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PORTUGAL

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

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1. OVERVIEW AND PROCESS FOR ESTABLISHMENT OF THE PLAN

1.1. Summary

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

The Paris Agreement (PA) reached in 2015 set, as long-term goals, limiting the increase in the global average temperature to 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 which science defines as maximum to ensure the continuation of life on the planet without overly disruptive change. It also set targets to increase the capacity to adapt to the adverse impacts of climate change and to mobilise finance 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 it is only with everyone's contribution that the challenge of climate change can 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 communicate successively the "Nationally Determined Contribution" (NDC) for the overall emission reduction effort, which should be successively more ambitious and prepare and report on "Long-Term Emission Reduction Strategies".

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

In line with the findings of the IPCC Special Report, it was also concluded in RNC2050 that it is in the decade 2021-2030 that the greatest efforts to reduce GHG emissions should be concentrated, this is the decade essential for aligning the national economy with a carbon neutrality trajectory.

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, which is the main national energy and climate policy instrument for the decade 2021-2030 towards a carbon-neutral future.

The challenges ahead require concerted action between energy and climate policies in order to set a workable path towards a carbon-neutral economy and society, while 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 geared towards Portugal's long-term objectives.

More recently, at international level, the Glasgow Climate Pact was adopted on 13 November 2021 at 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 strengthening their 2030 targets in order to close the remaining ambition gap.

At EU 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 (EU 2021/1119 of 30 June 2021) reflected the objectives

set out in the Green Deal, thus setting a binding EU target of a net reduction in GHG emissions for 2030 of at least 55 % compared to 1990 levels, as well as the objective of achieving climate neutrality by 2050 in Europe.

It is in this context that some of the policy initiatives included in the Fit-for-55 package (COM (2021) 550 final), presented in 2021, aimed at ensuring alignment of all EU climate and energy legislation with the new 2030 GHG emission reduction target, emerged.

In addition, as a response to the difficulties and disruptions in the global energy market caused by the change in the geopolitical landscape with the start of Russia's invasion of Ukraine, the REPowerEU Plan (COM (2022) 230 final) was also presented in May 2022, which is the EU's plan to accelerate the process of the energy transition and end fossil fuel dependency.

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 towards 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.

These new developments, which entail major changes in energy and climate policy, with significant impacts on the three pillars of sustainability at national level, give rise to the need to revise the NECP 2030 to ensure alignment of previously established policies, objectives and targets with this new international and Community context. This complex review exercise, which will run until the end of June 2024, includes an increase in the ambition presented above 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 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 expectations set out in the National Hydrogen Strategy approved by Council of Ministers Resolution No 63/2020 of 14 August 2020.

In the light of this international, Community and national context, Portugal approved its first Climate Basis Law (LBC) (Law No 98/2021 of 31 December 2009), consolidating objectives, principles and obligations for the different levels of governance for climate action through public policies, and establishing new provisions on climate policy, in particular:

- It sets out climate rights and obligations, strengthening citizens' right to participation;
- Defines the climate policy governance framework by creating new structures, including a Climate Action Council;
- Creates new requirements and timetables for climate policy planning and assessment tools, including the development of regional and local climate action plans, five-year sectoral mitigation and adaptation plans, a green industrial strategy to support the industrial sector in the climate transition process, as well as the preparation of carbon budgets for 5-year periods;
- It sets out new principles and rules for 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 LBC, which further revises the GHG emission reduction targets set out in RNC2050, are also reflected in the revision of the NECP 2030, given their impact on the current national climate and energy strategy, such as limiting the marketing of new light duty vehicles powered 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.

Alongside the ambition of carbon neutrality in December 2022, Portugal updated its national targets for renewable energy in final energy consumption in the transport sector through Decree-Law No 84/2022 and set new targets for maritime, air and rail transport.

Portugal has thus strengthened its prominent position in the international context, in particular in relation to the reduction of GHG emissions and the commitment to renewable energy sources, where very positive results have been achieved. In 2021, GHG emissions, without accounting for LULUCF emissions, were estimated at around 56.5 Mt CO₂eq, representing a decrease of 5.1 % compared to 1990, and 34.8 % and 2.8 % compared to 2005 and 2020 respectively. While exceptional conditions were observed in 2020, driven by the impact of measures in response to the COVID-19 pandemic, resulting in emission reductions, Portugal has been consolidating a decarbonisation trajectory of the national economy, aligned with the 2030 GHG emission reduction target.

Portugal has been moving towards increasing levels of uptake of renewable energy sources in the various 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 (+ 14,4 pps compared to 2005). In the electricity sector, Portugal is currently the third EU country with the highest level of incorporation of renewables (+ 31 pps compared to 2005).

As a result, Portugal reduced its external energy dependency (-21,7 pps compared to 2005), increasing domestic energy production and reducing primary energy consumption (-23.2 % compared to 2005), thus ensuring higher levels of security of supply.

It is worth highlighting the contribution of this sector to the Portuguese economy through the creation of a new employment-generating industrial and business sector, promoting regional development, driving exports of goods and services, driving innovation and scientific research, capable of attracting international investment and stimulating the internationalisation of national companies.

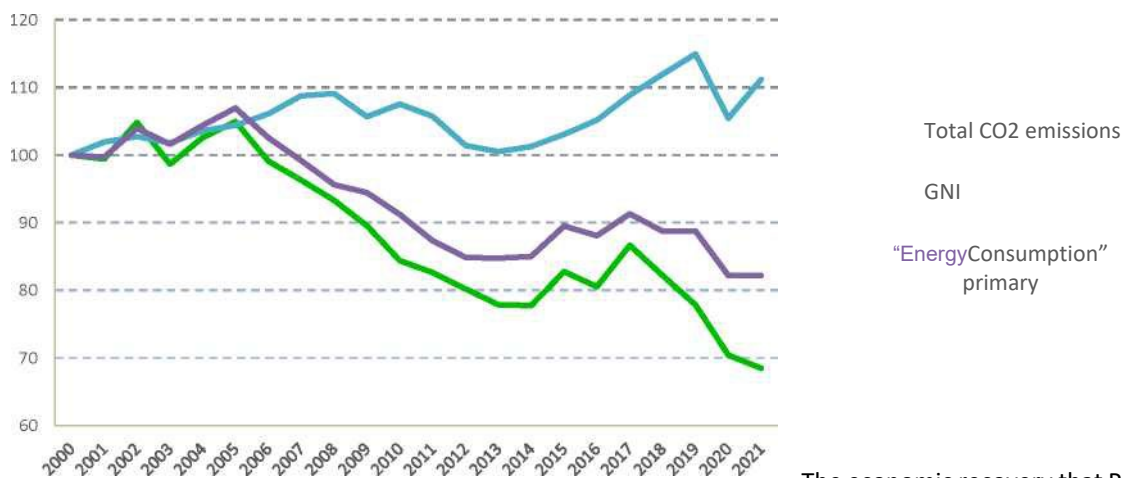
Table 1 – Evolution of key energy and climate indicators in Portugal [Source: APA, DGEG]

INDICATOR	2005		2021	VARIATION
Total CO₂ emissions (without LULUCF)	86,68 MTON	*	56,52 MTON	– 34.8 %
PRIMARY ENERGY CONSUMPTION	27,1 Mtoe	*	20,8 Mtoe	– 23.2 %
RENEWABLES IN FINAL CONSUMPTION	19.5 %	*	33.9 %	+ 14,4 pps
RENEWABLES IN ELECTRICITY	28.3 %	*	58.4 %	+ 30,1 pps
ENERGY DEPENDENCE	88.8 %	*	67.1 % ¹	– 21,7 pps

¹ including contribution from heat pumps

It is also important to highlight Portugal’s energy and climate pathway in recent years and the way in which it has been possible to disconnect the Gross Domestic Product from CO₂ emissions and primary energy consumption, a trajectory that is still ongoing in 2021. This means that Portugal has managed to generate wealth with less emissions and lower energy consumption, with clear benefits for the economy and society. This CO₂ reduction pathway is expected to continue in the coming decades, while Portugal is committed to an increasingly less carbon-intensive economy based on renewable sources and to improving energy consumption by adopting more sustainable practices throughout the value chain, optimising production processes, adopting new low-carbon technologies, and raising awareness of the need to continue this path.

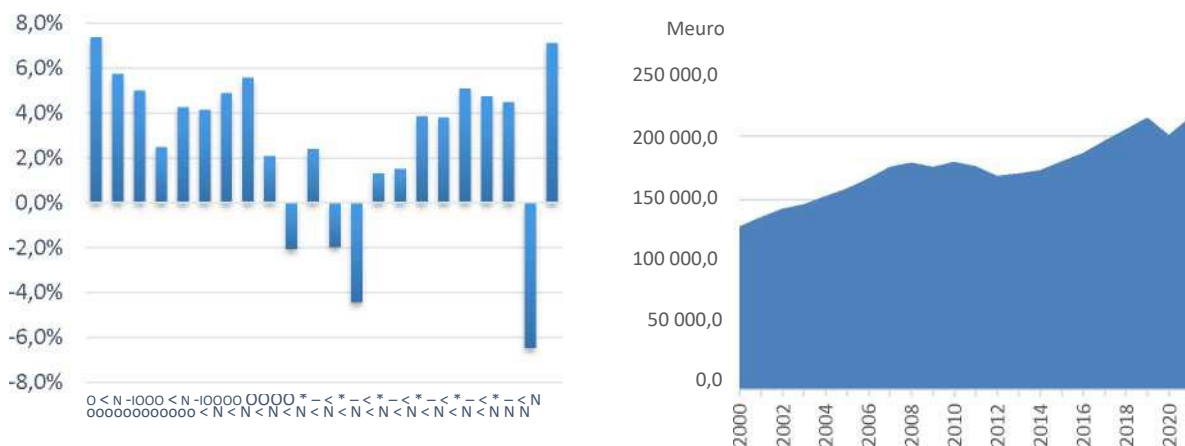
Figure 1 – Evolution of Gross Domestic Product, Total CO₂ Emissions (without LULUCF) and Energy Consumption Primary (2000 = 100) [Source: INE, APA, DGEG]



The economic recovery that Portugal has registered since 2013 was interrupted in 2020 as a result of the COVID-19 pandemic. In 2021, GDP increased by 7.1 % year on year, returning to EUR 214 billion in 2019.

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

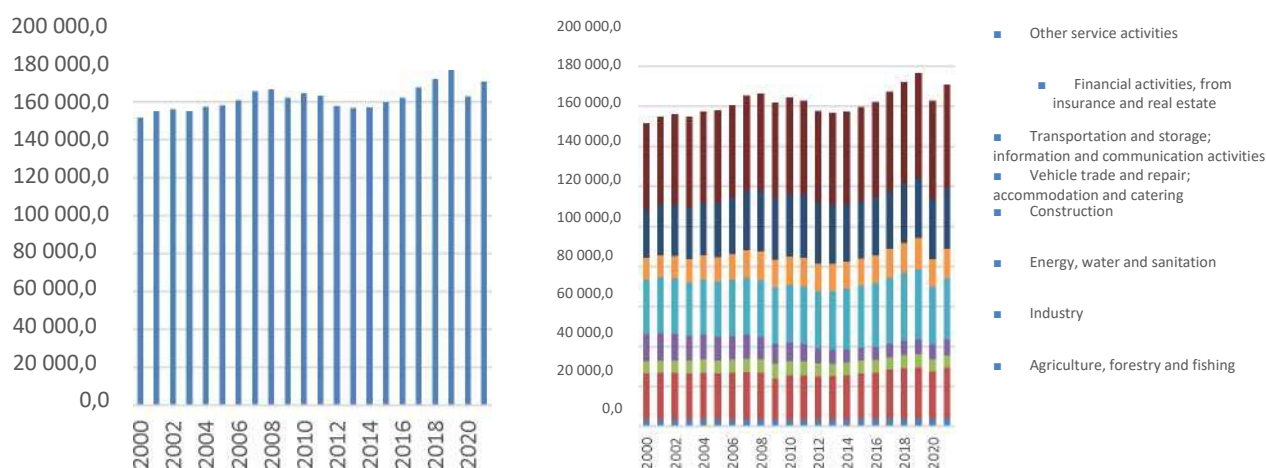
According to more recent projections, the growth path is expected to continue in the coming years.



In the production approach, in 2020, Gross Value Added (GVA) also decreased sharply due to the effects of the COVID-19 pandemic (-7.8 % compared to 2019). By sector of economic activity, in 2020, only the construction sector remained at pre-pandemic levels. The sector of financial, insurance and real estate activities decreased by 1.3 % compared to 2019, with the reduction in the remaining sectors being higher.

In 2021, GVA increased by 4.9 % compared to 2020, across all sectors of activity: Transport and Storage, Information and Communication Activities 8 %; Industry 6.9 %; Trade and Repair of Vehicles and Housing and Restoration 6.5 %; Agriculture, Forestry and Fisheries 5.8 %; Construction 4.6 %; Other Service Activities 4.3 %; Energy, water and sanitation 2.1 %; Financial, Insurance and Real Estate Activities 2 %.

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



Aligned with this vision and developed in conjunction with RNC 2050, the NECP 2030 is 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 preliminary version of a draft update envisaged under Article 14 of that Regulation.

The NECP 2030, as the main energy and climate policy instrument for the decade 2021-2030, is organised according to the structure set out in Part 1 of Annex I to the above-mentioned Regulation. Thus, the 2030 NECP addresses, albeit in a preliminary way at this stage, 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 commitments of the Union, including in terms of greenhouse gas emission reductions, renewable energy, energy efficiency and interconnections.

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 (UNFCCC), Portugal took on the objective of achieving carbon neutrality by 2050 and developed and endorsed the Carbon Neutrality Roadmap 2050 (RNC2050) which set out the vision, trajectories and guidelines for policies and measures to be implemented within that time horizon. RNC 2050 was the Long-term Low Greenhouse Gas (GHG) Development Strategy, submitted to the UNFCCC on 20 September 2019, which is under review to reflect the important energy and climate developments that have occurred since its adoption, in conjunction with the review 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, RNC 2050 concluded that the largest GHG emission reduction efforts should be concentrated in the

decade 2021-2030. This reduction is essential to align the national economy with a carbon neutrality trajectory. Thus, in conjunction with the objectives of RNC 2050, and following the developments at international, Community and national level already listed, the 2030 targets to increase ambition have been revised. The new targets are reflected in this revision 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 carbon neutrality by 2050 means moving away from a linear economic model, based on fossil fuels, and investing in an economy that relies on renewable resources and efficiently uses resources, continuing with circular economy models, which values the territory and promotes territorial cohesion.

The national emission reduction effort, as part of a broader global framework of action, will contribute to a significant reduction in adaptation costs, with clear economic savings.

Responding to this challenge involves transforming life into society, in particular production and consumption patterns, the relationship between energy production and use; how cities and housing, work and leisure spaces are thought, how we move and how mobility needs are considered. In addition to a technological challenge, this is also a social organisation challenge, which depends on the support and acceptance of society.

This global climate emergency context underlines the importance of the energy transition and the economic paradigm shift, particularly with regard to fossil fuels. Portugal committed 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 to abandon the use of fossil fuels. One example of this was the closure of the Matosinhos Refinaria in 2021.

In addition to the energy sector, other sectors of the economy should contribute to achieving urgent emission reductions through the guidelines and measures recommended in this plan, as well as in RNC 2050.

For the 2030 horizon, it is important to define the national objectives and strategy, consistent with a competitive, resilient and carbon-neutral economy, and 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 BY:
CARBON NEUTRALITY, AS AN OPPORTUNITY FOR THE COUNTRY, BASED ON A
DEMOCRATIC AND FAIR MODEL OF TERRITORIAL COHESION THAT ENHANCES 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 this decade, with the energy transition playing a particularly important role in the transition to decarbonisation. Portugal's strategy for 2030 is based on a combination of policy options and measures, 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 priority being given to energy efficiency, enhancing the diversification of energy sources and carriers, increasing the renewable energy base (including harnessing the potential of renewable gases such as biomethane and green hydrogen), increasing electrification, strengthening and modernising infrastructure, strengthening the relationship between different energy carriers (*sector coupling*), developing energy interconnections, market stability and investment, redesigning and digitising the market, encouraging research and innovation, promoting 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 for 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 committed around 38 % of the available

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

The RRP is a nation-wide programme, with an implementation period until 2026, which aims to implement a set of reforms and investments aimed at boosting the country's 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 in **20 components, grouped around three structuring dimensions, Resilience, Climate Transition and Digital Transition.**

The climate **transition dimension** results from 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 the drivers of competitiveness 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 components Forestry (C8) and Water Management of the Resilience Dimension (C9) also incorporate investments directly linked to the climate transition.

It should be noted that the investments financed by the RRP must ensure that a number of criteria are met to demonstrate that they are environmentally sustainable, including the '*Do No Significant Harm (DNSH)*' principle. Following the approval of the initial plan, Portugal submitted, on 26 May 2023, the update of the RRP, by means of a single application covering in addition to that update, an additional EUR 3,2 billion in loans, in order to increase the ambition of the RRP approved in 2021 and to address the increased costs in the measures already planned, as well as the grants corresponding to REPowerEU. When accounting for this request for additional funds, the total allocation of the RRP is increased 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 principle of 'Energy Efficiency Priority' when deciding on investment projects in the energy sector, with a view to sustainability and cost-effectiveness. This logic has also been reflected in investments made available to the domestic and services sector through the Environmental Fund or the Recovery and Resilience Plan. The energy renovation of the national building stock and the decarbonisation of energy consumption, including through enhanced electrification, are key measures to meet national energy and climate objectives, as well as to meet other policy objectives, such as tackling energy poverty and supporting vulnerable consumers, in line with the aim 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 objectives and renewable energy targets will have to be achieved in parallel with other strategic priorities, such as interconnections between different energy carriers or physical cross-border ones, with a view to a genuine integration of the country into the Energy Union and the need to achieve carbon neutrality, always ensuring security of supply in the country.

The energy transition in Portugal will unquestionably involve strengthening renewable energy by increasing electrification and developing a system based on renewable gases (be it renewable hydrogen or biomethane). Portugal has enormous potential for the development of a renewable electricity production sector that is heavily decarbonised by the availability of endogenous resources such as water, wind, sun, biomass and geothermia; and the fact that it has developed, and continues to develop, a reliable, robust and secure electricity system capable of dealing with the idiosyncrasy associated with the variability of the renewable generation and which will evolve significantly in the current decade. The fact that it was possible to anticipate the closure of coal-fired power plants operating in Portugal from 2023 to 2021 is in itself a demonstration and validation that Portugal is in a position to meet its ambitious targets.

By 2030, developments in the power generation sector will see considerable developments in the incorporation of solar

²As set out in Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 (the RRP Regulation), compliance with the principle of DNSH is mandatory, which means not to support or carry 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 (the EU Taxonomy Regulation).

photovoltaic energy. Wind generation will grow strongly, albeit with less expression than before. On *onshore* wind, the focus will be on hybridisation, over-equipping and retrofitting, three ways of increasing electricity generation from renewable sources, minimising consumer and environmental impacts, because they optimise grid investments already made. Investment in *offshore* wind will also have a significant role to play, seeking to build on the existing resource in the national coastal zone which has the potential for this type of technology and which has gained expression in other regions of the EU with an equally high potential for its application, thus leading to its development and reducing the costs of its installation and operation. In the case of solar and in particular solar photovoltaic, highly competitive technology prices compared to other conventional solutions combined with the abundance of the resource contribute to making use of this energy source an option with strong benefits for consumers.

It should also be considered that renewable hydrogen will play an important role. In particular, solutions are emerging that enable the direct production of renewable hydrogen using electricity from renewable energy sources (e.g. solar, wind), as well as the direct production of high-pressure hydrogen, simplifying its use in mobility.

The importance of the national gas system implemented in the country, which can operate in close coordination with the electricity system, ensuring the energy sector's resilience in terms of energy storage (in the short, medium and long term) and energy transmission and distribution, is also recognised. As regards the use of fossil natural gas for the production of electricity, the LBC provides for its prohibition from 2040, provided that security of supply is ensured.

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

Portugal held the first auction in 2019, specifically for solar photovoltaic, with a total of 1 400 MW divided into 24 lots. The results of the first auction in Portugal, which secured the lowest prices in Europe and the world's lowest prices, with direct translation into actual consumer gains, make it possible to draw a path, the results of which make it possible to predict the potential multiplier of this mechanism in future bids and its considerable and necessary contribution to achieving national renewable energy targets. The same happened in 2020 and 2021 in similar procedures for solar technology. **In the short term, Portugal's strategy will be to launch auctions for electricity generation from solar and offshore wind resulting in the allocation of new renewable capacity, including dispatchability, building on the success and experience of auctions already carried out.**

The aim of a renewable electricity generation system is to promote and enhance the use of electricity in the various sectors of the economy, with a particular focus on the transport sector, but also on industry and the residential and service sectors.

In parallel, the aim is to promote and strengthen the use of renewable gases, contributing to the resilience of the energy sector, the integration of the energy system into the different energy carriers and use in the different consumption segments, notably in industry and transport, but also in the residential and service sectors in the short to medium term.

The energy transition and the decarbonisation of the economy and society are not confined to technological change, through the replacement or adoption of new technologies, or the use of new forms of energy. To a large extent, the participation of the citizen, with a more active role as a consumer/energy producer and as an agent for behavioural change, will have a major impact on this path.

A more informed citizen represents better choices, more efficient and sustainable. On the other hand, a citizen at the heart of the decision 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. With the citizen as an informed and active player on the market, and with tools to protect the most vulnerable consumers, another of the strategic priorities for 2030 will be addressed, namely tackling energy poverty and consumer vulnerability.

In order to promote distributed generation and self-consumption of energy from renewable sources, a new legal framework was built, Decree-Law No 15/2022 of 14 January 2009, repealing Decree-Law 162/2019 of 25 October 2009, which: (I) enables and fosters individual self-consumption; (II) enables and fosters collective self-consumption; (III) enables renewable energy communities to be built up. The legal establishment of these figures enables citizens, businesses and other public and private entities to produce, consume, share, store and sell energy produced from renewable energy sources, thus actively participating in the energy transition.

This new scheme is complementary by combining centralised instruments for the promotion of clean energy with decentralised processes which, by their very nature, strengthen social and territorial cohesion by helping to reduce existing inequalities, in particular by creating jobs, improving the competitiveness of businesses distributed on national territory and combating energy poverty; it also significantly reduces costs for transmission and distribution networks, reduces losses and optimises energy generation solutions.

Due to the obvious advantages, but also the challenges it presents, the promotion of self-consumption of renewable energy – individual, collective or through renewable energy communities – will be accompanied in the short term by a programme to disseminate information and support the implementation of self-consumption projects, so as 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 self-consumption establishment in partnership with municipalities is of particular importance.

The vision of a considerably decarbonised electricity system, with a significant level of decentralisation and associated with high levels of digitalisation, will enable traditional consumers to become also electricity generators, 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, aggregators of producers and/or consumers, bidirectional smart meters, storage systems, local energy production, active consumers, flexibility supply/demand, electric vehicle etc. are the variables to be considered in building the grid model of the future. In order to ensure a genuine integration of all variables, and whatever configuration 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 the 2030 horizon.

In the residential sector, the aim is to increase the thermal comfort of households in heating and cooling, focusing on passive insulation, sun protection and ventilation solutions, and continuing with the trend towards electrification of the sector and the use of renewable energy sources. A continued focus on urban regeneration will provide an opportunity to incorporate energy and water efficiency improvements, the incorporation of low carbon materials and renewable energy sources, contributing to the fight against energy poverty.

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

Also at the level of infrastructure, 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 responding to the interconnection needs of energy markets and systems.

In view of the transition of the energy sector, the existing infrastructure for the reception, storage, transmission and distribution of gas will play an important role in enabling the introduction, distribution and consumption of renewable gases, in particular biomethane and renewable hydrogen, in the various sectors of the economy, enabling higher levels of incorporation of renewable energy sources into final energy consumption. Renewable hydrogen could be received in the natural gas network, blended to the volume prescribed in the legislation (this is a measure for the market initiation of renewable hydrogen in Portugal), or used in dedicated gas networks. In addition, it is expected that it will boost the development of the green industry and be used as a raw material. The use of biomethane in the gas grid will be a process of more direct implementation given its chemical affinity with natural gas. The use of the gas sector, in symbiosis with an increase in renewable electric power, is of utmost importance as it will allow energy storage in the form of renewable gases. In this perspective, particular emphasis should be placed on the production and incorporation of renewable gases such as renewable hydrogen and biomethane, which promotes a stronger substitution of fossil fuels and reduces the country's energy dependency. The growing recognition of the importance of renewable gases, in particular renewable hydrogen, is based on the fact that it enables energy storage and other renewable fuels to be prepared, helping to maximise the achievement of national targets for incorporating renewable sources into final energy consumption and decarbonising 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,

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, transport, distribution and consumption of renewable gases in Portugal. There is a desire for the growth of new industrial sectors that will consume renewable hydrogen as the main energy carrier (*enabler*). This orientation stems from the fact that Portugal presents very favourable conditions for the installation of a green hydrogen production industry with potential exporter, the main advantage being the low costs of producing electricity from renewable sources. The development of a green hydrogen production industry in Portugal has the potential to boost a new economy, combined with the huge potential for the decarbonisation of various sectors.

Renewable gases, in particular renewable hydrogen and biomethane, have the potential to play an important role in decarbonising sectors of the economy that currently have few alternative technological options and where electrification in the short to medium term could lead to significant costs. Renewable gases have the potential to replace fossil fuels in industry (e.g. in combustion processes such as raw materials and in mainly freight transport). This will allow Portugal to focus on solutions of varying scale, with different technologies and 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 real renewable gas economy. The development of a green hydrogen production industry in Portugal has the potential to boost a new economy, combined with the huge potential for decarbonisation.

It is envisaged to implement in the short term a set of mechanisms aimed at: (I) regulating the injection of renewable gases into the national natural gas grid; (II) implement a system of guarantees of origin for renewable gases; (III) concentrate available financial resources on national and European funds to support energy production in the production of renewable gases, in particular renewable hydrogen and biomethane; and (iv) assess the setting of binding targets by 2030 for the incorporation of renewable gases into the natural gas grid.

In particular, several sites of industrial plants are proposed in Portugal, and the Sines Industrial and Logistics Zone (ZILS) is proposed for the production of renewable hydrogen (for use in the green steel industry and for the production of ammonia, renewable methanol, etc.), powered by solar, wind and electricity grid energy with guarantees of origin and based on strategic partnerships, national and with other EU Member States, which will give a European dimension to the project as a means of securing Community funding and finding partners for the consortium.

This industrial scale ZILS project for the production of H₂^{green} is focused on leveraging solar energy as a competitive factor (the cost of electricity represents the largest share of production cost 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 presents very favourable conditions for the installation of such an industry, particularly in Sines in view of the multiple advantages it offers – strategic location on the Portuguese Atlantic coast, availability of a deep water port, transport infrastructure, storage and connection to the gas transmission network, an industrial area with current and future consumers of hydrogen, and availability of land.

The industrial sector will play an extremely important role and will be one of the main hubs in need of innovation. While decarbonisation is expected at a lower pace, it is a very sensitive sector about resource efficiency, energy efficiency, competitiveness and innovation. A number of sectoral roadmaps for a more decarbonised industry are underway, where the focus on the circular economy and the bioeconomy, including through industrial symbioses and resource reutilisation, as well as new business models determined by the provision of services, rather than the sale of goods, is an asset in the 2030 horizon.

This sector will also be heavily influenced by robotisation and digitalisation, with increased electrification, with increased use of biomass and combined with other forms of renewable energy such as solar thermal.

Decarbonisation of mobility and transport is another sector which, by 2030, plays a special role, as this is one of the sectors with the highest importance 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, leveraged to a large extent 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 light commercial vehicles, 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 charging or refuelling vehicles and vessels with alternative fuels (electricity and other renewable fuels).

Profound changes towards the decarbonisation of the sector are expected 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 where users will have more power to manage their own mobility as a result of increasing digitalisation. However, the paradigm shift is not limited to technological innovation. A continued commitment to public transport, 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 promotion of public transport and its competitiveness vis-à-vis individual transport, to decarbonisation and energy transition in the transport sector and which has a strong impact on the quality of transport service, and which promotes economic activity by increasing accessibility levels for people.

The increased demand for passenger mobility should be ensured with more public transport and zero-emission vehicles, and the generalisation of shared transport, with an increase in the expression of active modes in short-distance mobility. In the period up to 2030, the focus on electric mobility and advanced biofuels should be the most cost-effective decarbonisation option in this sector, but other important alternatives such as hydrogen-powered vehicles could emerge.

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

In freight transport, the commitment to 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 and hydrogen for heavy duty vehicles. Rail will play an important role in decarbonising freight transport over the medium to long distance, and investment in this infrastructure, decarbonisation through electrification and other energy carriers, such as hydrogen, 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, focusing on the development and adoption of measures for the adaptation of vessels flying the Portuguese flag, in particular measures to increase the efficiency of ships and new forms of propulsion, electric energisation of land-based vessels while at berth, the use of less polluting fuels available in the geographical area of operation and, at the same time, boosting the connection and interoperability of rail freight transport with commercial ports.

Changing behaviour towards mobility is also an aspect that should not be overlooked when it comes to mobility decisions and more efficient behaviour, by promoting eco-driving and using new technologies to induce sustainable mobility.

Finally, the waste and waste water sector, although with little overall expression of emissions, is a sector where substantial changes are expected by 2030. Indeed, with a view to meeting the target laid down in the Landfill Directive, in 2035 only a maximum of 10 % of the municipal waste generated can be landfilled. This will lead to a paradigm shift, encompassing 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 wasteful economy.

The priority will therefore be the reduction of waste generation and the intensive exploitation of reuse solutions, followed by the strengthening of the separate collection of municipal waste (RUs), boosting the recovery of materials in greater quantity and quality, with the aim of promoting their recycling and recovery and reintegrating them into the economy.

The rational use of existing water resources and the satisfaction of the needs of all consumers, including environmental ones, should be ensured.

On the other hand, as energy costs are one of the largest components of operating and operating costs for water supply and sewage services, with direct implications for tariffs, energy management is now one of the main challenges for the bodies managing these services.

It is with this aim of recognising the advantages of an integrated and multidisciplinary vision of system management (water quality, reliability, energy management and operation and maintenance) that the Government is taking steps to: (I) increase the resilience of public water supply systems by improving their performance, in particular as regards the

reduction of water losses; (II) increase the resilience of wastewater sewerage systems by removing undue connections, adapting treatment plants to extreme climatic events and reusing treated waste water; (III) increasing the resilience of rainwater drainage systems by eliminating undue infiltration, absorbing flows in periods of intense precipitation and reusing rainwater; (IV) to reduce the energy consumed in water services by improving energy and water efficiency and increasing the level of energy self-sufficiency of treatment plants and other installations.

The agriculture sector is expected to make an essential contribution to the decarbonisation of the Portuguese economy. Although at a lower pace than in other sectors, changes are expected in the present decade to reduce emissions, with a focus on more sustainable agriculture, through a wider spread of integrated production practices, along with the expansion of organic farming, conservation, regenerative and precision farming, reducing emissions associated with livestock effluents and the use of synthetic fertilisers, and enhancing carbon sequestration resulting from increases in soil organic matter content, in particular through the promotion of biodiverse pastures. This type of agriculture will improve the efficiency of water use, allowing for 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 reduction.

It will also be important to rethink the food chain – food diet choices, reduction of food waste, how food plants and animals are produced, pressure on soil, water and biodiversity, including 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 refrigeration requirements.

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 combating desertification and enhancing the land, which is one of the foundations of territorial cohesion. The potential of a sink, particularly in the forest area, will need to be strengthened by taking over its management in linking spatial planning aspects, and by investing in management practices and models that enhance the sink role of forests and increase their resilience to climate change, which have the potential to aggravate conditions for forest fires and land degradation.

The Landscape Transformation Programme (PTP), approved by Council of Ministers Resolution No 49/2020 of 24 June 2009, sets out a strategy for vulnerable forest territories with high fire hazards. The PWP measures are one of the measures of the PWP and are designed 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. The PRGP develops the desirable landscape, defines a medium to long-term transition matrix supported by a funding model that ensures its implementation.

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

In these areas, the necessary conditions will be created for the development of Integrated Landscape Management Operations (IBMOs) to be implemented in a pooled 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 actions over time and remuneration for ecosystem services.

The aim of implementing this Landscape Transformation Programme is to ensure the resilience of vulnerable territories, ensuring their sink potential, while ensuring more economic activity and protection of biodiversity.

In this context, it is important to mention the potential of the voluntary carbon market to be created at national level in this sector. This market aims to support efforts to mitigate GHG emissions, with a particular focus on enhancing the natural base carbon sequestration capacity, 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 profitability 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 to 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 the 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 driven by the adoption of an ambitious and broad-based agenda that includes all stages of the technology development cycle to commercialisation. To this end, a lot will be contributed by national support frameworks geared to research and technological development according to the country's priorities, such as renewable hydrogen, storage, smart grids, advanced biofuels, deep-sea geothermal, concentrated solar thermal, ocean energy, energy integration, energy conversion and storage, low-carbon processes, areas relevant to the circular economy, forests, precision agriculture, etc.

Achieving this goal 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 the adoption of deep decarbonisation policies of society has positive impacts on the economy, employment and society. In particular, reducing the emission of particulate matter, ozone precursors and nitrogen oxides and sulphur has a positive impact on air quality and improved 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 devise measures to support the transition towards the most energy-intensive sectors as regards the redeployment of activities and workers, particularly in regions that may be most affected by the transition. The creation of skills for the jobs of tomorrow 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 entails differentiated impacts on society. It is therefore crucial that the associated tax revenues can be redirected to society by supporting decarbonisation projects, reducing the burden on labour 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 in order to be a just transition. Energy poverty and vulnerability should be identified and addressed through measures aimed at urban regeneration, the promotion of energy efficiency in buildings, in particular through insulation measures, and the reduction of reliance on fossil fuels. In this context, the ongoing commitment to decentralised electricity production based on renewable energy communities and the valorisation of collective systems that mitigate maintenance costs make it possible to reduce energy costs and diminish households.

Financing the transition will require the effort of all sectors of the economy. Therefore, aligning public and private financial flows and tax policy with decarbonisation and energy transition objectives is key to a just transition.

Implementing this transition means boosting investment in the various sectors of activity. In this context, the current Multiannual Financial Framework 2021-2027, InvestEU and the Recovery and Resilience Facility, as the main sources of financing 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, bioeconomy, 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 spending should be consistent with the EU's climate neutrality objective by 2050, the 2030 climate targets and, consequently, the objectives of the Paris Agreement. In addition, 30 % of this expenditure has to be spent on climate-related projects. In the case of the Recovery and Resilience Facility, this percentage 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 is based on strategic axes for the economic and social development of the country during this decade, setting out 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 core thematic agendas for the development of Portugal’s economy, society and territory by 2030: (I) persons first: a better demographic balance, more inclusion, less inequality; (II) digitalisation, innovation and skills as drivers of development; (III) climate transition and sustainability of resources; and (iv) a competitive externally and cohesive country internally. This new energy model towards carbon neutrality is a unique opportunity for Portugal. In the context of the economic recovery that the country has been experiencing in recent years, the challenge of the energy and climate transition is seen as an opportunity to leverage the national economy in a sustainable development approach based on a democratic and fair model that promotes civilisation progress, technological advancement, job and wealth creation, and territorial cohesion, together with 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 sustainable wealth and more shared well-being.

1.1.3. Overview of the plan’s main objectives, policies and measures

Portugal puts forward strong arguments to continue to be 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 the 2030 horizon in terms of reducing GHG emissions, incorporating renewable energy sources in the various sectors, energy efficiency and promoting interconnections, which are reflected in the following targets:

Table 2 – National targets for Portugal for 2030

NATIONAL TARGETS	EMISSION (without LULUCF; for 2005)	Energy Efficiency (primary energy reduction)	RENEWABLE (in gross final consumption of energy)	RENEWABLE IN TRANSPORT	ELECTRICITY INTERCONNECTIONS
NECP 2030	– 45 % to - 55 %	35 %	47 %	20 %	15 %
Review	– 55 %	35 %	49 %	23 %	15 %

Figure 4 – Evolution of total CO₂ emissions towards 2030 (Mton CO₂)

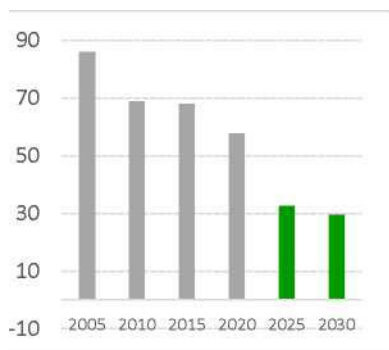


Figure 5 – Evolution of primary energy consumption – EE target

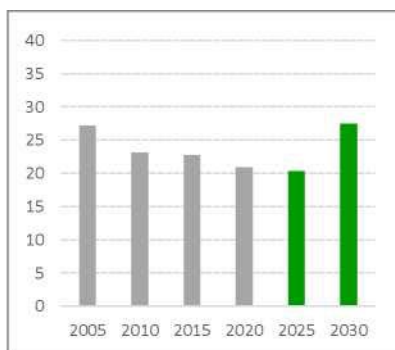


Figure 6 – Evolution of renewable contribution in final energy

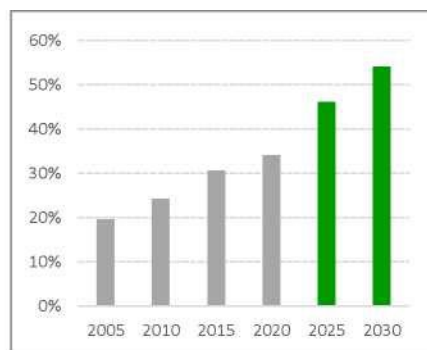
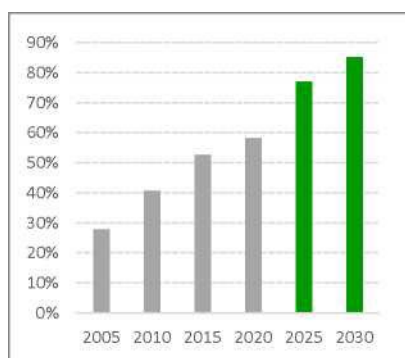
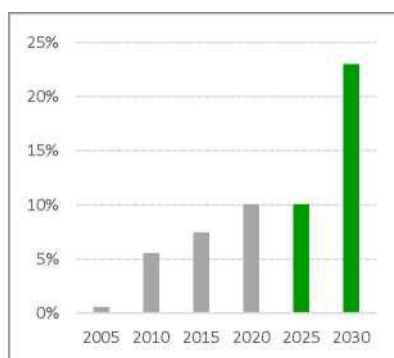
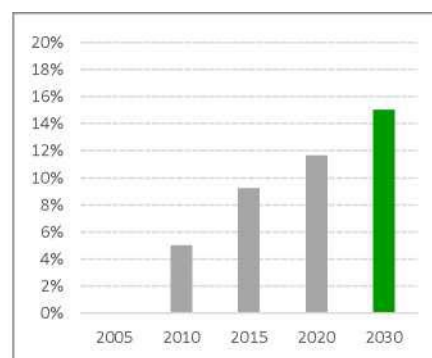


Figure 7 – Evolution of renewable contribution in electricity**Figure 8 – Evolution of the contribution of renewables in****Figure 9 – Evolution of PT-ES interconnection capacity**

The path towards carbon neutrality is a unique opportunity for Portugal. As such, the NECP 2030 has as its foundation a strong participatory component of society, whose contribution to a strategic vision towards 2030 is crucial. In the context of economic recovery, the challenge of decarbonisation and the energy transition is an opportunity to leverage the national economy in a sustainable development spirit and based on a just and cohesive transition, which promotes civilisation progress, technological advance, job creation and prosperity, 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 for the five dimensions of the Energy Union and Climate Action, the figure below illustrates the targets and national contribution set for the 2030 horizon under the NECP.

Table 3 – National targets and contribution to Union targets

TARGETS 2030	NATIONAL CONTRIBUTION TO UNION TARGETS	
	NECP 2030	NECP Review 2030
Reduction of CO_{2eq} (without LULUCF) (Mt CO_{2eq}) compared to 2005	– 17 %	– 28.7 %
Increasing the weight of Renewable Energy	47 %	49 %
Increasing Energy Efficiency³	35 %	35 %
Electricity interconnections	15 %	15 %

In order to support Portugal's strategic vision and ensure that the targets and objectives set for 2030 are met, eight national strategic objectives have been defined in a logic of energy and climate integration. Pursuing these interlinked strategic objectives will contribute to carbon neutrality.

