation Fund (FNRE)

The National Building Rehabilitation Fund (FNRE) is a special, closed-end and private underwriting real estate investment fund, geared towards the development of projects for the rehabilitation of buildings which will have as their predominant purpose the rental for permanent housing in order to provide housing on terms and conditions. The main objective of the FNRE is the development and implementation of building rehabilitation projects for the promotion of renting, in particular housing, with a view to urban regeneration and repopulation of urban centres, with the aim of achieving, in a medium- and long-term perspective, increasing investment valorisation. The FNRE may be supported by funds from the Social Security Financial Stabilisation Fund (FEFSS) and may use other sources and forms of financing.

Recovery and resilience plan (RRP)

The measures of the RRP, approved by the Council Implementing Decision of 13 July 2021, were aligned with the

NECP and RNC2050, and in this measure the RRP provided for a wide range of measures in areas such as energy transition and climate change adaptation, under the following components:

Component 8 – Forests, aiming at intervention at forest management level to protect the country's forests against rural fires, to modernise the cadastral system, among others;

The objectives of this component are to: (I) promote the active planning and management of vulnerable and environmentally valuable agricultural and forest land, (ii) protect biodiversity by supporting the restoration of agricultural and forest ecosystems, especially in burnt areas, (iii) contribute to territorial cohesion and job creation by revitalising the economic activities of rural territories, and (iv) increase the resilience of rural territories by reducing the risk of fires through effective and efficient fire prevention and, in the event of fires, by reducing damage through effective and efficient fire-fighting. This component includes three (3) reforms and five (5) investments, with an estimated total cost of EUR 615 million.

Component 9 – Water management, addressing water scarcity in the most affected regions and adapting to climate change;

The objectives of the component are to mitigate water scarcity and ensure the resilience of regions with the greatest drought problem and in critical need for water supply. Increasing water resilience is of paramount importance for the economic development of some regions. This component comprises three (3) investments with an estimated total cost of EUR 390 million.

Component 10 – Sea, focusing on boosting the blue economy, including measures to protect marine resources and promote research and skills in the sector, as well as the implementation of more energy efficient solutions, digitalisation and resource efficiency in the fisheries sector;

This component responds to the challenge of paving the way for a sustainable maritime economy, an area where Portugal has a strong potential. The objective of this component is to support the achievement of national objectives related to the productive potential of the maritime economy, ensuring the sustainability and competitiveness of the sea-related business system, tackling poverty in coastal communities, and preserving the value of ocean ecosystem services. The component includes one (1) reform and four (4) investments, with an estimated total cost of EUR 252 million.

Component 11 – Decarbonisation of industry focusing on the uptake of low-carbon processes and technologies in the industrial sector;

This component addresses the challenge of the contribution of industry and industrial processes to achieving the carbon neutrality objectives identified in RNC 2050 and NECP 2030. This requires a structural transformation, based on the reconfiguration of industrial activity, changes in production processes and the way resources are used. The measure aims to promote decarbonisation, energy and resource efficiency and the use of alternative energy sources in industrial processes. The component includes one (1) investment, with an estimated total cost of EUR 737 million.

Component 12 – Bioeconomy focuses on three strategic industrial sectors to promote a modern and circular bio-based industry;

This component aims at developing a viable, sustainable, circular and competitive bioeconomy. The objective of this component is to promote and accelerate the development of high added value products from biological resources as an alternative to fossil materials. Three sectors (textiles and clothing, footwear and natural resin) are expected to be specifically supported for the development of bio-based products and become more resource-efficient. The component comprises one (1) reform and one (1) investment, with an estimated total cost of EUR 145 million.

Component 13 – Energy efficiency in buildings aims to improve the energy efficiency of buildings, for example by investing in building renovation and distributing vouchers to energy poor households.

The objectives of the component are to renovate public and private buildings to improve their energy performance and comfort, while reducing greenhouse gas emissions, energy bills and country dependency, mitigate energy poverty and incorporate renewable energy sources into the built environment. The component

comprises three (3) investments with an estimated total cost of EUR 610 million.

Support for the construction of new energy efficient buildings and the renovation of buildings is also foreseen in Component 1 – National Health Service, Component 2 – Housing and Component 3 – Social Responses.

Component 14 Hydrogen and Renewable Energy promotes the production of renewable hydrogen and other renewable gases and renewable energy and storage capacity in the Autonomous Regions of the Azores and Madeira;

This component aims to promote the energy transition and decarbonisation of industry and transport, with a strong focus on the production of renewable hydrogen and other renewable gases. In the case of the Autonomous Regions, the focus is on the deployment of renewable energy (geothermal, wind, photovoltaic and hydropower) and storage. This component is key to reducing national energy dependency, improving the trade balance and increasing the resilience of the domestic economy. The component includes one (1) reform and three (3) investments, with an estimated total cost of EUR 370 million.

Component 15 – Sustainable mobility enhances sustainable mobility, including through the use of public transport.

The objective of this component is to reduce emissions and improve public transport by expanding networks, making them more accessible and strengthening public transport planning capacities. This is expected to lead to more public transport users, encourage a modal shift from private to public transport and promote better transport management and planning capacities. The component includes one (1) reform and five (5) investments, with an estimated total cost of EUR 967 million.

Components 1 – National Health Service and 3 – Social Responses also provide for the renewal of some of the vehicles in the fleets of health and social services with electric cars.

As part of the REPowerEU plan, and the obligation for Member States to integrate additional policies and measures into their RRPs, including a dedicated chapter dedicated to this plan, the revision of the national RRP was carried out. The reprogramming of the Portuguese RRP, subject to the Council Implementing Decision of 17 October 2023 amending the 2021 Implementing Decision, presented reforms and investments aimed at decarbonising the economy and strengthening energy independence and efficiency that reflect the new reality. For the REPowerEU chapter, Portugal proposes measures worth EUR 855 million in total costs, using the financial contribution and loans for six new reforms, five scaled-up investments and eleven new investments, focusing on energy efficiency of buildings, decarbonisation of industry, renewable energy and hydrogen, sustainable transport and the electricity grid.