³ Percentage reduction in primary energy consumption

Figure 10 – National targets for 2030

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1. DECARBONISING THE NATIONAL ECONOMY
 Ensure a trajectory to reduce national greenhouse gas (GHG) emissions in all sectors of activity, including energy and industry, mobility and transport, agriculture and forests and waste and wastewater, and promote the integration of mitigation objectives into sectoral policies (*mainstreaming*)
- 

2. PUTTING ENERGY EFFICIENCY FIRST
 Reduce primary energy consumption in the various sectors in a context of sustainability and cost-effectiveness, focus on energy efficiency and resource efficiency, focus on renovation and renovation of buildings, and promote zero-emission buildings
- 

3. STRENGTHENING THE FOCUS ON RENEWABLE ENERGY AND REDUCING THE COUNTRY'S ENERGY DEPENDENCY
 Enhance diversification of energy sources through increased and sustainable use of indigenous resources, promote increased electrification of the economy and encourage R & I in clean technologies
- 

4. ENSURING SECURITY OF SUPPLY
 Ensure the maintenance of a resilient and flexible system with diversification of energy sources and sources, strengthening, modernising and optimising energy infrastructure, developing interconnections and promoting integration, reconfiguration and digitalisation of the energy market, maximising its flexibility
- 

5. PROMOTING SUSTAINABLE MOBILITY
 Decarbonise the transport sector by fostering modal shift and better functioning of collective transport networks, promoting electric and active mobility and the use of alternative fuels limpos
- 

6. PROMOTING SUSTAINABLE AGRICULTURE AND FORESTRY AND BOOSTING CARBON SEQUESTRATION
 Reducing carbon intensity of farming practices and promoting effective agroforestry management contributing to increasing natural sink capacity
- 

7. DEVELOPING AN INNOVATIVE AND COMPETITIVE INDUSTRY
 Promoting industrial modernisation with a focus on innovation, decarbonisation, digitalisation (Industry 4.0) and circularity, contributing to increased competitiveness of the economy
- 

8. ENSURING A JUST, FAIR, DEMOCRATIC AND COHESIVE TRANSITION
 Strengthen the role of the citizen as an active player in decarbonisation and the energy transition, create a level playing field for all, combat energy poverty, create tools for the protection of vulnerable citizens and promote active citizen engagement and territorial enhancement

These eight national strategic objectives set for 2030 contribute positively 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 – Relationship between national strategic objectives and NECP dimensions

	DESCARBONIZACE	ENERGY EFFICIENCY	ENERGY SECURITY	INTERNAL MARKET	RESEARCH, INNOVATION AND COMPETITIVENESS
1. Decarbonise ECONOMY TO NATIONAL					
OL 2. PRIORITISING EFFICIENCY B > ENERGY					
* 3. STRENGTHENING THE COMMITMENT TO m ENERGIES RENOVERED AND REDUCTION A ENERGY DEPENDENCY OF THE COUNTRY					
gl 4. ENSURE THE SECURITY OF VS/SUPPLY					
5. PROMOTING SUSTAINABLE MOBILITY					



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 goals to contain the increase in global temperature to well below 2 °C above pre-industrial levels, with the commitment of the international community to pursue all efforts to limit it to 1.5 °C, which science defines as maximum to ensure the continuation of life on the planet without overly disruptive change. It also set targets to increase the capacity to adapt to the adverse impacts of climate change and to mobilise finance 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 its main commitments are to achieve a global balance between anthropogenic emissions and removals in the second half of the century, to prepare and communicate in succession the 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 package, the Europe on the Move package and the Clean Energy for all Europeans package, which sets out 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, a set of ambitious 2030 targets for increasing renewable energy, reducing energy consumption, reducing greenhouse gas (GHG) emissions and electricity interconnections.

Reference should also be made to the 2030 Agenda for Sustainable Development – “Transforming our World” – adopted at the UN 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 requires the integration of these objectives and targets into national, regional and global policies, processes and actions.

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 climate action, 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 bringing the EU’s climate, energy, transport and taxation policies in line with 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, is 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 bring it into line with the new emission reduction target. The following should be noted from

the outset:

- Revision of the European Emissions Trading Directive (EU ETS) 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);
- Establishment of a Carbon Border Adjustment Mechanism (CBAM);
- Creation of a Social Climate Fund (FSAC);
- Revision of the Regulation on setting CO₂ emission performance standards for new passenger cars and light commercial vehicles;
- Revision of the Directive on the Deployment of Alternative Fuels Infrastructure (AFIR);
- Approval of the FuelEU Maritime and ReFuel Aviation Regulations with a view to promoting sustainable fuels;
- Revision of the Renewable Energy Directive (RED);
- Revision of the Energy Efficiency Directive (EED);
- Revision of the Energy Performance of Buildings Directive (EPBD);
- Revision of the Energy Taxation Directive (ETD)

Other European energy and climate strategies, such as the System Integration Strategy (COM (2020) 2999 final), the Hydrogen Strategy (COM (2020) 301 final)⁴, the Offshore Renewable Energy Strategy (COM (2020) 741 final)⁵, the Renewable Renewable Energy Strategy (COM (2022) 221 final)⁶, the Strategy on Adaptation to Climate Change (COM (2021) 82 final)⁷, the Strategy for Sustainable Carbon Cycles (COM (2021) 800 final)⁸ and the EU Action Plan for Digitalisation of the Energy System (COM (2022) 552 final), have also been adopted to deliver on the Union's increased ambition¹⁰.

The economic recovery following 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 in 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 prepared the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions entitled 'Off Gas for Safe Winter' (COM (2022) 360 final) and proposed the Solidarity Regulation to improve the coordination of gas purchases, cross-border gas transfers and reliable price benchmarks (COM (2022) 549 final).

High electricity market prices since September 2021, mainly due to the high price of gas used as a raw material to produce electricity, led to the adoption of Council Regulation (EU) 2022/1854 of 6 October 2022 calling for an emergency intervention to address high energy prices.

In addition, due to the impacts of the COVID-19 pandemic on the EU economy, national measures have been put in place 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 responding to the challenges of the climate and digital transition. This

⁴ Powering a climate-neutral economy: EU Strategy for Energy System Integration COM (2020) 2999 final
⁵ Hydrogen Strategy for a climate-neutral Europe COM (2020) 301 final
⁶ An EU Strategy to harness the potential of offshore renewable energy for a climate-neutral future COM (2020) 741 final.
⁷ EU solar energy strategy COM (2022) 221 final.
⁸ Sustainable carbon cycles COM (2021) 800 final.

⁹ Building a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change COM (2021) 82 final.

¹⁰ Digitising the energy system – EU action plan – COM (2022) 552 final.

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 which provides for measures consistent 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.

Taking into account the evolution of energy and climate policies and geopolitical circumstances since the NECP was drawn up, 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 reliance on fossil fuels, aligning action in key areas, investing in cost-effective and carbon-neutral technological solutions, promoting active participation of citizens and ensuring a fair and just 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 country in terms of climate policy, having exceeded the targets set under the Kyoto Protocol and the 2020 targets for reducing GHG emissions, energy efficiency and promoting renewable energy sources, and is in line with the 2030 targets.

At national level, the first step towards achieving the targets set in the 2030 European Climate and Energy Package was taken in 2015, with the adoption of the Strategic Climate Policy Framework (QEPIc), aimed at decarbonising the economy and putting the country in a better position to face the challenges created by the Paris Agreement. The QEPIc established an integrated, complementary and articulated framework of climate policy instruments for 2020/2030, in conjunction with air policies. The National Climate Change Programme (PNAC 2020-2030) was approved, which identifies the guidelines for policies and measures capable of ensuring compliance with the 2020 and 2030 emission reduction targets, and the National Strategy for 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 -18 % to -23 % in 2020 and from -30 % to -40 % in 2030 from 2005 levels, contingent on the outcome of the European negotiations, and sectoral GHG emission reduction targets were set.

The establishment of these targets was supported in the previous National Low Carbon Roadmap 2050 (RNBC), which was the first national long-term modelling exercise of national emissions. Already by that date, national emission reductions of between 50 % and 60 % compared to 1990 were found to be possible, corresponding to a reduction of 60 % to 70 % in the energy sector compared to 1990.

However, it was found that the emission reduction potential then modelled is outdated today, in particular as a result of a faster than anticipated evolution of technologies, leading to a revision of these targets as part of the work of the current RNC 2050 towards higher ambition in the medium and long term GHG emission reductions.

The Commission for Climate Action (CCS) was established in 2015 and established the National System of Policies and Measures (SPeM), which integrates policies and measures aimed at decarbonising the various sectors involved. The work carried out in the context of the SPeM and under the aegis 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 measures set out in this Plan.

As regards renewable energy and energy efficiency, and in the interests of integration, Portugal has relied on the National Renewable Energy Action Plan (PNAER 2020) and the National Energy Efficiency Action Plan (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 – Reducing inequalities.

At national level, the Portuguese government committed in 2016 to ensure its emissions neutrality 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 (RNC2050), which was the long-term low greenhouse gas emission development strategy submitted to the UNFCCC on 20 September 2019, was developed and endorsed. RNC 2050 identifies the main drivers of decarbonisation and lines of action to be pursued towards a carbon-neutral society by 2050.

Achieving carbon neutrality by 2050 requires reducing GHG emissions by 90 % compared to 2005 and achieving carbon sequestration levels of between 9 and 13 million tonnes of CO₂ in 2050. Achieving carbon neutrality by 2050 implies full decarbonisation of the power generation system and urban mobility, profound changes in the way we use energy and resources, a commitment to circular models, as well as boosting 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, more significant emission reductions are expected in the decade 2021-2030.

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

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

Following developments at national and European level, which prompted the adoption of new targets and the strategic framework on energy and climate, the targets set in the NECP 2030 are now out of date. The ongoing review process will be underpinned by a new modelling exercise in parallel with the revision of RNC 2050 to ensure alignment of policies, objectives and targets between the short and long term.

This document is the preliminary version of the revision of the NECP, submitted by Portugal to the European Commission in December 2019. This review 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 effectively delivered on EU and international commitments.

In this context, the 2030 National Energy and Climate Plan, approved by Council of Ministers Resolution No 53/2020 of 10 July, the Carbon Neutrality Roadmap 2050 (RNC 2050), approved by Council of Ministers Resolution No 107/2019 of 1 July, and the Basic Climate Law, approved by Law No 98/2021 of 31 December, are noteworthy. In addition, the National Programme for Spatial Planning Policy (PNPOT) and the Circular Economy Action Plan (CEAP), which embody the three main axes of environment and climate action policy, should be mentioned in cross-cutting terms. The articulation and interconnection of these three axes 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 phase 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:

- Carbon Neutrality Roadmap (RNC2050), approved by Council of Ministers Resolution No 107/2019 of 1 July;
- National Strategy for Adaptation to Climate Change (ENAAC 2020), approved by Council of Ministers Resolution No 56/2015 of 30 July, which also established the National System of Policies and Measures subsequently regulated by Council of Ministers Resolution 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 2011;
- National Air Strategy (ENAR 2020), approved by Council of Ministers Resolution No 46/2016 on 26 August;
- Circular Economy Action Plan (CEAP), approved by Council of Ministers Resolution 190-A/2017;
- National Programme for Spatial Planning Policy (PNPOT), approved by Law No 99/2019 of 5 September 2011;
- National Programme for Territorial Cohesion (PNCT), approved by Council of Ministers Resolution No 72/2016 of 24 November 2011;
- National Action Programme to Combat Desertification 2014-2024 (PANCD), approved by Council of Ministers Resolution No 78/2014 of 24 December;
- National Strategy for Sustainable Cities 2020, approved by Council of Ministers Resolution No 61/2015 of 11 August;
- National Strategy for Green Public Procurement (ENCPE 2020), approved by Council of Ministers Resolution No 38/2016 of 29 July;
- National Strategy for Nature Conservation and Biodiversity 2030 (ENCNB 2030), approved by Council of Ministers Resolution No 55/2018, 7 May;
- National Environmental Education Strategy (ENEA 2020) for the period 2017-2020, approved by Council of Ministers Resolution No 100/2017 of 11 July;
- European Emissions Trading Scheme (ETS), Decree-Law No 38/2013 of 15 March 2012 and Decree-Law No 93/2010 of 27 July 2012.

New TRANSVERSAIS Policies and Measures:

- The Basic Climate Law, approved by Law No 98/2021 of 31 December 2015;
- Public Administration Resource Efficiency Programme for the period up to 2030 (ECO.AP 2030), approved by Council of Ministers Resolution No 104/2020 of 24 November;
- National Strategy for Green Public Procurement 2030 – ECO360, approved by Council of Ministers Resolution No 13/2023 of 10 February;
- Horizon 2025 Sustainable Bioeconomy Action Plan (PABS), approved by 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 Council of Ministers Resolution No 120/2021 of September 01;
- Green Skills and Jobs programme, vocational training programme in the field of energy (Ministerial Implementing Order No 21/2023, of 6 January);
- Strategic guidelines on the exploitation of the potential of lithium minerals in Portugal, approved by Council Regulation No 11/2018 of 31 January 2008;
- Reform and simplification of environmental permits, approved by Decree-Law No 11/2023 of 10 February 2009.

Energy sector current policies and measures:

- National Hydroelectric Potential Dams Programme (PNBEPH);
- National Plan for the Promotion of Biorrefineries, approved by Council of Ministers Resolution No 163/2017 of 31 October 2007;
- Industrial Strategy and Ocean Renewable Energy Action Plan, approved by Council of Ministers Resolution No 174/2017 of 24 November 2008;
- The National Electricity System Security of Supply Monitoring Report and the National Gas System Security of Supply Monitoring Report of 2021 and 2022;
- The National Electricity Transmission Network Development and Investment Plan for the period 2022-2031;
- The National Transmission Network Development and Investment Plan, storage infrastructure and liquefied natural gas terminals for the period 2018-2027;
- Electricity Distribution Network Development and Investment Plan for the period 2023-2025;
- Natural Gas Distribution Network Development and Investment Plans for the period 2019-2023.

New Energy Sector Policies and Measures:

- Energy certification system for buildings, regulated by Decree-Law No 101-D/2020 of 7 December 2006, as amended
- Long-term Strategy for the Renovation of Buildings (LTRS), approved by Council of Ministers Resolution No 8-A/2021 of 3 February 2007;
- National Hydrogen Strategy (EN-H2), approved by Council of Ministers Resolution 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 (PRP), January 2023;
- Mechanism for decoupling the price of natural gas from MIBEL, Decree-Law 33/2022, of 14 May, as amended;
- Energy saving plan approved by Council of Ministers Resolution No 82/2022 of 27 September 2009.

Current policies and measures of the RESIDUE AND WATES sector:

- Strategic Plan for Urban Waste (PERSU 2020 +), approved by Ministerial Implementing Order No 241-B/2019 of 31 July;
- National Water Plan, approved by Decree-Law No 76/2016 of 9 November 2015;
- Hydrographic Region Management Plans (RBMPs) for the 2th cycle (2016-2021), approved by Council of Ministers Resolution No 52/2016 of 20 September, corrected and republished by Corrigendum No 22-B/2016 of 18 November;
- Legal framework for the production and use of reclaimed water, obtained from waste water treatment, approved by Decree-Law No 119/2019 of 21 August 2011;
- National Strategy for Combating Food Waste (ENCDA), approved by Council of Ministers Resolution No 46/2018 of 27 April 2011;
- Strategic Plan for Water Supply and Sanitation of Waste Water (PENSAAR 2020), approved by Order No 4385/2015 of 30 April.

New Policies and Measures for RESIDUE AND WATES:

- National Waste Management Plan 2030 (PNGR), approved by Council of Ministers Resolution No 31/2023 of 24 March;
- Hydrographic Region Management Plans (RBMPs) of the 3th cycle (2022-2027) under finalisation;
- National Strategy for the Reuse of Waste Water and Action Plans for the 50 largest urban waste water treatment plants in the country by 2020¹¹, under preparation;

¹¹So that treated waste water can then be used for other purposes (e.g.: watering, supplying fire brigade, street washing or car washing).

- National Strategic Plan for Water Supply and Wastewater Sanitation Services 2020-2030, under approval.

Current policies and measures of the AGRICULTURE AND FLORESTES sector:

- Rural Development Programme 2014-2020 (RDP 2020), approved by Commission Implementing Decision C (2014) 9896 of 12 December 2014;
- National Strategy for Agricultural and Agro-Industrial Efluentes (ENEAPAI) 2018-2025, under review;
- National strategy for sludge management, in the process of being finalised;
- Code of Good Agricultural Practice (CBPA), approved by Order No 1230/2018 of 5 February 2015;
- National Forest Strategy (NFE), update approved by Council of Ministers Resolution No 6-B/2015 of 4 February 2011;
- National Strategy for the Promotion of Cereals Production, approved by Council of Ministers Resolution No 101/2018 of 26 July 2008;
- National Strategy for Organic Farming (ENAB), approved by Council of Ministers Resolution No 110/2017 of 27 July 2011;
- National Regadios Programme, approved by Council of Ministers Resolution No 133/2018 of 12 October 2009.

New Sectoral Policies and Measures of AGRICULTURE AND FLORESTES:

- The Landscape Transformation Programme, approved by the Council Resolution of Ministers No 49/2020, 24 June 2020
- National Strategy for Agricultural and Agro-Industrial Efluentes 2030, approved by the Council of Ministers Resolution No 6/2022 of 25 January 2015;
- Common Agricultural Policy Strategic Plan (PEPAC 2021-2027)
- Innovation Agenda for Agriculture 2020-2030, approved by Council of Ministers Resolution No 86/2020 of 13 October 2020

Current policies and measures in the sector of MOBILITIES AND TRANSPORT:

- The strategic Transport and Infrastructure 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 Cleanable Active Mobility (EMNAC) 2020-2030, approved by Council of Ministers Resolution No 131/2019 of 2 August.

New MOBILITIES AND TRANSPORT Sectoral Policies and Measures:

- The National Railway Plan (NFP), under development;
- National Strategy for Active Personal Mobility 2030, under development;
- Strategy for increasing the competitiveness of the Continent Commercial Ports Network – Horizon 2026, approved by Council of Ministers Resolution 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 (NIP 2030).

Current policies and measures in the sector of INVESTIGATION and INNOVATION:

- Research and Innovation Strategy for Smart Specialisation EI & I, 2014-2020, adopted on 23 December 2014;
- Thematic agendas for research and innovation 2030, following Council of Ministers Resolution No 32/2016 of 3 June;
- Thematic Agenda for | Research and Innovation 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 2006 approving the reform of green taxation;
- Financial support for electric mobility and the purchase of less emitting vehicles in the fleets public transport;
- Support Programme for Tariff Reduction (PART), approved by Order No 1234-A/2019 of 4 February 2015;
- Programme for the Remuneration of Ecosystem Services in Rural Spaces (2019-2038), approved by Council of Ministers Resolution No 121/2019 of 30 July;
- Phasing out of coal tax exemptions by 2030, State Budget Act 2018.

New FINANCIAL Policies and Measures:

- Portugal 2030 strategy, approved by Council of Ministers Resolution No 98/2020 of 13 November 2020;
- Portugal 2030 programmes (Competitiveness 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 dedicated REPowerEU chapter).

Regional framework

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 political, legislative and administrative powers. In areas 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 to the Energy Union dimensions – decarbonisation, energy efficiency, energy security, internal energy market and research, innovation and competitiveness – are identified below:

AUTONOMOUS REGION OF THE AZORES

Current TRANSVERSAIS policies and measures:

- Regional Strategy on Climate Change (ERAC), approved by Council of Government Resolution No 123/2011 of 19 October 2008;
- Regional Climate Change Programme (PRAC), approved by Regional Legislative Decree No 30/2019/A of 28 November 2015;
Territorial Management Instruments;

New TRANSVERSAIS Policies and Measures:

- Roadmap for Carbon Neutrality of the Azores, under development
- Roadmap for the Regional Circular Economy, under development.

Energy sector current 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 (PRAEE), under development;
- Programme for Energy Efficiency in Public Administration (ECO.AP Azores), approved by Regional Legislative Decree No 19/2019/A of 6 August 2015;

- 'PROENERGIA' (system of incentives for the production and storage of energy from renewable sources), approved by Regional Legislative Decree No 5/2010/A of 23 February 2009, as amended;
- EDA Multiannual Strategic Plan and Budget (pepo);
- Strategy for the incorporation of renewable technologies for energy production in fisheries

New Energy Sector Policies and Measures:

(...) (A) SOLENERGE programme – financial incentives for acquisition solar systems photovoltaic – approved by Regional Regulatory Decree No. 17/2022/A of 8 September.

Current policies and measures in the sector of MOBILITIES AND TRANSPORT:

- Strategy for the Implementation of Electric 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 sector of MOBILITIES AND TRANSPORT:

* Electrical Mobility Incentive Programme, approved by Council of Government Resolution No 49/2020 of 5 March 2009.

Current policies and measures in the sector of waste:

- 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 2009.

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 Council of the Government Resolution 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 2009 (to be updated in the short term);
- Regional Agenda for Circular Economy;
- Regional Energy and Climate Plan for the Autonomous Region of Madeira, under preparation.

Energy sector current policies and measures:

- Madeira Island Sustainable Energy Action Plan under recast/update;
- Sustainable Energy Action Plan for the island of Porto Santo, under redrafting/updating.

Current policies and measures in the sector of MOBILITIES AND TRANSPORT:

- Action Plan on Sustainable Urban Mobility of the Autonomous Region of Madeira (PAMUS-RAM), approved by Council of Government Resolution No 378/2019 of 21 June 2011;
- Integrated Strategic Transport Plan for the Autonomous Region of Madeira (PIETRAM) 2014-2020.

Current policies and measures in the sector of waste:

- Waste Strategy Paper 2020-2030.

1.2.3. Key issues of cross-border relevance

In this context, it is worth noting the agreement drawn up in 2006 between the Portuguese Republic and the Kingdom of Spain in the context of the creation of the Iberian Electricity Market (MIBEL), setting a target for the establishment of interconnectors with a commercial capacity of 3 000 MW, in order to foster and enhance price convergence between the two markets and to enhance security of supply.

Regional cooperation for cross-border interconnections is a key issue, as 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, reducing dependence on fossil fuels and further decarbonising the economy. This process started in 2015 with the signature of the Madrid Declaration, evolved with the signature of the Lisbon Declaration in 2018 and the Alicante Summit was most recently concluded in December 2022.

In November 2018, the Valladolid Declaration between Portugal and Spain was signed, in which the two governments stressed 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 building on 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 functioning of MIBEL's internal and external interconnection. Other Luso-Spanish Summits followed, keeping these topics in their objectives, the last one having been held, with the signature of a declaration, in March 2023 in Lanzarote, Spain.

On 20 October 2022, the governments of Spain, France and Portugal agreed on a commitment they ratified at the Euromed Summit of 9 December 2022 – Alicante Summit – to create a green corridor for 100 % hydrogen ('H2Med') to connect the Iberian Peninsula to the rest of Europe, creating the hydrogen infrastructure needed to enable the development of a pan-European hydrogen market.

In March 2023, at the XXXIV Luso-Spanish, Portugal and Spain Summit, they reiterated the commitment to implement 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 exporting region of renewable hydrogen, committing to further strengthen 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 in that it makes it possible to check the 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 and adapt them to the new, more inclusive reality between energy and climate policies.

To this end, the National System of Policies and Measures (SPeM), created by Council of Ministers Resolution No 56/2015 of 30 July 2012, and subsequently regulated by Council of Ministers Resolution No 45/2016 of 26 August 2009, is used to monitor policies and measures and projections with an impact on the energy transition.

This system fosters debate, design and assessment of progress in implementing policies and measures contributing to GHG emission reductions and the 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 largely derive from the requirements previously contained in Regulation (EU) No 525/2013 of the

European Parliament and of the Council of 21 May 2013 (MRM).

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

Due to 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, through the construction of indicators and the identification of 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 different sectors of the economy and society, it is essential that the governance model translates into political commitment and is delivered through effective support and action on the progress of the transition. Thus, the coherent articulation of the various components set out in this Plan requires the definition of a system of governance, with appropriate instruments, without prejudice to the specific competences assigned to the various sectors.

The political commitment to the transition to a competitive, resilient, carbon-neutral and circular economy, in a context of full integration with economic growth objectives, led to the establishment in 2015 of the Inter-ministerial Commission on Air, Climate Change and Circular Economy (CA2), now renamed the Climate Action Commission (CCS), which is chaired by the member of government responsible for the environment, climate action and energy transition and integrated by the government departments of energy areas, spatial planning, finance, agriculture, sea, economy and innovation, transport, health, tourism, civil protection, regional development, local government, foreign affairs and cooperation, education and science, and representatives of the regional governments of the Azores and Madeira.

This Commission provides policy orientations on climate change and air, and has the task of promoting the articulation and mainstreaming of climate change policies into sectoral policies, and monitoring the implementation of relevant sectoral measures, programmes and actions that will be adopted. The specific responsibilities of CCS are set out in Order No 2873/2017 of 6 April 2017, with particular reference to monitoring compliance with the commitments made by Portugal at national, Community and UN level, promoting and monitoring the relevant national plans on climate change and circular economy, validating policy options and measures proposed in the field of mitigation and monitoring, and supporting the definition of national positioning in international negotiations.

Thus, adapting the existing governance structures at national level, the Commission now monitors energy policy and sectoral policies with an impact on national air, climate change, circular economy and energy objectives, taking into account the synergies between them, with the Commission promoting, monitoring and monitoring the NECP.

The model put in place aims to secure long-term political commitment, as the transition to a carbon-neutral society is a matter of utmost national and international relevance and has significant impacts on the economy and society, while it is 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 of CCS¹², as a political advocacy and decision-making structure. The CAC is responsible for the promotion, supervision and monitoring of the NECP. In the context of the policy coordination of the NECP, close coordination with other inter-ministerial committees should be ensured, given the relevance of the topic to European development policy and financing, as well as to the fulfilment of national commitments such as the SDGs.

The **technical coordination** of the NECP shall be the responsibility of the Coordination Group, shall aim to coordinate and promote the preparation and revision of the NECP, to ensure the articulation of the national contribution for the purpose of fulfilling 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 **NECP monitoring and projections system** is based on the current system (SPeM) established by Council of Ministers Resolution No 45/2016 of 26 August 2009, which aims to: involve and strengthen the accountability of sectors in integrating the climate dimension into sectoral policies; monitor, monitor and report on the implementation of policies and measures and their effects; ensure that projections of GHG and other air pollutant emissions are reported; assess compliance with national obligations, including sectoral targets.

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

The CAC works 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 advising 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, it is up to the CCS to issue an opinion on climate policy instruments, including on the NECP2030. The CAC is supported by a technical support structure, which includes the services of the Assembly of the Republic.

As provided for in the LBC, planning instruments such as RNC 2050 and PNEC 2030 are discussed and voted on by the Assembly of the Republic.

¹² Established by Council of Ministers Resolution No 56/2015 of 30 July (QEPIC) and amended by Resolution of the Council of Ministers No 190-A/2017 of 11 December (PAEC), the specific competences of which are laid down in Order No 2873/2017 of 6 April, which is under revision, in order to ensure that it is adapted to the new energy and climate policy framework established by the NECP 2030.

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

1.3.1. Involvement of the national parliament

In accordance with the Constitution of the Portuguese Republic, it is the responsibility of the Government, within the framework of its administrative powers, to carry out all the measures necessary to promote economic and social development and to meet collective needs, including the drafting of the revision of the National Energy and Climate Plan 2030 (PNEC 2030), published by Resolution of the Council of Ministers No 53/2020 of 10 July, which is currently under way.

As foreseen in the CLLD, the final version of the NECP 2030, to be submitted by 30 June 2024, should be preceded by a public consultation, the opinion of the Climate Action Council and will be approved by the Assembly of the Republic.

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 NECP 2030 takes place through a consultation process which includes meetings and pre-hearing events.

From the outset, meetings were held with the participating entities of the National System of Policies and Measures (SPeM) and the Coordination Group of the National Strategy for Adaptation to Climate Change (GC ENAAC) in order to raise awareness of the ongoing review and gather input from the bodies, strengthening the review process.

As part of the NECP platform project, it was also possible to participate in the first of six multilevel dialogues organised by ZERO – Associação Terrestre Sustentável (National Non-Profit Association) between the second quarter of 2023 and the end of 2024.

The NECP platform project, co-funded by the European Union under LIFE Grant Agreement No 101076359, aims to support the establishment of Climate and Energy Dialogues by providing multi-actor exchange platforms. This first session was attended by different local and regional representatives, as well as the NECP co-coordinating bodies, and gave an insight into the main concerns identified by the different regions/cities. The transport sector has generally been identified as one of the main sectors to be targeted in the energy and climate transition of the next decade.

It should also be noted that the CLLD foresees the preparation by February 2024 of Regional Climate Action Plans, Municipal Climate Action Plans and Sectoral Climate Change Mitigation and Adaptation Plans, which are planned to be developed in line with the objectives and targets defined in the Carbon Neutrality Roadmap and NECP 2030.

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

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

In the course of the technical work of the process of revising and updating the NECP 2030, institutional and civic participation, as well as the monitoring and active cooperation of bodies representing the various sectoral interests, were promoted through various discussions. This exercise was based on a dialogue with society, and technical sessions were held with stakeholders from 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 collection period for written

contributions).

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

As part of the preparation of the preliminary review of the NECP 2030, a regional périple of participatory assemblies, involving the areas of energy and climate governance and regional development, and the Portuguese Environment Agency, I.P. and the Directorate-General for Energy and Geology, co-coordinating the revision of the NECP 2030, were promoted. Between May and June 2023, five sessions (Vila Nova de Famalicão, Silves, Coimbra, Lisbon and Évora) took place involving society and aimed at: (I) the involvement of civil society in the process of updating and revising the NECP 2030; (II) raising awareness of the strategic objectives of the NECP 2030; and (iii) the collection of input that will benefit the preparation of the draft update of the PNEC2030.

Public consultation

As part of the review of the PNEC2030, the prior public consultation process took place in two separate periods. The first prior hearing 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 2030 NECP. In this process, 59 participations were obtained from the various sectors of the economy and society, the contributions of which were analysed and incorporated into the version of the NECP now presented.

To sum up, the majority of respondents 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 36 % as unambitious, with the transport sector identified as having the greatest potential to increase ambition on GHG reduction, incorporation of renewables and improvement of energy efficiency.

The decarbonisation and energy efficiency dimensions are those which, according to the respondents, require more attention in the review process of the NECP 2030, and where the allocation of public funding is considered to be the most pressing. In general, respondents consider that new or revised existing policies and measures should be defined for most of the eight objectives set out in the NECP 2030. The focus on public transport, just transition and energy poverty, strengthening the circular economy and increasing ambition in renewable energy generation were the topics selected as the most relevant in the review of the NECP 2030.

All participations, including their treatment, shall be set out in a prior consultation report, which [shall be](#) made publicly available.

The second period of public consultation will take place in 2024, following receipt and incorporation of the Commission's recommendations on the draft revision submitted in June 2023.

Strategic environmental assessment

In order to comply with Decree-Law No 232/2007 of 15 June 2030 laying down the arrangements for assessing the effects of certain plans and programmes on the environment, transposing 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 NECP currently in force.

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 factors, relevant for the national territory, in terms of environment and sustainability, covering the sectors covered by the NECP.

Therefore, since 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, which 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 participating in the Committee for the Energy Union and Climate Action and the European Commission's Technical Working Groups on the Integrated Energy-Climate Plans (Working Group 2 of the Energy Union Committee), maintaining an open communication with the European Commission and the other Member States. Portugal has regularly kept the European Commission informed of the ongoing work on the revision of this Plan through the state of play of the meetings of this group and other exchanges of information, through questionnaires or bilateral meetings.

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

In the process of updating the NECP 2030, Portugal participated in the workshop held on 8 September 2022 by the Commission with a view to drawing up guidelines for Member States on the process of updating national plans.

1.4. Regional cooperation in preparing the plan

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

The coordination of the policies and measures planned in the NECP 2030 has been promoted with other Member States during the NECP development process which is now in the process of being reviewed, through two initiatives aimed at implementing regional cooperation under Article 12 of Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.

The first initiative was promoted by the Government of the Republic of France, in which Portugal participated together with other countries, including Switzerland, and was a presentation session of the French NECP. This initiative discussed the issues associated with the definition of the plans on the basis of the NECP presented.

The second initiative was promoted by the Government of the Kingdom of Spain, in which Portugal and France participated, and in which the countries presented their NECPs, discussed the internal energy market and energy security, in particular in the field of energy interconnections.

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 has, as part of its foreign policy, promoted various interactions with neighbouring MS, in particular with Spain, during the process of developing the NECP in 2019, in order to ensure an appropriate level of involvement and agreement in areas of cooperation. This process is maintained with some regularity in the framework of the Luso-Spanish Summits, as mentioned in point 1.2.3.

Some of the topics of major 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 on 9 December 2023 in Alicante (Spain).

2. NATIONAL OBJECTIVES AND TARGETS

2.1. Decarbonisation dimension

2.1.1. Targets for GHG emissions and removals

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

Under 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 (the Effort Sharing Regulation) on binding annual GHG emission reductions by Member States from 2021 to 2030, a new Union target was established to reduce its GHG emissions by 40 % by 2030 compared to 2005 levels in the sectors not covered by the EU ETS (non-ETS). The revision of this Regulation, which results from the 'FIT-for-55' package, thus updates the previously established GHG emissions reduction target, putting the EU on a path that is in line with climate neutrality in 2050.

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

Table 4 – Non-ETS sector CO_{2eq} emissions reduction target (s\ LULUCF) compared to 2005

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

In order to meet the new 2030 target, the annual emission limits (EEA) set out in Annex II to Commission Implementing Decision (EU) 2020/2126 of 16 December 2020 have been revised, resulting in a more ambitious non-ETS emission reduction trajectory. In this context, it should be clarified that the limits foreseen for 2021 and 2022 have not been amended and the figures provided for in that Decision remain in force. The same applies to 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. To sum up, the figures for the subperiod 2023-2025 have now been revised and will be published in a new Decision.

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

Table 5 – Emissions limit for Portugal in the non-ETS sectors (Mt), established by the Effort Sharing Regulation for 2005¹³

	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 submitted for the subperiod 2026-2030 will be subject to review 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 will also apply to international shipping, road transport, buildings and other industrial sectors, the scope of the Effort Sharing

Regulation remains.

ii. The Member State's commitments under Regulation (EU) 2018/841

Under 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 (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 strengthened for that sector.

This amendment stems from the "FIT-for-55" package and aims to accompany the increased ambition and contribute to achieving the new 55 % net GHG emission reduction target 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 set out in the new Regulation will be implemented in two stages, with the first phase, running until 2025, maintained the system currently in place, whereby Member States should ensure that emissions from LULUCF do not exceed removals from LULUCF (the rule known as '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, Portugal must ensure that the sum of GHG emissions and removals in the LULUCF sector achieved in 2030 does not exceed, after the application of the flexibilities provided for in the Regulation, the target of – 1 358 000 TCO_{2eq}.

In addition, Portugal and the other MS are also committed to achieving a certain amount of net GHG emissions and removals for the period 2026-2029 ("budget 2026-2029") pursuant to Article 4 (4) of the above-mentioned Regulation.

To this end, and anticipating some difficulty in reaching 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 will be properly monitored over the period 2021-2030, in line with the evolution of GHG emissions and removals resulting from the LULUCF sector.

¹³ the emission limits submitted for 2021-2022 and 2026-2030 were calculated pursuant to Commission Implementing Decision (EU) 2020/2126 of 16 December 2020. For the subperiod 2023-2026, the calculation used will be reflected in a new Decision to be published during the first half of 2023.

The LULUCF Regulation also lays down rules for the accounting of emissions and removals from the LULUCF sector and for the assessment of Member States' compliance with commitments, defining that the accounting of emissions and removals resulting from managed forest land should 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 CO₂ equivalent per year, of the average annual net emissions and is calculated and presented by each MS in the National Forestry Accounting Plan for the subperiod 2021-2025.

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

Based on the methodologies, data and assumptions explained in section 3 "Description of 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 at 10 556 GgCO_{2eq}.year⁻¹ (including the contribution of forest products following the "instantaneous oxidation" approach).

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 reducing GHG emissions,

including sectoral targets and adaptation objectives

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

Table 6 – National CO_{2eq} emission reduction target (without LULUCF) compared to 2005

OTHER NATIONAL TARGETS	2030	2040	2050
PNEC2030	– 45 % to -55 %	65 % to 75 %	– 85 % to -90 %
Revision of the PNEC2030	– 55 %	65 % to 75 %	– 90 %

The figure below illustrates the trajectory to reduce total GHG emissions towards 2030, in line with the commitment to reach carbon neutrality in 2050.

Figure 13 – Evolution of GHG emissions and reduction targets set for 2030 (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, so it will be necessary to ensure that the 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 the degree of maturity of the technologies and cost-effectiveness. Thus, in the current decade, the decarbonisation process is expected to be more pronounced in electricity generation, transport and buildings. At sectoral level, the following national targets have been set for the 2030 horizon (non-ETS sectors):

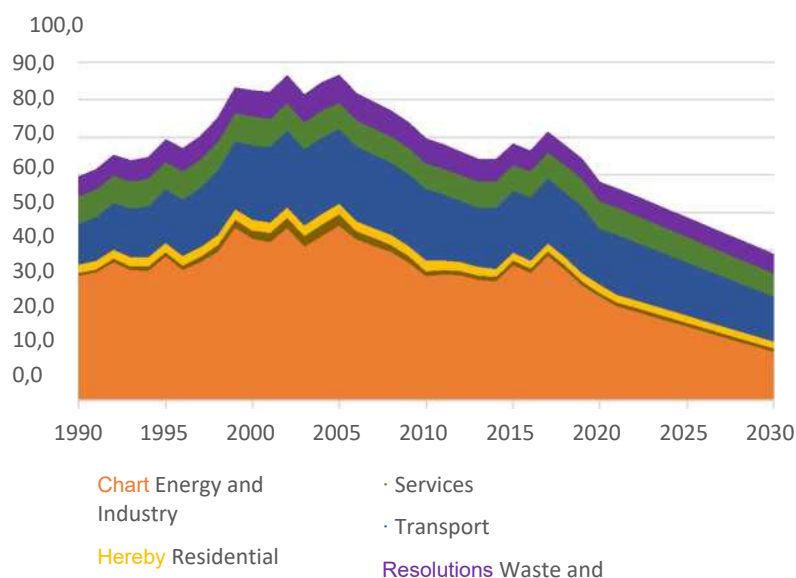
Table 7 – Sectoral national CO_{2eq} emission reduction targets compared to 2005

	2020	2030
Services	— 65 %	— 70 %
Residential	— 14 %	— 35 %
Transport	— 14 %	— 40 %
1 agriculture	— 8 %	— 11 %
Waste and Waste Water	— 14 %	— 30 %

It should be noted that the revision of these targets could be considered after the finalisation of the work on the revision of the NECP 2030.

Emissions in 2020 confirm a trajectory to meet 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 that the respective sectoral target for 2030 is met.

Figure 144 – Greenhouse gas emissions by sector and reduction targets set in Horizon 2030 (Mt CO_{2eq})



2.1.2. Renewable energy targets

i. Contribution to the Union's binding target of at least 32.5 % renewable energy in 2030 in terms of the share of energy from renewable sources in gross final consumption of energy in 2030

On renewable energy, Portugal has a strong case to continue building 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 the contribution to the Union's binding target of reaching at least 32.5 % renewable energy by 2030 in terms of the share of energy from renewable sources in gross final energy consumption is among the most ambitious at European level.

Table 8 – Indicative path and contribution of Portugal to the binding Union target in 2030

Renewables in gross final energy consumption ¹⁴	2020	2022	2025	2027	2030
NECP 2030	31 %	34 %	38 %	41 %	47 %
Revision of the 2030 NECP	31 %	34 %	39 %	43 %	49 %

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) the potential.

¹⁴The indicative trajectory for the evolution of renewable energy in Portugal respects the reference points defined in the Regulation on the Governance of the Energy Union and Climate Action, more precisely Article 4(a) (2), where the indicative trajectory is expected to reach the respective reference points by 2022, 2025 and 2027 of at least 18 %, 43 % and 65 % of the total increase in the share of renewable energy between the national binding target for 2020 and 2030.

In particular, the main *drivers* have been defined to achieve a 49 % share of renewables in final energy consumption in 2030, focusing on electrification of the economy and consumption, evolution of installed capacity and renewable electricity generation, strong penetration of electric vehicle and other sustainable mobility solutions, introduction of renewable gases, high-efficiency technologies in various sectors, and research and innovation/maturation of alternative cost reduction technologies.

Equally important is the promotion of the establishment of power generation centres that bring energy production closer to energy consumption, enabling progress towards an increasingly decentralised model, with a focus on individual and collective self-consumption solutions, with advantages in terms of losses in energy distribution and transmission, among others.

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

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



ii. Estimated trajectories for the sectoral share of renewable energy in final energy consumption from 2021 to 2030 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 have been set for 2030:

Table 9 – Estimated pathways for the sectoral share of renewable energy in final energy consumption towards 2030

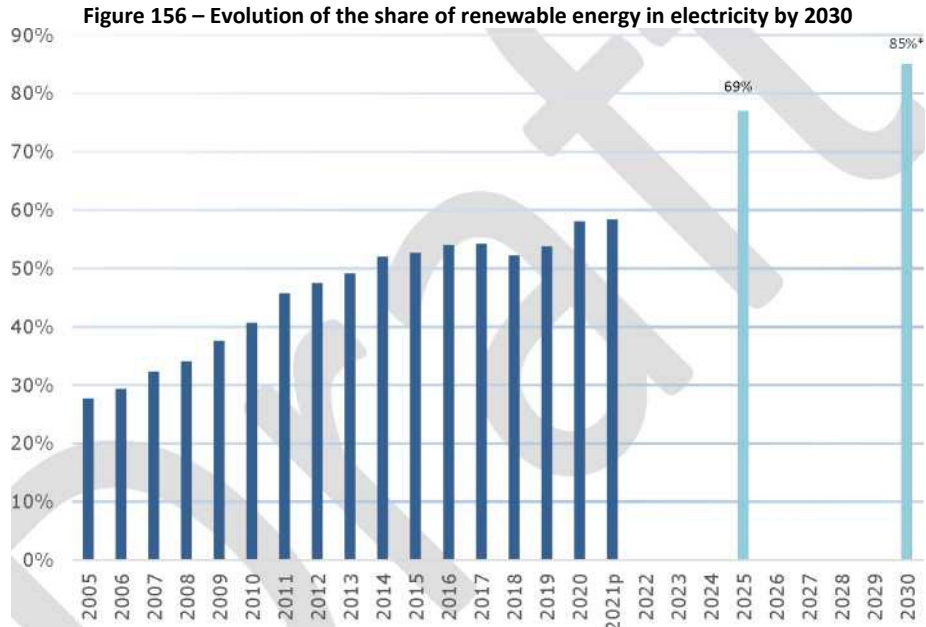
	PNEC2030			Revision PNEC2030	
	2020	2025	2030	2025	2030
Electricity	60 %	69 %	80 %	77 %	85 % *
Heating and catering	34 %	36 %	38 %	43 %	47 %
Transport	10 %	13 %	20 %	10 %	23 %

* This figure does not take into account the consumption of electricity for hydrogen production, as a European methodology for this is not yet defined (in the context of SHARES, Eurostat). Considering this consumption component and the electricity system as a whole, this share is equivalent to 90 %.

With regard to the electricity sector, there is a prospect of a strong increase in the electrification of consumption, the acceleration of the enhancement of the exploitation of renewable energy potential with a particular focus on *onshore and offshore* solar and wind technologies, in parallel with the promotion of distributed generation, the promotion of storage systems, the reinforcement and optimisation of infrastructure and the promotion of pilot projects (concentrated solar thermal, stimulated geothermal and waves). In this case too, the importance of power plants is recognised in bringing production closer to energy consumption, allowing for a shift towards an increasingly decentralised model. 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 a huge potential to exploit indigenous resources for electricity production, 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.



* As mentioned above, the figure to be reached in 2030 does not take into account the consumption of electricity for hydrogen production, as a European methodology for this is not yet defined (in the context of Eurostat SHARES). Considering this consumption component and the electricity system as a whole, this share is equivalent to 90%.

In this context, with regard to electricity production, it is worth noting in particular:

Hydroelectricity

Enhance the use of the national hydropower potential, in particular by completing the construction of the Alto Tâmega hydroelectric complex consisting of three hydroelectric plants – Gouvães (pumped), Alto Tâmega (turbination) and Daivões (turbination) – which together account for 1.2 GW of new capacity, with only the completion of the use of the Alto Tâmega planned for 2024. This complex will also contribute to improving security of supply through its pumping capacity.

In the Autonomous Region of Madeira, increasing the use of hydroelectric potential will be achieved by extending Calheta's hydroelectric plant.

Onshore wind

Portugal has untapped wind potential, however, attention should be paid to the current wind farms, giving them the conditions to become more competitive. To this end, the strategy to strengthen *onshore* wind involves over-equipping and the

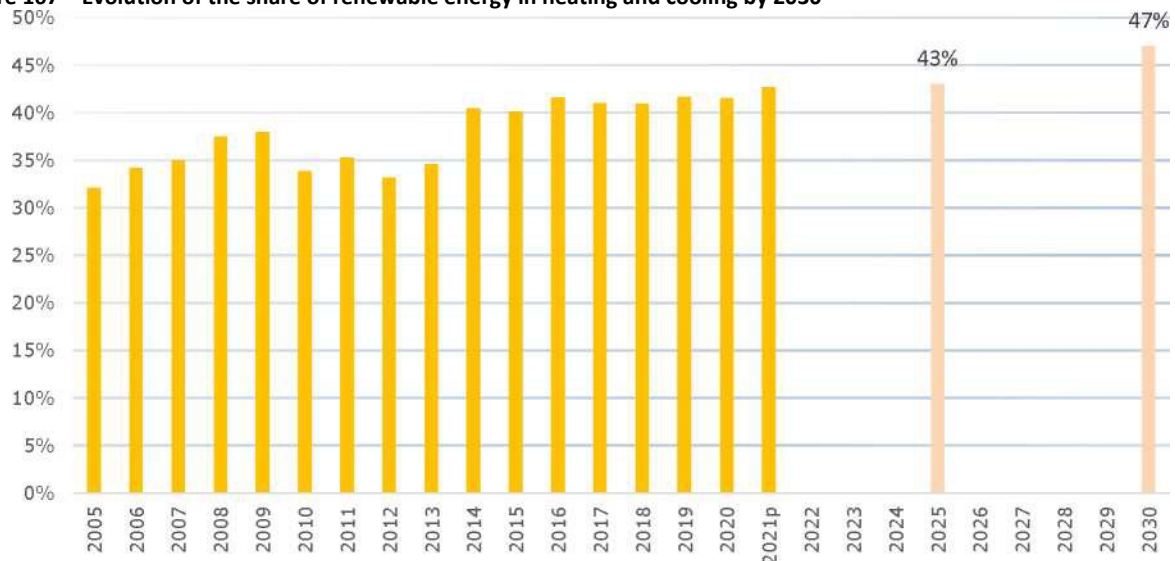
	reequipment/ <i>repowering</i> , creating the necessary conditions for enabling these options.
Solar Photovoltaic	<p>The drastic reduction of technology costs and the extraordinary national potential for using the sun as a source for electricity production make this technology key to achieving the objectives. The two main tools that will be used to accelerate the development of solar capacity in Portugal will be: (i) auctions for the allocation of injection capacity into the grid and (ii) the possibility for developers to develop grid reinforcements with the network operator in situations where there is no reception capacity (ideally for large projects).</p> <p>In the interests of complementarity with centralised energy production instruments, the promotion and dissemination of decentralised energy production from renewable energy sources and energy communities, which will grow very significantly by 2030, deserve particular importance.</p>
Biomass	<p>Forest biomass is an important endogenous resource, so energy recovery under certain conditions is a solution that contributes to creating value in the forestry sector. Biomass energy recovery is also considered, from a forest management perspective, as a form of forest fire prevention.</p>
Geothermia	<p>The Autonomous Region of the Azores has the potential to increase the exploitation of geothermal resources, and an increase in installed capacity is therefore envisaged with the aim of achieving maximum production in relation to the available resource. Support for deep geothermal pilot projects could be envisaged, given the reduction in recorded drilling costs, and the fact that it is a technology for dispatchable electricity production.</p>
Solar Thermal Concentrate	<p>Pilot projects based on Concentrated Solar Thermal Technologies will be promoted as a technology enabling energy storage.</p>
Offshore wind	<p>Promotion and exploitation of the infrastructure set up off Viana do Castelo, with the 25 MW installation allocated to the Windfloat Atlantic project. The identification of maritime deployment areas, compatible development needs for port infrastructure and points for connection to the National Electricity Transmission Network is ongoing, with the aim of installing up to 2 GW of new capacity in ocean location by 2030. Capacity allocation models are also under consideration and the 1th <i>offshore</i> project-oriented electricity grid injection allocation auction is under preparation, to be held by the end of 2023. Promoting and exploiting available wind resources on the Portuguese mainland by creating new areas in the National Maritime Spatial Planning Plan for the installation of <i>offshore</i> renewable energy. These new areas aim to start a phased auction process with a view to allocating 10 GW by 2030, where much of the capacity will be installed after 2030.</p>
Waves	<p>The potential of wave energy in Portugal is recognised and pilot projects should be supported and their expansion into new areas should be allowed. There are two technologies being tested in Portuguese waters and a wave energy park is planned to be set up in one of these projects. Spaced maritime areas for <i>offshore</i> power plants have a relevant resource for the exploitation of wave energy and are also open for the installation of capacity based on these technologies.</p>
Hybrid systems	<p>The promotion of hybrid systems will give more flexibility to the system and efficient use of resources, given the possibility of complementarity between forms/sources of energy (wind, wave and solar) while maximising grid connection capacity. The Portuguese legislation was updated in 2022 to provide legislative framework and densification of hybridisation.</p>
Coal	<p>The <i>phase-out</i> of coal-fired electricity generation, scheduled to take place by 2023, was completed in 2021, in particular by closing the two plants operating in mainland Portugal – Pego and Sines.</p>
Gas	<p>It plays an important role in the transition to a renewable-based energy system, with natural gas being used as <i>backup</i> of the power generation system. Its use is expected to be gradually reduced, in line with the objectives of the Climate Law, which provides for a ban on the use of fossil natural gas for the production of</p>

electricity from 2040, provided that security of supply is ensured. For the national gas system, blending of renewable hydrogen and other renewable gases such as biomethane is also envisaged, considering a blending percentage of 10 to 15 % by volume by 2030 in the RNTG (in line with the National Hydrogen Strategy currently in place but also in the process of revision, which could be revised). 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 possible.

As regards the heating and heating sector, the share of fossil fuel consumption at sectoral level is expected to decrease, as energy efficiency measures and electrification of consumption are stepped up. In this context, it will be possible to increase the share of renewable energy use through increased use of renewable biomass and gases.

It should be noted that Portugal is one of the countries of the European Union where it may not be possible to increase the share of renewable energy sources by 1.3 % or 1.1 % per year in the heating and catering sector, in accordance with Directive (EU) 2018/2001. However, given that renewable gases, such as biomethane and renewable hydrogen, are expected to play a greater role by 2030, this outlook could change in the short to 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 that, at the modelling level, it was possible to include in this Plan data on heat pumps to the same extent as they were accounted for in the calculation of the contribution of renewable energy to gross final energy consumption in the heating and cooling sector, which explains the evolution compared to historical developments (2005-2018) and projections for this sector.

Figure 167 – Evolution of the share of renewable energy in heating and cooling by 2030



Increasing the uptake of renewables in the heating and cooling sector, and thereby meeting the target for this sector, will include:

Biomass	Forest biomass is an important indigenous resource, so energy recovery under certain conditions is a solution that contributes to the share of renewable energy. The strategy includes decarbonising existing thermal consumption and promoting energy efficiency, including by promoting the installation of small decentralised biomass thermal plants (e.g.: cogeneration), minor
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High-efficiency cogeneration	size and not putting so much pressure in terms of biomass availability and energy system. Biomass energy recovery is also considered, from a forest management perspective, as a form of forest fire prevention.
	High-efficiency cogeneration using renewable energy sources makes it possible to achieve significant energy savings, with its preferred use in energy-intensive industries. New potential studies will seek to determine the energy needs that can be met in a circular economy environment and to identify economic and legislative barriers.
Renewable gases	Renewable gases, in particular biomethane and renewable hydrogen, are an important alternative for replacing fossil fuels in the heating and cooling sector. To this end, the regulation of renewable gases and their introduction into the gas transmission and distribution networks will greatly contribute. In particular, it will be important to retrofit networks to 100 % dedicated hydrogen networks, to create hydrogen production and consumption poles (<i>H₂ Valleys</i>) and to promote the injection of biomethane into gas networks.
Heat pumps	In the residential and service buildings sector, and in addition to other efficient solutions, heat pumps are one of the most efficient ways of heating and cooling, with renewable energy, contributing to increased comfort and enhanced electrification of consumption. However, given that many of this equipment contains fluorinated gases, priority will be given to equipment containing natural refrigerants.
Thermal solar	In buildings, solar thermal should work with other high-potential and efficient technologies such as biomass boilers and heat pumps. Still, it will maintain a significant role in the preparation of hot water and, in addition to other efficient solutions, it is one of the most efficient ways of heating space and water, contributing to increased comfort. In the case of industry, the ability to meet low/medium temperature heat needs is expected to grow substantially.
Thermal Networks Urban	On the basis of the studies and analyses carried out, it is considered that this is not a good option in the light of the climatic conditions in Portugal and therefore no developments are envisaged in the present decade.

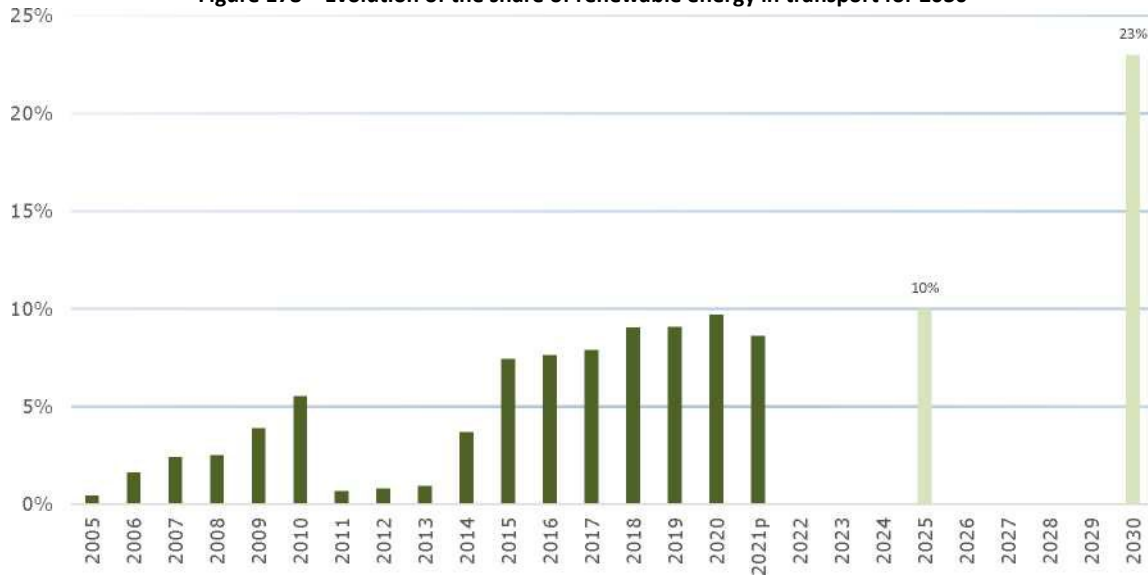
For the transport sector, a focus on sustainable mobility and decarbonisation of energy consumption is envisaged through the promotion and enhancement of public transport, the promotion of complementarity and modal articulation, the promotion of electric mobility, complemented by the promotion of sustainable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

In line with the proposal for the new Regulation on the deployment of alternative fuels infrastructure, which will repeal Directive 2014/94/EU of the European Parliament and of the Council (AFIR), Member States will have to revise the National Policy Framework (NLF) for the development of the market for alternative fuels 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 transport, for shore-side electricity supply in maritime and inland ports, and for electricity supply to stationary aircraft.

In line with the EU objective of achieving climate neutrality by 2050 at the latest, reference should also be made to the proposal for the new Regulation on the use of renewable and low-carbon fuels in maritime transport (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 thermal grid or using zero-emission technologies in ports under the jurisdiction of a Member State.

On the other hand, the proposal for a regulation on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation) aims to establish minimum shares for the supply of sustainable aviation fuels.

Figure 178 – Evolution of the share of renewable energy in transport for 2030



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

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

Increasing the uptake of renewables in the transport sector and thereby ensuring that the transport target 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 a greater uptake of renewable sources in energy consumption. To this end, the introduction of electric vehicles will be promoted and supported, and charging infrastructure at the various levels will be strengthened, and bidirectionality and smart charging will be promoted, as called for in the AFIR proposal.
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 the long-distance heavy goods transport, heavy road and rail passenger transport, maritime and aviation sectors, to leverage the decarbonisation of consumption and to promote increased consumption of renewable energy sources.

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

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

the introduction of alternative energy sources. Therefore, this sector should increasingly be a priority sector in the definition of policies and measures for their decarbonisation, always bearing in mind that this sector is a cross-cutting and sensitive sector, with an impact on almost all other sectors of activity and thus with an impact on the competitiveness of the economy.

iii. Estimated trajectories per renewable energy technology that the Member State plans to use to meet overall and sectorial renewable energy trajectories between 2021 and 2030¹⁵

In the light of the scenario envisaged for the evolution of the power generation sector in Portugal, the following table shows the evolution of expected installed capacity, broken down by technology, for the 2030 horizon in order to meet the targets set for this sector and with impacts on other sectors.

Table 1100 – Prospects of evolution of installed capacity for electricity generation by technology in Portugal towards 2030, based on planned policies and measures – WAM Scenario

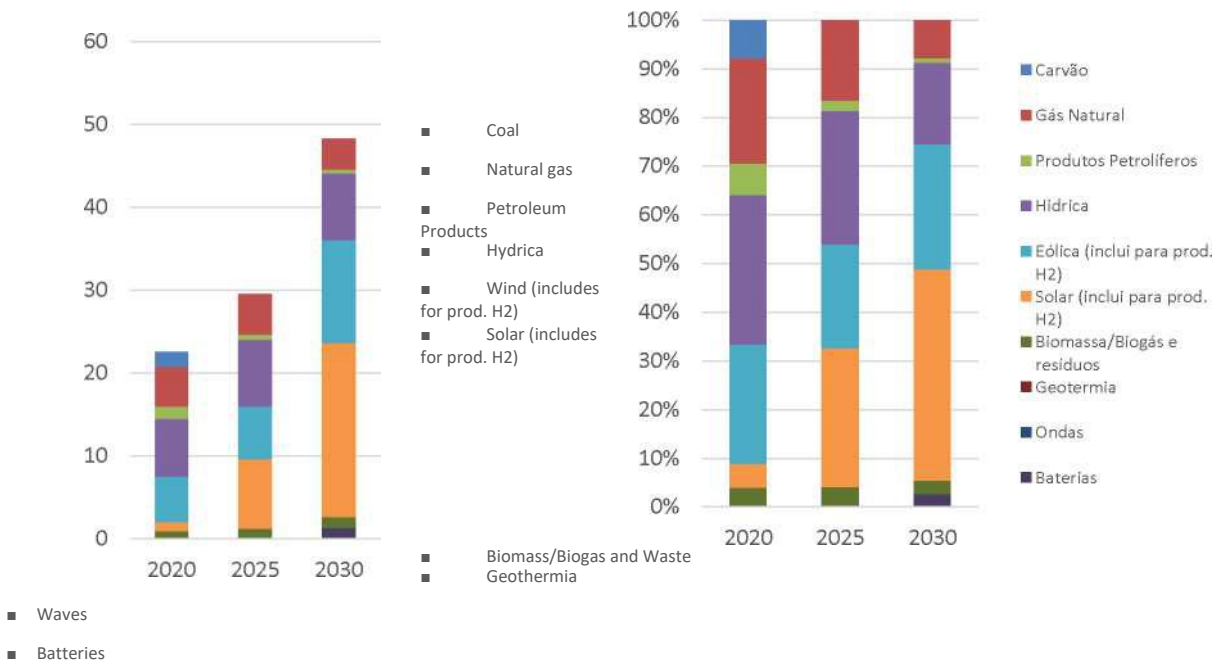
(GW)	2025	2030
Water	8,1	8,1
<i>of which pumped</i>	3,6	3,9
Wind *	6,3	12,4
Onshore wind	6,3	10,4
Offshore wind	0,0	2,0
Solar Photovoltaic *	8,4	20,4
of which centralised	6,1	14,9
of which decentralised	2,3	5,5
Concentrated thermal solar	0,0	0,6
Biomass/Biogas and Waste	1,2	1,4
Geothermia	0,0	0,1
Waves	0,0	0,2
Natural gas	4,9	3,8
Petroleum Products	0,6	0,4
TOTAL	30	47

* – includes installed capacity for hydrogen production.

The increase in installed capacity for electricity production between 2020 and 2030 reflects the decarbonisation of the existing electricity system and seeks to meet the electricity needs arising from the development of the green industry in Portugal. In this context, a marked industrial development is expected in Portugal, resulting in an installed electrolysis capacity of around 5.5 GW in 2030, added to the rest of the industry dedicated to digitalisation and energy transition. In this context of the country's green industrialisation, the order of magnitude of electricity consumption is expected to be close to 100 TWh.

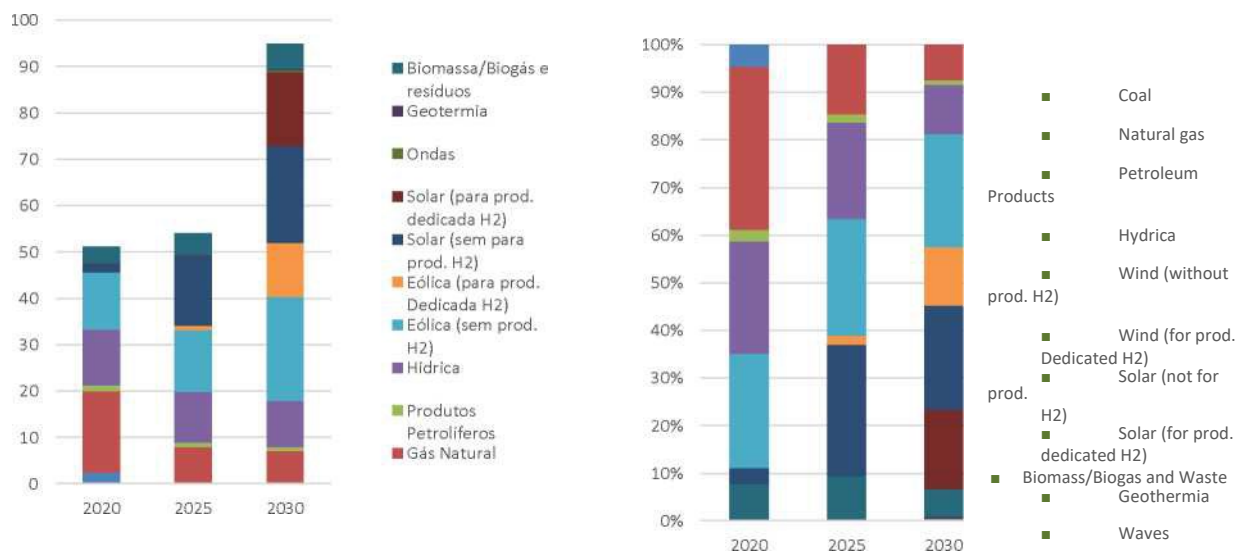
¹⁵Including the expected total gross final energy consumption by technology and sector in Mtoe and the total planned installed capacity (divided by new capacity and repowering) by technology and sector, in MW.

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



Taking into account the scenario envisaged for the evolution of the power generation sector in Portugal, renewable energy can be expected to contribute **80 %** of electricity production by **2026**. **90 %¹⁶** of the electricity produced in the Portuguese electricity generation system is expected to be renewable in 2030, with a focus on wind with around 36 % and solar with around 39 %, which will be the technologies with the highest growth in the next decade.

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



¹⁶This figure differs from the 85 % shown in Table 9.

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

Table 11 – Prospects of evolution of renewable consumption in the heating and cooling sector by technology in Portugal towards 2030, based on planned policies and measures – WAM scenario

<i>(ktoe)</i>	2025	2030
Biomass	1 135	1 230
Heat pumps	813	854
Heat from thermal solar	154	209
Heat from cogeneration	569	498
Renewable gases	41	174
TOTAL	2 713	2 965

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

Table 12 – Prospects of evolution of renewable consumption in the transport sector by technology in Portugal towards 2030, based on planned policies and measures – WAM Scenario

<i>(ktoe)</i>	2025	2030
Biofuels 1nd generation	27,6	6,0
Advanced biofuels	287	308
Renewable hydrogen	3	62
Electricity	77	211
TOTAL	394	587

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 bioenergy demand is broken down in the table below.

Table 13 – Prospects of evolution of bioenergy demand in Portugal towards 2030, based on policies and planned measures – WAM Scenario

<i>(ktoe)</i>	2025	2030
Electricity	829,9	847,5
Heating and catering	1 135	1 230
Transport	314	314
TOTAL	2 279	2 392

v. Other national trajectories and objectives, including long-term or sectoral trajectories¹⁷

Not applicable.

2.2. Energy Efficiency dimension

1.1 Indicative national energy efficiency contribution to achieving the Union's 32.5 % energy efficiency target in 2030¹⁸

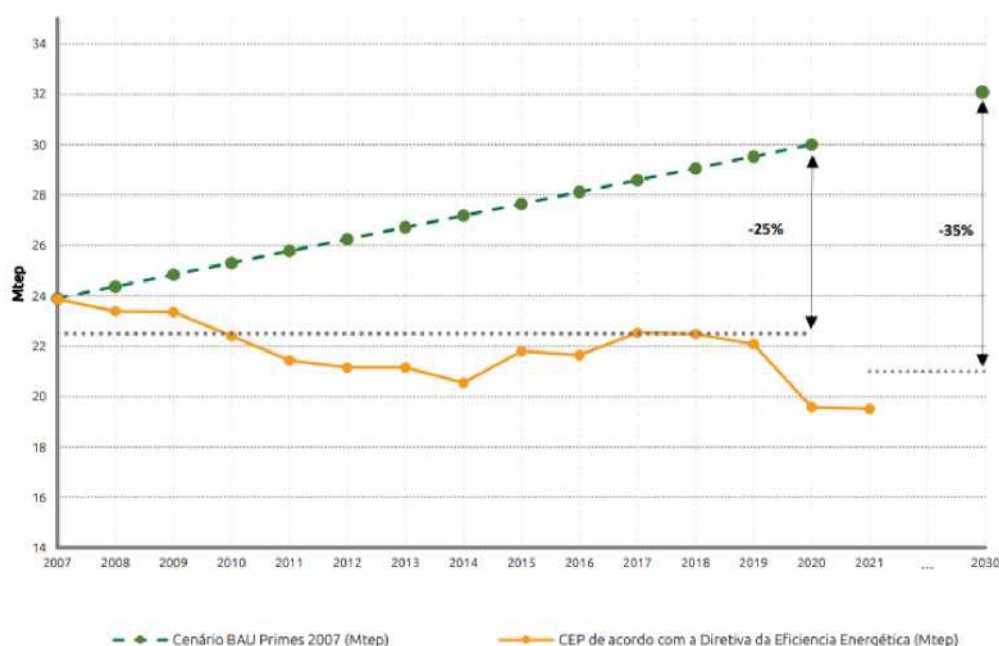
The Energy Efficiency Directive (EED) provides for a reduction in primary or final energy consumption of 32.5 % by 2030 at Union level, based on projections of the 2007 PRIMES model, where energy efficiency plans have not been taken into account and whose reference year is 2005.

Just as Portugal demonstrates a high level of ambition and determination to be at the forefront of the energy transition through a strong focus on renewable energy, energy efficiency also plays an important role in the 2030 horizon, which represents the basic principle of European energy policy – ‘energy efficiency first’.

Table 134 – Indicative national energy efficiency contribution to achieving the 32.5 % target of the Union's energy efficiency in 2030

	2020	2030
Primary energy consumption reduction target¹⁹	25 %	35 %

Figure 21 – Indicative pathway for the indicative national energy efficiency contribution to the achievement of the Union's 32.5 % energy efficiency target in 2030 (in use-free primary energy consumption non-energy)



¹⁷For 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 from waste water treatment
¹⁸Target referred to in Article 1(1) and Article 3(4) of Directive 2012/27/EU [version as amended in accordance with proposal COM (2016) 761] based on primary or final energy consumption, primary or final energy savings or energy intensity
¹⁹Excluding non-energy uses

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

It follows from Article 8 of the proposed revision of the EED that all Member States should 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 in 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. This was done by counting the average final energy consumption for the years 2016 to 2018, resulting in total savings of around 6 739 682 toe over the period 2021-2030. This savings figure is also a target for the implementation of Article 8 of the proposed revision of the EED.

Table 145 – Final energy savings/savings target – Article 7 EED

	2020	2030
Final energy savings according to article Article 7 of Directive EU 2018/2002 – Mtoe	N.d.	6,74

The figure below illustrates the cumulative energy savings to be achieved in the period 2021-2030 under the article. Article 7 of the Directive.

Figure 22 – Accumulated amount of energy savings to be achieved in the period 2021-2030 deriving from Article 7 of Directive 2012/27/EU



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

Building renovation

Refurbishing 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. As part of the proposal for the revision of the EPBD (*Energy Performance of Buildings Directive*), consideration is being given to the development by Member States of a National Building Renovation Plan and, among other provisions, a new energy certificate model and the introduction of the *Zero Emission Buildings concept (Zero Emission Buildings)*.

The revision of the SCE and the redesign of the financing/support mechanisms for building renovation and the implementation/implementation of the Long-Term Strategy for Building Renovation will therefore become essential.

²⁰Pursuant to Article 7 on energy saving obligations of Directive 2012/27/EU [version as amended in accordance with proposal COM (2016) 761]

Mobility and transport	The path towards energy transition and carbon neutrality undeniably passes through the transport sector. A combination of active and shared mobility, enhanced public transport, e-mobility and soft mobility can promote significant gains in energy efficiency in transport.
Industry	Promoting the decarbonisation of the industry sector involves focusing on resource efficiency and reduction, and promoting the circular economy, optimising as much as possible the <i>nexus</i> of energy, water and material efficiency in production processes, while ensuring increased productivity and competitiveness.
Agroforestry	There are opportunities in this sector to promote the implementation of energy efficiency measures for the rational use of energy and resources. In this sense, 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 technologies.
Equipment	Electrical equipment, in particular in households and services, has a significant role to play in energy consumption. It is therefore important to promote the replacement of equipment and make the current equipment stock more efficient, finding synergies with Ecodesign.

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

Table 16 – Monitoring indicators for energy efficiency

Indicator	2021	Unit	Objective
Energy intensity of primary energy savings	106	toe/MEUR (GDP)	1
Energy intensity of final energy savings	82	toe/MEUR (GDP)	1
Energy intensity in industry	121	toe/MEUR (GVA)	1
Energy intensity in agriculture and fisheries	124	toe/MEUR (GVA)	1
Intensity class in Transport	26	toe/MEUR (GVA)	1
Energy intensity of households	24	toe/MEUR (GVA)	1
Energy intensity in services	16	toe/MEUR (GVA)	1
Final energy consumption <i>per capita</i>	1,6	toe/inhabitant	1
Consumption de electricity NA	1 151	GWh	1

i .3 the indicative targets of the long-term strategy for the renovation of the national stock of residential and non-residential buildings, both public and private²¹

By Council of Ministers Resolution 8-A/2021 of 3 February, the Portuguese Government approved the Long-Term Strategy for the Renovation of Buildings (LTRS), which aims to meet the European and national objectives of achieving carbon neutrality and promoting the energy efficiency of existing buildings, with a view to their transformation into NZEB buildings.

In this Strategy, it is estimated that the investment needed by 2050 to deliver on the proposed improvement packages

²¹Under Article 2a of the Directive revising Directive 2010/31/EU on the energy performance of buildings

would be EUR 143,492 billion, with a larger share of the renovation of the stock of residential buildings worth EUR 110,078 billion, compared with the EUR 33,414 billion stock of non-residential buildings. It should be noted, however, that given the current economic context, these figures will already be outdated.

The objective of LTRS is to achieve primary energy savings of 11 % by 2030 and 34 % by 2050, as well as 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.

However, in view of the proposed revision of the Energy Performance of Buildings Directive, an obligation to draw up a National Building Renovation Plan is being considered.

ii .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' buildings²²

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.

Savings per archetype and for total park

Type of building	Climate zone	Construction period	ID	Primary energy savings (2050) Archétype (kWh/m ²)	Primary energy saving (2050) Total building stock (Mtoe)
Single family	I1	< 1960	Arch.1	24,0	0,06
Single family	I2	< 1960	Arch.2	24,0	0,05
Single family	I3	< 1960	Arch.3	45,3	0,02
Single family	I1	1961-1990	Arch.4	17,2	0,07
Single family	I2	1961-1990	Arch.5	27,6	0,13
Single family	I3	1961-1990	Arch.6	47,8	0,03
Single family	I1	1991-2005	Arch.7	16,4	0,05
Single family	I2	1991-2005	Arch.8	24,5	0,09
Single family	I3	1991-2005	Arch.9	39,4	0,02
Single family	I1	2006-2016	Arch.10	7,0	0,01
Single family	I2	2006-2016	Arch.11	0,7	0,01
Single family	I3	2006-2016	Arch.12	13,7	0,00
Single family	I1	> 2016	Arch.13	5,6	0,00
Single family	I2	> 2016	Arch.14	5,5	0,00
Single family	I3	> 2016	Arch.15	7,4	0,00
Multi-family	I1	< 1960	Arch.16	17,1	0,03
Multi-family	I2	< 1960	Arch.17	19,4	0,00
Multi-family	I3	< 1960	Arch.18	27,4	0,00
Multi-family	I1	1961-1990	Arch.19	16,8	0,14
Multi-family	I2	1961-1990	Arch.20	19,5	0,03
Multi-family	I3	1961-1990	Arch.21	28,1	0,00
Multi-family	I1	1991-2005	Arch.22	18,3	0,11

²² pursuant to Article 5 of Directive 2012/27/EU

Type of building	Climate zone	Construction period	ID	Primary energy savings (2050) Archétype (kWh/m ²)	Primary energy saving (2050) Total building stock (Mtoe)
Multi-family	I2	1991-2005	Arch.23	21,0	0,04
Multi-family	I3	1991-2005	Arch.24	30,1	0,00
Multi-family	I1	2006-2016	Arch.25	14,5	0,02
Multi-family	I2	2006-2016	Arch.26	15,5	0,00
Multi-family	I3	2006-2016	Arch.27	25,1	0,00
Multi-family	I1	> 2016	Arch.28	9,5	0,00
Multi-family	I2	> 2016	Arch.29	13,3	0,00
Multi-family	I3	> 2016	Arch.30	10,6	0,00
Public	I1	—	OTHER	24,3	0,01
Private	I1	—	MERCHANT	34,7	0,29
Public	I1	—	TEACHING	19,9	0,01
Private	I1	—	DESK	17,5	0,08
Private	I1	—	HOTELS	22,6	0,08
Private	I1	—	RESIDENCE	25,3	0,03
Public	I1	—	HEALTH	55,1	0,06
Public	I1	—	SPORT	52,1	0,03

iii . The indicative milestones for 2030, 2040 and 2050, the nationally established measurable progress indicators, a 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)²³

Under LTRS, a set of targets has been established for the horizons 2030, 2040 and 2050. These objectives set out the progress path to be achieved through the implementation of the packages of improvement measures to be achieved on the stock of existing buildings in terms of expected impact as well as the 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 (m²);
- 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/m²);
- Energy savings (EUR 2020/m²).

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

Table 17 – 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 %

²³ pursuant to Article 2a of Directive 2010/31/EU

Indicator	2030	2040	2050
Percentage of total renewable energy	57 %	62 %	98 %
Percentage reduction of 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 (EUR2020/m ²)	82	165	258
Savings (EUR2020/m ²)	88	191	279

Table 18 – 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 reduction of 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 (EUR2020/m ²)	81	145	155
Savings (EUR2020/m ²)	137	240	447

Table 19 – 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 reduction of 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 (EUR2020/m ²)	82	164	256
Savings (EUR2020/m ²)	89	192	283

The results of the simulations and implementation of the mentioned packages of measures suggest cumulative primary energy savings of 40 % in residential buildings by 2050 and 28 % in non-residential buildings, totalling 34 % of the total building stock existing at the time.

iv . 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 as regards heating and cooling

Not applicable.

2.3. Energy Security Dimension

In February 2022, the Russian military aggression against Ukraine led to a reduction in gas flows through several pipelines serving Europe and put at risk the security of supply in the EU. To increase security of energy supply, the European Commission has put forward a toolbox and measures to mitigate Russia's level of dependence on fossil fuels, in particular the "REPowerEU" and "Put gas for safe winter" communications, and the following regulations:

- **Regulation (EU) 2022/1032** on gas storage, which introduces filling targets and trajectories for underground gas storage facilities, seeking to ensure that the European Union increases its preparedness to cope with the winter period.

Portugal has notified the European Commission on a monthly basis of the evolution of the filling level recorded at the Carriço Underground Storage and the Sines LNG Terminal.

- **Council Regulation (EU) 2022/1369** on coordinated measures to reduce gas demand, which provides that Member States should voluntarily reduce their gas consumption between 1 August 2022 and 31 March 2023 by at least 15 % compared to the average consumption over the same period in the previous five consecutive years. That Regulation was amended by Council Regulation (EU) 2023/706 as regards the extension of the demand reduction period, extending that period by one year to 31 March 2024, for measures to reduce gas demand and to strengthen the reporting and monitoring of the implementation of those measures.

In order to comply 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 gas demand reduction target corresponding to the difference between the filling target set in Regulation (EU) 2017/1938 for 1 August 2022 and the volume of gas stored on that date. In addition, at the request of the European Commission and in view of the conditions set out in the Regulation, a reasoned request to limit the mandatory demand reduction by 8 % was also communicated.

In the same context, Council of Ministers Resolution No 82/2022 of 27 September approved the Energy Savings Plan 2022-2023, defining a set of measures to reduce energy consumption in the sectors of central government, local public administration and private sector (industry, commerce, services and residential), which are mandatory only in the first case. The measures are complementary and do not overlap with existing implementing measures in other existing public policy instruments. Focused on demand-side management, the plan has as its strategic drivers:

- 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 and trade and services, as well as balanced and sustainable consumption campaigns;
- 3) Promote the production of renewable electricity for self-consumption.

The plan provides for mechanisms for regular monitoring of the evolution of gas consumption and, if necessary, proposals to amend the adopted measures will be made. In the event of an alert being declared in the Union, the measures will become mandatory and exceptional measures may also arise.

According to the Regulation, Portugal has reported to the Commission every two months the demand reduction achieved.

- **Council Regulation (EU) 2022/1854** on emergency intervention to mitigate the effects of high energy prices through exceptional, specific and time-limited measures.

The Energy Savings Plan 2022-2023 aims to reduce electricity consumption and consequently, due to the dependence of the Portuguese electricity system on natural gas-fired thermal power plants, the consumption of gas used for their production. In this sense, the plan aims both to achieve the objectives set out in this Regulation and in Regulation (EU) 2022/1369.

Portugal regularly reports to the European Commission on the demand reductions achieved and on the implementation of the other measures provided for in the Regulation.

- **Council Regulation (EU) 2022/2576** on enhancing solidarity by better coordinating gas purchases, reliable price benchmarks and cross-border gas transfers, including the implementation of a platform allowing aggregation of demand and joint purchase of gas;
- **Council Regulation (EU) 2022/2577** establishing a framework for accelerating the deployment of renewable energy;
- **Council Regulation (EU) 2022/2578** establishing a market correction mechanism to protect Union citizens and the economy from excessively high prices.

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

Table 20 – REPowerEU Energy Security Monitoring Indicators

Indicator	Result	Unit	Objective
Reduction of natural gas consumption ¹	27,4	%	15 %
Level of natural gas storage	109 ²	%	90 % ³

¹ the evaluation shall be carried out in accordance with the terms laid down in Council Regulation (EU) 2022/1369, comparing the consumption of the period from April 2023 to May 2023 and those of the reference period;

² the result refers to the situation as at 1 November 2022, as under Regulation (EU) 2022/1032 at that date there was a mandatory compliance target for all Member States of 80 %;

³ the objective refers to the situation to be verified on 1 November, starting in 2023, in accordance with Article 6a (1) (b) of Regulation (EU) 2022/1032.

The consequence of the Russian aggression against Ukraine was the culmination of a number of measures that had already been taken and which appeared in some way to affect the security of energy supply of the Union and its Member States. The reduction of Russian gas flows in the second half of 2021, in the process of economic recovery from the COVID-19 pandemic, was a first warning, which, in view of the evolving situation, necessitated the study and adoption of national legislative measures to strengthen security of supply, including the publication of Ministerial Implementing Order No 59/2022 of 28 January, which fixes the minimum overall quantity of security gas stocks and provides for the establishment of an additional reserve in the National Gas System. This Order makes it compulsory for the various market players to set up an additional reserve during the period from 1 October to 31 March.

With the development of the geopolitical situation and the effects on energy costs, Portugal adopted an additional set of measures throughout the year:

- **Decree-Law No 30-A/2022 of 18 April 2006**, as amended, approves exceptional measures designed to simplify procedures for the production of energy from renewable sources. Among the measures approved are the administrative simplification for the installation of power plants for renewable energy sources and the mandatory incorporation of at least 1 % of biomethane and hydrogen by hydrolysis of water into the supply to be carried out by gas suppliers;
- **Council of Ministers Resolution No 82/2022 of 27 September 2009** defining preventive measures to deal with the current situation and possible future disruptions, always with a view to ensuring security of energy supply. A strategic water reserve is created in a number of reservoirs associated with hydroelectric plants. It is also stipulated that the necessary steps will be taken to increase storage capacity in Portugal by at least 1.2 TWh and that investment will be made in the Port of Sines allowing up to 8 bcm of LNG to be transferred between ships each year. Finally, this Resolution of the Council of Ministers approves the Energy Savings Plan, referred to above, which is in force until 31 December 2023;
- **Decree-Law No 70/2022 of 14 October 2009** establishing a strategic natural gas reserve belonging to the Portuguese State and laying down extraordinary and temporary measures to report information and ensure the security of gas supply;
- **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.

The measures adopted, which will be further developed in the following sections, have as their main objectives energy security issues:

- the replacement of fossil fuel imports by domestic production of fuels of renewable origin, supporting 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 way;
- the structural reduction of energy consumption, making more efficient use of energy. This reduction, together with the change in the origin of energy sources, promoted by the substitution of fossil sources (imports) by (domestic) renewable sources, will make it possible to act consistently to reduce dependence.