This component thus contributes to addressing the specific recommendations addressed to Portugal to reduce its dependence on fossil fuels (Country Specific Recommendation No 4 of 2022 and 2023) and to focus investment on the energy transition and a low-carbon economy (Country Specific Recommendation No 3 of 2019) and on clean and efficient production and use of energy (Country Specific Recommendation No 3 of 2020). It includes in particular measures to accelerate the deployment of renewables, to simplify permitting, to decarbonise the transport sector, to improve energy efficiency of buildings, to upgrade electricity transmission and distribution grids, to increase electricity storage and to strengthen the acquisition of green skills needed for the green transition.

The REPowerEU chapter includes a set of reforms to simplify permitting by establishing a one-stop-shop for permitting renewable energy projects and accelerating the uptake of renewable gas and hydrogen in the country.

- a reform to streamline permitting, including the creation of a one-stop-shop for the permitting of renewable energy projects and the training of public officials dealing with renewable energy permitting (C21-r48: Simplification of the legal and regulatory framework for renewable energy projects);
- the adoption of a set of actions that will contribute to the uptake of biomethane and renewable

hydrogen in the country (C21-r46: Regulatory framework for renewable hydrogen and C21-r47: First auction for sustainable biomethane and biomethane action plan);
- the creation of a new body to monitor and help shape policies to help households in energy poverty (C21-r43: National Energy Poverty Observatory);
- the development of energy efficiency one-stop shops for citizens (C21-r44);
- a reform to promote green skills for various categories of workers and unemployed (C21-r45: Green Skills).

The REPowerEU chapter includes investments to support and facilitate the development of renewable energy.

- investments in renewable energy in Madeira and Azores (C21-i10-RAA: Incentive scheme for the purchase and installation of renewable energy storage systems in the Azores and C21-i11- RAM: System of incentives for the production and storage of energy from renewable sources in Madeira and Porto Santo);
- a set of key technical studies for the development of offshore wind energy (C21-i07: Technical studies for offshore energy potential);
- a digital one-stop-shop platform for permitting and monitoring renewable energy projects (C21-i09: One-stop-shop for permitting and monitoring renewable energy projects);
- large-scale investment to create storage capacity to increase the flexibility of the energy system (C21-i08: Flexibility and network storage).

Portugal also proposes to invest in the decarbonisation of transport by supporting:

- the purchase of zero-emission public transport buses in Madeira (C21-i13-RAM: Decarbonisation of 11 transport);
- the purchase of zero emission ferries in the Azores (C21-i15-RAA: Purchase of two electric ferries);
- the installation of recharging/refuelling stations and the construction of a funicular in Nazaré (C21-i16: Nazaré lift);
- the construction of a Bus Rapid Transit system in Braga (C21-i14: Bus Rapid Transit Braga).

The REPowerEU chapter includes additional investments for:

- energy renovation in public buildings in Madeira (C21-i04-RAM: Energy efficiency in public buildings in Madeira);
- the establishment of a scheme to finance the production of net zero technologies (C21-i05: Support for Green Industry Development);
- further decarbonisation of industrial processes and production (C21-i01: Extended measure: Decarbonisation of Industry);
- decarbonisation of public transport (C21-i12: Extended measure: Decarbonisation of Public Transport);
- enhancing energy efficiency in residential, service and public buildings (C21-i02: Extended measure: Energy efficiency in residential buildings and C21-i03: Extended measure: energy efficiency in buildings used by the services sector)
- the increase in the production of renewable gases (extended measure C21-i06: hydrogen and renewable gases).

For each of the measures of the RRP, compliance with the 'Do No Significant Harm' (DNSH) principle is ensured.

The tables identifying the components of the RRP related to the action lines by size of the National Energy and Climate Plan and the contribution of the RRP measures to the updated climate and energy objectives and targets in terms of financing are set out in **Annex II**.

POSEUR

The Operational Programme Sustainability and Efficiency in the Use of Resources (POSEUR) corresponds to one of the 16 programmes set up for the operationalisation of the Portugal 2020 Strategy. POSEUR aimed to foster sustainable growth by addressing the challenges of transition to a low-carbon economy (axis 1 of the programme), based on a more efficient use of resources (axis 3) and fostering greater resilience to climate risks and disasters (Axis 2). In this context, with an allocation of 438 million dedicated to Axis 1, POSEUR supported in 2022 projects aimed at increasing the energy efficiency of public infrastructure, promoting sustainable urban and multimodal mobility and renewable energy production and distribution. In turn, million projects worth 390 million climate change adaptation and risk prevention projects (axis 2) and worth EUR 879 million were supported in the same year for efficient use of resources (axis 3).

Portugal 2030 – Programme for Climate Action and Sustainability 2030 (PACS)

The PACS, established through the European Commission Implementing Decision of 14 December 2022, financed by the Cohesion Fund, is a key instrument for Portugal to address the challenges of the energy transition and to achieve carbon neutrality in 2050. This programme provides for investments of around EUR 3.1 billion and covers several strands, including climate change adaptation, risk prevention and disaster resilience, the transition to a circular economy and sustainable urban mobility.

Other financing arrangements

The **Financial Instrument for Urban Rehabilitation and Revitalisation 2020** (IFRRU 2020) is a financial instrument aimed at revitalising cities, supporting the physical revitalisation of space dedicated to disadvantaged communities and supporting energy efficiency in housing. In 2022, this instrument supported 440 projects, providing EUR 1.4 million for this purpose. The Reabilitar **to rent programme – accessible housing – covers the financing of rehabilitation operations for** buildings aged 30 and over, which after rehabilitation should be predominantly used for housing purposes, where, in the case of 'affordable rent', the instalments are to be rented out on a conditional rent basis.