The renewable energy objectives and targets that 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, it should be noted that the share of Russian gas imports has always been below 10 %. It should also be noted that it is not the Portuguese State which is responsible for the purchase of natural gas, but the same is purchased by importers/suppliers on the international market. However, it is constantly monitored to ensure that the quota does not exceed the residual figures, as has been the case so far, since the gas supply to Portugal has a diversified portfolio, relying mainly on two major suppliers, Nigeria and the United States of America.

i. National objectives for increased diversification of energy sources and supply by third countries 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. Without the production of natural gas and oil, Portugal is committed to developing indigenous renewable energy resources, which is 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, as regards the gas and oil sectors, Portugal already has a diversified portfolio of suppliers and origins of these products (see Chapter 4), which should be sought to consolidate, as the most recent studies/evaluations show a good level of security of supply, fostered by this diversification. The increase in the underground storage capacity of Carriço and the Sines LNG Terminal tanks also contributed to the diversification of natural gas supply sources to Portugal.

In the case of electricity, diversification of sources outside the country is more limited due to geographical issues, so the focus is essentially on diversifying domestic production by focusing on renewable production in line with Portugal's potential. The hydrogen energy carrier makes it possible to maximise the exploitation and exploitation of the potential of indigenous RES *and, through the coupling* sector, to promote flexibility and enhanced security of energy supply across various sectors (e.g.: tram, industry, mobility, etc.). However, emphasis is also placed on external origins, with a commitment to strengthening interconnections with Spain, which will allow for a better balancing of the National Electricity System (SEN) and, consequently, an improvement in security of supply.

Finally, it should be noted that, in the interests of security of supply, diversification of sources and routes of supply of energy resources is crucial, without compromising decarbonisation objectives.

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

Energy security achieved by ensuring security of supply will need to take into account decarbonisation objectives, building on the specificities of energy systems and also seeking 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 by third countries, without compromising decarbonisation objectives.

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

In this respect, and continuing with the current path of reducing energy dependency, and in view of Portugal's objectives for 2030, which include a stronger commitment to harnessing indigenous renewable energy resources (including

renewable gases) and improving energy efficiency, it is envisaged that the country's energy dependence on the outside world will continue to be reduced.

Table 21 – Portugal's objective to reduce 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 2006, as amended, regulates the autonomous storage of electricity and lays down the procedures inherent in the licensing of such installations, as well as the storage associated with power plants.

Increasing storage capacity and integrating system services allows maximising the use of the infrastructure of the Public Service Electric Network (RESP), reducing its sensitivity, and contributes to greater integration of renewables into the national energy system (SEN) and greater flexibility from the without, allowing for GHG emission reductions.

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

National targets for the deployment of domestic energy sources:

Portugal will continue to focus on the development of a highly decarbonised electricity production sector, given the availability of indigenous renewable resources, such as water, wind, sun, biomass and geothermia, and the fact that Portugal has developed a reliable and secure electricity system capable of dealing with the variability that the strong focus on renewables has introduced, and which is expected to be the subject of major developments in the current decade. By 2030, it is envisaged to increase the exploitation of renewable energy potential with a particular focus on *onshore/offshore* solar and wind technologies, in parallel with the promotion of distributed/decentralised generation (with a focus on individual and collective self-consumption) and the promotion of pilot projects (concentrated solar thermal, stimulated geothermal and waves).

National targets for increased storage:

In order to achieve a better articulation of the national energy system in its various sub-sectors, storage systems in their different forms, as a tool for flexibility and stability of the national electricity system, are considered essential and crucial.

It is therefore important to maintain the commitment to reversible pumping systems in hydropower plants and to seek to develop other technological solutions that will involve the application of battery technology and hydrogen technologies. A significant part of the new storage capacity should be directly linked to renewable power plants, ensuring a connection to renewable hydrogen production points and subsequent injection into the gas grids.

In the case of electricity, storage is seen as a tool for flexibility and stability of the national electricity system.

An increase in storage capacity through pumped reversible hydropower and production of renewable hydrogen for injection into gas grids is expected by 2030, and at a later stage of the decade, a contribution from battery technologies. A significant part of the storage capacity should be linked to the wind and solar technologies themselves, with the remaining storage dedicated. It should be noted that in competitive procedures for the allocation of photovoltaic electricity generation capacity in 2020, coupled electricity storage solutions were considered.

As regards energy storage objectives in the natural gas, oil and oil derivatives sector, there are national rules, stemming from Community legislation, for the establishment of emergency stocks, in view of crisis response and emergency/disruption of the supply of these products. The current capacity of Carriço underground storage allows for

the storage of all the natural gas security reserves 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, subject to the need, that these falls are 100 % compatible with H₂ and that the existing caverns can be converted to 100 % H₂.

During 2022, the Gouvães hydroelectric plants (880 MW), pumped, and Daivões (114 MW) were put into operation and the trajectory for the development of hydropower installed capacity with pumping was reached.

Table 22 – Capacity installed for battery storage and pumping for the 2030 horizon

	2025	2030
Battery storage (GW)	0,0	1,0
Pumping (GW)	3,6	3,9

Distributed energy storage is key for the decarbonisation of the energy system. Therefore, the development of studies to enable the design of the energy system with greater spatial resolution is essential to assess in detail the impact of distributed production, consumption and storage, contributing to the assessment of needs. The national storage plan is expected to be carried out for needs assessment.

Water pumping capacity is very relevant for the assessment of storage needs in the national energy system. This requires a study to assess the potential of water capacity to optimise the satisfaction of energy storage needs.

National targets for increasing demand response:

As regards demand response, and in the case of the electricity sector, energy savings associated with existing and projected efficiency measures and consumption needs taking into account the expected penetration of electric vehicles (with a smart charging perspective) are considered 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 in order to reduce variations in the daily load profile in the public service electricity grid, as well as the generalisation of smart charging strategies in electric vehicles and their participation in local or system flexibility services.

Based on what is monitored on security of supply, which is included in the annual security of supply monitoring reports for the electricity and natural gas sector (RMSAs), a proper balance between existing demand and supply is intended for a time horizon up to 2030-2040. The prospective offer takes into account the permitting procedures for new infrastructure and the energy policy guidelines (new installations and decommissioning of existing installations).

For the analysis of the adequacy and balancing of energy systems, within the framework of the RMSAs, in particular for the National Electricity System (SEN) and the National Gas System (SNG), the following are considered as main indicators:

Table 23 – Adequacy indicators for energy systems – electricity and gas

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

2.4. Internal Energy Market dimension

2.4.1. Electricity interconnectivity

To ensure a better functioning and development of the internal energy market, together with 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 the setting of 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. Also recognising this importance, Portugal is committed and committed to achieving 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 responding to the interconnection needs of energy markets and systems.

Table 24 – Portugal’s electricity interconnection target

	2030
Electricity interconnection target	15 %

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

Table 25 – indicators related to capacity/level of interconnection

Indicator	2021	Unit	Objective
Electrical Interconnection Capacity²²	3745	MW	t
Peak-load interconnection capacity	93	%	t
Interconnection capacity in relation to renewable capacity	62	%	t
Average value of price difference on the daily market	0,76	EUR/MWh	1

2.4.2. Energy transmission infrastructure

i. 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 the 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 gas system, Portugal is seeking to develop its transmission and distribution networks, with projects contributing to this objective now recognised by the European Commission as having an important 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 these relevant projects have already been included in the 5th list of Projects of Common Interest (PCI) adopted at the end of 2021 (new list will be approved by the end of 2023). 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 a cost-effective way to ensure 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 South-West Europe interconnections, with the aim of increasing interconnection capacity between the Iberian Peninsula and France, as well as supporting Portugal and Spain in the implementation of the Minho-Galicia interconnection.

²² Average annual value of commercial interconnection capacity towards Spain – Portugal (import direction)

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* RESF and aims to promote installed *offshore* wind capacity, this may require possible reinforcements of the continental transmission network.

On the other hand, green hydrogen has assumed high importance in the current economic and political context in relation to the EU's ambitions to end Russian fossil fuel imports in the coming years and to reach climate neutrality by 2050. The EU has set an ambition for the year 2030 to consume 20 million tonnes per year of hydrogen in the Union, and of this total, 10 million tonnes per year have been set to be produced within the EU.

On 20 October 2022, the governments of Portugal, Spain and France signed a commitment, 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* aimed at accelerating 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', which will link the region of Celorico da Beira in Portugal to the region of Zamora in Spain.

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

The current proposal for a Plan for the Development of the National Gas Transmission Network for the period 2024-2033, presented by the Transmission System Operator in March 2023, includes projects to respond to the Government's determinations for the creation of two new cavities in Carriço Underground Storage, with a view to providing Portugal with more gas storage capacity and strategic gas reserves, as well as the strategic orientation of Portugal's active participation in the creation of a 100 % hydrogen green corridor ('H2Med') to connect the Iberian Peninsula to the rest of Europe.

Council of Ministers Resolution No 82/2022 of 27 September 2009, as mentioned above, defined preventive measures to deal with the current conflict situation in Ukraine and possible future disruptions, establishing the need to strengthen the natural gas storage capacity installed in Portugal in at least two additional cavities, in order to:

- To obtain an additional amount of underground storage capacity in Carriço's infrastructure of more than 1.2 TWh; e
- Enable all emergency stocks or other stocks that may be defined to be accommodated in such underground storage.

The creation of a European green hydrogen transport corridor includes the interconnection between Portugal and Spain connecting Celorico da Beira with Zamora, linked to a pipeline connecting by sea Barcelona and Marseille.

H2Med, coupled with internal hydrogen transport axes in Portugal, Spain and France, will enhance the development of one of the main hydrogen corridors via the Mediterranean through the construction of a 248 km hydrogen transport interconnection, including the 162 km of the Portuguese section between Celorico da Beira and Vale de Frades, with a transport capacity of 81 GWh/d.

The National Hydrogen Transport Axis comprises the construction and adequacy of the Figueira da Foz pipelines (with the possibility of connecting to the Carriço AS) – Celorico da Beira – Monforte, also submitted to the 2023 PCI list, which together will enable the sustained and faster decarbonisation of current gas consumption while providing means to export green hydrogen to Europe, produced from endogenous renewable energy sources, harnessing the *onshore* and *offshore* potential in Portugal.

The projects of Portugal, Spain and France associated with the H2Med green hydrogen corridor were submitted for PCI status in December 2022.

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

The following projects are identified for Portugal in the time horizon 2021-2030 on the priority corridor North-South electricity interconnections in Western Europe (NSI West Electricity), defined in the 5th PIC list approved at the end of 2021 (new PCI list will be approved by the end of 2023):

(...) (A) 2.16 cluster of internal lines

- 2.16.1 Internal line between Pedralva and Sobrado (PT), formerly 'Pedralva e Alfena (PT)'
- 2.16.3 Internal line between Vieira do Minho, Ribeira de Pena e Feira (PT), formerly 'Frades B, Ribeira de Pena e Feira (PT)'

(...) (A) 2.17 Portugal-Spain interconnection:

Beariz –Fontefrías (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 Beariz (ES), Fontefrías (ES) and Ponte de Lima (PT)

The establishment of a new electricity interconnection between the transmission systems of Portugal and Spain in the Minho/Galicia region will achieve a minimum of 3 000 MW 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.

It should be noted that a new process of defining the PCI list is ongoing (which will be the 6th PCI list to be defined by the end of 2023), in which, for the electricity sector Portugal only submitted one candidate project, the Minho-Galicia interconnector.

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

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

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

ii. Main (trans-European energy) infrastructure projects planned in addition to projects of common interest (PCIs)²⁵

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

In the electricity sector, in particular, projects linked to the strengthening of internal grids (transmission and distribution) for the integration and accommodation of renewable electricity production (in order to realise the national potential for this type of electricity production);

On the other hand, depending on the actual evolution of Portugal and Spain's electricity systems, particularly in 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 into the European internal market, through the use of *transshipment*.

At the level of the transport sector, the National Hydrogen Strategy (Council of Ministers Resolution No 63/2020 of 14 August) points to the decarbonisation of maritime transport, particularly in domestic passenger and freight transport, where there is potential for green hydrogen and other renewable fuels, such as synthetic fuels, to play an important role in decarbonisation, with the current prospects for the decarbonisation of the maritime transport sector pointing to an increase in the 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. These areas, which are geographically distributed across different parts of the country, will seek to exploit the endogenous regional potential for hydrogen production, taking into account existing and planned infrastructure as well as consumption potential and typology.

2.4.3. Market integration

In relation to the topic of market integration, monitoring indicators to be considered for this purpose are listed below:

Table 26 – Indicators to promote flexibility of the energy system

Indicator	2021	Units	Objective
Smart metering	4 032 663	NO	T
Installed distributed generation capacity	580,5	MW	T

Portugal, by means of Decree-Law No 15/2022 of 14 January, in its current wording (<https://dre.pt/dre/detalhe/decreto-lei/15-2022-177634016>) and Order No 14064/2022 of 6 December (<https://dre.pt/dre/detalhe/despacho/14064-2022-204338646>), defined the timetable for the installation of smart meters, ensuring that 100 % of final customers are covered and integrated into smart grids by the end of 2024 (connected in BT) in mainland Portugal.

The autonomous regions are excluded from this objective, since they can adapt the legal system of the electricity sector according to their specific characteristics. To that extent, it is envisaged to replace existing meters for smart metering equipment for all consumers connected in BT by the end of the 1st quarter of 2025 for AMR.

²⁵In 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)

In addition, Decree-Law No 15/2022 recognises the existence of a specific regulatory framework, which operationalises the concept of smart grids – Smart Electricity Distribution Network Services Regulation for which ERSE is responsible.

In this context, the target for 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 has defined a proposal for a timetable for the installation of smart meters in mainland Portugal, as provided for in Decree-Law No 15/2022 of 14 January, as amended, and that the Government approved the schedule for the installation of smart meters and their integration into smartgrid infrastructure by Order No14064/2022 of 6 December for distribution system operators in mainland Portugal, ensuring coverage of 100 % of final customers by 2024 (ERSE).

i. National objectives related to other aspects of the internal energy market such as market integration and coupling²⁶, including a timeframe for when the objectives shall be met

Not applicable.

ii. National objectives related to non-discriminatory participation of renewable energy, demand response and storage, including through aggregation, in all energy markets, including a timeframe for meeting the targets

Among other innovations, DL 15/2022 evolves the model of the SEN towards a more decentralised system, with a more active role on the part of consumers, in production and storage for own consumption, and possibly selling 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 role of the aggregator, the removal of barriers to participation in electricity markets. It is also envisaged, with the provision of dynamic supply contracts, to adjust the consumption profile at differentiated prices between time periods, promoting the provision of flexibility services.

There is also a need for a paradigm shift in the electricity sector, creating the figure of market aggregator and laying the foundations for moving towards a model that ensures flexibility of distributed resources and demand response. In addition, the Manual of Procedures for the Global Management of the Electricity Sector System (MPGGS) has been updated by implementing the harmonised European methodology for the handling of deviations, which follows from ACER's Decision No 18/2020 (ISH) of 15 July 2020. This handbook also sets out the technical and commercial conditions for the management of SEN interconnectors with regard to congestion management at the interconnector, including market separation, continuous allocation of cross-zonal capacity to be implemented within the intraday horizon, controllability of interconnection, 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 27 – Indicators for consumer participation in the energy system

Indicator	2021	Units	Objective
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²⁶Such as increasing system flexibility, in particular with regard to promoting competitive electricity pricing in line with applicable sectoral law, market integration and coupling, aimed at increasing the marketable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, dispatching, redispatching and curtailment mechanisms and real-time price signals

Installed capacity in own consumption (individual and collective)	353	MW	T
Energy Communities	0	NO	T
Citizens' Energy Communities	n.D	NO	T
Access to consumption management information	n.D	%	T

Between 1 June 2018 and 31 May 2019, the pilot project was carried out to improve the tariff for access to the networks at extra high voltage (MAT), high voltage (HV) and medium voltage (MT), in accordance with the rules approved by 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-oriented, thus promoting a more efficient use of electricity networks. 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, in addition to 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 shift of 2.2 % of consumption out of the super peak period by the participants. Extrapolating this effect to a 23-year horizon (2018 to 2040), the cost-benefit analysis resulted in 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 has included in the Electricity Sector Tariff Regulation a new tariff option for access to networks, known as the optional network access tariff 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, Centre, South) and the differentiation of the power price in peak hours by three seasons (Alta, medium, low). As network access tariffs show negative prices in 2022 and 2023, it has not yet been possible to implement the new tariff option. While maintaining the premise that customers should have access to information in order to better manage their consumption, it is important to note that E-REDES, with 95 % of consumption facilities in BT, should continue the effort on digitalisation. In 2022, around 54 % of consumers connected in BT and 81 % of self-consumers connected in BT had access to the load diagrams, with disaggregated information over 15-minute periods. It is important to maintain the trajectory and make this information available to all consumers and self-consumers.

Currently, the activity of producing for self-consumption of electricity is regulated by Decree-Law No 15/2022 of 14 January 2006, as amended. It lays down the discipline applicable to energy sharing schemes by creating the rules for setting up collective self-consumption projects (CCA), renewable energy communities (RECs) or citizen energy communities (CCE), and the rules for permitting and operating UPAC's and storage facilities for these types of projects.

Although there are no major differences to be pointed out between Decree-Law No 15/2022 and the previous one in relation to individual and collective self-consumption or CER, reference is made to the legal establishment of the concept of Citizens' Community for Energy (CCE), the exemption from the DSO's opinion on UPAC on the basis of contracted power and consumption profile, the definition of proximity (physical and electrical), the possibility of adopting dynamic management systems, enabling dynamic energy monitoring, control and management, in real time, with a view to optimising energy flows and, finally, the absence of any burden on the self-consumer for the replacement of the user's meter (UI).

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

Table 28 – Evolution of installed capacity to self-consumption (MW)

Year	<= 30 kW	> 30 kW E <= 1 MW	> 1 MW
2015	4,6	6,1	0,0
2016	8,2	18,2	0,0
2017	9,2	32,0	1,2
2018	7,1	30,6	6,1
2019	8,8	82,7	3,3
2020	30,1	25,4	0,0
2021	70,5	145,5	0,0
2022	131,3	216,5	4,9

Approximation of production consumption has many advantages. On the one hand, it reduces losses in energy distribution and transmission and the investment needs of the grid, on the other hand, it protects consumers from price volatility. For energy sharing projects, it is important to revise the tariff structure in order to give the right signals on the advantage of ensuring proximity between production and consumption in the development of such projects.

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 point of view and from the point of view of obtaining funding. Support will be provided through qualified public entities in partnership with local agencies and partners. The aim is to set up self-consumption projects in the short term, with a particular focus on municipalities in the hinterland 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 electricity system adequacy

Ensuring the adequacy of the electricity system is addressed in the SEN Security of Supply Monitoring Report (RMSA-E), where security of supply indicators are defined. Security of supply of the electricity system is essentially linked to the performance of the electricity system in two respects: *adequacy* (static assessment of the sufficiency of installed capacity to cover hourly electricity demand) and *security* (operational analysis with assessment of the capacity of the system to respond to disruptions in the supply-demand balance).

The assessment of the security of supply conditions over the horizon of RMSA-E is carried out using probabilistic indicators, resulting from the simulation of the configurations of the power generating system with the RESERVAS model, which reflect its performance in the two strands mentioned above. This model is applied by the transmission system operator who collaborates with the DGEG in developing 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 twelve monthly ICPs for each year. In this analysis, the planned contribution of a capacity of 10 % of NTC (*Net Transfer Capacity*) is considered. For checking the adequacy of the system's ability to cover the peak of consumption it is considered that the ICP with a probability of exceedance between 95 % and 99 % shall not be less than 1,0.

ii) *Security*²⁷

Operational reserve needs are assessed by the imbalances in the supply-demand balance that occur between all the 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 *Loss of Load Expectation (LOLE)* indicator calculated by the *RESERVAS* model, which incorporates the loss of load expectation associated with the Adequacy component (or static LOLE) and the expectation of loss of load due to insufficient operational reserve – security component, is used to measure the overall levels of security of supply provided by the configuration of the national power generating system analysed. In the assurance of supply analysis, according to the studies developed by the transmission system operator, this indicator shall be less than or equal to 5 (h/year).

It should be noted that, in accordance with Regulation (EU) 2019/943, provision is made for defining 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 objectives for flexibility of the energy system

With the increasing integration of variable renewable production into the SEN, there is a pressing need to equip the Global Technical Manager of the System with tools for more and better real-time monitoring of this production, as well as flexibility mechanisms to ensure a balance between production and consumption.

In the light of the above, by 2022 all generating installations with more than 1 MW of installed capacity which are already connected to the transmission and distribution networks must implement means of communication in order to receive instructions from the System Manager to discontinue or reduce in real time the energy injection they produce. To this end, the production facility must be provided with the necessary and appropriate means of communication, measurement and control so that it can receive the instructions for interruption or reduction from the System Manager, directly or via the dispatching centre to which the producer's installation is associated. Such needs have already been reflected in legislation in Decree-Law No 15/2022.

The previous requirement should be implemented as soon as possible for generating installations of more than 1 MW that are not connected to transmission and distribution networks.

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

Part of the new hydroelectric plants with storage capacity and reversibility (pumping mode) expected to be put into service by 2026 (reversibility 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 back-up facility for rapid deployment (reserve to be raised and down).

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

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

National objectives to protect energy consumers

At this stage of development of the Plan there are no specific objectives or targets in this context. However, the NECP's strategic objective of ensuring a just, democratic and cohesive transition by strengthening the role of the citizen as an active player in decarbonisation and the energy transition is highlighted; creating a level playing field

²⁷ It should be noted that *only stationary system disturbances (sufficiency of the secondary and tertiary reserve) are analysed in the Security strand and therefore the dynamic analysis of the system (under transitional arrangements) is not included.*

for all; tackling energy poverty; create tools for the protection of vulnerable citizens; and to promote the active involvement of citizens and territorial development.

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 greater dissemination of knowledge in the fields of energy and climate, 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 more informed consumer represents better, more efficient and sustainable choices, and a consumer at the heart of the decision represents a more active consumer in the energy transition, available to participate in the structural changes that are needed to achieve this challenge.

In this context, measures are envisaged to promote information for consumers and businesses by contributing to improved 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 for energy poverty, including a timetable for meeting the targets

For this topic, the indicators for monitoring the identified objectives are listed below:

Table 29 – Energy poverty indicators

Indicator	2021	Unit	Objective
Number of beneficiaries of the Social Energy Tariff	814 66928	no	1
Weight of energy bills in the household budget	n.a.	%	1
Inability to keep dwellings warm during winter	16,429	%	1
Inability to keep dwellings cool during summer	n.D	%	1
Dwellings with high moisture levels and roof losses	n.a.	%	1

There are no specific targets under this Plan, however, we highlight the NECP's strategic objective of ensuring a fair, democratic and cohesive transition, strengthening the role of the citizen as an active player in decarbonisation and energy transition, creating a level playing field for all, combating energy poverty, creating instruments for the protection of vulnerable citizens and promoting active citizen engagement and territorial valorisation.

In this context, measures are envisaged to combat energy poverty and improve the instruments to protect vulnerable customers, in particular the "Valle Efficiency" programme, which is currently under review. This programme is aimed at economically vulnerable households and aims at improving the thermal comfort of housing through the replacement or purchase of energy-efficient equipment and solutions and interventions in their surroundings. One of the conditions for applying for the Efficiency Valle is to be a beneficiary of the social electricity tariff. To this end, a long-term strategy to combat energy poverty has been developed with the main objective of obtaining a diagnosis and characterisation of the problem, developing monitoring indicators, monitoring strategies, setting medium and long-term energy poverty reduction targets at national, regional and local level and proposing specific measures to

²⁸Total number of beneficiaries of the Tarifa Social de Energia (Electric Energy + Natural Gas). Data from the DGEG's TARIC social system, relating to automatic processing in December 2021.

²⁹https://ec.europa.eu/eurostat/databrowser/view/ilc_md01/default/table?lang=en

achieve these objectives, as well as forms of financing.

The National Long-Term Strategy for Combating Energy Poverty 2022-2050 was in public consultation from 20/01/2023 until 03/03/2023 and is in the final stage of preparation with a planned publication date by the end of the 2st half of 2023. Once this strategy has been achieved, measures to tackle energy poverty will be defined and scaled up, providing benefits that guarantee the supply of energy to vulnerable customers or providing support for improvements in the energy efficiency of housing.

The measure “Valle Efficiency” is under review and the “creation of the National Energy Poverty Observatory” is foreseen in the revision of the update of the RRP (which was in public consultation between 06/04/2023 and 21/04/2023).

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

“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, namely:

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 have shown a worsening of comfort conditions and a consequent increase in energy consumption, especially in summer, mainly due to the high domestic thermal load coinciding with daytime occupancy periods. Therefore, this package of measures was not considered in non-residential buildings.

It provides **for the following indicators of progress** in the fight against energy poverty:

- Number and percentage of people affected by energy poverty, by geographical location (preferably statistical sub-section);
- Share of household disposable income spent on energy, by geographical location (preferably statistical sub-section);
- Arrears of utility bills by geographical location (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);
- Amount awarded in energy cheques, by geographical location (preferably statistical sub-section), if implemented;
- Amount awarded in subsidies for the replacement of ambient heating and DHW systems with more efficient systems.

2.5. Dimension Research, innovation and competitiveness

i. National funding objectives and 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 in new carbon-neutral technological solutions, in order to continue the path of decarbonisation of the economy and achieve the targets set for 2030 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, taking into account the various national competences as well as its framework for ongoing cooperation and activities within the EU.

The Portuguese government has recently committed to overall investment in research and innovation (R & I) of 3 % of GDP in 2030. Portugal's proposed 2030 targets for energy and climate and the trajectory towards carbon neutrality imply a continuation of investment in carbon-neutral technologies. This assumes that investments in R & D in the areas of energy and climate will be stepped up by 2030.

Table 30 – National funding targets for research and development in the public and private sectors (% of GDP)

	2030
Total R & I investment in Portugal	3.0 %
Investment in R & I in Energy	0.2 %
R & I investment in water and climate	0.2 %

The European Energy Research and Development and Innovation Strategy, including the *European Strategic Energy Technology Plan* (SET Plan), *Horizon Europe* (the current programme proposal for 2021-2027 successor to *Horizon 2020*), the Investment Plan for Europe (Junker Plan) and the Innovation Fund (*Innovation Fund*), integrate R & D energy targets for the time horizon 2020-2030. Portugal's participation and cooperation within the SET Plan has been shown to be beneficial in combining efforts towards common objectives of penetration of new technologies and response to joint challenges in disruptive actions. Portugal has been involved in the various implementation groups and activities, considering it important to collaborate between expert groups in developing 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 should initially 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) supporting 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) support for the promotion of business models based on low-carbon products and services; (VI) Support for the implementation of results.

Portugal has developed a set of 15 Thematic Research and Innovation Agendas, coordinated by the Foundation for Science and Technology, I.P. (FCT), which aim to mobilise experts from R & D institutions and businesses in identifying challenges and opportunities within the national scientific and technological system.

These agendas are expected to also contribute to the development of research and innovation by contributing to the response to the problems or needs of different sectors of society. The main objective of the thematic agendas is to promote collective reflection on the knowledge base supporting the country's scientific, technological and socio-economic development on the themes concerned. The 15 themes of these agendas focus on different areas with a significant impact on the energy transition and climate action, namely in the area of Agrofood, Forestry and Biodiversity, Climate Change, Urban Science and Cities for Future, Circular Economy, Industry and Manufacturing, Sea, Sustainable Energy Systems, etc.

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

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

Not applicable.

iii. National competitiveness objectives

As regards competitiveness, in particular in the effort for the energy/climate transition, there is a need for the development of training and reskilling programmes for workers in the most diverse sectors, with a stronger focus on those most impacted by this transition. There is also a need to develop industrial *clusters* and create new jobs, so-called “green jobs”.

The reskilling of workers, with the development of new technical skills, is of utmost importance for companies to adapt to a new energy/climate reality, or even to phase out *industrial* units, and there is a transfer of workers between different sectors. This was the example of the workers in the coal thermal power plants which had since been dismantled in 2021 and who had the opportunity 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 sector and sustainable mobility, and is expected to create around 200 new jobs and support the reorientation of workers in the region affected by the closure of coal power plants through training and reskilling.

A similar situation occurred at the closure of the Matosinhos Refinaria, 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.

More recently, an initiative called “Verdes/ *Green Skills and Jobs Work and Skills Programme*” promoted by the Institute for Employment and Vocational Training aims to foster the reskilling of workers and qualification of unemployed people in the areas of renewable energy and energy efficiency. Information to the general public on energy and climate issues and the consideration of these issues in the education of children and young people, and the promotion of knowledge and a greater degree of public information on these issues, are considered very important. More and better informed consumers and customers of energy services are also important and the promotion and promotion of energy literacy is therefore of utmost importance.

Table 31 – Competitiveness indicators

	2021	Unit	Objective
Green jobs	n.D	NO	T
Green skills	n.D	NO	T
Implementation of the Just Transition Fund	n.D	MEUR	T
Energy literacy	n.a.	%	T

3. PLANNED POLICIES AND MEASURES

The 8 objectives of the NECP, described in Chapter 1, include 64 lines of action and 277 associated measures, which are described by means of fiches for each action line. These include their description, the identification of the main

sectors covered, the action measures contributing to each line of action and the time frame for their implementation, the main links with other strategic public policy instruments and framing the measures envisaged, indicative sources of funding and a pre-identification of the bodies responsible for the development and implementation of the measures. It should be noted that most of the measures are expected to continue in time and therefore the time horizon indicated is the same as the present one of the plan. Each line of action also identifies the contribution to each of the dimensions of the NECP.

In order to fill in *this template*, a readjustment has been made in the distribution of the measures, while maintaining 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 the national axes/objectives assumed for the 2030 horizon

MEASURE

Concrete action directly contributing to the achievement of the targets and objectives set

3.1. Decarbonisation dimension

3.1.1. GHG emissions and removals

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

As mentioned in sub-chapter 1.1.3, one of the strategic objectives of the NECP is to ensure a trajectory to reduce national GHG emissions in order to achieve the carbon neutrality objective in 2050 and to promote the integration of mitigation objectives into sectoral policies (*mainstreaming*).

The scenarios analysed as part of the work of RNC2050 confirm the existence of GHG emission reduction potential in all sectors of the national economy. The feasibility and high cost-effective potential of energy efficiency and renewable energy penetration options are also 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 – which contribute to the objectives of reducing GHG emissions, renewable energy and energy efficiency.

In order to decarbonise the economy and achieve the targets set at national level for reducing GHG emissions in 2020 (-18 % to -23 % compared to 2005) and 2030 (-55 % compared to 2005), action is needed in all sectors of activity, including energy, residential and services, industry, transport and mobility, waste and waste water, agriculture and forests and other land uses. There is also a need for cross-cutting action to promote green taxation, to develop a more circular economy and to ensure the sustainability of the 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, including energy efficiency, renewable, mobility and transport, agriculture and forestry and industry objectives.

LINE OF ACTION

1.1. PROMOTING THE DECARBONISATION OF THE POWER GENERATION SECTOR

DESCRIPTION

Promote the energy transition, with a view to progressively reducing the use of fossil fuels in electricity production, focusing heavily on indigenous renewable resources and 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 the production of electricity 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 (S)

Energy, Buildings

ACTION MEASURES

In order to promote the decarbonisation of the electricity-generating system, in addition to the action measures under Objective 3 – REFORCE TO PROPOSAL IN RENOVEW ENERGIES AND REDUCING THE ENERGY DEPENDENDENDENDENTIC OF THE COUNTRY, the following action measures are envisaged:

1.1.1. Ceasing electricity production from coal – Targeted measure

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 coal-fired electricity by 2030 at the latest and was 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 out in the Paris Agreement.

To that end, and in view of the existence of factors which are a disincentive to coal-fired electricity production, such as the increase in the price of CO₂ emission allowances, the end of the ISP exemption and the increase in the price of coal, as well as security of supply studies already carried out, the closure of the thermal power stations in Pego in 2021 and in Sines in 2023 was envisaged. In this perspective, the necessary technical assessments have been developed that took into account the evolution of the electricity grid and the power plant to assess the impacts and anticipate possible mitigation measures for the SEN.

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

With a view to ensuring a just transition, several measures have been put in place 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. To this end, a study was also carried out in 2021 to assess the need for retraining of plant workers ('Study on the reclassification and identification of employment opportunities for workers affected by the end of coal-fired electricity production at the Pego and Sines power stations' – ISCTE – financed by the Instituto do Emprego e Formação Profissional, I.P.), and a 'Just Transition Compensation Mechanism', financed by the Environmental Fund, was also set up with the aim of ensuring the maintenance of the income of the workers affected, directly and indirectly, by the end of the production of electricity from coal in the Pego TermoElectric Power Plant and its consequent closure, which is a transitional mechanism. [Date: 2019-2023]

1.1.2. Assess the conversion of coal-fired plants to renewable sources

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

The Sines plant is undergoing decommissioning and partial adaptation to renewable energy projects, including renewable hydrogen production. The Pego Central had the capacity to connect to the grid 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 renewable gas production.

1.1.3. Promote *phase-out* of electricity production from fuel oil and diesel in the Autonomous Regions

The autonomous regions have implemented an energy policy in line with national and international guidelines and commitments in this area and are also committed to decarbonising the economy and electricity generation, proof of this is their way to promote renewable energy sources with the aim of reducing GHG emissions and fossil fuel imports.

In the case of the electricity sector, decarbonisation will require the replacement of thermal power plants using fuel oil or gas oil as a fuel, with renewable energies complemented by solutions ensuring security and quality of supply. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

RNC2050; RMSA-E; EAE 2030

SOURCES OF FUNDING

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

ENTITY RESPONSIBLE

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

LINE OF ACTION

1.2. CONTINUE THE IMPLEMENTATION OF THE EU ETS SCHEME

DESCRIPTION

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

Energy; Industry; Buildings; Transport; Waste

ACTION MEASURES

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

1.2.1. Promoting a strategy for the exclusion of installations from the EU ETS 2021-2025 – Achieved Measure

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 allowing an equivalent contribution of emission reductions, and for the possible exclusion of installations emitting less than 2 500 TCO_{2eq} (without being subject to equivalent measures).

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

1.2.2. Establishing the legislative framework on indirect cost compensation mechanism in the EU ETS – Achieved Measurement

The rules on State aid measures under the EU ETS have been laid down and special and temporary measures have been 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 with the publication of Ministerial Implementing Order No 203/2021 of 28 September 2021, as amended by Ministerial Implementing Order No 231/2021 of 2 November, establishing an aid measure in favour of installations covered by the EU ETS scheme operating in sectors and subsectors deemed to be exposed to a significant risk of carbon leakage due to costs related to GHG emissions passed on in the electricity price, in order to compensate for these costs, commonly referred to as indirect costs.

This aid measure applies, in respect of indirect costs incurred annually by eligible ETS installations, from 1 January 2021 to 31 December 2030, and the planned aid has already been granted in respect of the costs incurred in 2021 and the evaluation period for applications for the year 2022 is ongoing. This will continue for the period 2023-2030.

[Date: 2021-2030]

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

To align the new provisions on the implementation of the EU ETS resulting from the publication of Directive (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 Community. This revision concerns phase 4 of the implementation of the EU ETS (2021-2030) and includes a number of significant changes, such as:

- Reduction of allowances available annually with a view to achieving the new emission reduction target for the EU ETS 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 plants in the EU ETS;

- Revision of the aviation rules to ensure that it contributes to the EU's climate objectives, inter alia by increasing the auctioning of allowances and ending the free allocation process from 2027;
- Extension of the EU ETS to the maritime transport sector in order to make a significant contribution to reducing greenhouse gas emissions from maritime activities and increasing the efficiency of those activities.
- Establishment 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).

[Planned date: 2024]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

The ETS Directive

SOURCES OF FUNDING

FA; FSAC; MFF 2021-2027

ENTITY RESPONSIBLE

MAAC; GRA; GRM; APA

LINE OF ACTION

1.3. REDUCE THE CARBON INTENSITY OF THE BUILDING STOCK

DESCRIPTION

Reduce the carbon intensity of buildings, consume energy more efficiently, promote further electrification of the sector, replace fossil fuels with renewable energy sources, promote the use of low carbon materials, promote behavioural change and increase the sharing economy, with a particular focus on rehabilitation to increase energy and water efficiency and increase thermal comfort, contributing to reducing energy poverty. Alongside electrification, the importance of renewable gases such as biomethane and H2 renewable should be mentioned, taking advantage of existing gas networks and ensuring a carbon-neutral solution and efficient cost compared to electrification.

SECTOR (S)

Energy

ACTION MEASURES

In order to reduce the carbon intensity of the building stock, in addition to the action measures relating to the improvement of energy efficiency in buildings under Objective 2 – DAR ENERGY THE ENERGY EFICIENIENCY and the action measures under Objective 3 – REFORCE TO PROPOSAL IN RENOVEW ENERGIES AND REDUCTION TO ENERGY DEPENDENDENDENCE OF THE COUNTRY, the following action measures are foreseen:

1.3.1. Promoting rehabilitation as the main form of intervention at building and urban development level Promote the rehabilitation of buildings as the main form of intervention in the building stock by increasing the useful life of buildings with a 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 the use of digital platforms and the creation of *one-stop-shop* as an information generator and facilitator of small and major renovations of buildings. [Planned date: 2020-2030]

1.3.2. Promoting sustainable construction techniques and efficient buildings

Promote the incorporation of secondary raw materials into building components, bioclimate architecture, passive houses and modular, multifunctional and dynamic architecture. Focus on the re-use of construction components and the use of recycled materials, both in new construction and rehabilitation operations. Promote the treatment and recycling of building materials in a way that makes it possible to reuse them, making the sector more sustainable. Promote the certification of water efficiency and building material as a distinctive tool for resource efficiency and sustainability in construction. Promote the improvement of the energy and water efficiency of buildings and the reduction of energy needs, including the energy embodied in the building itself, and promote the use of renewable energy sources. [Planned date: 2020-2030]

1.3.3. Promote the electrification of buildings accompanied by increased incorporation of renewables

Electrification of final consumption is identified as one of the most important drivers for decarbonising the economy, notably because it is associated with an increasing uptake of renewable sources in its production. New buildings should therefore focus

on the uptake of local renewable energy sources and electricity, thus promoting the replacement of fossil fuels in buildings. The role of renewable gases will also become increasingly relevant in this sector. [Planned date: 2020-2030]

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

With the digital transition taking place in parallel with the energy transition, digital platforms are increasingly asserting themselves as an effective tool in raising consumer awareness and stimulating them to implement more energy and water efficient solutions in buildings. It is therefore important to encourage more extensive use of existing platforms (e.g.: CasA + portal, digital one-stop shop for the expeditious implementation of energy and water efficiency measures by residential consumers, making use of their interoperability with the Energy Certification System for Buildings (ECS) and AQUA + to speed up the process of converting the improvement opportunities identified in the respective energy certificate and water efficiency classification of buildings. In this context, the functionalities of the CasA + Portal should be enhanced and its interoperability extended to other platforms and entities, aiming at its functioning as a *hub* facilitating the interaction of consumers with credible providers of technical and financing solutions on the market as well as expeditious access to available financial or fiscal incentives. [Planned date: 2020-2030] **contribution TO NECP Decarbonisation DIMENSIONS;** Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; ENAR; SCE

SOURCES OF FUNDING

IFRRU 2020; FNRE; Reabilite for Arrendar Programme, PRR, FA

ENTITY RESPONSIBLE

MAAC; MH; DGEG; ADENE; GRA; GRM

LINE OF ACTION

1.4. REDUCE WASTE GENERATION AND LANDFILLING AND PROMOTE RECYCLING PLANTS

DESCRIPTION

With a view to decarbonising the waste sector, reducing waste generation is a priority and where it is not possible to reintroduce it into the economy with higher added value. In accordance with Community legislation and the national strategy in this area, the most notable 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 plants, including organic recycling.

SECTOR (S)

Waste and waste water; Circular Economy

ACTION MEASURES

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

1.4.1. Preventing the production and hazardous nature of waste

Prevention of waste production and hazardous waste will be achieved through prevention actions in 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 substances, resource efficient and durable. One example is the promotion of extended producer responsibility, voluntary agreements with priority vectors to promote cleaner production and sustainable product design, the reduction of food waste and the encouragement of a reduction in the use of single-use packaging. [Planned 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 material taken back and sent for recycling and recycled bio-waste by encouraging separate collection and capilarity, differentiated treatment of each fraction, the implementation of technical specifications ensuring that waste is not contaminated, the promotion of home and community composting and a strong awareness among the population and businesses. [Planned date: 2020-2030]

1.4.3. Reduce landfilling

The reduction of landfilling will be achieved through diversion of recyclables, including bio-waste from landfills, encouraging their separate collection and differentiated treatment, but also 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 delivering high value added materials/products and energy instead of fuels of non-renewable origin. [Planned date: 2020-2030]

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

By encouraging proximity of the collection network to the user and the separation of the various fractions, boosting synergies in waste collection and treatment 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, promoting digitalisation, self-sufficiency of the competitiveness and sustainability of the sector, reducing the impacts associated with waste management. Promote methodologies to facilitate the separation of waste by citizens, calling for knowledge of recyclable materials. [Planned date: 2020-2030]

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

In promoting a more circular economy, it is important to ensure the application of the principle of the waste hierarchy by promoting the direct reintroduction of waste into the economy, into new applications or after recovery, preferably by preparation 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 regulation encouraging the recycling of waste and the use of recycled products and materials to the detriment of virgin raw materials, research and development of new products and applications, awareness-raising and education on the preference for recycled products and materials or containing recycled material. As regards energy, it is also important to recover biogas and electricity produced from the UK. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

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

SOURCES OF FUNDING

RRP

ENTITY RESPONSIBLE

MMAC; GRA

LINE OF ACTION

1.6. DECARBONISE AND MAKE MORE RESILIENT BUSINESSES, CITIES AND TERRITORIES

DESCRIPTION

Mobilising and involving local and regional actors, strengthening the role of civil society and business in building a carbon-neutral society, is key to the decarbonisation process. In addition to the mitigation component, increasing resilience should be promoted both at 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 building stock (residential and commercial) and using energy more efficiently, deepening knowledge on climate change mitigation, disseminating best practices and boosting behaviour in society. Sustainable and rational use of the territory will also be promoted, minimising GHG emissions and intensifying carbon sequestration; focus on the containment of urban perimeters, limiting soil sealing.

SECTOR (S)

Territory and Cities; Businesses; Mobility and transport

ACTION MEASURES

In order to decarbonise cities, in addition to the action measures set out in the corresponding action lines of Objective 5 – PROMOVER SUSTAINABLE MOBILITIES and Objective 2 – DAR ENERGY EFICIENCE, the following action measures are envisaged:

1.6.1. Reducing the carbon intensity of the transport and urban logistics system

Develop and implement Sustainable Urban Mobility Plans (SUMP) by the MIFs/MAs and local authorities. Promote demand management (passengers and freight) and town planning in order to reduce travel volumes (traffic) and travel distances. Create Reduced Emission Zones (LEZ), where applicable. Adopt tools to support mobility management and information systems and technologies supporting mobility and communication – smart mobility – for users (generalisation of real-time information at stops, public information portals, *apps* for mobile devices). [Planned date: 2020-2030]

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

Promote the development of carbon neutrality plans and strategies in the corporate sector, including the regular accounting and reporting of GHG emissions linked to their activity. These short to medium and long-term strategies should be aligned with the

NECP2030 and the national objective of achieving carbon neutrality by 2050 and should be linked to the sectoral carbon neutrality roadmaps where they exist [expected date: 2020-2030]

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

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 among the younger population on climate change and air quality, and promote living labs for decarbonisation in cities, involving the municipality, knowledge institutions and businesses in the development of pilot projects. [Planned date: 2020-2030]

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

Avoid the conversion of green areas and subsequent sealing of their surface. Strengthen the development of existing urban areas and promote the coordination of the natural values to be safeguarded. Support the implementation of rehabilitation and regeneration of the built fabric throughout the planning process, rather than new ones. Take care of the urban design which should give priority to walking traffic. Promote greater inter-municipal cooperation. Include strict preventive measures in the Territorial Management Tools and promote effective monitoring. Concentrate all binding rules for individuals on municipal management plans. Clarify the land regime, ending with urbanable land. Make territorial planning more flexible. Make the strategic environmental assessment procedure more effective to carry out, at the earliest stage of planning, scrutiny of strategies, plans and programmes in relation to increased risk and impact with regard to climate change, land degradation and GHG emissions. Put in place an operational governance framework at regional level. [Planned date: 2020-2030]

1.6.5. Regenerating and revitalising urban centres, taking into account sustainability criteria

Promote functional densification of urban tissues, including diversification and enhancement of the supply of local services and trade that enhances sustainable mobility patterns. Promoting energy sustainability in public space and urban systems, including energy efficiency of street lighting and energy and water efficiency of urban water and sanitation systems. Promote the regeneration and revitalisation of riparian urban fronts through resilient projects, the promotion of the blue economy and the promotion of sea-related sport activities and sustainable tourism. Promote the energy sustainability of industrial, technological and business parks, ports and logistics platforms. Promote urban agriculture by creating dedicated spaces 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. [Planned 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 set and the planning tools for mitigation. The sectoral plans should be adopted every five years in dialogue with the representative structures of each sector and should be in place over the same time horizon. [Planned date: 2023-2024]

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

Develop municipal and regional climate action plans to contribute to the objectives and targets set out in the national climate action policy planning instruments, including those set out in the Climate Basis Law. These plans should be linked to other planning tools relevant to the territory concerned, in particular territorial management tools, and should make use of existing information from other previously developed local or regional plans, such as inter-municipal and local climate adaptation plans, Covenant of Mayors plans, Just Transition Plans or regional carbon neutrality roadmaps, where they exist. In this context, the establishment of a network of cities and a platform to support it should also be promoted as a technical group with comprehensive expertise, ranging from energy management in cities to the establishment of investment plans appropriate to different contexts, including the empowerment of the technical frameworks of the municipal chambers and the stimulation of activities to mobilise and share experience, at national and international level [expected date: 2022-2024]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; Sustainable Cities 2020; ENAR; PNPOT; SUMP; PMEA; PROTA

SOURCES OF FUNDING

PRR, FA, POSEUR; PACS; MFF 2021-2027; PACS

ENTITY RESPONSIBLE

MAAC; MP; MH; MCT; GRA

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 circularity levels of material and water use, lead to a substantial adoption of (new) business models replacing the supply of goods with the provision of services and ownership by use, and to the proximity of production and consumption, and to reduce consumption by turning waste into (new) resources. Pursue the circular economy vision and actions that contribute to the reduction of GHG emissions, as set out in the Circular Economy Action Plan (CEAP).

SECTOR (S)

Waste and waste water; Industry; Services; Residential; Transport

ACTION MEASURES

To promote the transition to a circular economy, the following action measures are envisaged:

1.8.1. Promoting the recirculation of materials and water

Boost the market for recyclable materials. Enhance classification as a by-product and end-of-waste status, including articulation with collaborative laboratories for the circular economy. Strengthen management systems for specific waste streams with a view to creating synergies and assessing the application of Extended Producer Responsibility (EPR) to emerging streams. Promote the establishment of new industrial areas developed for industrial symbiosis, with plans for the rationalisation of materials and energy and the rehabilitation of existing industrial areas. Promote regional agendas based on analysis of regional metabolism and identify opportunities for closing cycles. Improve treatment of the solid phase of the treatment plant with a view to optimising the process from an environmental, economic and technical point of view and the recovery of sludge. Develop innovation projects in the area of conversion of WWTP to resource recovery factories with zero CO₂ emissions. Promote the production and use of reclaimed water obtained from waste water treatment. Promote sectoral agendas for the circular economy. Promote the use of compost resulting from the recovery of bio-waste. Recover material energy. Promote the use of biogas for energy production. Promote the incorporation of waste into biofuels. Promoting the use of energy production capacity in SA systems, in particular through the use of biogas. [Planned date: 2020-2030]

1.8.2. Promoting material efficiency of products

Improve the production process with less waste generation. Reuse components in the production process. Encouraging the *eco-design* of products to contain less resistant and durable material and materials, as well as enabling dismantling and further facilitating the separation of materials. Encourage *eco-design* for the incorporation of naturally occurring or recovered materials. Encourage and inform on productive methodologies under *zero production, eco-design, safe and sustainable by design initiatives and measures*. [Planned date: 2020-2030]

1.8.3. Boosting circular business models

Encourage innovation in the supply of radically different new products that make existing products redundant, and therefore not necessary, or that offer the same function with a radically different product (e.g. digitalisation). Encourage greater and intensive use of products by sharing them and by serving the use of products. Encourage longer product longevity by: design to last and recover, improved maintenance, reconditioning, remanufacturing of discarded products (or parts/components of) in a new product, with the same functions and repurposing the discarded products (or parts/components of) into a new product with different functions. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; PAEC; PERSU 2020 +; PENSAAR 2020; PEPGRA

SOURCES OF FUNDING

FA, RRP

ENTITY RESPONSIBLE

MAAC, MEM, MH, ADENE, MI

Action Line (new)

1.10 PROMOTING INSTRUMENTS TO STRENGTHEN CLIMATE ACTION

DESCRIPTION

Promote the implementation of cross-cutting instruments across all sectors to leverage climate action, both in the strategic climate policy planning process, 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 directly or indirectly contribute to the achievement of climate policy, as well as those contributing to the six environmental objectives of the EU 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 (S)

All

ACTION MEASURES

To promote instruments to strengthen 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 on greenhouse gas emissions of five years, in line with the other climate policy instruments and international guidelines, by carrying out a forward-looking climate policy analysis to ensure compliance with that limit.

[Planned date: 2022-2030]

1.10.2. Preparing the Budget for Climate Action – New Measure

Identify measures that directly or indirectly contribute to the achievement of the main climate policy instruments for climate change mitigation and adaptation, including by identifying their consolidated budgetary allocation to be made available for the implementation of each of those measures in the various budgetary programmes

[Planned date: 2022-2023]

1.10.3. Preparing the Green Budget – New Measure

Identify in the State Budget measures that contribute directly or indirectly to the achievement of the main policy instruments for each of the six objectives of the EU 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, with an indication of the respective consolidated budgetary allocation to be made available for the implementation of each of those measures in the various budgetary programmes;

Provision of an estimate of the contribution of the measures entered in the State budget to the achievement of the targets of the Climate Law

In this context, the Green Budget Working Group is set up, which will be responsible for the preparation of the Climate Action Budget and the Green Budget. [expected date: 2024-2030]

1.10.4. Consolidating the Legislative Impact Assessment on Climate Action – New Measure

Consolidate the Legislative Impact Assessment on Climate Action, which was incorporated as a pilot project into the existing system of prior legislative impact assessment (Council of Ministers Resolution No 5/2021 approving 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 impact assessment of legislative initiatives with regard to climate balance, in line with the Climate Basis 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, encouraging more informed decision-making by the Council of Ministers, as well as promoting better policy making.

[Planned date: 2021-2023]

CONTRIBUTION TO 5 DIMENSIONS

All

PRINCIPAL INSTRUMENTS

Climate Basis Law; State budget; Legislative procedure (AIL)

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE

MAAC; MF

Action Line (new)

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 to the generation of co-environmental and socio-economic benefits such as the protection of biodiversity and natural capital, by: (I) certification of projects, in line with European and international principles and good practices, enabling carbon credits to be generated and consequently traded; (II) Framework for actions to offset emissions and financial contributions to climate action.

SECTOR (S)

All

ACTION MEASURES

In order to establish a voluntary carbon market, the following action measures are envisaged:

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 steps to make their municipalities or their organisations/services/products more sustainable, committing to emission reduction objectives and targets to support the overall goal of reaching carbon neutrality by at least 2050. In this context, there has been a growing interest in society at large, albeit with greater emphasis from the private sector, in using voluntary carbon markets as a tool for offsetting emissions.

However, it is necessary that the actions taken by the various parties can be properly framed so that they are credible and transparent, so that they do not translate into greenwashing practices *and* can contribute to national climate action objectives.

In order to make the best use of such instruments and to maximise the benefits such as supporting biodiversity and fostering natural capital, it is essential to establish a regulatory framework at national level to ensure transparency and quality – compatible with *European* and international MRV standards – of monitoring, reporting and verification. [Planned date: 2022-2023]

1.11.2. Develop the carbon registration and credit platform – new measure

Transparency of the activity taking place within the voluntary carbon market is essential to ensure its effectiveness and credibility, which is one of the fundamental principles governing this type of market, which is essential to avoid double counting of GHG emission reductions or carbon sequestration. In this way, the registration platform should allow for the registration of projects, market players, carbon credits and transactions carried out, which should be publicly available. [Planned date: 2023-2024]

1.11.3. Develop 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 project that will be included in the voluntary carbon market and should define a set of parameters, criteria and procedures to determine the baseline (or base) scenario 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. These 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. [Planned date: 2023-2030]

1.11.4. Establish the legislative framework for the qualification of verifiers and their operationalisation – New measure

Define the requirements and conditions for carrying out the activity of verifiers for the purpose of validating and verifying the information required of verifiers under the legislative framework to be adopted when setting up the MRV, as well as creating the qualification system and opening the process of applying for verifiers. [Planned date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; Climate Basis Law

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE

MAAC; APA; ICNF

Action Line (new)

1.12 PROMOTING WATER MANAGEMENT

DESCRIPTION

Promoting water management measures is a strategic area of intervention in view of the need to mitigate water scarcity and ensure the resilience of the territories most affected by drought, based on climate change scenarios and the perspective set out in the National Strategy on Adaptation to Climate Change (ENAC) 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 (S)

Waste water; Industry; Agriculture; Cities

ACTION MEASURES

1.12.1. Promoting optimisation and resilience of water services – formerly classified as action measure 2.3.2 – New measure

Increase the resilience of public water supply systems by improving their performance, in particular as regards the reduction of water losses; Increase the resilience of wastewater sewerage systems by removing undue connections, adapting treatment plants to extreme climatic events and reusing treated waste water, both for own use and for disposal 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 discharges without treatment, 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 WWTP and ETA and other facilities. Promote the use of reclaimed water in non-potable urban uses and carry out campaigns to raise public awareness of water saving. 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 the plots; promoting the use of more effective irrigation practices (as provided for in Action Measure 6.4.1); adapting crops to our climate and less water-consuming; use of meteorological stations and soil moisture monitoring probes that allow irrigation needs to be adjusted more accurately and in real time according to evapotranspiration rates. [Planned date: 2020-2030]

1.12.2. Improving Water Efficiency – New measure

A more efficient use of water, where necessary and without waste, requires buildings and equipment to be more efficient in water efficiency, and businesses, professionals and citizens to be better able to use it efficiently, the aim is to promote the water-energy nexus in the management of water supply systems and their use. [Planned date: 2020-2030]

1.12.3. Promoting the use of Drinking Water (RWW) – New measure

In order to meet 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 current use, in line with the principles of the circular economy. The use of treated waste water is, moreover, an example of what can be a climate change adaptation measure and good water management practice, in particular to address water scarcity aggravated by increased frequency and intensity of droughts, thus increasing the resilience of the systems.

Potential non-potable uses (urban, agricultural, forestry, industrial, landscape, etc.) should therefore be considered, including supporting ecosystems and assessing potential producers and potential users, so that this strategy can also contribute to the climate and energy transition. [Planned date: 2023-2030]

1.12.4. Promoting seawater desalination projects – New measure

Promote the installation of desalination plants in addition to other supply enhancement measures, allowing for modularity and the possibility of additional increases in water availability to mitigate future risks of water scarcity in more vulnerable regions. [Planned date: 2023-2026]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; RBMP; PENSAARP2030; PEPAC

SOURCES OF FUNDING

RRP, ERDF

ENTITY RESPONSIBLE

MAAC

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 of this objective.

SECTOR (S)

Agriculture; Energy

ACTION MEASURES

In order to promote the decarbonisation of livestock farming, the following action measures are envisaged:

6.2.1. Promote the installation or reconversion of effluent management and treatment systems to reduce GHG emissions

Develop and adopt livestock effluent management systems as a key factor in reducing GHG emissions in this sector. [Planned date: 2020-2030]

6.2.2. Support improvements in digestibility in animal nutrition

Promote food strategies to increase digestive food efficiency, minimising the potential pollutant load, in particular for GHGs. [Planned date: 2020-2030]

6.2.3. Promote integrated solutions for the treatment of agricultural and agro-industrial effluents

The new National Strategy for Agricultural and Agro-Industrial Effluents (ENEAPAI 2030) is based on the concerted will between the environment and agriculture to provide technically and economically viable solutions for the sectors under consideration, focusing primarily on intensive pig and cattle farming.

The new ENEAPAI 2030 (MCR No 6/2022) is based on five axes related to: (I) compliance with environmental and sectoral rules; (II) setting up a monitoring structure for ENEAPAI 2030; (III) promotion and prioritisation of sustainable management solutions and 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 former); (3) the milk basin of Esposende -Vila do Conde, forming part of the respective NVZ, (Vila do Conde, Póvoa do Varzim, Póvoa do Varzim and Vila Nova de Famalicão); (4) Western Region (Torres Vedras); (5) municipalities of Montijo, Palmela and Setúbal.

The solutions found as a result of ENEAPAI should be aligned with the guiding principles of Circular Bioeconomy and RNC2050. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; RDP 2020; PEPAC; ENEAPAI 2030; NREAP

SOURCES OF FUNDING

EAFRD; EAGF; The Cohesion Fund

ENTITY RESPONSIBLE

AEM; MAAC; GRA

LINE OF ACTION

6.3. REDUCE NITROGEN FERTILISER CONSUMPTION

DESCRIPTION

Encouraging the reduction of the use of nitrogen fertilisers by reference to the Code of Good Agricultural Practice (Order No 1230/2018 of 5 February 2009), the Code of Good Practices for Reducing Emissions from Amonac (2022), under the National Teams

Directive (Decree-Law No 84/2018 of 23 October 2009) and the EU Regulation for fertilising products (which will replace the current Regulation EC 2003/2003 on fertilisers).

SECTOR (S)

Agriculture; Circular Economy

ACTION MEASURES

In order to reduce the consumption of nitrogen fertilisers, the following action measures are envisaged:

6.3.1. Adoption of the Code of Good Agricultural Practice

Apply recognised codes of good practice for this purpose in order to reduce the use of nitrogen fertilisers as a promoter of GHG and ammonia emission reductions. [Planned date: 2020-2030]

6.3.2. Improving the efficiency and effectiveness of land application of fertilisers

Promote the uptake of fertilisation techniques that minimise nutrient losses by expanding organic farming, conservation and precision, reducing emissions associated with animal effluents and fertiliser use and promoting increased carbon sequestration resulting from increases in soil organic matter content. [Planned date: 2020-2030]

6.3.3. Replacement of mineral fertiliser use with organic fertilisers

Encourage the production of organic fertilisers, together with the promotion of substitution of synthetic (mineral) fertilisers by organic ones. The recovery of agricultural waste through the composting process, of which the URSA – Alqueva Product Recirculation Unit – is an example, is a key factor in this regard. The existence of a number of recirculating units located close to the production sites of the by-products will help to encourage the replacement of mineral fertilisers by compost. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; RDP 2020; PEPAC; ENEAPAI 2030; ENAR; NREAP; BREF birds and pigs

SOURCES OF FUNDING

EAFRD; EAGF

ENTITY RESPONSIBLE

AEM; MAAC; GRA

LINE OF ACTION

6.5. INCREASING THE NATURAL CARBON SINK CAPACITY OF AGRICULTURE AND FORESTRY

DESCRIPTION

The aim is to increase the carbon sink capacity of agriculture and forestry.

SECTOR (S)

Agriculture; Forest

ACTION MEASURES

In order to increase the natural sink capacity of agriculture and forestry, the following action measures are envisaged:

6.5.1. Support afforestation and improvement of the environmental value of forests

It will be achieved through support for afforestation of non-agricultural land, afforestation in areas of high susceptibility to desertification, support for actions to improve the resilience of forest stands, support for 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 existing stands in unadjusted ecological conditions using better adapted species, support for increasing the area subject to forest management plans and promoting the improvement of the economic value of forest stands, support for certification of sustainable forest management, promotion of the implementation of management models and standards of the Regional Forest Planning Programmes (PROF), boosting forestry intervention areas, forest management units, forest management entities, qualification of operators in the sector and promotion of ecosystem services. [Planned 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 of forest producers and making the territory more resilient to rural fires and pests. [Planned date: 2020-2030]

6.5.3. Conserve, restore and improve agricultural and forest soils and prevent erosion

It will be achieved by installing, conserving and restoring riparian galleries that maintain the water regime and prevent erosion, by adopting agricultural and forestry techniques that promote an increase in soil organic matter levels and soil carbon sequestration, in particular through minimum tillage, direct sowing and grass between permanent crops. The application of compost resulting from the recovery of agricultural waste, which will contribute to increasing the percentage of soil organic matter, with benefits in terms of soil structure and fertility, as well as the reduction of water erosion, will also be relevant in this area. It will also support 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. [Planned date: 2020-2030]

6.5.4. Continue to support and develop Ecosystem Services Remuneration Programmes in Rural Spaces

The 1st phase of the Rural Ecosystem Services Remuneration Programme, 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 from fires. The remuneration of ecosystem services aims 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 and resilience of the territories.

The aim is to continue to promote this type of mechanism which aims to compensate for unvalued contributions from the market, including contributing to erosion control, carbon sequestration, regulation of the hydrological cycle, conservation of biodiversity, reduction of fire susceptibility and improvement of landscape quality. [Planned date: 2020-2030]

6.5.5. Promote the implementation of the programmatic intervention measures provided for in the HYPERLINK "<https://dre.pt/application/file/a/136477282>" Landscape Transformation Programme (PTP) – New measure

The Landscape Transformation Programme (PTP) is a strategy for vulnerable forest territories with high fire hazards. The Landscape Transformation Programme, approved by Council of Ministers Resolution No 49/2020 of 24 June 2009, will be implemented in the medium and long term by means of four programme measures:

- a) Redevelopment and Landscape Management Programmes (PRGP), aimed at promoting landscape design as a reference for a new economy in rural territories, promoting a multifunctional, biodiverse and resilient forest, more cost-effective, more carbon sequestration and capable of producing better ecosystem services;
- b) Integrated Landscape Management Areas, which define a pooled management model, implemented through Integrated Landscape Management Operations (IBMOS), targeted at specific micro-territorial contexts, preferably included in the PRGP, with an appropriate scale for active and rational management;
- c) 'Condominio de Aldeia' means an integrated Village Support Programme located in forest territories, with the aim of ensuring the management of fuels around settlements in areas with high forest density and high number and dispersion of small rural settlements;
- d) 'Parcel for Ordenar' programme, with a view to increasing the physical size of agricultural land in the context of mini-stroke and thus increasing economic, social and environmental viability and sustainability.

The Landscape Transformation Programme is aligned with the PNPOT guidelines, the National Forest Strategy 2030 (ENF 2030) and the National Strategy for Nature Conservation and Biodiversity 2030 (ENCNB 2030). In conceptual and programmatic terms, the HWTP also responds to the guidelines of the Inner Recovery Programme. [Planned date: 2020-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; ENF; RDP 2020; PEPAC; ENCNB; MAWP

SOURCES OF FUNDING

EAFRD; EAGF; The Cohesion Fund; FA; RRP

ENTITY RESPONSIBLE

AEM; MAAC; GRA; DGT; ICNF; AGIF

LINE OF ACTION

6.6. PROMOTE MORE EFFECTIVE MANAGEMENT OF THE AGRICULTURAL AND FORESTRY SYSTEM WITH REDUCED

BURNT AREA AND REDUCED IMPACT OF BIOTIC AGENTS

DESCRIPTION

The aim is to reduce the number of fires, burnt area and emissions from fires and reduce the affected area and emissions from biotic agents.

SECTOR (S)

Agriculture, Forestry and other land uses

ACTION MEASURES

In order to promote more effective management of the agroforestry system with reduced burnt area and reduced 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 provided for in the National Plan for Integrated Rural Fire Management, in particular those forming part of the strategic objective “Care of rural areas”. Support the functioning of the Forest Sapadores teams, increase their efficiency, and provide the ICNF with a force of forest firefighters. Implement the National Plan for Controlled Fire and the National Programme for Reducing Rural Fire Ignitions. [Planned date: 2020-2030]

6.6.2. Promoting productivity and improving the economic value of forest stands

It will be achieved through the professional and active management of stands, maximising the potential of the seasons, using improved plants, multifunctionality, more demanding technical solutions, certification of sustainable forest management, consolidation or conversion of the already established forest, as part of a new specialisation of the territory, and the restoration of degraded or undercrowded forest systems. The sectors must invest in forest-based products with higher added value and apply fair prices to the producer, creating a value chain that is passed on from production to marketing of the final product. [Planned date: 2020-2030]

6.6.3. Reducing biotic agricultural and forestry risks – this results from the breakdown of action measure 6.6.1 – New measure to implement the Forest Health Operational Programme and the Action Plans, Contingency Plans, Control Plans for Harmful Biotic Agents. Implement the Programme of Action for the Control of Invasive Species. Strengthen the control of imports and movements of timber and agricultural and forestry reproductive material. Support the empowerment of the sector for more effective monitoring and control and strengthen the capacity for early detection of invasive biotic agents. Control pests and emerging diseases in agricultural and forestry systems. [Planned date: 2020-2030]

6.6.4. Promoting the reduction of the spread of dwellings, protecting infrastructure, in particular the High, Medium and Low Voltage electricity grid, and isolating potential fire outbreaks – New measure

Build and restore Secondary Fuel Management Fund Networks in accordance with existing legislation, which is evolving and increasing the amount of infrastructure needed by these defence networks built in their surroundings. At the same time, taking into account the state of the electricity networks and the ageing of their assets, consider alternative solutions, such as the conversion of air networks into underground networks or, in the case of the Low Voltage network, the replacement of air networks without isolation by isolated networks. These alternatives aim to promote not only greater security of network operation, but also enhance technical quality of service and efficient operation of networks. [Planned date: 2020-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

RNC2050; ENF; RDP 2020; PEPAC; PNPOT; PNGIFR; PDIRD-E; PDIRT-E

SOURCES OF FUNDING

EAFRD; The Cohesion Fund; ERDF; FA; RRP

ENTITY RESPONSIBLE

AEM; MAAC; GRA; ERSE; DGEG; Network Operators

LINE OF ACTION

6.7. INCENTIVISING THE ROLE OF THE BIOECONOMY FOR DECARBONISATION

DESCRIPTION

Promote the decarbonisation of bio-based economy value chains by increasing the use of agricultural, livestock and forest-

based by-products/residual materials with new circular business areas contributing to the reduction of GHG emissions.

SECTOR (S)

Agriculture; Forest; Energy

ACTION MEASURES

In order to encourage the role of the bioeconomy for decarbonisation, in addition to the proper articulation with the action lines on the transition to a circular economy of Objective 1 on the use of biomass under Objective 3 and on alternative fuels under Objective 5, the following action measures are envisaged:

6.7.1. Promote the use of residual biomass of forest and agricultural origin

Boost the markets for materials and strengthen systems for managing this type of waste (using compounds resulting from the recovery of bio-waste, making use of biomass resulting from logging, cutting and thinning, pruning and harvesting for energy), developing models for the collection and mapping of information, and promoting new business areas. [Planned date: 2020-2030]

6.7.2. Support the establishment of crop areas for energy purposes of very short rotation forest species – measure eliminated

Measure eliminated 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 renewable materials of agricultural, livestock and forestry origin as substitutes for fossil materials

It will be achieved through the use of agricultural and forestry commodities as part of the circular economy and sustainable construction, the development of new products in the textile, footwear and natural resin sectors, support for the establishment and modernisation of primary processing units for agricultural and forestry products, and support for the establishment of centres for the collection and transport of residual biomass. Promotion of the transformation (conversion) of chemical energy from organic compounds, biogas and biomethane of agricultural animal origin into thermal and electrical energy (cogeneration). [Planned date: 2020-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

RNC2050; ENF; PABS; RDP 2020; PEPAC; PNPB

SOURCES OF FUNDING

EAFRD; The Cohesion Fund; ERDF, RRP

ENTITY RESPONSIBLE

AEM; MAAC; GRA30

³⁰Not applicable for measure “Support for the establishment of areas for energy purposes of very short rotation forest species”

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy efficient

ACTION MEASURES

To foster eco-innovation and cleaner production processes, promote the digitalisation of industry (Industry 4.0), the following action measures are envisaged:

7.3.1. Promoting the digital industry (Industry 4.0)

Promote the digitalisation of the industrial sector, incorporating resource efficient management logics, improving process efficiency, reducing energy and resource consumption, and promoting the decarbonisation of processes, products and services. Digitalisation supporting the energy transition, including through sensing, communication and storage of data and microservices [Planned date: 2020-2030]

7.3.2. Promoting reindustrialisation creating green jobs

Promote the creation of green jobs to address the needs of the energy and climate transition through accredited entities. [Planned date: 2020-2030]

7.3.3. Minimise the consumption of fluorinated gases with a view to replacing them with natural refrigerants

Prohibit the placing on the market of equipment containing F-gases with high GWP (Global Warming Potential). Prevent the release of fluorinated gases into the atmosphere. Promote the use of natural refrigerants to replace fluorinated gases. Promote alternatives to sulphur hexafluoride (SF₆), whose GWP is very high.

3[planned date: 2020-2030]

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 line with the Climate Basic Law (Article 68), a green industrial strategy should be developed to support companies in the process of the climate and energy transition of the industrial sector and in meeting emission reduction targets, enhancing their competitiveness. This strategy should also be linked to the innovation and development agenda and should be approved following a procedure involving a hearing of a number of national, regional and local authorities.

[Planned date: 2024]

7.3.5. Deepening industry-sustainability pull mechanisms – New Measure

This measure aims to deepen the mechanisms for attracting new productive investment for sustainability, focusing on suppliers of goods and equipment needed to ensure the climate and energy transition and taking advantage of Portugal's comparative advantages in terms of access to low-cost electricity and green hydrogen, and Europe's most extensive lithium reserves, taking advantage of the conditions in Portugal for its operation to develop with a lower environmental footprint. Highlights in this context a focus on the green steel industry, the production of electric and zero-emission vehicles in the battery and hydrogen value chain.

ENTITY RESPONSIBLE

MAAC; WPM; GRA; ADENE; MI

ACTION MEASURES

In order to improve knowledge on climate change mitigation, disseminate good practices and boost low carbon behaviour in society, in addition to action measures on the development of low-carbon plans and strategies and dissemination of good practices and knowledge on local climate change under Goal 1 – decarbonising NATIONAL ECONOMY, 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 educational initiatives on climate change mitigation and air quality within the themes in the curricula. Support the development of training to enable the creation of skills supporting the transition to a carbon-neutral economy and better air quality. [Planned date: 2020-2030]

8.3.2. Deepening knowledge on 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 Empowerment Project (LIFE CAP PT II – Portugal *Capacity Building for Better Use of LIFE II*) is being implemented to disseminate the LIFE financial instrument to increase the number of project proposals for LIFE applications and improve their quality. Part of the project is dedicated to the sub-programme “Climate Change Mitigation and Adaptation” (CLIMA) through dissemination and information sessions on the financing of climate change mitigation/governance and training PROJECTS, which contribute to the transition to a carbon-neutral economy. [MINUTESplanned: 2020-2030]

8.3.3. Promote awareness raising on low carbon behaviours

Various actions and in line with the measures identified at sectoral level in the “behaviours” strand. Development of campaigns to raise awareness of the carbon-neutral economy. [Planned date: 2020-2030]

8.3.4. Promote awareness raising and empowerment (education and training) for more sustainable production and consumption patterns

Ensure that citizens have access to relevant information and awareness of behaviour that leads to more sustainable production and consumption patterns. To this end, awareness raising campaigns on sustainable production and consumption will be

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 decarbonisation of industry is advocated by promoting the use of renewable resources, energy storage, electrification and the use of renewable gases. With a highly renewable base electricity system, the aim is to promote and enhance the use of electricity in the different sectors of activity and economy, in parallel with the increased use of other renewable energy sources such as biomass, biofuels and renewable gases. The industrial sector will play an extremely important role, with one of the main hubs of need for innovation and the creation of new business models. Strengthening the prospects of the circular economy, industry 4.0 and technology innovation is crucial on the path to identifying and creating innovative, efficient and emission solutions very close to zero over the next 30 years.

SECTOR (S)

Industry; Energy; Waste

ACTION MEASURES

To promote the decarbonisation of industry, the following action measures are envisaged:

7.1.1. Promoting renewable energy

Promote and encourage the penetration of renewable energy sources, in particular solar thermal, solar photovoltaic, green hydrogen and biomethane, also as a way to promote increased competitiveness by reducing energy costs. [Planned date: 2020-2030]

7.1.2. Increase the use of clean alternative fuels and other national resources with potential for use as an energy source, promoting emission reductions in industry

Promote and encourage the uptake and penetration of renewable energy sources, in particular renewable gases, renewable fuels of non-biological origin, waste based fuels (CDR) and other clean fuels. The replacement of heavily polluting fuels with those with lower emission factors, notably those of renewable origin (such as biomethane, green hydrogen and synthetic methane), the use of efficient equipment and optimised consumption management are crucial processes to ensure decarbonisation, as they allow for a substantial reduction in energy bills and GHG emissions due to the progressive and feasible replacement of high-polluting fuels with cleaner sources, while promoting greater competitiveness of industry. A stronger focus on the use of hydrogen as a driver 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. [Planned 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

developed, involving and articulating with the various stakeholders in 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 consumers and supply chains. Capacity building in the field of education at the level of compulsory education will also be promoted through the inclusion of educational content/projects in the field. Promote the training of entrepreneurs and consumers, in liaison with stakeholders and non-governmental organisations, and, in conjunction with the distribution sector, strive for adequate empowerment of employees who are in direct contact with the consumer. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

ACTION MEASURES

In order 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 an auction system for the allocation of injection capacity into the electricity grid

In a scenario of strong demand for production allowances and scarcity of reception capacity in the grid, auctions are one of the best ways to respond to such demand and accelerate investment in new capacity, giving priority to projects with the lowest costs and with the highest implementation guarantees, allowing for a better articulation between the permit issuing process and investments in new grid capacity. In this logic, the implementation of an auction system

emissions due to the substitution of fossil fuels with indigenous and cleaner sources, while promoting greater competitiveness of industry. The role of hydrogen as a driver for the decarbonisation of industry is also important, in line with the REPowerEU objectives of accelerating the transition to electrification. [Planned date: 2020-2030]

7.1.4. Consider the potential contribution of Carbon Capture and 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 the hard-to-reduce GHG emissions in very specific sectors (Hard-to-slaughter sectors), such as some industrial sectors where existing technological solutions do not yet fully eliminate emissions (e.g. process emissions from decarbonising the materials used), consideration should be given to the contribution of activities promoting the capture and storage of CO₂ (CCS) or capture for subsequent use of CO₂ (CCU), with a view to concluding on the need and feasibility of promoting such activities. [Planned date: 2020-2030]

7.1.5. Supporting business investment in decarbonisation – New measure

Leveraging the decarbonisation of the industrial and business sector and promoting a paradigm shift in the use of resources, delivering on national medium-long term targets and helping to accelerate the transition to a carbon-neutral economy. The aim is to promote the competitiveness of industry and enterprises through their decarbonisation, to support business investment in productive innovation processes, including through the incorporation of low-carbon processes and technologies and the development of 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 the Industry, which is part of the Climate Transition Dimension – is part of this type of support.
- The Agendas mobilising Enterprise 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, based on R & D, innovation and the diversification and specialisation of the production structure. These agendas are intended to support the development of projects that make it possible to transform the specialisation profile of the Portuguese economy by encouraging more value-added and knowledge-intensive activities geared towards international markets and the creation of skilled jobs. This is an initiative included in the RRP.

[Planned date: 2023-2026]

7.1.6. Ensure 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 European 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 (EU ETS). This gradual reduction of the free allocation will be made as there is also a gradual introduction of this Carbon Border Adjustment Mechanism to ensure that the applicable rules on third countries are compatible with the rules of the World Trade Organisation.

The sectors covered by this mechanism are Cement, Fertilisers, Iron and Steel, Aluminium and Chemistry (Hydrogen) and also apply to imported electricity. [Planned date: 2023-2030]

PRINCIPAL INSTRUMENTS

RNC2050; ENAR; PERSU 2020 +; PRAEE

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OPs; PITD), PRR; PT2030; CEF2; Horizon Europe; LIFE; The Innovation Fund

ENTITY RESPONSIBLE

MAAC; WPM; GRA; MI

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 driving decarbonisation,

differentiating in competitiveness and promoting them can translate into economic and environmental gains.

SECTOR (S)

Industry; Energy

[Planned date: 2023-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; INDUSTRY 4.0

SOURCES OF FUNDING

FITEC, Portugal 2030, Environmental Fund, PITD; RRP

ENTITY RESPONSIBLE

WPM; MAAC; GRA; MH; MI

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 energy, water and material consumption, contributing to the fight against climate change.

SECTOR (S)

Industry; Services; Waste

ACTION MEASURES

To promote the circular economy in industry, the following action measures are envisaged:

7.4.1. Promoting the circular and low-carbon economy in industry

Promote the circular economy, the efficient use of resources, including water, and the prevention of waste generation, including through the use of waste materials 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 products, including low carbon profile products. [Planned date: 2020-2030]

7.4.2. Promoting industrial symbioses (urban, local, regional)

Using by-products and waste as a substitute for raw materials. [Planned date: 2020-2030]

7.4.3. Promote the development of low-carbon products and services designed for various life cycles

Through the adoption of tools for assessing the sustainability of products and services and for identifying solutions to be applied, such as life cycle assessment, product and service certifications, enabling companies to align their activity with the principles of the circular economy (e.g. eco-label, EMAS, eCIRCULAR) among others. [Planned date: 2020-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; PAEC

SOURCES OF FUNDING

FITEC; FA; LIFE; HORIZON EUROPE; RRP

LINE OF ACTION

8.3. DEEPEN KNOWLEDGE ON CLIMATE CHANGE MITIGATION, DISSEMINATE GOOD PRACTICES AND BOOST LOW-CARBON BEHAVIOUR IN SOCIETY

DESCRIPTION

Reaching out to the citizen and civil society is key to the success of climate and energy policies. To this end, it is necessary to send a message that is closer and more connected to people. It is therefore necessary to make visible the role that individuals can play in the adoption of solutions, in particular with regard to behavioural change and the introduction of more sustainable consumption decisions. Empower society and create skills that should be linked to green job creation, steer individual behaviour

towards efficient low-carbon resource management decisions and promote the active involvement of society in this transition, support the dissemination of good practices and participation in networks for the exchange of experience.

SECTOR (S)

All. Civil Society

8.3.5. Promote the training and re-skilling of the professional sector for the energy and climate transition – New measure

Promoting the empowerment and valorisation of companies and workers in the Green Skills, with the aim of enhancing technical skills in the area of energy and climate transition. In this context, particular emphasis is placed on the operationalisation of the Protocol of Vocational Training Centre for Energy Transition, to be set up in Sines. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; ENEA

SOURCES OF FUNDING

FA; Community Funds (OP SEUR, Regional OPs), LIFE; RRP; Green Work and Skills Training Programme
MAAC; GRA; DGEG; APA; ADENE; MH; IEFP; APREN

LINE OF ACTION

8.5. PROMOTING PLATFORMS FOR DIALOGUE FOR SUSTAINABLE DEVELOPMENT AND LEVERAGING CAPACITY

FOR ACTION AT NATIONAL, REGIONAL AND LOCAL LEVEL

DESCRIPTION

Promote permanent and lasting dialogue and discussion platforms at national and local level, involving key actors across sectors, and which can actively contribute to building a more transparent, proactive and inclusive energy policy that ensures that national energy and climate targets and commitments are met.

SECTOR (S)

Cross-sectional

ACTION MEASURES

To promote platforms for dialogue for sustainable development and leverage capacity for action at national, regional and local level, the following action measures are envisaged:

8.5.1. Promoting the creation of the Portuguese Energy Council – Measure eliminated

This measure has been removed as organs already exist in these areas.

8.5.2. Leveraging the role of Local Energy and Climate Agencies, regional and local associations and cooperatives

Local energy and climate agencies, regional and local associations and cooperatives, in view of their proximity to local actors and citizens, appear to be key entities in promoting, in a local approach, the sustainable development of the area (s) in which they are located, and are key players at local level in achieving 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 indigenous local energy resources, the promotion of the use of new technologies, the promotion of information and awareness-raising activities, contributing to the sustainable development of the region and the country. [Planned 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 Basic Law (Article 10), a public, free and web-based digital tool allowing citizens and civil society to participate in climate action and to monitor systematic and national information on:

- a) The greenhouse gas emissions and the sectors that contribute most to these emissions;
- b) The progress of the targets referred to in Section II of Chapter IV;
- c) The available sources of funding, 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 context of climate change; e
- f) International cooperation projects on climate change.

[Planned date: 2022-2024]

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

RRP

ENTITY RESPONSIBLE

MAAC; GRM; GRA; ADENE

ii. Regional cooperation measures in this area

Not applicable.

iii. Financing measures in this area at national level

See point 5.3 (i).

3.1.2. Renewable energies

Portugal aspires a shift from fossil fuels to new forms of energy production and consumption towards a future with a carbon-neutral economy. This path involves continuing to harness and maximise the indigenous renewable potential in Portugal, which is partly untapped, such as solar and *offshore* wind, while adopting more demanding consumption patterns and focusing on new and emerging clean technologies.

I. Policies and measures to achieve the national contribution to the binding EU level 2030 target for renewable energy**LINE OF ACTION****3.1. ACCELERATE 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, the country's energy dependence, generating wealth, employment and economic development. However, Portugal has huge potential for producing clean energy from renewable resources, which are largely untapped, in particular for solar and offshore wind. The current mechanisms for promoting renewables should therefore be strengthened and reviewed to ensure that the 2030 targets are met. Achieving 80 % renewable energy sources in the electricity sector by 2026 implies a doubling of renewable installed capacity by 2021-2030.

SECTOR (S)

Energy; Industry

it provides a number of advantages, including: (i) limiting investors' risk (ii) economic efficiency, (iii) achieving 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 in the NECP and without burdening consumers. The frequency, the number of auctions to be conducted 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 the evolution of installed capacity to meet the targets of the NECP and the evolution of the transmission and distribution networks. The conduct of the auction (s) is announced sufficiently in advance to ensure the greatest predictability for potential stakeholders.

The following auctions have already taken place: FV solar auction in 2019, FV solar auction in 2020 and floating PV solar auction in 2021. In addition to these, the competitive procedure for reserving connection capacity previously used by the Pego coal-fired power plant was also carried out in 2021, which was attributed to a proposal for a hybrid solar-wind generation with storage and production of renewable gases. Auctions are also envisaged for the allocation of capacity for offshore wind projects by 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 in the following ways: (i) there is capacity in the network by issuing the

reserve title for injection capacity into the network in the form of a general regime (RESP); or (ii) by agreement between the applicant and the operator of the RESP on the part of the applicant for the financial costs arising from the construction or reinforcement of the network necessary for the reception of the energy produced by the power plant.