The Energy Consumption Efficiency Promotion Plan (PPEC) aims to promote measures to improve efficiency in electricity and gas consumption through actions undertaken by the various players in the sector (from suppliers to consumers).

FINANCING THROUGH THE PRIVATE FINANCIAL SECTOR

The international momentum around sustainable finance has been leading to the development of new green financial products. It is therefore expected that some of these products will also be developed in Portugal by the Portuguese financial sector. Some European financial institutions have been placing on the market financial products that stimulate access to finance that has a positive environmental impact, such as:

O**Green Bonds – Green** Bonds are any kind of bond instrument where the value of the debt borrowed will be used exclusively to finance or refinance, in part or in full, new and/or eligible green projects. The definition of project eligibility is usually given by the International Capital Market Association's (ICMA) Green Bond Principles. This market has been growing since 2018, when the total value of global green bonds was USD 167.3 billion, with the United States, China and France issuing 47 % of green bonds. In February 2023 a political agreement was reached between the European Parliament and the Council on the Commission proposal for a European Green Bonds Regulation, or EU Green Bonds in English (EUGBonds). This Regulation establishes a regulatory framework that will allow interested companies and public entities to raise financial resources on the capital market in order to finance their green investments. Thus, EUGBS issuers should ensure that at least 85 % of the funds collected by the title will be allocated to economic activities aligned with the Taxonomy Regulation (Regulation (EU) 2020/852). In Portugal, more and more corporate groups have been issuing green bonds as a form of financing for green projects and technologies and the issuance of green bonds is expected to increase significantly in the future, as investors have been reacting positively to companies and countries that present these options when capturing investment.

- DeGreen **Loans:** Green loans are any type of loan instrument made available exclusively to finance or refinance, in whole or in part, new and/or existing eligible green projects. These green loans consist of the provision of a loan to an entity, where the interest rate to be paid will depend on the company's ability to achieve the environmental objectives defined and agreed between the lender and the fund. For a loan to be considered green, there are several procedures referred to in the Principles for Green Loans produced by the Loan Market Association. This option is currently widespread in a number of international banks which offer companies the possibility to borrow a green loan which, being directed towards the generic operation of the company (rather than a technology or project in particular as in the Green Bond), may see its interest falling if the company as a whole achieves certain specifically defined objectives.
- -Sustainable **Investment Funds: Sustainable investment**funds are funds that have environmental, social and governance criteria when choosing their assets. I.e. funds that seek to acquire shares and/or corporate bonds that have demonstrated sustainability practices. These funds are growing markedly, with 53 % of European funds having some kind of environmental, social and governance criteria in structuring their portfolio. At global level, only 26 % of funds have some sort of sustainability screening, thus highlighting the pioneering of the European capital market.
- -Impact **funds**: Impact investments are investments made in companies, organisations and funds with the intention of generating measurable environmental and social impact together with a financial return. Impact funds are linked to philanthropic investors and foundations, who want to invest in projects that have a positive environmental and social impact, and which also generate some kind of financial return.
- Blended **Finance**: Another emerging financing concept is the so-called Blended Finance, which has emerged to catalyse the mobilisation of additional capital for investments related to sustainable development. Blended Finance uses a combination of public and private (or philanthropic) funding to finance projects with a high development impact and to improve the risk-return profile of the project, i.e. the commercial viability for the private investor.

The investment momentum linked to the decarbonisation of the economy and the energy transition is also an opportunity for innovation in the financial sector with the creation of new products and services linked to this new green economy. On the other hand, the financial sector should consider continuing investments in the so-called 'brown economy' in order to avoid*stranded assets*. These approaches contribute to reducing the risks associated with investment and to attracting new clients.

5.4. Impacts of planned policies and measures on other Member States and on regional cooperation

i. Impacts on the energy system in neighbouring MS and other MS of the region

For energy systems, considering the objectives and targets and their defined policies, it is expected that there will be a higher level of system integration and higher levels of interconnection of systems, leading to higher levels of resilience for both the national system and the energy system of Spain (as neighbouring MS).

The impact on other EU MS is conditioned on the level of integration of the Union's internal market, and in order to increase this level, obstacles and constraints already identified will have to be overcome.

ii. Impacts on energy prices, utilities and energy market integration

From a regional perspective, and considering both the Iberian electricity market (MIBEL) and the Iberian natural gas market (MIBGAS), the objectives, targets and planned policies and measures (as defined in Chapter 2 and 3 respectively) will bring more maturity and liquidity to these markets with positive impacts, for example on energy prices.

It should also be noted that the increasing technological maturity, with the consequent reduction in investment costs for their installation, as well as the implementation of taxation/taxes, tariffs and system costs can have an impact on the functioning of the markets with a consequent impact on energy sales prices.

iii. Where relevant, impacts on regional cooperation

Not available at this stage

Annex I

Table 71 – Cost of the main electricity generation technologies considered in the TIMES-PT model (EUR 2016 prices)

Technology	Medium sizes	Technical lifespan	Investment Costs (CAPEX)				Fixed operating and maintenance costs				Variable operating and maintenance costs (exc. Energy costs)				Ref.
			2020	2030	2040	2050	2020	2030	2040	2050	2020	2030	2040	2050	
Unit:	MW	years	EUR/k W	EUR/k W	EUR/k W	EUR/k W	EUR/k W	EUR/k W	EUR/k W	EUR/k W	EUR/GJ	EUR/GJ	EUR/GJ	EUR/GJ	
Natural Gas															
Conventional Combined Cycle gas	550	35	758,57	758,57	758,57	758,57	18,96	18,96	18,96	18,96	1,00	1,00	1,00	1,00	JRC (2013)
Advanced Combined Cycle gas	550	35	618,72	618,72	618,72	618,72	12,43	12,43	12,43	12,43	1,00	1,00	1,00	1,00	EDP (2018)
Gas Cycle Combined with capture of CO2 combustion	550	35		1 226,00	1 193,00	1 160,00		44,00	43,00	42,00					JRC (2013)
Gas Open Cycle (Peaker) Advanced (OGCC)	550	35	515,00	505,00	503,00	501,00	13,00	13,00	13,00	13,00	1,00	1,00	1,00	1,00	JRC (2013)
Water															
Wire hydroelectric		70	1 450,00	1 339,00	1 226,00	1 209,00	15,00	13,00	12,00	12,00					(1)
Hydropower Barrage (high capacity factor)		80	1 052,00	1 031,00	995,00	923,00	11,00	10,00	10,00	9,00	1,00	1,00	1,00	1,00	(1)
Hydropower Barrage (low capacity factor)		80	1 052,00	1 031,00	995,00	923,00	11,00	10,00	10,00	9,00	1,00	1,00	1,00	1,00	(1)
Hydropower pumped dam		80	809,00	792,00	765,00	709,00	8,00	8,00	8,00	7,00	1,00	1,00	1,00	1,00	(1)
Geothermal															
Enhanced Geothermal System (Hot dry rock)		30	8 490,00	6 367,00	6 367,00	6 367,00	297,00	223,00	223,00	223,00					(2)
Flash hydrothermal geothermal		30	2 335,00	2 122,00	2 122,00	2 122,00	82,00	74,00	74,00	74,00					JRC (2013)
Wind															
Offshore Offshore Wind		25	3 911,00	3 030,00	2 676,00	2 364,00	125,00	97,00	86,00	76,00					IRENA
Onshore Wind		30	1 037,00	1 016,00	995,00	985,00	41,00	41,00	41,00	41,00					EDP (2018)
Micro Wind		20	5 208,00	4 381,00	3 910,00	3 600,00	104,00	88,00	78,00	72,00					(3)
Waves and Marés															
Wave – generic technology	5	30	5 424,00	3 431,00	2 918,00	2 481,00	163,00	103,00	88,00	74,00					(4)
Tidal stream	10	30	4 364,00	2 761,00	2 347,00	1 996,00	253,00	160,00	136,00	116,00					(4)
Solar Photovoltaic															
Solar Tel Panel (crystalline silence) – Residential		30	1 409,00	1 345,00	1 299,00	1 245,00	31,00	31,00	31,00	31,00					(5)
Solar Tel Panel (crystalline silence) – Commercial		30	1 057,00	1 009,00	974,00	933,00	28,00	28,00	28,00	28,00					(5)
Centralised solar photovoltaic (crystalline silence)	100	30	778,00	742,00	717,00	687,00	23,00	23,00	23,00	23,00					(5)

Solar PV High Concentration		30	1 674,00	1 597,00	1 542,00	1 478,00	25,00	24,00	23,00	22,00					JRC (2013)
Concentrated solar															
PTC reference plant – 7,5 h storage (molten salt)	160	25	4 012,00	2 346,00	1 790,00	1 460,00	100,00	59,00	45,00	37,00					(6)
PTC reference plant – 9 hours storage (molten salt)	150	25	4 021,00	2 265,00	1 728,00	1 410,00	101,00	57,00	43,00	35,00					

(1) TIMES-PT Database; REN date own Calculations for Afs; JRC (2013); EDP (2010), (2) JRC (2013), Capacity factor Communication from APREN (3) WWEA (2016); Distributed Wind market Report US (2016) (4) COGEA (2018) . European Market Study on Ocean Energy (Wave and Tidal Stream). Available on: https-//op.europa.eu/en/publication-detail/-/publication/e38ea9ce-74ff-11e8-9483-01aa75ed71a1 (5) EDP (2018), FIXOM Adjusted by APREN (2018) (6) ES capacity data for short term + JRC (2013) in 2050

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Table 72 – Cost of the main transport technologies and mobility of electricity generation considered in the TIMES-PT model (prices EUR 2016)