The procedures for obtaining a capacity reservation permit (general arrangements, competitive procedure and agreement between the party concerned and the network operator) are laid down in Decree-Law No 15/2022 of 14 January 2006. [Planned date: 2019-2030]

3.1.2. Encourage the spread of hybrid systems based on renewable technologies by ensuring that they are regulated – Measured

The implementation of such systems gives greater flexibility and better use of resources as it allows for complementarity between forms of energy and, consequently, the possibility of minimising production costs. On the other hand, it maximises grid connection capacity through capacity building without additional network investment. To enable the development and implementation of such a solution, the appropriate legal framework as well as the technical criteria to be met by such systems will be 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, as amended, establishing the organisation and operation of the National Electricity System, inter alia by transposing Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 concerning common rules for the internal market in electricity and partially transposing 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.

3.1.3. Encourage the increase in *onshore* wind production, in particular through over-equipping and *retrofitting*

Portugal still has untapped wind potential, while the current wind farms need to be enabled to become more competitive.

Over-equipping is a rational pathway 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 grid capacity can be exploited.

In terms of *retrofitting*, similarly to over-equipment, the sites where power plants are located the essence of the environmental impact has already been taken into account and 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 for allowing overequipping and repowering, and the limitations currently provided for (20 % of additional connection power) may 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. [Planned date: 2019-2030]

3.1.4. Promoting renewable cogeneration and gradually reducing incentives for cogeneration from fossil fuels. Cogeneration systems play a very important role in energy efficiency and reducing GHG emissions, as it is one of the most efficient solutions for energy production (electricity, heat and cooling). On the other hand, the fact that cogeneration plants are close to energy consumption points is reflected in the reduction of losses and the need for investment in infrastructure. It is therefore important to promote the adoption of cogeneration based on renewable energy sources, as well as the conversion of existing plants from fossil fuels to renewable energy sources, making the best use of indigenous resources. [Planned date: 2020-2025]

3.1.5. Promoting ocean renewable energy

Ocean renewable energy has the potential to 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. Portugal has a very relevant potential for ocean renewable energy that needs to be explored, which in parallel has the potential to create a new export sector in these new energy technologies.

Portugal has a high potential for offshore wind energy, which can mostly be exploited by floating turbines, as well as a reasonable potential for wave energy. Multi-use of space is also sought through the combination of technologies relevant to the energy system and, more broadly, to the blue economy. In this context, and in order to expand installed capacity, areas for renewable energy exploitation in the Atlantic Ocean are being delineated and integrated into national maritime spatial plans, along with the

necessary expansion of NTS and supporting port infrastructure. Models for the allocation of injection capacity into the RESP, including by auction, will also be implemented. In support of innovation, it is planned to create a Technological Free Zone off Viana do Castelo for the development of demonstration projects. For the assessment of this potential, a multi-disciplinary and inter-ministerial working group at national level was set up in 2022. [Planned date: 2020-2030]

3.1.6. Strengthening electricity generation from Geothermia

The Autonomous Region of the Azores, which is rich in high-enthalpy geothermal resources and already exploits for electricity production, will continue to invest in this resource with the aim of achieving maximum productivity in relation to the available resources and technologies. [Planned date: 2020-2030]

3.1.7. Promote pilot renewable energy projects in the demonstration phase and sparsely spread

Of the projects to be promoted, the focus is on dispatchable solar Thermoelectric power generation pilot plants with storage, floating solar and wave energy projects, as well as renewable synthetic gas plants. Other technologies based on ocean location or source, to be developed in the Technological Free Zone off Viana do Castelo, are also included. [Planned date: 2020-2030]

3.1.8. Implement a system of guarantees of origin for renewable electricity and gases

It is essential that the consumer knows the origin of the electricity he consumes, especially when it comes from renewable sources. The purpose of implementing a system of guarantees of origin is 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, by means of Public Consultation No 112, launched the “Proposal for a revision of the Manual of Procedures of the Entity for Guarantees of Origin (EEGO)” (<https://www.erse.pt/atividade/consultas-publicas/consulta-p%C3%BAblica-n-%C2%BA-112/>) introducing renewable and low-carbon gases into the Guarantee of Origin System.

Furthermore, Decree-Law No 84/2022 of 9 December, as amended, which sets targets for the consumption of energy from renewable sources by completing the process of transposing 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 lays down the mechanisms for issuing guarantees of origin (see Chapter VI, Articles 28 to 35).

The system of guarantees of origin for renewable gases is essential for the consistency of the operation of the entire energy production and consumption system, and is already launched by Decree-Law No 60/2020 of 17 August 2012, which re-establishes the mechanism for issuing guarantees of origin for low-carbon gases and gases of renewable origin. The 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. [Planned date: 2023-2024]

3.1.9. Promoting increased reception capacity in energy networks – New measure

Energy reception capacity in certain areas of the grid is limited in part, so to further promote distributed generation and self-consumption of energy, individual, collective, or through renewable energy communities, to invest in the creation of capacity for receiving energy from renewable sources in the distribution grid areas with the highest demand. Investment should consider not only the reinforcement and expansion of the infrastructure, but also the introduction of dynamic and probabilistic management models. [Planned date: 2025-2030] **CONTRIBUTION TO 5 DIMENSIONS**

Decarbonisation; Energy security; Internal Market; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; EAE 2030; EI-ERO 2017-2030; PDIRD-E, PDIRT-E

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OPs); FA; NER 300 and Innovation Fund; Horizon Europe; The Structural Funds; InnovFin Energy Demo Projects; RRP

ENTITY RESPONSIBLE

MAAC; AEM; GRA; GRM; DGEG; DGRM; APA; ERSE; TSO and DSO, WPM, MI

LINE OF ACTION

3.2. PROMOTING THE SPREAD OF 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 consumption site itself, results in reduced costs for transmission and distribution networks, reduced losses and optimisation of energy generation solutions.

SECTOR (S)

Energy; Residential; Industry; Services; 1 agriculture

ACTION MEASURES

In order to promote the further spread of distributed generation and self-consumption of energy and energy communities, the following action measures are envisaged:

3.2.2. Foster distributed generation and self-consumption of energy from renewable sources by removing barriers to their dissemination

The need to give a strong boost to distributed energy generation, in particular with regard to local solar power generation, will play a key role in strengthening the consumer as an active agent, boosting energy communities, impacting on the need to strengthen networks 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 UPAC's, more than tripling the installed capacity between 2020 and 2022 (from 256 MW to 842 MW). It should also be noted that the generation adequacy rule could be adapted to maximise the use of an installation/site and allow for more renewable energy generation in the local grid. [Planned date: 2019-2030]

3.2.3. 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, local social and economic 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 2006, as amended, which established the legal framework for renewable energy communities, and partially transposed Directive (EU) 2018/2001 with a view to implementing this legal framework, the promotion of energy communities should 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. The need for adequacy and relaxation of criteria for access to finance and for streamlining and relaxing licensing procedures. [Planned date: 2020-2030]

3.2.4. Promote programmes to support the establishment of energy communities in partnership with municipalities

It aims to provide support, both from a technical point of view and from the point of view of obtaining funding, 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 hinterland municipalities and with a higher prevalence of energy poor consumers such as social housing projects. [Planned date: 2020-2025]

3.2.5. Redesign the Self-Consumption and Renewable Energy Communities Portal

The licensing of individual and collective self-consumption projects and renewable energy communities requires the existence of a platform to ensure interoperability between the systems of the licensing entity and of the network operators. With this platform licensing procedures are digitalised and some of the processes – such as verification of compliance with physical and electrical proximity rules between members – are also automated; or verification of compliance of delivery point codes. This tool will speed up licensing 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. [Planned date: 2020-2024]

3.2.6. Implement an electronic information portal on self-consumption and renewable energy communities

The aim of this portal will be to inform consumers and facilitate the entire process of installing systems for self-consumption, individually, collectively and within renewable energy communities. It is essential to create a platform or complement an existing one by aggregating in a single place information that enables public and private entities to clarify questions about licensing, care, legislation, training, etc., to disseminate reference projects that can be replicated, thereby enhancing synergies. [Planned date: 2023-2024]

3.2.7. — Integration of self-consumption and storage at electric mobility recharging points – New measure to facilitate integration with the electric mobility model adopted in Portugal by studying possible changes to the existing model that promote integration. [Planned date: 2023-2025]

3.2.8. Promoting a programme for simplified access by public authorities to self-consumption – New measure Public entities, including but not limited to municipalities, are important vehicles for promoting 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 by public authorities to self-consumption. [Planned date: 2023-2025]

3.2.9. Develop a programme for capacity-building actions for the various actors in self-consumption – New measure

The empowerment of the various actors involved in the national electricity system is key to the success of self-consumption activity. It is proposed to strengthen skills and clarify procedures through the creation of guides and the development of training and awareness-raising actions focusing on individual, collective self-consumption and renewable energy communities, addressing administrative, technical, economic and legal aspects. [Planned date: 2023-2030]

3.2.10. Promote a technical guide to encourage 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. [Planned date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; PAESC-RAM

SOURCES OF FUNDING

FEE; UPS; Community funds; RRP; LIFE; CEF2

ENTITY RESPONSIBLE

MAAC; AEM; GRM; GRA; DGEG; ERSE; EEM ADENE; MH, IHRU

LINE OF ACTION

3.3. PROMOTE 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 by optimising and replacing equipment, taking advantage of renewable energy technologies (renewable heat and electricity and renewable gases).

SECTOR (S)

Residential; Industry; Services

ACTION MEASURES

To promote the efficient use of renewable energy in heating and cooling systems, the following action measures are envisaged:

3.3.2. Promote the renovation of heating and cooling systems from renewable energy sources

Encourage the replacement of outdated heat and cold production systems with more efficient and renewable energy systems. Electrification of heating and cooling by promoting the procurement and use of heat pumps for AQS and ambient air heating and cooling in buildings. [Planned date: 2020-2030]

3.3.3. Promoting efficient use of heating and cooling systems – New measure

Promoting efficient use through consumer information, stimulating consumer participation in aggregation for demand participation through heating/cooling systems
Large consumers of heat/cold. [Planned date: 2023-2027]

3.3.4. Promote the development of a National Action Plan for heat pumps – New measure

Development of a National Action Plan to accelerate the uptake of heat pumps in Portugal in buildings and industry, with the framework of the EU Calor Bombas Action Plan. [Planned date: 2023-2025] **CONTRIBUTION TO 5 DIMENSIONS**

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; PROENERGIA

SOURCES OF FUNDING

FA; RRP

ENTITY RESPONSIBLE

MAAC; DGEG; MH

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, changes in permitting should be made with a view to optimising it and introducing simplified and dematerialised procedures and in line with international standards.

SECTOR (S)

Energy

ACTION MEASURES

In order to optimise and simplify the licensing process associated with renewable power plants, the following action measures are envisaged:

3.4.2. 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 introduce improvements and simplify the system for the allocation of energy production licences and to generalise the competitive procedure as a means of managing the shortage of reception capacity of the RESP, ensuring that the allocation of injection capacity into the grid necessarily brings a benefit to consumers.

This measure has since been partially implemented with the publication of Decree-Law No 15/2022 of 14 January 2006, as amended, which establishes the organisation and operation of the National Electricity System. It will also be relevant, given the complexity of the current legislative framework for the sector, to continue a general review with a view to simplifying, clarifying and reducing the number of pieces of legislation, contributing to greater clarity and efficiency in the implementation of new projects. [Decree-Law No 15/2022 of 14 January 2007; Decree-Law No 30-A/2022 of 18 April 1989; Decree-Law No 72/2022 of 19 October 1989; Decree-Law No 11/2023 of 10 February 2006] [Intended date: 2023 – 2024]

3.4.3. Operationalising the One-Stop Shop for the Licensing of Renewables

The operationalisation of a one-stop-shop will make it possible to speed up permitting procedures for energy production projects, reduce permit times and make simple information available to developers and citizens. The central figure in the operationalisation of this action will be the “Project Manager” who, among other functions, should: (I) identify, manage and resolve the main problems; (II) proactively manage the licensing process; (III) disseminate the information of the case to the parties involved; (IV) identify, manage and mitigate the risks associated with the process; (v) ensure interoperability with other existing licensing platforms (e.g.: Single Environmental Licensing and the Marine Electronic Point).

In order to support the One-Stop Shop for licensing, an electronic platform will be set up, in particular that laid down in Decree-Law No 15/2022 of 14 January 2009, to facilitate the processing of licensing procedures and the provision of information on them. This platform should aggregate and make available in a simple and practical way information on the permitting process for power generation projects, including information on the progress of the process, thereby bringing market players closer to the institutions involved in the permitting process, contributing to burden reduction. [Planned date: 2020-2024]

3.4.4. Set up and operate the Mission Unit for Licensing of Renewable Energy Projects (Umer 2030) – New measure

The mission of Umer 2030 is to ensure that the objectives of the NECP 2030 (current and after revision) are met and to speed up the realisation of renewable energy projects. Umer 2030 will be responsible for:

- Procedural operationalisation resulting from the consolidation of the legal and regulatory framework applicable to electrical and environmental licensing (measure 3.4.2);
- Development, implementation and management of the Single Balance for Licensing and Monitoring of Renewable Energy Projects (Measure 3.4.3)
- Proposal for a Sectoral Programme for Renewable Go-To Areas (measure 3.4.4);

- Actions to empower the heads and technicians of central public administration entities (DGEG, APA, ICNF, DGPC, Directorate-General for Agriculture and Rural Development), regional (Regional Coordination and Development Committees (CCDR) and local authorities (municipalities) in permitting procedures for renewable energy projects, in line with procedural operationalisation.

[Planned date: [2023-2030]

3.4.5. Develop and implement the “Renewable Go-To Areas” Sectoral Programme – New measure

Identify areas that are conducive to the development of renewable energy (Go-To-Areas), i.e. specific sites (onshore or offshore) deemed suitable, with no significant environmental impacts, for the installation of renewable energy generation units, in line with the Repower EU guidelines and other initiatives stemming from the FIT- for-55 package, on the promotion of renewable energy use, energy performance of buildings and energy efficiency. The Sectoral Programme for Renewable Go-To Areas will be developed under the Legal Regime of Territorial Management Instruments and will build on the work “Preliminary identification of areas with lower environmental and asset sensitivity for the location of renewable electricity generation units”, carried out by the informal working group coordinated by the LNEG and involving the Portuguese Environment Agency (APA), the Directorate-General for Energy and Geology (DGEG), the Directorate-General for Territory (DGT), the Institute for Nature Conservation and Forests (ICNF) and the Directorate-General for Cultural Heritage (DGPC). [Planned date: 2022-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OPs)

ENTITY RESPONSIBLE

MAAC; GRA; DGEG; APA; IAPMEI; LNEG; DGT; ICNF; DGPC

LINE OF ACTION

3.5. PROMOTE PROPER PLANNING OF TRANSMISSION AND DISTRIBUTION NETWORKS TO ENHANCE THE INTEGRATION OF NEW RENEWABLE 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 should ensure the availability of grid capacity for the reception and delivery of electricity, with appropriate levels of quality of service and security, and their proper and efficient development, within the internal market in electricity.

SECTOR (S)

Energy

ACTION MEASURES

In order to promote appropriate planning of transmission and distribution networks to enhance the integration of new renewable capacity, the following action measures are envisaged:

3.5.2. Adapt the planning criteria for transmission and distribution systems

Proper planning of transmission and distribution networks is crucial for the success of policies to promote renewable energy in the power generation system, as this is the only way to ensure the efficient flow of electricity produced from power plants to the final consumer, to ensure security of supply and continuity and quality of service, and to ensure that only the necessary investments are made to meet grid evolution needs.

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 with regard to distributed generation and self-consumption, grid intelligence, management support systems, smart meters, storage, energy management, energy communities, electric vehicles, etc. [Planned date: 2020-2025]

3.5.3. Adjust the definition of reception capacity for new production

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 allowing for optimisation of network capacity while ensuring the reliability and

security of the network. An important step in this direction has already been taken with the publication of Decree-Law No 15/2022 of 14 January 2009 (in particular as regards restrictions on connections and controllability). [Planned date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market

PRINCIPAL INSTRUMENTS

PDIRT-E; PDIRD-E

Sources OF FINANCIATION n.e.c.

ENTITY RESPONSIBLE

MAAC; GRA; ERSE

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 (S)

Energy; Industry; Transport; Waste; 1 agriculture

ACTION MEASURES

In order to promote the production and consumption of renewable gases, the following action measures are envisaged:

3.6.2. Regulating the injection of renewable gases

Publish the technical and economic regulations provided for in Decree-Law No 231/2012 of 26 October 2006 on the definition of the technical, quality and safety requirements for renewable gases, as well as the procedures applicable to the licensing of installations for the treatment of these raw gases and their injection into the SNG infrastructure, which is necessary to promote the introduction of renewable gases, in particular renewable hydrogen and biomethane, both into gas transmission and distribution networks and for transport use, removing existing barriers.

Decree-Law No 62/2020 of 28 August 1999 establishing the organisation and operation of the National Gas System (SNG), incorporating the possibility of using the gas network for mixtures of gases including renewable gases, was published.

Decree-Law No 62/2020 of 28 August stipulates that a number of sectoral regulations must be amended to incorporate the new legislative model. ERSE therefore carried out a regulatory review in 2021 of the RARII, ROI and MPGTG and RT and in 2023 (RQS) (currently ongoing).

The DGEG also promoted the revision of various safety regulations:

- Regulation of RNTG, approved by the Order no806-C/2022 of 19 January 2001
- Regulation of RNDG, approved by the Order no806-B/2022 of 19 January 2001
- Regulation of Terminal for the Reception, Storage and Regasification of Liquefied Natural Gas, approved by the Order No 1113/2022 of 27 January 2001
- Regulation on underground gas storage in natural saline formations, approved by Order No 1112/2022 of 27 January 2009.

The definition of the methodology for the injection of renewable gases according to the gas consumption in each geographical area will be promoted. [Planned date: 2023-2025]

3.6.3. Study and set targets for the incorporation of renewable gases

Create the necessary conditions and mechanisms to enable, exploit and promote demand for renewable gases, in particular renewable hydrogen and biomethane, with a view to the emergence of a genuine renewable gas market in Portugal. To this end, targets for the incorporation of renewable gases into natural gas networks and in the various sectors of the economy where their incorporation is valuable and enable the decarbonisation of consumption will be studied, assessed and set. Portugal has established the National Hydrogen Strategy (EN-H2), which is annexed to Council of Ministers Resolution No 63/2020 of 14 August. [Planned date: 2020-2024]

3.6.4. Define and implement a quality certification system for renewable gases

In order to ensure that renewable gases comply with minimum quality requirements and that they do not jeopardise the security of energy supply and continuity and quality of service, a certification system should be established to enable this assessment to be carried out. [Planned date: 2020-2025]

3.6.5. Implement a system of guarantees of origin for renewable gases

It is essential that the consumer knows the origin of the renewable gases he consumes, especially when it comes from renewable sources. The purpose of implementing a system of guarantees of origin is 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. [Planned date: 2020-2023]

3.6.6. Promoting the production, transmission, distribution and consumption of green hydrogen

Hydrogen has huge potential as an energy carrier, which can act as energy storage, feedstock for green derived products or as a fuel for the 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 spreading and exploiting indigenous sources, as well as diversifying energy sources and reducing energy dependency. Pressure on water bodies should be avoided and minimised, while diversifying the sources of water used for the production of H_2 green by ensuring the use of water from alternative sources, such as water for reuse, which enables its production without depleting natural water reserves.

To this end, an industrial policy will be developed for the implementation in Portugal of a renewable gas production cluster, in particular green hydrogen, with the aim of positioning Portugal as a major European *player* in the green hydrogen market, leveraged at this stage by solar energy as a competitive factor. The development of a green hydrogen production industry in Portugal will boost the decarbonisation of various sectors in Portugal. In the meantime, funding programmes for renewable gas production have been launched in 2019 (POSEUR) and 2021 and 2023 (RRP C14). In addition to the injection of renewable gases into existing networks, it will also be important to study the conversion and construction of dedicated networks for renewable gases, in particular for renewable hydrogen, as well as the development of hydrogen production and consumption clusters (*H2 Valleys*). [Planned date: 2020-2030]

3.6.7. Setting 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 competitive cost, there is a high productive potential for biomethane, both at the level of installations already producing biogas (ETARs, municipal waste management units, landfills) and at the level of agricultural, livestock, industrial and forestry production units. As this productive potential is known – which favours a technology that is mature and can be consumed immediately, replacing natural gas, without any change – it is urgent that this indigenous and renewable energy source be realised in Portugal.

High productive potential, technological readiness, mandatory shares of renewable energy and biomethane (RePowerEU: BCM 35 by 2030) highlight the strong need to support and encourage biogas production and purification. In particular, units in the agricultural, livestock, forestry and industrial sectors (*greenfield* projects) offer high production potential but need support to alleviate the investment burden in biogas plants. [Planned date: 2023-2030].

3.6.8. Establishment of the Biometane Action Plan – New measure

The Biometane Action Plan in Portugal will define a toolkit to achieve the objective of producing this renewable gas in Portugal. The Biometane Action Plan will establish an integrated strategy aiming at the sustainable development of the biomethane market in Portugal. The first phase of the action plan seeks to ensure a favourable regulatory framework, coupled with a set of public incentive policies supporting the creation of an internal market for biomethane, both in terms of supporting production and encouraging consumption. As a second step, the plan seeks to help scale up production and develop new value chains at regional level. To this end, the aim of this action plan is to promote and boost both production and consumption, creating the necessary conditions for a genuine biomethane economy in Portugal, where this development will take place in stages, enabling the actions and knowledge needed to develop the market to be implemented. [Planned date: 2023-2030].

3.6.9. Accelerate the simplification of permitting and regulatory procedures for injection requests – New measure

Accelerating and incentivising the promotion of renewable gas initiatives, as a sustainable pillar and embedded in a broader transition strategy towards a decarbonised economy. In order to promote the use of renewable gases in the energy system it is necessary to revise a set of measures and targets for incorporation in the various sectors of the economy. Such a review will entail creating the necessary conditions for this change, including laws, regulations and standards. This measure will consist of the revision and amendment of the National Gas Transmission Network Regulation and the National Gas Distribution Network Regulation and the definition of the interpretative framework to specify the conditions under which hydrogen produced is considered to be *de facto* renewable in the light of the European Renewable Energy Directive and its delegated acts.

The advancement of renewable gas projects, in particular biomethane, may become complex due to the fact that they are subject

to numerous regulations of various types (waste, agriculture, livestock, industrial, urban planning, net discharges, noise, odours, transport, etc.) involving various bodies, from state to local level.

It will therefore be important to simplify the administrative procedure for applying for, authorising construction and regulating injection into the gas network. In this regard, efforts will also be made to develop knowledge among the technical staff of the competent bodies assessing and approving projects for the production of biomethane and green hydrogen [expected date: 2023-2030].

3.6.10. Implementation of a centralised auction system for the purchase of renewable gases for injection into the gas grid – New measure

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. To implement this measure, it is envisaged to launch this first auction for the centralised purchase of renewable gases for injection into the gas grid. This auction will make it possible to define an offtake system, thus enabling the domestic production of these renewable gases to be boosted. While the Ministerial Implementing Order laid down the rules for the auction (quantity and maximum price), the parts of the competitive auction procedure will define in detail the criteria for the tender, and it is expected that they will be announced in 2023. The natural gas network is structurally prepared to receive the quantities of renewable gases that will be traded in this auction and therefore there is no need for infrastructure changes. [Planned date: 2023-2030].

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050

SOURCES OF FUNDING

FA; UPS; Community Funds (OP SEUR, PACS, Regional OPs); Horizon Europe; Innovation Fund; The Structural Funds; InnovFin Energy Demo Projects; RRP (Investments Calculating Agendas); Just Transition Fund; RRP

ENTITY RESPONSIBLE

MAAC; WPM; DGEG; LNEG; APA

LINE OF ACTION

3.7. PROMOTING BETTER USE OF BIOMASS FOR ENERGY USE

DESCRIPTION

In view of the importance of forests and associated sectors in the national economy, and taking into account 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, consideration should be given to energy use solutions to help the management of rural areas by removing the existing fuel load in rural areas by means of a solution or set of solutions to justify and make a return to these measures, creating a genuine locally established and managed business model linked to the creation of a national market for biomass or, at least, self-sustainable regional markets.

SECTOR (S)

Energy; Forests; 1 agriculture

ACTION MEASURES

In order to promote better use of biomass for energy use, the following action measures are envisaged:

3.7.2. Promote local energy generation based on residual biomass

Promote and support the installation of small, decentralised, smaller thermal power plants that do not put as much pressure on the availability of biomass and on the energy system, promoting the substitution of fossil fuels and the decarbonisation of consumption in the various sectors. This solution could be combined with other solutions of varying size and the use of other types of fuel raw materials, but always with the threefold objective of helping to reduce the fuel load in forest, agricultural and agro-industrial areas, using energy-efficient solutions and minimising the burden on the national electricity system. 2019-2030

3.7.3. Promote and support the dissemination of centres for the collection, storage and availability of biomass at municipal or inter-municipal level

Centres for the collection and storage of biomass, in a local and distributed manner, ensure proper management of forests, agriculture, livestock, food and other organic waste, making it possible to optimise collection and reception processes, making available resources that can be used and recovered on a local energy side. [Planned date: 2020-2030]

3.7.4. Promoting information and awareness-raising activities

The measures to be taken include the development of a teaching dossier for vocational training to improve and optimise the collection and processing of residual forest biomass, the production of a manual of good practice for the use of forest biomass and leaflets for the dissemination and information on the potential uses of residual forest biomass, as well as the various types of equipment using/using biomass that highlight the possible returns. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; PAESC-RAM

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OP, OP Madeira)

ENTITY RESPONSIBLE

MAAC; AEM; GRM; GRA; DGEG; AGIF, I.P.; 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 the line of action to promote the decarbonisation of the industry under Objective 7 with regard to agro-industry, and the bioeconomy approach of this objective.

SECTOR (S)

Agriculture; Forest; Industry; Energy

ACTION MEASURES

In order 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, wind) to be used in agricultural and forestry installations and equipment (e.g. intensive livestock, irrigation equipment). It is also important to use floating photovoltaic plants to be installed in reservoirs and reservoirs for water use for raising water and distributing pressurised water. [Planned date: 2020-2030]

6.1.2. Increase the use of alternative fuels and other national resources with potential for use as an energy source

Promote and encourage the uptake and penetration of renewable energy sources, in particular biomass, and biofuels. [Planned date: 2020-2030]

6.1.3. Promote the installation of equipment and infrastructure for thermal/electrical energy production from use of biomass and biogas or biomethane

Whereas there is potential for the use of biomass and biogas or biomethane produced in livestock, agricultural and forestry holdings, the adoption of these production systems should be encouraged (e.g.: [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; RDP 2020; PEPAC, ENEAPAI 2030, PARCA, PARF

SOURCES OF FUNDING

EAFRD; The Cohesion Fund; ERDF

ENTITY RESPONSIBLE

MAAC; MA; GRA

ii. Estimated excess production of energy from renewable sources that could be transferred to other Member States

Not applicable. This analysis/assessment shall be carried out on an annual basis after closing the renewable energy share values and thus assess the possibility of statistical transfers by 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 (i).

iv. Specific measures to introduce one or more contact points, to streamline 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 INTERACTION WITH THE MARKET

DESCRIPTION

The energy sector and climate issues are complex and often communicate with language that is not understood by everyone, making the citizen unaware of the options available to them. It is therefore important to promote consumer energy literacy through more transparent information and greater dissemination of knowledge in the fields of energy and climate, 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 more informed consumer represents better, more efficient and sustainable choices, and a consumer at the heart of the decision represents a more active consumer in the energy transition, available to participate in the structural changes that are needed to achieve this challenge.

SECTOR (S)

Civil society; Companies

ACTION MEASURES

In order to promote information for consumers and businesses by contributing to improved energy literacy and to simplify interaction with the market, the following action measures are envisaged:

8.4.1. Promoting more and better outreach services to consumers

Electronic services and platforms do not reach all consumers, in particular those who are most vulnerable and have less access to such services, and should therefore be disseminated also through services close to consumers. Examples are citizens' shops and the Citizen Energy Space, which provide support structures at local level, focus on increasing energy literacy, empower citizens to implement energy and water efficiency measures and adopt energy sustainable behaviours, and report on the various financing options [Planned date: 2020-2030]

8.4.2. Promote simplification and standardisation of energy bills by setting minimum requirements at the level of content and structure

A clearer and simpler energy bill makes a significant contribution to improving consumers' understanding of the price structure of various energy products, enabling consumers to behave more efficiently to reduce their bills. [Planned date: 2019-2030]

8.4.3. Promote and develop new platforms for the promotion of energy literacy

Spread existing platforms and promote the emergence of new and better platforms making use of new information technologies to allow leap forward in terms of communication with the public, taking advantage of the increasing awareness and willingness of citizens to use new technologies. Examples of these platforms are CINERGIA – Information Centre for Energy, the Energy Route and the Energy Observatory. [Planned date: 2020-2030]

8.4.4. Promote and develop new platforms to improve market interaction

Promote and generalise the use of the Poupá Energia portal, with the aim of facilitating switching of supplier in the retail market, including user information and facilitating the switching of electricity suppliers to electric mobility. Creation of the National Energy Poverty Observatory to provide a public digital platform for data collection and processing. The annual survey tool, which

will allow the identification, characterisation and monitoring of energy poverty in Portugal, will be further developed in line with the objectives and indicators set out in the National Long-Term Strategy for Combating Energy Poverty. Providing detailed information on households in energy poverty or at risk of energy poverty will contribute to the identification and conduct of effective public policies. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; Internal Market

PRINCIPAL INSTRUMENTS

FA; Community Funds (OP SEUR, PACS, Regional OPs)

SOURCES OF FUNDING

Community Funds

ENTITY RESPONSIBLE

MAAC; GRA; DGEG; APA; ADENE; MH, ERSE

v. Assessment of the need to build new district heating and cooling infrastructure from renewable energy sources

Not applicable.

3.1.3. Other elements

i. National policies and measures affecting the ETS sector

The sectors covered by the EU ETS (in particular the power generation and industrial sector) are regulated at European level and the policies and measures identified therefore focus mainly on sectors not covered by the EU ETS. 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: “FURTHER 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”

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 passes through the transport sector, with the prospect of full 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 depends on how we move us. To this end, it is necessary to encourage the sharing of means of transport, the use of cleaner vehicles and to make public transport more attractive, of quality, convenient, rapid, integrated and easily accessible, favouring intermodality and, where possible, complementing smooth 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 cleaner mobility, providing greater comfort, speed and quality of life with lower energy consumption. The aim is to provide citizens with a quality, more convenient, quicker and easily accessible public transport service, helping to foster social cohesion and maximising accessibility for all citizens. The aim is to promote modal shifts by improving the supply of and access to public transport, reducing the dependence on individual transport on daily journeys.

SECTOR (S)

Transport

ACTION MEASURES

In order to promote modal shift, the following action measures are envisaged:

5.1.1. Support Programme for Tariff Reduction and Support Programme for Densification and Strengthening of Public Transport Provision (PROTransP)

Promote and maintain the Tariff Reduction Support Programme (PART) and Programme to Support the Densification and Strengthening of Public Transport Provision (PROTransP), contributing to the reduction of costs associated with collective public transport, thereby increasing its accessibility. [\[Planned date: 2020-2030\]](#)

5.1.2. Expand public transport networks and facilities throughout the territory

Promote the increase of the high capacity collective public transport network and maintain the momentum of continuity in the expansion of these systems. Of the projects to be implemented, focus on the expansion of the Lisbon and Porto metro networks [\[Planned date: 2020-2030\]](#)

5.1.3. Actions to promote multimodal inter-urban 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 in the modal split. [\[Planned date: 2020-2030\]](#)

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. [\[Planned date: 2020-2030\]](#)

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; NIP; PART; PIETRAM; PAMUS-RAM

SOURCES OF FUNDING

State budget; Community Funds (OP SEUR, PACS, Regional OPs); FA; AMR budget; RRP

ENTITY RESPONSIBLE

MAAC; MIH; Inter-municipal communities; Metropolitan Areas; Transport authorities; GRM; GRA; IMT

LINE OF ACTION

5.2. ENCOURAGE THE ENERGY TRANSITION IN THE TRANSPORT SECTOR.

DESCRIPTION

Achieving the decarbonisation of the transport sector is crucial to 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 by ensuring the use of clean energy, such as electricity, advanced biofuels, renewable hydrogen, biomethane and renewable fuels of non-biological origin.

SECTOR (S)

Transport; Energy

ACTION MEASURES

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 has an estimated average age of 16 years, contributing significantly to the increase in GHG 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 using more sustainable alternative energy sources, in parallel with increasing efficiency of their use through the energy performance rating of fleets. [\[Planned date: 2020-2030\]](#)

5.2.2. Include and prioritise environmental performance and low carbon criteria when awarding 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 should be linked to a contract for the provision of services or service concessions by the transport authorities to operators. Environmental performance

criteria, particularly in relation to the vehicle fleet, should be included in the contracting process, in line with Community guidelines and in particular Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2019 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles, which sets minimum procurement targets per Member State for the share of clean light and heavy-duty vehicles. [Planned date: 2020-2030]

5.2.3. Strengthening rail passenger transport

Improve the frequency and quality of rail passenger service to increase the use of this means of transport to the detriment of individual transport by investing in new rolling stock. [Planned date: 2020-2030]

5.2.4. Renewing the fleet of passenger and cargo vessels

The fleet of active passenger and cargo vessels in Portugal is in significant ageing conditions. It is therefore important to encourage the use of clean alternative fuel vessels and vessels in transport and other maritime activities, and the importance of electrification in short sea passenger and cargo inland waterway transport of ships at berth in port should be stressed. [Planned date: 2020-2030]

5.2.5. Promoting the use of renewable energy sources in transport fleets

Through the revision of the Energy Consumption Management Regulation in the transport sector, consider benefits for the use of renewable fuels in their fleets, thereby encouraging companies to incorporate renewable energy sources into their fleets. [Planned date: 2020-2030]

5.2.6. Look into repurposing diesel trains so they can be powered by green hydrogen and run on non-electrified tracks.

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 studied, which could be done with a large national component, followed by the implementation of a pilot project. [Planned date: 2020-2025]

5.2.7. Revision of the Energy Efficiency in Transport Regulation

In the transport sector, the Regulation on Energy Consumption Management for the Transport Sector (RGCEST) applies, which aims to improve energy efficiency in the transport sector, applying to transport companies and companies with their own energy intensive fleets and setting 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 harmonisation of the different legal instruments in force and updating and facilitating the implementation of energy consumption legislation in the sector. [Planned date: 2020-2025]

5.2.8. Introduce cleaner forms of energy in ferries operating between islands in the Autonomous Regions of Madeira and the Azores

Renew the passenger and car transport vessel (ferry) between Madeira and Porto Santo and in the Azores region, introducing cleaner and more efficient forms of energy. [Planned date: 2020-2030]

5.2.9. Promoting the use of rich blends of biofuels in dedicated fleets and heavy mobility – New measure For biofuels, the national strategy has been to set incorporation targets within the limits of the diesel technical specifications (EN 590) with a maximum physical incorporation limit of 7 % (v/v) of FAME, building on existing fuel infrastructure. However, higher shares could be used to decarbonise heavy mobility and dedicated fleets. The focus on local biofuel production solutions with increased production could bring to the national market for production, development and revitalisation, which currently only uses 50 % of its installed capacity. [Planned date: 2024-2030]

5.2.10. Creation of “Green Corridors” with rich blends of biofuels for heavy mobility – New measure

The creation of ‘green lanes’ corresponding to a national distribution network, with geographically distributed refuelling points in proportion to the location of the fleets and the creation of fuel distribution logistics for the supply of such points.

There will be a need to create an increased incentive for the use of rich blends of biofuels, as there is a significant economic gap between biofuels *and* fossil fuels they will replace. [Planned date: 2024-2030]

5.2.11. Promoting the energy transition of port areas – New measure

Promote the energy transition of the activity of port 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 with the view that ports are logistics, energy and confluence hubs of multiple activities (logistics, storage, industry) and represent interfaces between maritime, road and rail modes, energy consumers and producers. Port infrastructure is a key element for the storage and transport of hydrogen and derived products, and it is therefore crucial to give ports the right conditions to promote this activity. [Planned date: 2020-2030]

5.2.12. Develop strategies for the production of renewable fuels in the maritime and air transport sector – New measure

Encourage the development of strategies related to the production of renewable fuels for those modes of transport where it is most difficult to achieve their decarbonisation.

For the production of both *Sustainable Aviation Fuels* and renewable fuels used in maritime transport, there is a need to have access to various feedstocks, such as hydrogen and carbon, currently in small quantities on the market. Guidelines should therefore be developed to prevent competition for raw materials. [Planned date: 2020-2030]

5.2.13. Ensure the development of robust projects with a strong contribution to improving collective transport systems – New measure

The main objective of Sustainable Mobility is to ensure the development of robust projects with a strong contribution to improving collective transport systems, promoting the strengthening and increasing use of public transport, thereby reducing dependence on individual road transport, promoting the decarbonisation of the transport sector, and making an important contribution to the recovery of the economic and social effects resulting from the pandemic crisis, in particular on employment. The challenge of sustainable mobility is reflected in the European Green Deal, where the implementation of cleaner, cheaper and healthier forms of public and private transport is defined as a measure to achieve the proposed objectives. The importance of sustainable mobility is reflected in the investments made available through the Environmental Fund, or through the RRP, whose component C15 foresees to support sustainable mobility through the following projects:

- TC-C15-I01 investment: Expansion of the Lisbon Metro Network – Red Line to Alcântara
- TC-C15-I02 investment: Expansion of the Porto Metro Network – Casa da Música-Santo Ovídio
- TC-C15-I03 investment: Odivelas-Loures area light metro
- TC-C15-I04 investment: BRT Boavista Line – Empire
- TC-C15-I05 investment: Decarbonisation of public transport

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; PIETRAM; PAMUS-RAM

SOURCES OF FUNDING

State budget; Community Funds (OP SEUR, PACS, Regional OPs); FA; AMR budget; PRR, CEF2, PT2030 **RESPONSIBLE ENTITY** MAAC; DGEG; IMT; Public transport operators; ENSE; GRM; GRA; MI

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. It is therefore important to promote and support electric mobility by encouraging the introduction of electric vehicles and by strengthening charging infrastructure.

SECTOR (S)

Transport; Services

ACTION MEASURES

In order to promote and support electric mobility, the following action measures are envisaged:

5.3.1. Monitoring of the model for electric mobility

Portugal has established an innovative electric vehicle charging network management model with significant benefits for users. The network is fully interoperable between different electricity suppliers, thus increasing the efficiency and availability of the recharging network. This model is already implemented for part of the network, 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 the light of the evolution of the electricity system and the flexibility allowed by electric vehicles in temporary storage. 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), should also be considered. [Planned 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 Porto Santo, as part of the Porto Santo Sustainable – Smart Fossil Free Island initiative, an incentive for the purchase of electric vehicles is being provided by the Regional Government, which will then be extended to the island of Madeira. [Planned 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 made available a framework of incentives for the purchase of very competitive electric vehicles, with the support of the purchase of EUR 4 000 (passenger cars) and EUR 6.000 (light goods vehicles), as well as the vehicle tax, autonomous taxation and IUC exemptions. As long as the purchase cost of an electric vehicle is significantly higher than that of traditional combustion, the existing framework of incentives should be ensured and even expanded in both the budget and the typologies covered. 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. [Planned date: 2020-2025]

5.3.4. Promoting electric vehicles in urban micrologistics

Urban micro-logistics, including freight transport in the *last mile*, shows a potential for the use of zero-emission vehicles such as electric vehicles, quadricycles and electric charging bicycles. [Planned date: 2020-2030]

5.3.5. Promoting electric two-wheel vehicles

Despite the great potential for converting two-wheeled vehicles to electric vehicles, the two-wheeled electric vehicle market is still somewhat incipient. The use of this segment of electric vehicles should be promoted, financially or through positive discrimination measures. [Planned date: 2020-2025]

5.3.6. Promote the development of the publicly accessible charging network.

The publicly accessible recharging network shall follow the size of the electric vehicle fleet in circulation in Portugal. Given 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. Initiatives to be promoted to strengthen the charging network include: (I) adoption of criteria requiring the installation of charging stations, in particular in residential and commercial areas; (II) determine the obligation to install charging stations for electric vehicles on publicly accessible infrastructure [expected date: 2020-2025]

5.3.7. Promote the roll-out of charging points for electric vehicles in private buildings.

Create the appropriate conditions, techniques and regulations and incentives to scale up the electric vehicle charging network in private buildings, including facilitating new grid connections, strengthening existing ones and smart charging solutions. In 2022 and 2023, through the Environmental Fund, the Government supports the installation of chargers in condominiums up to EUR 1.800. [Planned date: 2020-2025]

5.3.8. Promote smart charging of electric vehicles with two-way energy flows.

Create the legal framework for the smart charging of electric vehicles and for the use of functionalities enabling reverse flows of energy with system services on islands, including in public or private car parks and charging stations, to contribute to the security of supply of the electricity system and to increase the penetration of renewable energy sources in an isolated insular context. Promote, both in mainland Portugal and on the islands, the integration of local renewable production and storage at charging stations and participation in flexibility services. [Planned date: 2020-2030]

5.3.9. Promote charging facilities for electric buses.

Establish a charging network for electric buses, for night-charging and complementary 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 penetration of renewable energy sources in an isolated insular context. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; NIP; PIETRAM; PAMUS-RAM; PAESC-RAM (under development); PAESI-Madeira; PAESI-Porto Santo; EMEA; PMEA

SOURCES OF FUNDING

State budget; Community Funds (OP SEUR, PACS, Regional OPs); FA; OP Madeira; RRP

ENTITY RESPONSIBLE

MAAC; DGEG; MOBI.E; GRM; GRA; MES; MH

LINE OF ACTION

5.4. PROMOTE CAR-SHARING SERVICES

DESCRIPTION

In parallel with 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. The aim is to promote car-sharing services with a focus on electric mobility and active mobility.