Category and type of vehicle	2030	2040	2050	2030	2040	2050	2030	2040	2050
Unit	kEUR/vehicle	kEUR/vehicle	kEUR/vehicle	kEUR/year	kEUR/year	kEUR/year	Mvkm/PJ	Mvkm/PJ	Mvkm/PJ
Light passengers									
Gasolina vehicle	20,46	20,43	20,42	0,61	0,61	0,61	473,9	518,1	571,4
Gasolina Hybrid Vehicle	20,51	20,51	20,51	0,62	0,62	0,62	645,2	711,7	793,7
Plugin/Gasoline Hybrid Vehicle	20,47	20,21	20,21	0,20	0,20	0,20	1 000,0	1 089,9	1 186,0
Petrol oil vehicle	20,84	20,79	20,78	0,63	0,62	0,62	531,9	576,4	628,9
LPG vehicle	20,41	20,36	20,35	0,61	0,61	0,61	531,9	576,4	628,9
Gas Oil Hybrid Vehicle	20,77	20,78	20,79	0,62	0,62	0,62	684,9	751,9	833,3
Plugin/Gasoil Hybrid Vehicle	22,89	22,89	22,89	0,23	0,23	0,23	1041,7	1 156,1	1 298,7
Natural Gas Vehicle	22,56	22,05	22,07	0,68	0,66	0,66	480,8	526,3	581,4
Battery electric vehicle 30	20,25	19,72	19,19	0,20	0,20	0,19	1 639,3	1 769,9	1 923,1
Hydrogen CVA (gas)	89,07	61,86	36,70	2,67	1,86	1,10	614,5	680,9	754,5
Hydrogen CVA (liquid)	89,07	61,86	36,70	2,67	1,86	1,10	645,4	715,1	792,3
Hydrogen vehicle/Fuel Cell	44,17	32,32	23,47	0,44	0,32	0,23	862,1	947,9	1 052,6
Plugin Hybrid Vehicle/Gas Hydrogen	41,67	30,41	27,61	0,42	0,30	0,28	1 097,2	1 196,9	1 307,3
Compressed Natural Gas Hybrid Vehicle	23,00	23,00	23,00	0,69	0,69	0,69	632,9	699,3	781,3
Motorbike									
Electric vehicle	6,98	6,57	6,18	0,14	0,13	0,11	5 422,6	5 658,3	5 658,3
Gasolina vehicle	5,84	5,84	5,84	0,29	0,29	0,29	957,1	978,2	978,2
Heavy passengers									
Interurban Bus – Vehicle to Gasoil	286,73	281,43	276,14	7,15	7,16	7,17	119,5	125,5	131,5
Interurban Bus – Natural Gas Vehicle	382,30	375,24	368,19	8,45	8,31	8,16	98,9	104,2	109,6
Interurban Bus – Hydrogen/Fuel Cell	444,27	316,48	275,45	14,27	12,02	9,77	234,1	248,6	263,1
Interurban Bus – Vehicle to Gasolina	286,73	281,43	276,14	7,90	7,91	7,92	98,8	103,3	107,9
Bus Urban – Vehicle to Gasoil	286,73	281,43	276,14	7,90	7,91	7,92	62,8	64,3	65,8
Bus Urban – Natural Gas Vehicle	382,30	375,24	368,19	8,45	8,31	8,16	31,7	32,4	33,2
Bus Urban – Hydrogen Vehicle/Fuel Cell	444,27	316,48	275,45	14,27	12,02	9,77	124,9	128,2	131,5
Bus Urban – Vehicle to Gasolina	286,73	281,43	276,14	7,90	7,91	7,92	50,3	51,4	52,6
Bus Urban – Hybrid plugin/Gasoil vehicle	409,79	403,19	396,59	12,44	11,89	11,71	92,8	93,7	94,0
Bus Urban – Electric Vehicle	340,49	301,41	262,33	13,34	12,76	12,57	208,9	210,3	210,8

Category and type of vehicle	2030	2040	2050	2030	2040	2050	2030	2040	2050
Unit	kEUR/vehicle	kEUR/vehicle	kEUR/vehicle	kEUR/year	kEUR/year	kEUR/year	Mvkm/PJ	Mvkm/PJ	Mvkm/PJ
Heavy Goods									
Petrol oil vehicle	190,67	187,21	186,93	5,72	5,62	5,61	105,4	118,3	131,2
Gas Oil Hybrid Vehicle	208,10	208,29	208,49	6,24	6,25	6,25	107,8	118,1	127,8
A Biofuel vehicle	190,67	187,21	186,93	5,72	5,62	5,61	105,4	118,3	131,2
Natural Gas Vehicle	217,17	213,50	209,84	6,52	6,41	6,30	86,3	94,0	101,2
Methanol vehicle	217,17	213,50	209,84	6,52	6,41	6,30	85,8	96,9	101,1
Dimethyl ether vehicle	217,17	213,50	209,84	6,52	6,41	6,30	105,4	118,3	126,3
Hydrogen vehicle/Fuel Cell	268,47	201,89	168,45	2,68	2,02	1,68	142,1	143,4	145,3
Gasolina vehicle	194,11	190,45	190,17	5,82	5,71	5,71	76,4	86,6	92,4
Gasolina Hybrid Vehicle	212,78	212,86	212,92	6,38	6,39	6,39	93,7	105,5	115,5
Vehicle with Etanol	196,16	192,75	192,33	5,88	5,78	5,77	66,2	75,4	75,9
Natural Gas Vehicle (spark ignition)	208,92	208,92	208,92	6,27	6,27	6,27	97,0	98,7	101,2
Natural Gas Vehicle (compression ignition)	233,66	233,66	233,66	7,01	7,01	7,01	106,7	111,0	116,3
Electric vehicle – Catre	239,03	196,00	168,45	2,39	1,96	1,68	219,7	233,5	247,3
Electric Vehicle – Induction	232,34	196,00	168,45	2,32	1,96	1,68	143,3	152,9	162,7
Electric vehicle – Bateria	253,13	201,89	168,45	2,53	2,02	1,68	214,2	220,5	226,8
Light Goods									
Gasolina vehicle	20,46	20,43	20,42	0,75	0,75	0,75	473,9	518,1	571,4
Gasolina Hybrid Vehicle	20,51	20,51	20,51	0,83	0,79	0,77	645,2	711,7	793,7
Plugin/Gasoline Hybrid Vehicle	20,47	20,21	20,21	0,88	0,88	0,86	1 000,0	1 117,3	1 265,8
Petrol oil vehicle	20,84	20,79	20,78	0,77	0,77	0,75	531,9	576,4	628,9
LPG vehicle	20,41	20,36	20,35	0,75	0,75	0,75	531,9	576,4	628,9
Gas Oil Hybrid Vehicle	20,77	20,78	20,79	0,84	0,81	0,79	684,9	751,9	833,3
Plugin/Gasoil Hybrid Vehicle	22,89	22,89	22,89	1,35	1,26	0,88	1041,7	1 156,1	1 298,7
Natural Gas Vehicle	22,56	22,05	22,07	0,90	0,90	0,90	480,8	526,3	581,4
Battery electric vehicle 30	20,25	19,72	19,19	0,32	0,32	0,32	1 639,3	1 769,9	1 923,1
Hydrogen CVA (gas)	89,07	61,86	36,70	0,94	0,94	0,92	614,5	680,9	754,5
Hydrogen CVA (liquid)	89,07	61,86	36,70	0,94	0,94	0,92	645,4	715,1	792,3
Hydrogen vehicle/Fuel Cell	44,17	32,32	23,47	1,22	1,07	0,94	862,1	947,9	1 052,6
Plugin Hybrid Vehicle/Gas Hydrogen	44,17	32,32	23,47	1,01	0,96	0,94	1 353,8	1481,1	1 622,2
Compressed Natural Gas Hybrid Vehicle	23,00	23,00	23,00	0,66	0,64	0,62	632,9	699,3	781,3
Plugin Hybrid Vehicle/Compressed Natural Gas	23,99	23,99	23,99	0,65	0,63	0,61	990,1	1 111,1	1 265,8

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Annex II

Table 73 – Component of the RRP related to action lines by size

Lines of action by dimension	Related RRP component	Investment/Reform
Decarbonisation dimension		
1.1 promoting the decarbonisation of the power generation sector	C21	C14-i02-RAM; C14-i03-RAA; C21-i07
1.2 continue the application of the cele scheme	— —	— —
1.3 reducing the carbon intensity of the building stock	C10; C13; C14; C21	C10-i01; C10-i04-RAA; C13-i01; C13 — i02; C13-i03; C14-i03-RAA; C21-I02; C21-I03
1.4 reduce waste generation and direct landfilling and promote recycling	C12	C12-i01; C21-R39
1.6 decarbonising cities	C02; C13; C15; C21	C02-i03-RAM; C13-i01; C13-i02; C13- i03; C15-i01; C15-i02; C15-i03; C15-i04; C21-i12
1.8 promoting the transition to a circular economy	C11; C12	C11-i01; C12-i01; C21-R39
6.2. Promote decarbonisation from livestock farming	— —	— —
6.3. Reduce nitrogen fertiliser consumption	— —	— —
6.5. Increase the natural sink capacity of agriculture and forestry	C08; C12	C08-i01; C08-i05; C12-i01
6.6. Promote more effective management of the agroforestry system by reducing the burnt area and the impact of biotic agents	C08; C12	C08-i01; C08-i05; C12-i01
6.7. Encouraging the role of the bioeconomy for decarbonisation	C12	C12-i01
7.1. Promoting the decarbonisation of industry	C05; C11; C12; C21	C05-i01.02; C11-i01; C12-i01; C21-I01
7.3. Fostering eco-innovation and cleaner production processes, promoting the digitalisation of industry (Industry 4.0)	C16 (indirect contribution)	C16 (indirect contribution)
7.4. Promoting the circular economy in industry	C11; C12	C11-i01; C12-i01
8.3. Increase knowledge on climate change mitigation, disseminate best practices and boost behaviours from low carbon in society	C12	C12-i01
8.5. Promote dialogue platforms for sustainable development and leverage intervention capacity at national, regional and local level	C12	C12-i01

Lines of action by dimension	Related RRP component	Investment/Reform
3.1. Accelerating electricity generation from renewable energy sources	C09; C11; C13; C21	C09-i02; C11-i01; C13-i01; C13-i02; C13-i03; C14-i01; C14-i02-RAM; C14 — i03-RAA; C21-i02; C21-i03; C21-i04 — AMR; C21-i06; C21-R46; C21-R47; C21 — R48; C21-i07; C21-i09; C21-i11-RAM
3.2. Promoting the spread of distributed generation and energy self-consumption and energy communities	C13	C13-i01; C13-i02; C13-i03; C14-i03 — AAR; C21-i02; C21-i03; C21-i04-RAM
3.3. Promoting the efficient use of renewable energy in heating and cooling systems	C13	C13-i01; C13-i02; C13-i03; C21-i02; C21-i03; C21-i04-RAM
3.4. Optimising and simplifying the permitting process associated a centers renewable electro-producers		
3.5. Promote appropriate transmission and distribution grid planning to enhance the integration of new renewable capacity		
3.6. Promote the production and consumption of renewable gases.	C14	C14-i01; C21-R47; C21-i06
3.7. Encouraging better use of biomass for energy uses	— —	— —
6.1. Promoting the production and use of renewable energy sources in the agricultural and forestry sectors	— —	— —
8.4. Promote a information day of consumers and businesses contributing to better energy literacy and simplifying market	— —	— —
5.1. Promoting modal shift to public transport	C15	C15-i01; C15-i02; C15-i03; C15-i04;
5.2. Encourage the energy transition in the transport sector.	C15	C15-i05; C21-i12; C21-i13-RAM; C21- i14; C21-i15-RAA; C21-i16
5.3. Promote and support electric mobility.	C01; C07	C01-i01; C07-i00; C21-i12; C21-i13 — AMR; C21-i14; C21-i15-RAA; C21-i16
5.4. Promote vehicle sharing services	— —	
5.5. Promote the production and consumption of alternative renewable fuels	C14	C14-i01; C21-i06
5.6. Promote infrastructures from sourcing from fuels alternatives for clean fuels	C14	C14-i01; C14-R29; C21-i06; C21-i12; C21-i13-RAM
5.7. Promoting active mobility and more efficient behaviour	C01	C01-i09
5.8. Promote goods transport by rail and sea.	C10; C15; C21	C10-i07; C15-i06; C21-i15-RAA