SECTOR (S)

Transport; Services

ACTION MEASURES

In order to promote vehicle sharing services, the following action measures are envisaged:

5.4.1. Boost shared mobility initiatives such as *car sharing, bike sharing and car pooling*

The provision of a vehicle sharing system is seen as a solution that increases the efficiency of the use of a fleet. These sharing systems can be of cars, bicycles, motorcycles, and more recently scooters. The use of these car-sharing systems results in a reduction of environmental impact and high energy efficiency, as well as a reduction in the occupancy of public space. [Planned date: 2020-2025]

5.4.2. Promote the adoption of mobility management support tools and information systems and technologies supporting mobility and communication

Incorporating new technologies and smart systems into mobility management are key tools to increase logistics efficiency, energy efficiency 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 passenger communication systems. [Planned date: 2020-2030]

5.4.3. Promoting *mobility tools as a service (mobility as a service)*

The concept of mobility as a service is the provision of a service enabling travel between a point A and a point B, through the mode of transport best suited to the needs of the passenger and the characteristics of the journey to be made. As an alternative to acquiring and possessing a vehicle, mode of transport, mobility as a service enables the use of multiple modes of transport and the choice of the most efficient mode for the journey in question. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; EMEA; PMEA

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

MAAC; GRA; 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 and hydrogen, are an alternative and complementary solution to electric mobility by 2030 and 2040, in particular for the long-distance heavy goods road, heavy passenger, 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 infrastructure for this purpose.

SECTOR (S)

Transport; Industry; Energy; Waste; 1 agriculture

ACTION MEASURES

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 domestic indigenous resources

The aim is for national biofuel production to be achieved through the recovery of residual biomasses or with little economic value, waste recovery and recovery, in particular used cooking oil (UCO), and other endogenous alternative resources.

To this end, the National Plan for the Promotion of Biorrefineries, approved by Resolution of the Council of Ministers No 163/2017, will be reviewed and implemented with a view to strengthening 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, ahead of bioeconomy and circular economy. To a large extent, it will go through the transposition of the new Renewable Energy Directive and will result in targets for the incorporation of advanced biofuels for the decade 2021-2030. [Planned date: 2020-2030]

5.5.2. Advancing the *phase-out* of conventional biofuels

Under the new Renewable Energy Directive (RED II), the share of high indirect land-use change-risk biofuels, bioliquids and biomass fuels produced from food and feed crops must gradually decrease to 0 % by 31 December 2030. To this end, the necessary changes should be promoted in order to comply with this rule by promoting advanced biofuels instead. [Planned date: 2021-2030]

5.5.3. Promote mixes that have higher shares of bioenergy

Assess existing national legislation on the quality of fuels and encourage the inclusion of higher percentages of biofuels, particularly in the case of diesel for professional use. [Planned date: 2020-2024] **CONTRIBUTION TO 5 DIMENSIONS**

Decarbonisation; Energy Security

PRINCIPAL INSTRUMENTS

RNC2050; PNPB

SOURCES OF FUNDING

FA; UPS; Community Funds (OP SEUR, PACS, Regional OPs); Innovation Fund; RRP

ENTITY RESPONSIBLE

MAAC; DGEG; LNEG; APA

LINE OF ACTION**5.6. PROMOTE INFRASTRUCTURE FOR THE SUPPLY OF ALTERNATIVE FUELS AS CLEAN FUELS****DESCRIPTION**

The transport sector is a priority for the development of policies and measures to promote the decarbonisation of the economy and society, with a very significant potential for improvement in the dimensions of diversification of energy sources and energy efficiency. Alignment with new European guidelines and legislation, in particular with the new Alternative Fuels Infrastructure Regulation (AFIR), will be important.

SECTOR (S)

Transport; Energy; Waste

ACTION MEASURES

To promote infrastructure for the supply of alternative fuels for clean fuels, the following action measures are envisaged:

5.6.1. Promote the installation of refuelling stations for 100 % renewable liquid and gaseous fuels 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 building on existing infrastructure for conventional fuels. However, the focus on local solutions for the use of advanced biofuels, biomethane and hydrogen other renewable fuels, whether in pure form or in high fossil fuel concentrations, will involve promoting the installation of 100 % renewable liquid and gaseous fuel refuelling points in public transport and municipal service fleets. Preference will be given to sites close to the production facilities of these renewable alternatives and preferably to projects linked to the use of residual biomasses or with little economic value. [Planned date: 2020-2030]

5.6.2. Promote and support the installation of green hydrogen and biomethane filling stations

The potential of green hydrogen and biomethane as energy carriers to reduce GHG emissions, increase shares of renewable energy in final consumption and offer high flexibility in use, and hydrogen can be used as a form of storage of renewable electricity, is recognised. 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 a challenge, so the availability of hydrogen and biomethane refuelling infrastructure is key to promoting its consumption.

The deployment of this network will be phased in and has already started with pilot and demonstration projects, mostly linked to public transport and logistics distribution fleets, promoting the development towards a network providing significant territorial coverage to enable mobility to gradually penetrate renewable gases. [Planned date: 2023-2030]

5.6.3. Promote the development of infrastructure for the supply of renewable energy sources to vessels in ports

Promote the use of renewable energy sources by ships at berth in port, such as electricity or hydrogen and renewable fuels of non-biological origin, by making *On-shorepower supply* available to vessels instead of using conventional fossil fuels for domestic energy generation, which improves air quality in those locations, as well as contributing to the reduction of GHG emissions if that electricity is produced from renewable sources. The reinforcement of electricity supply to port areas often requires the construction of substations at terminals or in their surroundings, enabling not only the supply of energy to ships, but also the stabilisation of the grid on the port fronts and the use of electric cargo handling equipment by replacing those of fossil fuels, contributing to decarbonisation and reducing levels and noise, which would otherwise not be possible. [Planned 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, which will repeal 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 alternative fuels 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. [Planned date: 2023-2024]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

RNC2050

SOURCES OF FUNDING

FA; UPS; Innovation Fund, RRP, MFF 2021-2027

ENTITY RESPONSIBLE

MAAC; MIH; DGEG; LNEG, MI

LINE OF ACTION

5.7. PROMOTING ACTIVE MOBILITY AND MORE EFFICIENT BEHAVIOUR

DESCRIPTION

Prioritising active mobility over individual motorised transport is a growing trend in developed societies, given the excellent value for money and huge benefits it brings in areas that are fundamental to the quality of life of all – even those who (yet) do not move actively. 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 generalise the benefits of active travel patterns in society, there are strong reasons to adopt new forms of mobility and improve the use of the transport system. The aim is to promote active mobility and more efficient behaviour, increasing the modal share of bicycles and pedestrians.

SECTOR (S)

Transport; Cities

ACTION MEASURES

To promote active mobility and more efficient behaviour, the following action measures are envisaged:

5.7.1. Implement 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 the implementation of policies, adapting international best practices to national and local contexts.

In 2030, every 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 goal, which 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, in daily travel, leisure activities and sports. In order to ensure the highest efficiency and effectiveness in the use of available resources, it is important to establish an action plan, focused on end-users (pedestrians and cyclists) and properly result-oriented, to maximise the return on investment.

The National Strategy for Active Mobility is composed of two separate instruments: the National Strategy for Clean Active Mobility 2020-2030 (ENMAC) and the National Strategy for Reasonable Active Mobility (EnMAP).

ENMAC, approved in 2019, sets as objectives: (I) increasing the modal share of cycling journeys within the national territory; (II) increasing the modal share of cycling in cities; (III) an increase in the active modal share (bicycle and pedestrian) in the national territory; (IV) increase in the total length of cycle paths; (v) reduction of road fatalities for pedestrians and cyclists. The EnMAP has the task of “providing the country with direct and indirect conditions so that walking is possible at all times, in a safe space and in a universal manner, making this way as a preference for daily travel and linking it, in particular, to cycling and public transport, as a decisive contribution to improving the quality of life of citizens. The following targets are set to be achieved by 2030: (I) increase the modal share of pedestrian movements from 16 % to 35 %; (II) increase the public space likely to be used by all by 50 %; [expected date: 2020-2030]

5.7.2. Programme Portugal Cyclable 2030

The Portugal Cyclable Programme 2030 provides an incentive to increase infrastructure dedicated to cycling as a mode of transport capable of gaining significant weight as a sustainable solution to meet many of the mobility needs of the urban population, both in the two major metropolitan areas on the Portuguese mainland, as in the territories of urban conurbations (diffuse urbanisation) and in established cities.

This programme foresees the construction of 1 000 km of cycle paths by 2030 ensuring the expansion and upgrading of cycling and pedestrian networks, improving their connectivity. [Planned date: 2020-2030]

5.7.3. Increase incentives for active mobility

Ensure that the incentives put in place to promote active mobility, bicycles and other lightweight vehicles, including electric versions, are maintained and increased. [Planned date: 2020-2030]

5.7.4. Promotion of cycling and other active modes with a view to increasing the mild modes in the modal split

Promoting pro-active behaviour, in particular in relation to cycling, implies an integrated marketing and communication effort – including continuous and consistent awareness-raising campaigns, impactful events and activities, as well as education promoting active modes and road citizenship – geared to stimulating profound change of attitudes. [Planned date: 2020-2030]

5.7.5. Promoting cycling by changing mobility behaviour in school and/or university age segments of the population

Education for active and sustainable road mobility should be provided from pre-school, and continued at the following levels, encouraging the shared and responsible use of public space. Communication resources, initiatives and campaigns targeted at groups with differentiated needs and expectations, where there is significant potential to increase the use of active mobility such as students, will be developed and promoted. [Planned date: 2020-2030]

5.7.6. Creation of a network of complementary equipment to support active mobility

Appropriate bicycle parking will be made available in all relevant destinations (safe, well-located and in the required quantities). The carriage of bicycles should tend to be practical and accessible, in rail, inland waterway and, in justified cases, road transport, interurban and urban journeys. [Planned date: 2020-2025]

5.7.7. Improvement of pedestrian infrastructure

Implement measures to facilitate pedestrian transit in well-established urban areas, facilitating safe pedestrian movement and reducing bottlenecks resulting from orography and limited space on some urban roads in the Autonomous Region of Madeira.

[Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; ENMA 2020-2030

SOURCES OF FUNDING

State budget, Community Funds (OP SEUR, PACS, Regional OPs); FA; RRP

ENTITY RESPONSIBLE

MAAC; GRA; IMT

LINE OF ACTION

5.8. PROMOTING FREIGHT TRANSPORT BY RAIL, SEA AND INLAND WATERWAY

DESCRIPTION

Freight transport is one of the main contributors to fossil fuel consumption and GHG emissions in the transport sector, notably due to the high modal share of road transport. The promotion of rail, maritime 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 to the decongestion of roads, which is particularly relevant in large urban agglomerations.

SECTOR (S)

Transport

ACTION MEASURES

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 times and transport costs (EUR/km), increase capacity (number and length of trains). [Planned 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. [Planned date: 2020-2030]

5.8.3. . Creating conditions for rail interoperability

Promote the electrification of signalling. To increase the length of freight trains to 750 m and at gauge level to promote the installation of (multi-purpose) sleepers allowing the gauge to be changed on international corridors. [Planned date: 2020-2030]

5.8.4. Promotion of the use of dry ports – New measure

In accordance with Decree-Law No 53/2019 of 17 April 2006, dry ports aim to increase the concentration and clearance of goods moving between temporary storage facilities, increasing the competitiveness of ports and of the exporting and national importer sector. This will not only reduce the pressure of cargo storage in seaports, but also facilitate freight cargo flows and increase the share of rail in the port interface, contributing to lower GHG emissions. These measures could be complemented by solutions using green means of transport. Accordingly, APDL has planned investments in the Leixões Rail Freight Terminal and the Guarda Rail Freight Terminal. [Planned date: 2023-2030]

5.8.5. Electrifying rail last-mile to ports by introducing operational improvements to rail access lines to port terminals – New measure

Promote the electrification of railway lines providing access to port terminals and operational improvements in the rail last 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 transport in freight transport for the hinterland of ports. [Planned 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 terminals dedicated to inland waterway freight transport [expected date: 2023-2030]

5.8.7. Strengthening the maritime connectivity of the mainland's commercial ports network – New measure

The reinforcement will be achieved by improving the navigability conditions of the mainland's commercial ports so as to empower them to demand larger ships, thereby increasing the efficiency of maritime transport and thus increasing the modal share of short sea shipping. [Planned date: 2023-2030] **CONTRIBUTION TO 5 DIMENSIONS**

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; NIP

SOURCES OF FUNDING

Community Funds (OP SEUR, PACS, Regional OPs); PRR, PT 2030 (PACS); CEF 2 and MFF 2021-2027

ENTITY RESPONSIBLE

MI

IV. National policies, timetables and planned measures to phase out energy subsidies, in particular for fossil fuels

In order to make taxation a tool for the transition to carbon neutrality, a Working Group was set up in Portugal in 2018³¹ with the task of promoting an analysis of energy taxation, in particular with a view to identifying and studying environmentally harmful incentives and proposing their phasing-out, as well as proposing the revitalisation of the carbon rate, taking into account possible impacts on the economic sectors concerned, within a framework of decarbonising the economy.

A phasing-out process of the exemptions associated with the use of coal for electricity generation also started in 2018 and is described below.

Elimination of exemptions for the use of coal for electricity generation

The State Budget Law for 2018 (Article 251) provided for the phasing out of the exemption from the tax on petroleum and energy products (ISP) applicable to coal and coke used for the production of electricity and cogeneration.

Thus, coal and coal coke (classified under codes NC2701, 2702 and 2704) used in the production of electricity and heat became subject in 2018 to a rate corresponding to 10 % of the ISP rate and 10 % of the rate of increase on CO₂ emissions (carbon rate). 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 ISP exemption and the addition of CO₂ emissions is 50 % allocated to the National Electricity System (SEN) for the reduction of the electricity tariff deficit to be allocated to the SEF and 50 % to the Environmental Fund for implementation in decarbonisation projects.

For 2019, an adjustment was introduced to reflect the carbon price already paid by these installations and a basic price of EUR 20/t was also established for determining the carbon tax.

The removal of the PSI and carbon tax exemptions continued in 2020, 2021, 2022 and 2023, with an extension of the scope in terms of energy products and uses, as shown in the figure below (in the Report accompanying the 2023 State Budget).

		Progress in phasing out the tax advantage on polluting products								
Territory	Product	Tax	2013	2019	2020	2021	2022	2023	2024	2025
PT continental	Coal	ISP	10 %	25 %	50 %	75 %	100 %			
		CBN (CO ₂)			25 %	50 %	75 %	100 %		
	Natural gas	ISP Fuel oil/n.a.			10 %	20 %	20 %	40 %	50 %	n.a.
		CBN (CO ₂)		no.						
	ARCE	CBN (CO ₂)			n.a.	5 %	10 %	30 %	65 %	100 %

³¹Order No 2835/2018, published in the Diário da República, Series 2, No 56, of 20 March 2018

ES, ^{oes} Autonomy	Coal	ISP CBN (CO2)	10 %	25 %	50 %	75 %	100 %		
	ARCE	CBN (CO2)		<i>n.a.</i>	5 %	10 %	30 %	65 %	100 %
	Diesel oil <i>n.a.</i>	ISP CBN (CO2)			25 %	37.5 %	50 %	75 %	100 %

Arce – Energy Consumption Rationalisation Agreement

An analysis of PSI tax expenditure identified in 2017 some EUR 441 million linked to fossil fuel tax exemptions. In 2020 this figure amounted to EUR 413,5 million, EUR 257,7 million in 2021 and EUR 237 million in 2022 (provisional implementation figures), according to the report accompanying the 2023 State budget.

In 2022, as an inflation mitigation measure, among other measures, the increase in the carbon rate was suspended, which kept its value from 2021 until 2023. The gradual unfreezing 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 production, it also provides that, for reasons of environmental policy, they may be taxed.

It is therefore the national intention to pursue the elimination of environmentally harmful subsidies, strengthening the application of the carbon levy and promoting increased taxation on resource use, recycling, as is already the case today, revenues for decarbonisation and just transition.

LINE OF ACTION

1.7. PURSUING GREEN TAXATION

DESCRIPTION

Contribute to inducing more sustainable production and consumption patterns, promote the reduction of GHG emissions, foster more sustainable behaviours, promote eco-innovation and resource efficiency, foster entrepreneurship and job creation, reduce external energy dependency, efficiently achieve international targets and objectives and diversify sources of revenue.

SECTOR (S)

Energy; Industry; Mobility and Transport; Services

ACTION MEASURES

In order to continue with green taxation, the following action measures are envisaged:

1.7.1. Taxation for the decarbonisation of the energy sector

Revitalise the Carbon Rate – 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 revision of tax benefits and other incentives linked to the use of fossil fuels. [Planned 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 in order to enhance positive discrimination against vehicles with the best environmental performance while maintaining taxation on the basis of CO₂ emissions. Exploring potential incentives for mobility with hydrogen and bioenergy, differentiating bioenergy from fossil fuels, promoting the use of bioenergy rich blends. [Planned date: 2020-2025]

1.7.3. Taxation for the decarbonisation of the residential sector and services

Introduce tax incentives for energy efficiency and the introduction of renewable energy and a more favourable tax regime for renewable energy buildings (e.g.: create tax incentives, such as reducing IMI, for nearly zero-energy buildings (NZEB)). [Planned date: 2020-2025]

1.7.4. Taxation for the promotion of low-carbon products and services

Create tax incentives for low-carbon products and services, including those with certification or incorporation of recycled material. [Planned date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; Green Taxation

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

MF; MAAC; GRA

3.2. Energy Efficiency dimension

Energy efficiency is one of the most important vectors for achieving a transition to a carbon-neutral economy while generating growth, jobs and investment opportunities. This is why energy efficiency is taken not only as an opportunity for development and modernisation, but also as the priority energy source, in the sense that energy that is not produced/consumed is the safest, cleanest and cheapest energy. This vision is in line with Community policy, and the EU has defined 'Energy efficiency first' as one of the guiding principles of its energy policy.

I. Energy efficiency obligation schemes and alternative policy measures pursuant to Articles 7a and 7b of Directive 2012/27/EU (revised)

LINE OF ACTION

2.2. PROMOTING MORE EFFICIENT EQUIPMENT

DESCRIPTION

It aims to make the current equipment stock more efficient either by direct replacement or by discouraging the purchase of new equipment with energy and environmental performance significantly lower than the best practices already available on the market, or by stimulating behavioural change in the purchase and consumption of energy.

SECTOR (S)

Residential, Services, Industry; Transport; Agriculture and Fisheries.

ACTION MEASURES

To promote more efficient equipment, the following action measures are envisaged:

2.2.1. Promote the replacement of inefficient equipment

Through the mechanisms put in place to this end, the aim is to promote the replacement of equipment with more efficient ones, thus reducing the specific consumption of household equipment. The guidelines and new provisions following the publication of the new Buildings Performance Directive should be taken into account. [Planned date: 2024-2026]

2.2.2. Promote the appropriate dissemination of information and communication of the new generation of energy 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 resulting from the application of the new energy labelling framework regime to different product types. In order to ensure the success of this new generation of labels, it will be essential to continue to focus on careful, coherent and effective information and communication to economic operators and consumers so that they gain a higher level of knowledge about the topic and contribute to their energy literacy. [Planned 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 on the energy efficiency of building building elements – New measure

The European energy label for household appliances and other energy-using equipment in buildings has enabled consumers to be active and demanding agents in energy efficiency, stimulating technological development in supply companies, which make increasingly efficient solutions available on the market.

To leverage this initiative, complementary tools can be developed for building building elements with labels such as windows, walls, roofs, floors, doors, etc. (e.g.: Class +), as a voluntary national initiative to be developed in conjunction with industry in the sector. To this end, this label should appear on the elements to be made available by manufacturers or suppliers to consumers, either by means of the applicable technical regulations or as a performance requirement for the award of financial

incentives. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

RRP; PPEC; FA; EO; The Cohesion Fund; ERDF; EAFRD; EMFAF

ENTITY RESPONSIBLE

MAAC; AEM; MI; WPM; GRA; DGEG; ADENE; ERSE; AT; Managing authorities of the funds; IFAP; ERSE

LINE OF ACTION

2.3. ENSURING 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 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 (S)**

Residential; Services, Industry; Transport; Agriculture, Fisheries

ACTION MEASURES

In order to ensure better management of energy consumption in the various sectors of the national economy, in addition to action measures under Objective 1 – decarbonise NACIONAL ECONOMY, Objective 6 – PROMOVER SUSTENTÁVEL AGRICULTURE AND enhance sequestration of CARBONO and Objective 7 – DESENVOLVER UMA INOVADORA INOVADORA AND COMPETITIVA, the following action measures are envisaged:

2.3.1. Promote the establishment of an Energy Efficiency and Consumption Management System (SGCEE) in the industrial and transport sectors

Establish a common system for reporting and monitoring energy consumption from a threshold to be defined for the industry and transport sector, integrating existing systems (Energy Intensive Consumption Management System (SGCIE) and RGCEST). 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 the level of energy consumption, encouraging harmonisation and simplification of procedures. [Planned date: 2023-2024]

2.3.2. . Promote the development of a transversal monitoring system – New measure

Set up a cross-cutting monitoring system integrating the information reported under the various instruments partially transposing 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 for consumption and promotion of energy efficiency in the various sectors and policies to address monitoring requirements under Article 8 of the proposed revision of the Energy Efficiency Directive (industry, buildings, transport, public administration, public lighting, etc.). [Planned date: 2024]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

SCE; SGCEE; SGCIE; ECO.AP 2030

Sources OF FINANCIATION n.e.c.

ENTITY RESPONSIBLE

MAAC; GRA; GRM; DGEG; ADENE; ERSAR (ADP); ANMP (E-REDES); DGTf

LINE OF ACTION

6.4. ADOPT MORE ENERGY AND WATER EFFICIENT AGRICULTURAL AND FORESTRY PRACTICES

DESCRIPTION

It aims to promote the adoption of more resource-efficient and regenerative agricultural and forestry practices with an impact on reducing GHG emissions, and improving energy and water efficiency.

SECTOR (S)

Agriculture; Forest; Energy

ACTION MEASURES

In order to adopt more energy and water efficient agricultural and forestry practices, the following action measures are envisaged:

6.4.1. Promoting energy and water efficiency

Establish mechanisms to promote the acquisition and use of tools for the management, installation and use of more efficient technologies (e.g.: optimisation of engines, pumping systems, ventilation and compression systems, heat and cold recovery, efficient lighting), including precision and measurement equipment and support for good irrigation practices.

[Planned date: 2024-2030]

It will be achieved through the acquisition and use of management tools, installation and use of more efficient technologies (e.g.: optimisation of engines, pumping systems, ventilation and compression systems, heat and cold recovery, efficient lighting) including precision equipment (e.g.: monitoring systems for actual crop water needs) and through support for good irrigation practices (e.g.: monitoring, using the water balance when deciding on irrigation, inspection and measurement of the effectiveness of irrigation installations applying compost and increasing the organic matter content of the soil by promoting its water retention capacity) and the recognition of good practices in irrigated farms with regard to the efficient use of water, by supporting water certification of irrigated farms, as well as choosing crops with lower irrigation needs and resistant to water stress. [Planned date: 2020-2030]

6.4.2. Creating an Energy Efficiency Regulation for Agriculture and Forestry – Measure deleted

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RDP 2020

SOURCES OF FUNDING

EAFRD; EAGF; The Cohesion Fund; ERDF; FA; RRP

ENTITY RESPONSIBLE

AEM; MAAC; GRA; GRM; Managing authorities of the Funds; IFAP

LINE OF ACTION

7.2. PROMOTING RESOURCE AND ENERGY EFFICIENCY

DESCRIPTION

Promote energy and resource efficiency in the industry sector by optimising as far as possible the angles of energy, water and material efficiency in production processes. This aims at increasing resource productivity, separating economic growth from resource use and increasing competitiveness.

SECTOR (S)

Industry; Energy

ACTION MEASURES

To promote resource and energy efficiency, the following action measures are envisaged:

7.2.1. Promoting the uptake of more efficient technologies

Optimisation of engines, pumping systems, ventilation and compression systems, combustion systems, heating and cooling systems, exchangers and heat recovery, industrial cold. Also promote efficient lighting. [Planned date: 2020-2030]

7.2.2. Promote 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 continue to be 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 and contributing to the achievement of energy and climate targets. This should also include retrofitting cogeneration units for operation also with renewable gases. [Planned date: 2024-2030]

7.2.3. Review the Industry Energy Efficiency Regulation

At industry level, the Intensive Energy Consumption Management System (SGCIE) is applied, which aims to promote energy efficiency and monitor the energy consumption of these installations, applying to energy-intensive installations. Given the weight and size of the sector, there is a clear opportunity to create new demands and targets for the industry sector. Measure

revised and included in measure 2.3.1 which has been amended. [Planned date: 2019-2024] **CONTRIBUTION TO NECP**

DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; ENAR; SGCI; PRAEE

SOURCES OF FUNDING

RRP

ENTITY RESPONSIBLE

MAAC; WPM; GRA; GRM

ii. Long-term strategy for the renovation of the national stock of residential and non-residential buildings, both public and private³²

LINE OF ACTION

2.1. PROMOTE ENERGY RENOVATION OF THE BUILDING STOCK AND NZEB/ZEB BUILDINGS

DESCRIPTION

It aims to mobilise the necessary efforts to promote energy 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 bills, reducing emissions or improving health and comfort, which is why energy renovation of buildings should be a priority.

SECTOR (S)

Residential; Services

ACTION MEASURES

To ensure effective energy renovation of the building stock, the following action measures are envisaged:

2.1.1. Promote a National Plan for Building Renovation

Develop and implement a plan to promote the renovation of buildings, contributing to an increase in the energy efficiency of the building stock and changing the paradigm of recent decades, focusing solely on new construction, and contributing 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 energy efficiency gains. It should be noted that the Long Term Strategy for the Renovation of Buildings (LTRS) was published in 2021 by Council of Ministers Resolution No 8-A/2021 of 3 February, with: characterisation of the national building stock; identification of cost-effective approaches to renovations relevant to different types of buildings; identification of policies and measures to encourage deep building renovations; future outlook for the sector; estimation of energy savings and other possible benefits and identification of the investments needed for their implementation. Monitoring of the implementation of this plan can be done through a multidisciplinary working group set up for this purpose. [Planned date: 2023-2024]

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) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (EPBD), will respond to a number of purposes, in particular the registration and monitoring of actions carried out on buildings and their technical systems. In this context, and responding to some of the new requirements of the EPBD, the energy certification of buildings is expected to enhance the integration of diverse information, namely: recording of technical solutions characterising buildings and opportunities for improvement; making available to final consumers the energy certificate thus allowing easy access to this document for the various contexts in which it is needed; record of maintenance and inspection of technical building systems; a register of operations for the installation, replacement or upgrading of technical building systems; register of energy consumption of large commercial and service buildings; enhancing interoperability with other systems and platforms of public administration. There will be energy performance requirements (MEPS); harmonisation of energy classes from A to G; introduction of renovation passport schemes for deep renovation of

³²Including policies, measures and actions to stimulate cost-efficient deep renovation, and policies and actions to reach the worst performing national building stock segments in accordance with Article 2a of Directive 2010/31/EU on the energy performance of buildings, as amended by Directive 2018/844

buildings; the concept of zero-emission buildings; the *Smart Readiness Indicator* (NIS); the concept of *life-cycle global warming potential* as an indicator to be included in future energy certificates for the calculation of embodied energy in buildings; the interoperability of the energy certificates database to enable the exchange of information with other platforms. Aggregated and anonymised energy certificate data should be publicly available and should be transferred annually to the *Building Stock Observatory* in order to monitor the evolution of the built stock. [Planned date: 2023-2024]

2.1.3. Provide a new version of the Energy Certificate

In line with the new requirements of the EU directive on the energy performance of buildings, it is recommended to strengthen the image and role of the energy certificate of buildings, 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, as it presents language closer to the citizen, will make it possible to create a greater understanding of the characteristics and performance of its building, whether by using qualitative rather than quantitative assessments, but also by creating more easily assimilated benchmarks, such as comfort indicators, thus meeting the objectives of an energy efficiency policy in buildings.

The new certificate will also set out the way forward if it is intended to implement improvement measures, as well as the corresponding real impact of these improvements. The planning and prioritisation of these measures will be in line with the strategy to be taken at the level of rehabilitation, first and foremost by reducing energy needs, and only then by acting on technical systems including the use of renewable energy.

In the context of strengthening the role of the energy certificate, this document is expected to: support the assessment of the energy performance of buildings and the fulfilment of applicable requirements at the time of their design or renovation, adapted to the new European legislative context; support the periodic assessment of the energy performance of large commercial and service buildings with a view to identifying 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 their implementation; to support access to financing instruments, providing identification of building condition and improvement needs, and subsequently monitoring, monitoring and validating the implementation of energy performance improvement measures; it shall support the granting of tax benefits, in particular by encouraging the implementation of improvement measures and the design or renovation of buildings with a view to achieving a high energy performance. [Planned date: 2020-2024]

2.1.4. Revise the Energy Efficiency Regulations in Housing and Services Buildings (public and private). This Regulation covers 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, inter alia, have 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) enabling high-efficiency alternative systems that safeguard compliance with NZEB requirements; (III) define charging infrastructure requirements for electric mobility; (IV) adapting buildings for the integration of smart technologies, such as automation and electronic monitoring of technical building systems; (v) carry out inspections of lighting and heating and cooling systems; (VI) promote the registration and documentation of installation, replacement or updating of technical systems; (VII) ensure greater transparency in the methodologies for calculating the energy performance of buildings by making them fit for purpose; (VIII) ensure interoperability with other systems that assess, classify and promote water efficiency, material efficiency and decarbonisation of the building. [Planned date: 2023-2025]

2.1.5. Transition from the promotion of NZEB buildings to the promotion of NZEB/ZEB buildings

Nearly zero-energy buildings, known as NZEB, are characterised by very high energy performance and their nearly zero or very small 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 carbon emissions on-site from fossil fuels.

The amendment proposed in the revision of the EPBD aims to promote the improvement of the energy performance of buildings and the reduction of greenhouse gas emissions from buildings in the Union, with a view to achieving a zero-emission stock of buildings 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 will need to be put in place to promote the adoption of this

paradigm by these actors, as well as the study and dissemination of a portfolio of technical solutions enabling new and existing buildings to gradually reach ZEB level. In the case of existing buildings, guidelines and support for the renovation project should also be established to support the monitoring of consumption, the implementation of efficient and durable equipment and the optimisation of consumption in a sustainable manner, promoting the understanding and adequacy of existing mechanisms with regard to the specific nature of these buildings and their potential. [Planned date: 2020-2030]

2.1.6. Encouraging more efficient construction and renovation – New measure

Through the support of different projects by the RRP, it is intended that new constructions will have to meet the requirement of being NZEB20 and in rehabilitation that a thermal comfort indicator is 10 % better than for new construction by the end of 2026. These projects are subdivided into:

- 1st right, Local Housing Strategies where the construction of new housing buildings and the rehabilitation and conversion of existing buildings into housing is planned, comprising 26.000 dwellings;
- National Urgent and Temporary Housing Fellowship where the construction of new housing buildings and the rehabilitation and conversion of existing buildings for housing is planned, comprising 2.000 accommodation;
- The Access Lease Programme, where the construction of new housing buildings and the rehabilitation and conversion of existing buildings for housing is planned, comprising 6.800 dwellings. [Planned date: 2020-2026]

2.1.7. Prosumer- New measure

In state- (and privately owned) housing buildings promote the energy rehabilitation of roofs, with improved thermal insulation, sealing and renewable energy systems for electricity and hot water production [Planned date: 2023-2030]

2.1.8. Promoting financing and technical assistance for the rehabilitation of buildings – New measure

The update of the SCE, in the context of the update of Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (EPBD), aims to address several purposes, with the aim of supporting the fulfilment of 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;
- Design funding schemes to promote rehabilitation;
- Remove non-economic barriers, including split incentives;
- Monitor social impacts, in particular on the most vulnerable households.

[Planned date: 2023-2026]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; SCE; Housing; LTRS

SOURCES OF FUNDING

The Cohesion Fund; ERDF; Efficient House 2020; FA; IFRRU 2020; The Rehabilitar for Arrendar Programme; FNRE; RRP

ENTITY RESPONSIBLE

MAAC; GRA; DGEG; ADENE; IHRU; LNEC, MH; IHRU

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. DECARBONISE PUBLIC ADMINISTRATION

DESCRIPTION

Decarbonise public administration, in transport and mobility vectors, buildings and public purchasing, leading for example in innovative and ambitious policies, equipping 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 procurement.

SECTOR (S)

Mobility and Transport; Energy; Public Sector of the State

ACTION MEASURES

In order to decarbonise public administration, the following action measures are envisaged:

1.5.1. Promote the decarbonisation of the stock of buildings of the central, local and regional public administration and the state-owned enterprise sector

With a view to promoting the decarbonisation of the state building stock, a review of the Energy Efficiency Programme in Public Administration (ECO.AP 2030) will be carried out. The revision of ECO.AP 2030 aims to define new targets and objectives for this programme, with the potential to extend its scope to local and regional public administration. The revision took into account the legal framework of the Ministry's role as an Intervocator for the ECO.AP Programme within the Central State Administration and the Local Energy Manager function, the redesign of the implementation model for Energy Efficiency Management Contracts and the promotion of financing models that enhance gains in scale and reduction of perceived risk associated with energy efficiency investments, the creation of a fiscal, budgetary and regulatory environment that favours investment in energy efficiency measures by public administration services and bodies, the strengthening of mechanisms for monitoring and monitoring compliance with the obligations of public administration services and bodies in the field of energy efficiency and energy certification, and the inclusion of a part of other emission reduction and emissions reduction measures.

With a view to achieving the objectives proposed by ECO.AP 2030, an Energy Efficiency Barometer is in place with the aim of characterising, comparing and disseminating the energy performance of the different public administration entities. The Barometer plays a central role in the strategy to promote energy efficiency in the public sector, providing detailed information on the structure of energy consumption in the public sector, thereby supporting the development of policies and measures to promote the efficient use of energy resources in the public sector. The need to extend this tool stems from the revision of Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency. In this review, the exemplary role of public bodies' buildings is no longer directed only to heated and/or cooled buildings owned and occupied by their central government, but to heated and/or cooled buildings owned and occupied by their national, regional or local authorities and entities directly financed and managed by these authorities, but not of an industrial or commercial nature. [Planned date: 2024-2025]

1.5.2. Promote the uptake of *easy wins*, energy efficiency and/or renewable energy uptake solutions

The solutions to be adopted include the promotion of the electrification of buildings accompanied by an increase in the incorporation of renewables, through the installation of solar thermal collectors for heating in buildings or equipment with high needs such as swimming pools, sports grounds, 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. [Planned date: 2020-2030]

1.5.3. Promote green public purchasing in line with its New National Strategy for Green Public Purchases

Incorporate low-carbon requirements in public purchases of energy goods and services, equipment and buildings, in public purchases of vehicles and transport services as well as in road construction works, and in public procurement of other goods and services. On the other hand, the option of purchasing low-carbon services instead of products (servitisation) will be promoted. [Planned date: 2020-2030]

1.5.4. Promote the introduction and use of low-emission vehicles and sustainable mobility in the state

Promoting increasingly sustainable mobility should start in the institutions of the state, leading by example in the adoption of innovative and ambitious policies. High levels of penetration of electric vehicles in the State fleet will be achieved through the creation of an obligation to meet purchase quotas for electric vehicles for the State administration and the provision of incentives for the introduction of electric vehicles into the state vehicle fleet, such as the ECO.mob project. It is therefore important to draw up a new sustainable mobility programme for public administration in order to continue the ECO.mob programme and pursue 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. [Planned date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

RNC2050; ECO.MOB; ECO.AP 2030; ECO.AP Azores; ENAR; ENCPE; PAESC-RAM

SOURCES OF FUNDING

FA; AMR budget; RRP

ENTITY RESPONSIBLE

MAAC; MF; MH; GRM; GRA; ESPAP; APA; DGEG; ADENE; Municipalities

LINE OF ACTION

2.4. PROMOTING ENERGY EFFICIENCY IN STREET LIGHTING

DESCRIPTION

The Public Lighting (IP) is responsible for a very significant share 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 another driving force for municipalities. In this context, it is essential to promote investment in an efficient and new generation IP that will make it possible to adapt the lighting levels needed for safe pedestrians and vehicles, increasing energy savings, enabling the introduction of new functionalities and applications for consumer management and control, and boosting smart cities. Policies will be adopted to promote the development of an efficient and new generation IP, promoting energy reskilling to achieve energy savings and ensuring adequate lighting, in line with the existing standardisation for public roads across the country.

SECTOR (S)

Energy; Municipalities; State-owned enterprise sector

ACTION MEASURES

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

With a view to the necessity and appropriateness of creating and implementing technical rules, taking a proactive and pedagogical approach, in order to assist in the work carried out by IP infrastructure designers and installers, a technical manual should be created and published, in which it should address at least the main concepts of Luminotecnia, criteria for IP projects (including the provision of a calculation tool) on the basis of EN13201 and a review, in conjunction with the APA, of the definition of criteria provided for in the national strategy for green public procurement under the IP. [Planned 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 7 of Directive EU 2018/2002, it is necessary to set up a Public Lighting Consumption Management System (SGCIP), to be set up with the aim of promoting energy efficiency and monitoring the energy consumption of the national IP infrastructure. To this end, it is also important to promote the installation of smart metering systems. The SGCIP should include the obligation to draw up and report on the existing IP register and an IP Energy Requalification Plan for 2030, with the annual reporting of energy savings achieved by those responsible for managing this infrastructure. The IP's energy upgrading plan will aim to create conditions for improving the quality of lighting in public spaces and roads, but also to reduce energy consumption, while the cadastre of existing infrastructure and retrofitting is promoted in accordance with the needs of each case. [Planned date: 2024-2026]

2.4.3. Promoting the redevelopment of the street lighting park – New measure

The upgrading of the national public lighting park (with LED technology), managed by municipalities or other entities, should be promoted with a view to increasing energy efficiency levels and promoting the reduction of the energy costs of municipalities. [Planned date: 2020-2028]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

FA; RRP

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. PROMOTE VOCATIONAL TRAINING FOR THE ENERGY EFFICIENCY SECTOR

DESCRIPTION

Strengthening the professional skills and qualifications of technicians in the fields of energy efficiency serves to meet the targets and objectives set at national and European level, which point to increasing the energy efficiency of the economy and 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 (S)

Services; Industry; Energy; Transport

ACTION MEASURES

In order to strengthen vocational training for the energy efficiency sector, the following action measures are envisaged:

2.5.1. Promote new training strands for specialised 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 Services Buildings, Industry and Transport; (II) design and installation of Solar Thermic and Solar Photovoltaic complying with technical standards defined by the State; (III) Energy Management and Service Building Maintenance; (IV) professionalisation and qualification of public lighting installers and designers; (v) control management systems to meet the requirements arising from the revision of the EPBD Directive and the introduction of new technological solutions in buildings; (VI) Measurement & Verification of energy efficiency improvement projects, based on IPMVP (International Protocol for Measurement and Verification) methodologies, as a means of matching the quantification of avoided consumption and standardising methodologies for assessing energy savings; (VII) efficient window designers and installers and thermal insulation applicators in buildings; (VIII) water efficiency and water-energy nexus technicians and specialists in buildings; (IX) technicians for inspection of technical systems (x) technical systems for natural ventilation, mechanical ventilation and indoor air quality (xi) professionalisation and qualification for energy simulation. [Planned date: 2023-2030]

2.5.2. Promote training for construction technicians and specialists and NZEB and ZEB buildings

In view of the fact that the implementation of the NZEB 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 adequate life-cycle performance), support for the technical training of the various actors will be promoted, starting from the design phase, through the construction phase and to the exploitation/use phase of these buildings. [Planned date: 2023-2030] **contribution FOR 5 DIMENSIONS** Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

MEC; MTSSS; MAAC; 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 point 5.3 (i).

3.3. Energy Security Dimension

Security of supply should be ensured by adopting appropriate measures to reduce external energy dependence, counteracting an imbalance between supply and demand, in particular as regards 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), new grid planning mechanisms, deployment of smart grids, decentralisation of generation and flexibility, among others, will greatly contribute to this.

1. Energy security policies and measures

LINE OF ACTION

4.1. PROMOTE STORAGE SYSTEMS

DESCRIPTION

In order to better manage the national energy system in its various sub-sectors, it is considered essential, and play a crucial role, to have adequate storage systems, in their different forms, as a tool for system flexibility and stability. It is therefore important to maintain and encourage investment in reversible pumping systems in hydropower plants and to seek to develop other technological solutions which will include the application of battery system technology and hydrogen technologies.