Lines of action by dimension	Related RRP component	Investment/Reform
1.7. Continue to promote green fiscal	— —	— —
Dimension energy efficiency		
2.2. Promote equipments more efficient	C05; C11	C05-i01.02; C11-i01
6.4. Adopt more energy and water efficient farming and forestry practices	C09	C09-i01; C09-i01.02; C09-i03-RAM; C21-i01; C21-i02
7.2. Promoting energy and resource efficiency	C05; 10; C11	C05-i01.02; C10-i02; C11-i01
2.1. Promoting the energy renovation of the building stock and the NZEB buildings	All investments with construction have energy efficiency measures, with the exception of culture	C13-i01; C13-i02; C13-i03; C21-i02; C21-i03; C21-i04-RAM; Everyone the investments that have been built, have measures for efficiency energy other than culture
1.5. Decarbonising public administration	C01; C06; C12; C13	C01-i01; C06-i01; C06-i05-RAA; C12 — R25; C13-i02; C21-i04-RAM
2.4. Promote energy efficiency in street lighting	C14	C14-RAA;
2.5. Promoting vocational training for the energy efficiency sector	C21	C21-R45
Security of supply dimension		
4.1. Promote the systems from storage	C09; C14	C09-i02; C14-RAM; C14-RAA; C21-i08; C21-i10-RAA; C21-i11-RAM
4.4. Promoting the digitalisation of the energy system	C14	C14-RAM
4.5. Promote appropriate planning of the national energy system towards the energy transition	C21	C21-R47; C21-R46; C21-R48
4.6. Carry out the necessary risk assessments, preventive action and emergency plans in the energy sector		
4.7. Adjusting the role of natural gas in the energy mix, focusing on decarbonising the sector	C05; C11; C12; C14	C05-i01.02; C11-i01; C12-i01; C14-i01
4.8. Promoting diversification of sources and routes of supply of energy resources	C14	C14-RAA; C14-RAM
Dimension internal energy market		
4.2. Promoting the development of interconnections		
4.9. Promoting integration into the European internal energy market	— —	— —

Lines of action by dimension	Related RRP component	Investment/Reform
4.3. Promote the introduction of new management tools for the national electricity system	C14	
8.1. Ensuring a just transition	— —	— —
8.2. Tackling energy poverty and improving tools to protect vulnerable customers	C13	C13-i01; C21-R43; C21-R44
Dimension research, innovation and competitiveness		
1.9. Promote R & D projects supporting the transition to a carbon-neutral economy	C05	C05-i01.02; C05-i03
2.6. Encouraging R & I in the field of energy efficiency	C05	C05-i01.02; C05-i03
3.8. Encourage R & I in renewable energy, storage; hydrogen, advanced biofuels and other 100 % renewable fuels	C05	C05-i01.02
6.8. Promote R & I projects that constitute support a one management	C08; C12	C08-i01.03; C08-i02.01; C08-i02.02; C08-i02.03; C08-i05.02; C12-i01.01
6.8.7. Encourage research and innovation in the decarbonisation and energy efficiency of the agro-forestry sector	C12	C12-i01.01
7.5. Promote R & D projects in support of one industry innovative and competitive low-carbon	C05; C12	C05-i01.02; C05-i03; C12-i01.01

Table 74 – Contribution of the RRP measures to the lines of action in terms of financing

Component of the RRP	Investment	Name of the Investment	Final allocation	*Related course of action*
C08 – Forests	C08-i01.01	Transformation from Landscape dos Vulnerable Forest Territories – 'Integrated landscape management areas (AIGP) and Aldeia condominiums'	***EUR 256.623.802***	***6.5***
	C08-i01.02	Transformation from Landscape dos Territories from Forest Vulnerable: Landscape Rehabilitation and Management Programmes	***EUR 3.376.050***	***6.5***
	C08-i01.03	Transformation from Landscape dos Vulnerable Forest Territories – Parcel to Ordenar	***EUR 10.000.148***	***6.5***
	C08-i02.01	Land use cadastre and land cover monitoring system: SMOS	***EUR 29.370.000***	***6.8***
	C08-i02.02	Land use cadastre and land cover monitoring system: National Forest Inventory	***EUR 1.630.000***	***6.8***
	C08-i02.03	Land use cadastre and land cover monitoring system: National Land Cadastre System	***EUR 45.000.000***	***6.8***
	C08-i02.04	Land use cadastre and land cover monitoring system: National System of Land Cadastre – Local Dimension North Region	***EUR 5.000.000***	***6.8***
	C08-i02.05	Land use cadastre and land cover monitoring system: National Land Cadastre System – Local Dimension Central Region	***EUR 5.000.000***	***6.8***
	C08-i03	Fuel breaks management- Primary grid	***EUR 120.000.000***	***6.6***
	C08-i04.01	Means to prevent and combat rural fires – under-investment Aircraft	***EUR 70.000.000***	***6.6***
	C08-i04.02	Means to prevent and combat rural fires – under-investment Land means	***EUR 15.960.000***	***6.6***
	C08-i04.03	Means of preventing and combating rural fires: Radar net	***EUR 3.040.000***	***6.6***
	C08-i05.01	MAIS Forest Programme: Reform of the fire prevention and fighting system	***EUR 40.000.000***	***6.6***
	C08-i05.02	MAIS Forest Programme: Enhanced action by forest producer organisations (OPF) and competence centres in the forestry sector	***EUR 10.000.000***	***6.6***

Component of the RRP	Investment	Name of the Investment	Final allocation	*Related course of action*
C09 – Water management	C09-i01.01	Algarve Regional Water Efficiency Plan: Sm1 – Reducing water losses in the urban sector	***EUR 43.900.000***	***1.12***
	C09-i01.02	Algarve Regional Water Efficiency Plan: Sm2 – Reducing water losses and increasing efficiency in the agricultural sector	***EUR 18.500.000***	***1.12***
	C09-i01.03	Algarve Regional Water Efficiency Plan: Sm3 – Strengthening water governance	***EUR 5.500.000***	***1.12***
	C09-i01.04	Algarve Regional Water Efficiency Plan: Sm4 – Promote the use of treated residential water, SM5 – Increase the available capacity and resilience of existing reservoirs/uplift systems and strengthen with new sources of water and SM	***EUR 169.498.742***	***1.12***
	C09-i03-RAM	Plan for water efficiency and strengthening of supply and irrigation systems of Madeira	***EUR 82.150.386***	***1.12***
	C09-i04	Harnessing hydraulic from purposes	***EUR 141.262.968***	
C10 – Sea	C10-i01	Blue Hub, Blue Economy Infrastructure Network	***EUR 99.199.719***	***3.1***
	C10-i02	Green and Digital Transition and Security in Fisheries	***EUR 21.000.000***	***7.1***
	C10-i03.01	Atlantic Defence Operations Centre and Naval Platform – Pillar I – Multifunctional Naval Platform and Pillar II – Operations Centre	***EUR 147.500.000***	
	C10-i03.02	Atlantic Defence Operations Centre and Naval Platform – Pillar III – Alfeite Arsenal Academy (Academy 4.0)	***EUR 2.000.000***	
	C10-i04-RAA	Development of the "Cluster of the Sea of the Azores'	***EUR 48.100.000***	
	C10-i05-RAA	Transition efficiency certificate, digitisation e reduction of environmental impact in the	***EUR 5.000.000***	
	C10-i06-RAM	Ocean Technologies	***EUR 20.000.000***	***3.1***
	C10-i07	Green Shipping	***EUR 50.000.000***	***4.8***
C11 – Industrial decarbonisation	C11-i01	Decarbonisation of Industry	***EUR 737.000.000***	***3.1/7.1/7.2/7.4***
C12 – Bioeconomy	C12-i01.01	Bioeconomy: Integrated Projects (Textile and Clothing, Footwear and Natural Resina) and	***EUR 140.250.000***	

Component of the RRP	Investment	Name of the Investment	Final allocation	*Related course of action*
		Improvement of Bravo Pinheiro potentials with potential for resinage		
	C12-i01.02	Bioeconomy – Forest Management and Resination Support	***EUR 4.750.000***	***6.7***
C13 – Energy efficiency in buildings	C13-i01	Efficiency class on buildings residential	***EUR 300.000.000***	***1.3/2.1/3.2/3.3***
	C13-i02	Energy efficiency in central government buildings	***EUR 240.000.000***	***1.3/1.5/3.2/3.3***
	C13-i03	Energy efficiency in buildings used by the services sector	***EUR 70.000.000***	***1.3/2.1/3.2/3.3***
C14 – Renewable gases	C14-i01	Hydrogen and renewable gases	***EUR 185.000.000***	***3.1/3.6/5.5/5.6***
	C14-i02-RAM	Renewable electricity potentiation in the Madeira Archipelago	***EUR 83.886.101***	***1.1/3.1***
	C14-i03-RAA	Energy transition in the Azores	***EUR 116.000.000***	***1.1/1/3/3.1/3.2***
C15 – Sustainable mobility	C15-i01	Expansion of the Lisbon Metro Network – Red Line to Alcântara	***EUR 357.509.619***	***5.1***
	C15-i02	Expansion of the Porto Metro Network – Casa da Música-Santo Ovídio	***EUR 351.985.261***	***5.1***
	C15-i03	Light Metro Odivelas- Loures	***EUR 390.000.000***	***5.1***
	C15-i04	BRT Boavista line – Empire	***EUR 66.000.000***	***5.1***
	C15-i05	Decarbonisation of Public Transport	***EUR 48.000.000***	***5.2***
	C15-i06	Digitalisation of Rail	***EUR 49.000.000***	
C21 – REPowerEU	C21-i01	Scaled-up measure: Decarbonisation of Industry	***EUR 100.000.000***	***7.1***
	C21-i02	Scaled-up measure: Energy efficiency in residential buildings	***EUR 120.000.000***	***1.3/2.1/3.2/3.3***
	C21-i03	Scaled-up measure: Energy efficiency in buildings used by the services sector	***EUR 80.000.000***	***1.3/2.1/3.2/3.3***
	C21-i04-RAM	Energy efficiency in public buildings in Madeira	***EUR 14.000.000***	***1.5/2.1/3.3/3.3***
	C21-i05	Support for Green Industry Development	***EUR 50.000.000***	***7.3***
	C21-i06	Scaled-up measure: Hydrogen and Renewable Gas	***EUR 70.000.000***	***3.6/5.5/5.6***
	C21-i07.01	Technical studies for offshore energy potential	***EUR 42.000.000***	***3.1***
	C21-i07.02	Technical studies for offshore energy potential	***EUR 8.000.000***	***3.1***
	C21-i08	Network flexibility and Storage	***EUR 100.000.000***	***3.1/4.1***
	C21-i09	One-stop-shop for the Licensing and Monitoring of Renewable Energy Projects	***EUR 10.000.000***	***3.4***

Component of the RRP	Investment	Name of the Investment	Final allocation	*Related course of action*
	C21-i10-RAA	Incentive system for the purchase and installation of renewable energy storage systems in the Azores	***EUR 6.000.000***	***4.1***
	C21-i11-RAM	System of incentives for the production and storage of energy from renewable sources in Madeira and Porto Santo	***EUR 18.900.000***	***4.1***
	C21-i12	Scaled-up measure: Decarbonisation of Public Transport	***EUR 90.000.000***	***5.2/5.3/5.6***
	C21-i13-RAM	Decarbonisation of Transport	***EUR 11.500.000***	***5.2/5.3/5.6***
	C21-i14	BRT Braga system	***EUR 100.000.000***	***5.2/5.3***
	C21-i15-RAA	Purchase of 2 electric ferries	***EUR 25.000.000***	***5.2***
	C21-i16	Nazaré funicular	***EUR 10.000.000***	
Total			***EUR***	