The focus on the production and consumption of renewable gases, changing an import exclusivity to a situation where there is a significant proportion of domestic production, will have to be accompanied by the existence of 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 valuation of existing assets and, on the other hand, the transition to a 100 % renewable gasian infrastructure. It is therefore crucial to create conditions to reduce the risks to the security of gas supply and to adapt storage infrastructure to 100 % renewable solutions.

SECTOR (S)

Energy

ACTION MEASURES

In order to promote storage systems, the following action measures are envisaged:

4.1.1. Creating the legal framework for the implementation of storage systems – Targeted measure

Establish the legal framework to enable and encourage 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.

4.1.2. Develop and implement the National Strategy for Storage

The main objective of this 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 security of supply, quality of service and economic sustainability of the options to be adopted. It should be based on an economic analysis and the interface between storage systems and network development. This document shall be updated at least every 5 years to take account of technological developments and costs. New guidelines resulting from the process of review/reform of the electricity market initiated by the European Commission in 2023 should also be taken into account. The study on energy storage potential in Portugal was published in 2021. [Planned 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 SEN

Support the development of pilot projects promoting the implementation of low and undermature technologies with a view to

improving their technical and economic feasibility, with a focus on linking renewable production with storage. In parallel with increasing production and storage capacity, access to networks should also be promoted and facilitated. The 2020 solar auction included the possibility of including storage, with several winning offers presenting solutions with battery storage. 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 strengthened.

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 flexible management of the electricity system, thus making it more able to respond to the challenges of the energy transition, including the increased penetration of intermittent renewable energy sources and the expected increase in electricity consumption. This measure should be implemented in conjunction with the National Strategy for Storage (measure 4.1.2) (expected 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 electricity systems and increase the penetration of intermittent renewable energy sources. There are already a number of projects implemented and others under preparation in both the Autonomous Region of the Azores and the Autonomous Region of Madeira (such as Calheta's hydroelectric use). [Planned date: 2020-2030]

4.1.5. Ensuring increased gas storage capacity – New measure

The consequences of the geopolitical situation arising 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 energies (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 maturity 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 national territory in order to allow a constant flow to consumers, while always focusing on the suitability of such facilities for hydrogen consumption. [Planned date: 2023-2028]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; PAESC-RAM; PAESI-Madeira; PAESI-Porto Santo

SOURCES OF FUNDING

ERDF; FA; Community Funds (OP SEUR, PACS, Regional OPs); Horizon Europe; Innovation Fund, PRR

ENTITY RESPONSIBLE

MAAC; GRM; GRA; DGEG; ERSE; MES; 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, based on the search for synergies between the various options, between them a rapid and progressive reinforcement and modernisation of infrastructure and market reconfiguration and digitalisation. This is in line with the concerns of the European Commission, which published in 2020 an Action Plan on Digitalisation of the Energy System and a Path to the Digital Decade (2030 horizon).

SECTOR (S)

Energy; Residential; Services; Industry

ACTION MEASURES

To promote the digitalisation of the energy system, the following action measures are envisaged:

4.4.1. Promote 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 consumers and makes it available to consumers, which allows for more dynamic and efficient management of the system, favouring energy efficiency, improved consumer offers 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 2024 in mainland Portugal. At the same time, access to more accurate

information through smart meters will also have a positive impact on, for example, 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. [Planned date: 2020-2024]

4.4.2. Promoting the development of smart grids

The planning of transmission and distribution networks, and their investments, should include an innovation component that enhances high performance levels based on intelligent systems. On the environmental side, it is recognised that smart electricity and gas grids are levers for the energy transition, as they drive the growing consumption of renewable energy. It is within this framework that R & D projects will be promoted in order to respond to the growing and imminent need for control, monitoring and dynamic management of networks, taking into account the various types and sources of energy circulating on them. 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 this purpose, which should take into account the need to maintain the resilience of systems and networks by mitigating and preventing security impact.

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 legislation and regulation, which give effect to the development of smart grids will be promoted. At the same time, obtaining more accurate information in the use of smart grids 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 phenomena and events. [Planned 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 upcoming changes in the sector. This new reality may also require legislative changes to ensure an appropriate legal framework to make it possible, for example, to make consumption data available with granularity and to set deadlines for creating new solutions. [Planned date: 2020-2025]

4.4.4. Promoting the development of network information, sensation and automation systems – New measure

The management of a network with increasing levels of complexity and with an ever-wider range of active/dynamic resources requires the development of more advanced information, sensing and automation systems of the network, providing the levels of observability of network controllability that are essential for network operators to make effective use of flexibility resources, including storage, and investment in this area is crucial [expected date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; Energy security; Internal Market; I & I & c

PRINCIPAL INSTRUMENTS

NIP; PDIRD-E/G; PDIRT-E/G

SOURCES OF FUNDING

CEF mechanism; RRP; PILD

ENTITY RESPONSIBLE

MAAC; WPM; MI; GRA; DGEG; ERSE; Network Operators

LINE OF ACTION

4.5. PROMOTE PROPER PLANNING OF THE NATIONAL ENERGY SYSTEM TOWARDS THE ENERGY TRANSITION

DESCRIPTION

Promoting the increase in installed renewable electricity capacity, including distributed generation and self-consumption, as well as the need to promote other renewable energy sources that are currently low in the various sectors, necessarily requires a network infrastructure response that allows not only to accommodate this increase in capacity and diversification of sources, but also to address all the challenges that the new energy supply and demand paradigm brings to the national electricity system. The same challenge is posed to 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. Consistency of national electricity and gas planning (including

renewable gases) alongside Union-wide planning is equally important.

SECTOR (S)

Energy

ACTION MEASURES

In order to promote the appropriate planning of the national electricity system and the national gas system, the following action measures are envisaged:

4.5.1. Form a strategic vision of the national electricity grid and renewable gas grids 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, with the main objectives of: (I) provide a strategic vision on the networks; (II) reflect on the market models for energy trading and system services; (III) assessing 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, grid repurposing and the definition of dedicated networks specifically for renewable hydrogen. [Planned date: 2020-2030]

4.5.2. Planning and fostering integrated and joint management of the network, in a regional and cross-border logic

In the interests of value for money, it is of the utmost importance that network and energy management also take place across borders, and dialogue between national and regional network operators should therefore be promoted and supported. Coupled with this approach, the interdependence of the electricity and gas system should also be considered at national and cross-border level, in a logic of *sector coupling*, a logic which is in line with the Community approach and policy. There is a need for integrated studies, including different sectors related to energy, e.g. electricity, gas, mobility. These studies are already progressing at European level (ENTSO-E and ENTSO-G), but regional studies are also needed to assess the adequacy at country level. [Planned date: 2020-2030]

4.5.3. Adapting and encouraging continuous improvement of network planning tools

The current network planning tools, in the form of Network Development and Investment Plans (RDPs), should take into account the targets and objectives set out in the NECP and RNC2050 and the need to adapt network 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 Network Development and Investment Plans (RDPs), guidelines for continuous improvement will be promoted and strengthened.

The same logic should be applied to the planning of gas/H₂ networks, while at the same time the interdependence of the electricity system and the gas system should be considered, in line with the logic of *sector coupling*, providing increasingly integrated planning, which is in line with the Community approach and policy.

To further improve network planning and management/operation it is also crucial to foster dialogue and cooperation between public entities, operators and other actors involved. [Planned date: 2020-2030]

4.5.4. Setting up mechanisms for network planning at local level

The challenge of adequacy of network infrastructure enabling an effective energy transition is in particular the Low Voltage Network (BT), which will no longer be a passive network, but will integrate a whole range of new concepts, from grid intelligence, management support systems, smart metering, 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 respect, it is still necessary to consider the future of the municipal distribution concessions in BT and the concession of the technical management of distribution networks in planning, as required by Decree-Law No 15/2022.

To ensure this transformation, mechanisms should be put in place to provide actors with the necessary tools to plan BT networks efficiently and cost-effectively, ensuring quality of service and security of supply. [Planned date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

PRINCIPAL INSTRUMENTS

RNC2050; PDIRT-E; PDIRG; PDIRD-E; PDIRD-G; RMSA-E; RMSA-G

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

MAAC; GRA; ERSE; DGEG; Network operators; GRM

LINE OF ACTION**4.6. CARRY OUT THE NECESSARY RISK ASSESSMENTS, PREVENTIVE ACTION AND EMERGENCY PLANS IN THE ENERGY SECTOR****DESCRIPTION**

Under Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2009 concerning measures to safeguard security of gas supply, the need to draw up Preventive Action Plans and Emergency Plans is defined. The implementation of this Regulation also requires risk assessment, security of supply and prevention and action in the event of a regional emergency. These assessments presuppose a mapping of risks, with the definition of the likelihood and impact of certain events causing greater restrictions and disruption to national gasist systems. The plans to be defined in this context, on the basis of information from the risk assessments, shall set out the preventive measures to reduce or eliminate the impacts of such events and the mode of action in an emergency/crisis situation in the event of the occurrence of an event identified in the risk assessments. 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 has been published, which broadly follows the procedures defined for the gas sector (included in Regulation (EU) 2017/1938), advocating the identification of risks in the electricity sector and the establishment of a Risk Preparedness Plan setting out these scenarios and related prevention and crisis measures.) In the oil sector, there are also plans for intervention and mobilisation of emergency oil stocks (PIURS) to ensure security of supply in the national oil system (SPN). These plans also provide 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.

SECTOR (S)

Energy

ACTION MEASURES

In order 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 issues

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 the one considered for the gas sector, and cooperation should therefore be seen in the same way, also giving importance to interaction with authorities and similar entities in discussion and cooperation fora, such as the *Electricity Coordination Group* (organised and coordinated by the European Commission). [Planned date: 2020-2030]

4.6.2. Promote better coordination between operators and other actors in the sector

In order to comply with the provisions laid down in the current rules on security of supply, in particular for the identification and assessment of risks and the drawing up of preventive and emergency response plans, it is necessary to gather information in order to accurately characterise the respective systems (gas, electricity and oil).

In addition to collecting information from operators and other entities and actors operating in their systems, they need to cooperate closely with each other and with the competent authorities in order to obtain assessments and planning closer to reality and thus greater effectiveness and efficiency. [Planned date: 2020-2030] **CONTRIBUTION TO 5 DIMENSIONS**

Energy security; Internal Market

PRINCIPAL INSTRUMENTS

PPA SNG; SP SNG; PPR SEN

Sources OF FINANCIATION n.e.c.**ENTITY RESPONSIBLE**

MAAC; DGEG; ENSE; ERSE

LINE OF ACTION

4.7. ADJUST THE ROLE OF GAS IN THE ENERGY MIX, FOCUSING ON DECARBONISING THE SECTOR

DESCRIPTION

The way for the energy transition in this decade will be through a combination of technologies and energy carriers, where gas will still have a role to play, despite the ban on the use of this fuel for electricity production from 2040, provided that security of supply is ensured, as provided for in the Climate Law. With a view to gradually reducing fossil fuel consumption, natural gas, being the lowest GHG emissions, will remain as an energy source for the next decade, in particular in the power generation sector and in industrial consumption, with the increasing integration of renewable gases and the consequent decarbonisation of the gas sector being a priority. The trajectory by 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 (S)

Energy

ACTION MEASURES

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 in the power generation system, ensuring the transition to renewable gases

Maintaining natural gas-fired electricity generation capacity until 2040 will ensure the necessary *backup* 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 the appropriate levels of security of supply. Security of supply over the horizon 2040 will be assessed against the need to maintain in the SEN the capacity of combined cycles with natural gas, either as a way of guaranteeing baseline capacity to the system or as a means of guaranteeing inertia and responding to real-time disruptions to the supply/demand balance.

To this end, and by promoting the production and increasing integration of renewable gases, in particular green hydrogen and biomethane, a timetable will be established for the gradual decarbonisation of natural gas thermal power plants by incorporating increasing shares of renewable gases, leading to their full decarbonisation by 2040. [Planned date: 2020-2030]

4.7.2. Adapting network planning to the energy transition

The current network planning tools in the form of Network Development and Investment Plans (RDPs) should take into account the NECP targets and objectives as well as the need to adapt grid investments to prepare these infrastructures for the challenges of the energy transition (increased electrification, further integration of renewables, in particular new power plants and the production and injection of renewable gases, among others). [Planned date: 2020-2030]

4.7.3. Increasing the uptake of renewable gases in the natural gas grid – New measure

The development of investments in renewable gases will be leveraged by the increasing incorporation of renewable gases into the natural gas grid. It is therefore crucial to set the incorporation targets and develop the legislative and administrative instruments to achieve them, in addition to what is already provided for in Decree-Law No 62/2020 establishing the organisation and functioning of the national gas system (SNG). [Planned date: 2022-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

PRINCIPAL INSTRUMENTS

RNC2050; PDIRGN; PDIRD-GN; RMSA; PAESC-RAM

SOURCES OF FUNDING

RRP

ENTITY RESPONSIBLE

MAAC; GRM; DGEG; ERSE

LINE OF ACTION

4.8. PROMOTE DIVERSIFICATION OF ENERGY SUPPLY SOURCES AND ROUTES

DESCRIPTION

In the interests of security of supply, diversification of sources and routes of supply of energy resources is crucial, without compromising decarbonisation objectives. Although Portugal has a reasonable diversification, there is still a considerable

concentration of these, with preferential routes on energy supply, and it is therefore important to improve diversification and/or deconcentration of the origins of energy resources.

SECTOR (S)

Energy

ACTION MEASURES

In order to promote diversification of energy supply sources and routes, the following action measures are envisaged:

4.8.1. Promoting and strengthening external cooperation in the field of energy

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 or new cooperation platforms, 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. [Planned date: 2020-2030]

4.8.2. Boosting national infrastructure and Portugal’s role in European and international energy markets

In the particular case of natural gas, Portugal’s potential to operate as one of the gateways for entering 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 greater diversity in the reception of tankers). The focus on the production of renewable gases, with a particular focus on renewable hydrogen, could allow for a change in flows in the infrastructure of the Port of Sines. Given the role that gas will have, like the future role of hydrogen, whether in its liquid state or through green ammonia, it is important to provide the Port of Sines with the capacity to dispose of renewable hydrogen products.

It is also important to maintain the national objective of promoting interconnections in this sector and to this end to maintain and strengthen cooperation with Spain, France and the European Commission, including through high-level groups on the topic of interconnections, in particular the High Level Group on Interconnections in Southwest Europe set up under the Madrid Declaration of 2015 and its enhanced role with the Lisbon Declaration of 2018. [Planned date: 2023-2030]

4.8.3. Creating a sustainable market for maritime LNG, boosting the use of LNG on ships

It will be important to consider the creation of a sustainable market for maritime LNG by 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 may 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 LNG bunkering to ships. It should be noted that the new international regulations (IMO – *International Maritime Organisation* 2020) entered into force on 1 January 2020, which regulate the type of fuel that can be used in maritime transport and require a significant reduction in the sulphur content of fuel oil used by ships. In this sense, LNG, as a fuel, is a potential alternative. [Planned date: 2020-2030]

4.8.4. Creating a market for alternative fuels, boosting 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 and subsequent storage capacity in national ports. This will create conditions for their use in maritime transport and boost a new market with export potential for these products (such as green methanol, green hydrogen and green ammonia). [Planned date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS

Energy Security, Internal Market

PRINCIPAL INSTRUMENTS

NIP

SOURCES OF FUNDING

CEF mechanism; EFSI; RRP; AFIR

ENTITY RESPONSIBLE

MAAC; WPM; GRA; DGEG, MI

COURSE OF ACTION – NEW

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 system of supply and demand

through aggregation for 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 (S)

Energy

ACTION MEASURES

In order to promote flexibility in the electricity system, the following action measures are envisaged:

4.12.1. Promoting participation of demand and supply through aggregation, participation of small production and self-consumption – New measure

Encourage the participation of consumers and producers in the services to be provided to the system by means of aggregation activity, by leveraging that already defined in Decree-Law No 15/2022 of 14 January 2009. [Planned 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, including the needs for the provision of local and system flexibility services, aligned with renewable and decarbonisation objectives, taking into account security of supply. The flexibility needs of the system should be periodically assessed in line with what is defined in the new electricity market design in the EU, where the negotiation process in the EU started in 2023, with a view to improving the design of the Union electricity market. [Planned date: 2024-2025]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency, Energy Security, Internal Market; I & I & c

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE

MAAC; 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 management tools of the national electricity system 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 (i).

3.4. Dimension Internal energy market

3.4.1. Electricity infrastructure

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 study the creation of alternatives to the current interdependence between the Portuguese and Spanish electricity market, in particular through the assessment of interconnection with other markets, in order to enhance security of supply and promote further electricity market integration.

SECTOR (S)

Energy

ACTION MEASURES

In order to promote the development of interconnections, the following action measures are envisaged:

4.2.1. Enhance regional cooperation

Promote close coordination for the monitoring of interconnection projects, assessing the corresponding financing needs and monitoring 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 those between Spain and France) and to strengthen cooperation on such platforms. [Planned date: 2020-2030]

4.2.2. Delivering on the new interconnections already identified

To implement the electricity interconnection between Portugal (Minho) and Spain (Galicia), which will be achieved through the construction of a new double 400 kV air line between Beariz (ES) – Fontefria (ES) – Ponte de Lima (PT) – Vila Nova de Famalicão (PT), including the new 400 kV substations at Beariz, Fontefria in Spain and Ponte de Lima in Portugal. This project has the Project of Common Interest (PCI) label awarded by the European Commission. [Planned date: 2023-2024]

4.2.3. Implement new internal network building projects

Some grid reinforcements to be implemented aim at increasing interconnection capacity and reducing possible negative impacts caused by energy supply limitations or interruptions. To this end, two projects to strengthen the internal network, which were awarded the PCI label by the European Commission on the last trusted list at the end of 2021, will be implemented as follows: (I) internal line between Pedralva and Overriding (PIC 2.16.1); (II) internal line between Vieira do Minho, Ribeira de Pena and Feira (PIC 2.16.3). The general objective of these projects is to increase the transmission capacity of the essentially renewable national electricity grid in the Minho region, in particular electricity from water and wind sources, and are also linked to the new Minho-Galicia interconnector, enabling excess production to be disposed of within the Minho region, which may occur under certain conditions of operation of the SEN. These projects were not submitted by their promoter to the PIC application for the list to be approved by the European Commission by the end of 2023. [Planned date: 2020-2030]

4.2.4. Promote cooperation and identification of new interconnection projects

Considering the expected additional electrical power to be installed in Portugal by 2030 stemming from 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 and between their respective competent authorities and regulatory authorities. [Planned date: 2023-2030]

4.2.5. Promote the interconnection of isolated island electrical systems

Promote inter-island electricity interconnection as a tool to optimise resources and infrastructure for generation and storage, maximise the use of renewable energy and improve the resilience and stability of small isolated electricity systems. [Planned 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 a basis of ensuring competitiveness between market players. This definition of the regulatory and legal framework will also seek to address the challenges posed by the new EU legislation stemming from the Clean Energy for All Europeans package, in particular the instruments linked to market design and design by incorporating the changes resulting from the 2023 reform process of the EU electricity market design. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy security; Internal Market

PRINCIPAL INSTRUMENTS

PDIRT-E; PAESC-RAM; NIP

SOURCES OF FUNDING

CEF mechanism; EFSI; EIB

ENTITY RESPONSIBLE

MAAC; GRM; GRA; DGEG; ERSE; MES; TSO

Action Line – New line of action

4.10. PROMOTING 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 associated with the electricity value chain. Energy networks are a critical public service infrastructure and are an *essential* enabler 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 the structural differences that exist with other European countries, improving service conditions and resilience of critical infrastructure and limiting tariff impacts for all consumers.

SECTOR (S)

Energy

ACTION MEASURES

In order 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 changing challenges that encompass the climate-impacted energy transition, with the increasing electrification and digitalisation of the economy, it is crucial to increase the resilience of distribution networks, either by physically converting air network underground in the most vulnerable areas or areas of higher environmental risk, or by increasing commitment to digital infrastructure and services, adequately protected from cyber physical risk. [Planned date: 2025-2030]

4.10.2. Promoting energy efficiency of electricity infrastructure – New measure

The increase in demand or consumption of electricity, the expected increase in distributed generation, with the change in power flows in the grids, and the obsolescence of the electricity grid with the presence of small sections of conductors, are elements that are enablers of technical losses on the grid. These factors need to be tackled by making investments to maintain the networks under appropriate operating conditions and losses at appropriate levels. [Planned date: 2025-2030]

4.10.3. Promoting the modernisation of the network – New measure

It is crucial to promote asset renewal in order to maintain network reliability levels, managing the risk of failure associated with these assets and ensuring security of supply. [Planned date: 2025-2030]

4.10.4. Promoting the strengthening of energy networks by facilitating electrification of consumption – New measure

Measures to encourage the decarbonisation of transport, reduce air pollution and energy efficiency boost the growth of the electric vehicle fleet that will impact the electricity distribution networks. For 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 heavy 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 suitably sized for the necessary capacity to be made available. [Planned date: 2025-2030] **CONTRIBUTION TO 5 DIMENSIONS**

Energy security; Energy Efficiency; Decarbonisation

PRINCIPAL INSTRUMENTS

PDIRD-E and PDIRT-E

SOURCES OF FUNDING

n.a.

ENTITY RESPONSIBLE

Network operators; MAAC; ERSE; DGEG

ii. Regional cooperation in this area

In the context of regional cooperation on energy interconnections, the commitments between Portugal, Spain and France to:

- Continued close coordination for the monitoring of interconnection projects, assessing the corresponding financing needs and monitoring their progress in order to define a new roadmap for their implementation;

- Construction of 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 in the internal energy market, such as Spain and Portugal;
- Euro-Mediterranean cooperation on energy work with partners in the region in developing interconnections, including by exploiting the potential for renewable energy production and increasing energy efficiency, for the mutual benefit of the economies and peoples of the EU and its Southern and Eastern Mediterranean neighbours.

The 11th 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 the preparation and identification of funding sources within the European framework to assess and implement new electricity interconnection projects between France and Spain;
- Identify and carry out additional reinforcements of existing networks in order to make full use of electricity interconnection capacity.

In November 2018, the Valladolid Declaration between Portugal and Spain was signed, 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.

iii. Financing measures in this area at national level, including EU support and the use of EU funds

See point 5.3 (i).

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

H2Med, coupled with internal hydrogen transport axes in Portugal, Spain and France, will boost the development of one of the main hydrogen corridors via the Mediterranean through the construction of a 248 km hydrogen transport interconnection, including the 162 km of the Portuguese section between Celorico da Beira and Vale de Frades, with a transport capacity of 750 000 tonnes/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 infrastructure use and ensure full substitution of fossil-based hydrogen with renewable hydrogen.

These areas, which are geographically distributed, will take into account the production potential and consumption potential, as well as their typology. They will also enable effective system integration, either by diversifying the use of hydrogen in its value chain, by storing it or, finally, by the possibility of reducing potential curtailment *and* increasing flexibility in the system.

Action Line – New line of action

4.11. PROMOTING THE DEVELOPMENT OF HYDROGEN INFRASTRUCTURE

DESCRIPTION

The creation of a 100 % hydrogen green corridor ('H2Med') to connect the Iberian Peninsula to the rest of Europe is the first pillar of the European Hydrogen Backbone aimed at accelerating Europe's decarbonisation by creating the hydrogen infrastructure needed to enable the development of a competitive, liquid and pan-European hydrogen market.

SECTOR (S)

Energy

ACTION MEASURES

In order 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. [Planned date: 2023-2030]

4.11.2. Delivering on the new infrastructure already identified – New measure

The National Hydrogen Transport Axis comprises the construction and adequacy of the Figueira da Foz pipelines (with the possibility of connecting to the Carrigo AS) – Celorico da Beira – Monforte, also submitted for application for the PCI list in 2023, which together will enable the sustained and faster decarbonisation of current gas consumption, while providing the means to export green hydrogen to Europe, produced from indigenous renewable energy sources, exploiting the potential for onshore and offshore energy production in Portugal. [Planned date: 2023-2030]

4.11.3. Promoting the development of H2 Valleys – New measure

The development of viable infrastructure for the storage and transport of hydrogen will have to be supported by the existence of production and consumption of hydrogen. In this regard, it is essential to promote the creation of geographically dispersed H2 valleys taking into account the potential final uses of hydrogen (e.g.: industry sector, transport sector, etc.) and the potential for their production. [Planned date: 2023-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Security

PRINCIPAL INSTRUMENTS

PDIRT-E; PAESC-RAM; NIP

SOURCES OF FUNDING

CEF mechanism; EFSI; EIB

ENTITY RESPONSIBLE

MAAC; GRM; GRA; DGEG; ERSE; MES; TSO

ii. Regional cooperation in this area

In the context of regional cooperation on energy interconnections, the Lisbon Summit resulted in the commitment between Portugal, Spain and France to build the infrastructure necessary for the operationalisation of an efficient and decarbonised internal energy market, in particular cross-border interconnections of gas and electricity networks, notably in those Member States that have not yet achieved a minimum level of integration in 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 approach to promote efficient use of networks.

On 20 October 2022, the governments of Spain, France and Portugal agreed on a commitment they ratified at the Euromed Summit of 9 December 2022 in Alicante 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, Portugal and Spain Summit, Portugal and Spain reiterated their commitment to continue working towards the realisation 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 exporting region of renewable hydrogen and commit to continue strengthening its electricity interconnections.

Portugal and Spain will continue to work towards the realisation 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 exporting region of renewable hydrogen. Portugal and Spain commit to continue strengthening their electricity interconnections. Both countries welcome the recent agreement reached between the regulators of Spain and France on the financing of the new electricity interconnection by the Bay of Biscay.

3.4.3. Market integration

i. Policies and measures relating to market integration objectives

At the Valladolid Summit and in its Declaration, Portugal and Spain affirmed the importance of the functioning of MIBEL's internal and external interconnection to meet the challenge of incorporating renewable energy and the development of the Iberian Electricity Market (MIBEL). It was also established that work will continue on 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. In order 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 infrastructure needed to strengthen 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 (S)

Energy

ACTION MEASURES

In order to promote integration into the European internal energy market, the following action measures are envisaged:

4.9.1. Adapt regulation to promote redesign and new market design

National legislation and regulations will need to be adapted on the basis of developments in European regulations and legislation on market design and design (created under the Clean Energy for All Europeans legislative package on *Market Design* and the subject of this measure, the publication of the new Internal Electricity Market Regulation and Directive on the rules for the internal electricity market) and the implementation of the network codes associated with the sectors concerned (electricity, natural gas and renewable gases). This new regulation entails changing the role of some market players and setting tariffs and other costs that have implications for the definition of energy prices. [Planned date: 2020-2030]

4.9.2. Creating 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 the functioning of the Iberian gas market (MIBGAS) increasingly effective, a closer link between the operation of the Iberian gas market and the other European *hubs* should be promoted in order to improve its liquidity and make Portugal, and the Iberian Peninsula, a major *player* on the European energy market. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

Main INSTRUMENTS n.a.

SOURCES OF FUNDING

n.e.c.

ENTITY RESPONSIBLE

MAAC; DGEG; ERSE

ii. Measures to make the energy system more flexible in relation to renewable energy generation, including the development of intraday market coupling and cross-border balancing markets

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, so it will be necessary to redefine each other's role. In this new model, all actors, including producers, operators, suppliers, customers and political and regulatory institutions, are key elements in the process of ensuring 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 (S)

Energy; Industry

ACTION MEASURES

In order to promote the introduction of new management tools for the national electricity system, the following action measures are envisaged:

4.3.1. Regulating the role of the Market Aggregator – Achieved Measure

This new figure which will operate within the framework of the SEN aims to fill gaps in the market supply of aggregation services. The market aggregator shall be obliged to purchase the energy produced by power plants under a special scheme covered by the general remuneration scheme which wish to sell that energy to it and shall be obliged to place it on the market. It will also be able to purchase energy produced by power plants under a 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.

4.3.2. Review the regulatory and market environment for system services

At European level, the whole process associated with system services is in profound change with a view to harmonising current national markets to markets operating on European Single Windows, for each of the different types of booking. Incentives to secure power that contribute to maintaining the availability of electricity generation capacity and to making investments in new generation capacity (investment incentive), in terms that ensure levels of security of supply should also be reviewed in the context of the new EU electricity market design (currently under negotiation). [\[Planned date: 2019-2024\]](#)

4.3.3. Study and promote the introduction of the Prosecutor's Agregador

This new figure which will operate within the framework of the SEN aims to fill gaps in the market supply of aggregation services. The demand aggregator will aim at grouping together different actors/entities, such as final consumers, small producers, storage, electric vehicle recharging points or any combination thereof, and acting as a single entity and participating in the electricity market and providing system services. This mechanism promotes the flexibility of the system, improves the

management of the system in the interests of security of supply and promotes greater participation of market players. [Planned 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 as part of 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, through the programming carried out through the production forecasts of production facilities, which needs to be adopted in the Portuguese electricity system. [Planned date: 2020-2025]

CONTRIBUTION TO 5 DIMENSIONS

Energy security; Internal Market

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

PR

ENTITY RESPONSIBLE

MAAC; GRA; DGEG; ERSE

The operating model for the European intraday market, based on a continuous intraday market, will make it possible to trade energy between players located in different countries/price zones with implicit capacity allocation.

In order to achieve this objective, several European market operators and system operators implement the XBID (*Cross-Border Intraday Market Project*) project, which provides the basic contractual, systems and procedures infrastructure for which such a pan-European continuous intraday market will be implemented. This market will enable electricity to be traded for up to 60 minutes before it is delivered, thus enabling renewable energy to be integrated.

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 laying down guidelines on electricity balancing, it is necessary to promote the coordination of the markets for system services managed by European system operators. To achieve the implementation of these standards, European system operators are cooperating together to implement them:

- *Imbalance Netting* – a process that makes it possible, during the real-time operation, to offset the real-time imbalances of the various European electricity systems. The integration of Portugal into this mechanism is expected to take place in the course of 2019;
- *Reserve Replacement Reserves* – Based on the TSO-TSO model, its main objective is to establish and operate a centralised platform capable of collecting all *Replacement Reserves* (RR) offers from the various national markets operated by each TSO and to make an optimal allocation of offers and interconnection capacity in order to meet, within 30 minutes before real time, the differences between 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* – Based on the TSO-TSO model, its main objective is to establish and operate a centralised platform capable of collecting all *Frequency Replacement Reserves* (mFRR) offers from the various national markets operated by each TSO and to make an optimal allocation to meet their needs both before real time and in real time. Portugal is expected to meet the deadlines laid down in Regulation (EU) 2017/2195 of 23 November 2017, i.e. Portugal will be integrated into this new mechanism in 2024;
- *Automatic Frequency Restoration Reserves* – Based on the TSO-TSO model, its main objective is to establish and operate a centralised platform capable of mobilising in a coordinated and cost-effective manner the balancing energy bids for *automatic Frequency Replacement Reserves* (aFRR) from the various national markets operated by each TSO and to make an optimal allocation of interconnection capacity in order to meet the needs of each TSO in real time. Portugal is expected to meet the deadlines laid down in Regulation

(EU) 2017/2195 of 23 November 2017, i.e. 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 different systems;
- Greater coordination of the various systems services markets and promote 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 implemented in order to encourage the participation of new participants in the system services market and thus increase efficiency, competition and operational security.

iv. Policies and measures to protect consumers, especially vulnerable and energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

See paragraph 3.4.4. The proposed update of the Recovery and Resilience Plan (RRP), in public consultation, presents as a measure to support “The development and implementation of a local One-stop-shop model” its main objective is to provide a means to raise public awareness and awareness of the effective implementation of energy efficiency and renewable energy measures, as well as the uptake of energy sustainable behaviours, by increasing energy literacy.

The establishment of these structures, which may have sub-municipal territorial permeability (e.g.: parishes), it will meet the objective of accelerating and aligning with the strategic objectives the investments foreseen in the RRP and proposed under REPowerEU.

v. Description of measures to enable and develop demand response including those addressing tariffs to support dynamic pricing

The pilot project to improve the network access tariff in MAT, AT and MT was carried out between 2018 and 2019, in accordance with the rules adopted by the Energy Services Regulatory Authority (ERSE) Directive 6/2018 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-oriented, thus promoting a more efficient use of electricity networks. 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, in addition to 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 shift of 2.2 % of consumption out of the super peak period by the participants. Extrapolating this effect to a 23-year horizon (2018 to 2040), the cost-benefit analysis resulted in 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 procedure for 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 optional network access tariff 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, Centre, South) and the differentiation of the power price in peak hours by three seasons (Alta, medium, Baixa). 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 participation of demand in system services and the development of flexibility services projects is in operation.

Based on the results of the pilot projects, ERSE will carry out a benefit-cost analysis to assess the merits for the electricity system. The completion targets for smart meters planned by 2024 facilitate demand participation.

3.4.4. Energy poverty

It must be ensured that the decarbonisation and energy transition process is carried out in a fair, cohesive and inclusive manner, so that the way ahead in the next decade cannot exacerbate energy poverty, on the contrary, it must look for solutions to mitigate this issue. Energy poverty needs to be identified and addressed by 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 most affected sectors, and to develop policies, respectively, to create the conditions for their development, and to anticipate appropriate territorial or social responses in education, training and re-skilling in order to ensure a just transition.

LINE OF ACTION

8.1. ENSURING THE 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 (S)

Cross-sectional

ACTION MEASURES

To ensure the just transition, the following action measure is foreseen:

8.1.1. Develop a Just Transition Strategy

Develop a Just Transition Strategy aimed at ensuring climate justice by protecting the communities most vulnerable to the climate crisis, which should identify and address the opportunities and risks associated with decarbonisation and the energy transition towards carbon neutrality in 2050, and identify 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 bodies, 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 drawn up in line with developments at Community and international level on just transition. It is also intended that this strategy should cover all sectors of activity, taking into account the interests of businesses, workers and the communities to which they belong, as well as the interests of society as a whole, which are interested in the 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, for example, the Action Plan to End Coal Electricity Generation under Goal 1 – decarbonise NATIONAL ECONOMY [Planned date: 2020-2030]

8.1.2. Implementing Territorial Just Transition Plans – New measure

Implement the measures foreseen in the Territorial Just Transition Plans and covered by the Just Transition Fund as part of the Regional Operational Programmes of the Central, Norte and Alentejo Region. [Planned 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 affected, directly and indirectly, by the end of coal-fired electricity production at the Pego Thermoelectric Power Plant, and its consequent closure, is maintained during a transition phase until they find employment. [Planned date: 2021-2023]

8.1.4. Pursuing economic diversification for a just transition – new measure

In order to mitigate the socio-economic impacts resulting from 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 Tagus and Alentejo Litoral, which needs to be continued. [Planned date: 2022-2023]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation

PRINCIPAL INSTRUMENTS

RNC2050

SOURCES OF FUNDING

FA; PO Norte 2030, OP Centro 2030; PO Alentejo 2030; JTF

ENTITY RESPONSIBLE

MAAC; WPM; MTSS; MCT; MH; MI

LINE OF ACTION

8.2. TACKLING ENERGY POVERTY AND IMPROVING TOOLS TO PROTECT VULNERABLE CUSTOMERS

DESCRIPTION

Energy poverty has an impact not only on the well-being and comfort of citizens, but also on health, mortality, educational attainment, adult income, social isolation of families and young people, among others. Inclusive strategies to combat energy poverty and increase efficient energy consumption among the population in poorer socio-economic conditions and info-exclusion should therefore be devised and developed by stimulating actions of a varied nature, including actions on the ground close to the citizens concerned. In order to combat effectively, it is necessary to know in greater detail the national reality in order to target measures more effectively, such as the renovation of buildings, the promotion of renewable energies and communication and education campaigns. A consumer as an informed and active player on the market, and with tools to protect the most vulnerable consumers, will respond to another of the strategic priorities for 2030, namely tackling energy poverty and consumer vulnerability.

SECTOR (S)

Domestic

ACTION MEASURES

In order to tackle energy poverty and improve tools to protect vulnerable customers, the following action measures are envisaged:

8.2.1. Delivering on the long-term strategy to combat energy poverty

Adopt a long-term strategy for tackling energy poverty that improves knowledge on energy poverty, strives for the best response to the problem and creates a structural change to mitigate it.

This strategy, which will be developed together with the relevant bodies, will include, inter alia, representatives of central and local government bodies, consumer associations, representatives of the energy sector and academia. It will aim to obtain a diagnosis and characterisation of the problem, develop monitoring indicators, monitoring strategies, set medium and long-term energy poverty reduction targets at national, regional and local level and propose specific measures to achieve these objectives, as well as forms of financing. The “Valle Efficiency” programme is ongoing and is currently under review.

The National Long-Term Strategy for Combating Energy Poverty 2022-2050 was in public consultation from 20/01/2023 until 03/03/2023 and is estimated to be published by the end of the 3th quarter of 2023.

The National Energy Poverty Observatory will be established. [Planned 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 factors leading to the emergence of energy poverty is essential in order to understand the causes that have structurally or occasionally triggered or influenced energy poverty. Together with the recognition of these factors, there is a need for clear methods for measuring energy poverty, which offer 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 system for assessing and monitoring energy poverty.

The main objectives of the National Long-Term Strategy for Combating Energy Poverty are to tackle energy poverty, protect vulnerable consumers and actively integrate them into the just, democratic and cohesive energy and climate transition. Based on four guiding principles: (I) increasing the energy and environmental performance of housing; (II) strengthening the conditions for

access to essential energy services; (III) reduce the burden of energy consumption; and (iv) strengthen knowledge and access to information. Thus, the creation of a National Energy Poverty Observatory, with a national and local dimension, will help to identify, characterise and monitor the issue of energy poverty, as well as to increase the energy literacy of citizens. It is also of high importance to establish an interconnection system with the *Energy Poverty Advisory Hub* for the presentation of indicators. [Planned date: 2023-2025]

8.2.3. Continue protection mechanisms for vulnerable consumers and consider introducing new mechanisms

Continue to put in place mechanisms to reduce the energy burden of household consumers, helping to ensure that the price of energy is not an exclusionary factor in access to these services, irrespective of the economic, social or geographical situation of consumers, while serving the aim 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, such as 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 for the protection of vulnerable customers in Portugal given the current levels of energy poverty and the occurrence of increasingly extreme climatic events.

The “Valle Efficiency” programme is ongoing and is currently under review.

Forms of support for the participation of vulnerable consumers in energy communities and collective self-consumption will also be promoted. [Planned date: 2023-2024]

8.2.4. Develop programmes to promote and support energy efficiency and integration of renewable energy to alleviate energy poverty

Promote more structural programmes, actions and support mechanisms to combat energy poverty, such as incentives for changes in consumption patterns, targeted interventions for investments in energy efficiency, renovation of buildings and programmes aimed at the integration of renewable energy (e.g.: programme efficiency). These support mechanisms will be developed together with municipalities in order to better suit reality and promote closer proximity to energy poor consumers. [Planned 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 spirit of proximity and greater scope for policies to mitigate energy poverty (e.g.: Citizen Energy Area). [Planned date: 2020-2030]

8.2.6. Disseminating information to alleviate energy poverty

In the field of complementary measures are 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 offer all available information on energy tariffs and social support available on the market. In this regard, it is of particular importance to provide information and tools for price comparison between different operators and to have campaigns to disseminate relevant information about the energy market. Despite being a form of indirect intervention, consumer knowledge of the energy markets and of all available support tools plays a key role in changing consumption patterns and can be a measure in minimising energy poverty. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy efficient

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

UPS; FA, PPEC; RRP

ENTITY RESPONSIBLE

MAAC; WPM; MTSS; GRA; DGEG; RNAE; Energy agencies; MH, IHRU, ERSE; ADENE

3.5. Dimension Research, innovation and competitiveness

1. Policies and measures related to the elements set out in point 2.5

LINE OF ACTION

1.9. Promote R & d projects 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, as well as to support the participation of companies and national bodies in research and innovation programmes that contribute to the decarbonisation of the Portuguese economy.

SECTOR (S)

All sectors.

ACTION MEASURES

To promote R & D & I projects supporting the transition to a carbon-neutral economy, the following action measures are envisaged:

1.9.1. Promote coordination with the Thematic Research and Innovation Agendas of the Foundation for Science and Technology. The FCT Agendas aim to mobilise experts from R & D institutions, businesses and public authorities in identifying challenges and opportunities within the national science and technology system, in a medium and long term perspective, contributing to the development of R & I responding to problems or needs of different sectors of society. In support of R & I projects contributing to the decarbonisation of the economy, the following 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 research and innovation agendas. [Planned date: 2020-2030]

As mentioned in Section 2.5 for the BER dimension, on the 15 planned Thematic Agendas, two of them were identified with a particular impact on the PNEC2030 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 in all sectors of activity

Promote eco-innovation projects in low-carbon technologies and R & D projects supporting the transition to a carbon-neutral economy by reducing the costs of the transition. Support the development of innovative, low-carbon products and services, the creation of *living labs* for decarbonisation, including by supporting initiatives involving research centres, academics and businesses. [Planned date: 2020-2030]

Different actions should be highlighted:

- Collaborative Laboratories (CoLabs): Of the 35 CoLabs in operation, at least 4 are active in areas of particular relevance to the PNEC2030: 'Energy and Sustainability', 'Materials, Circular Economy, and Urban Sustainability', 'Climate, Space and Ocean', and 'Biodiversity and Forest'.
- Participation in IPCEI-Hy2Waves (p. situation as at 30 June 2022): Submitted a total of 8 proposals; Hy2Tech 2 proposals, 1 approved; in Hy2Use 1 submitted and approved; in Hy2Move, 2 proposals were submitted; at Hy2Infra, 4 proposals are being prepared.

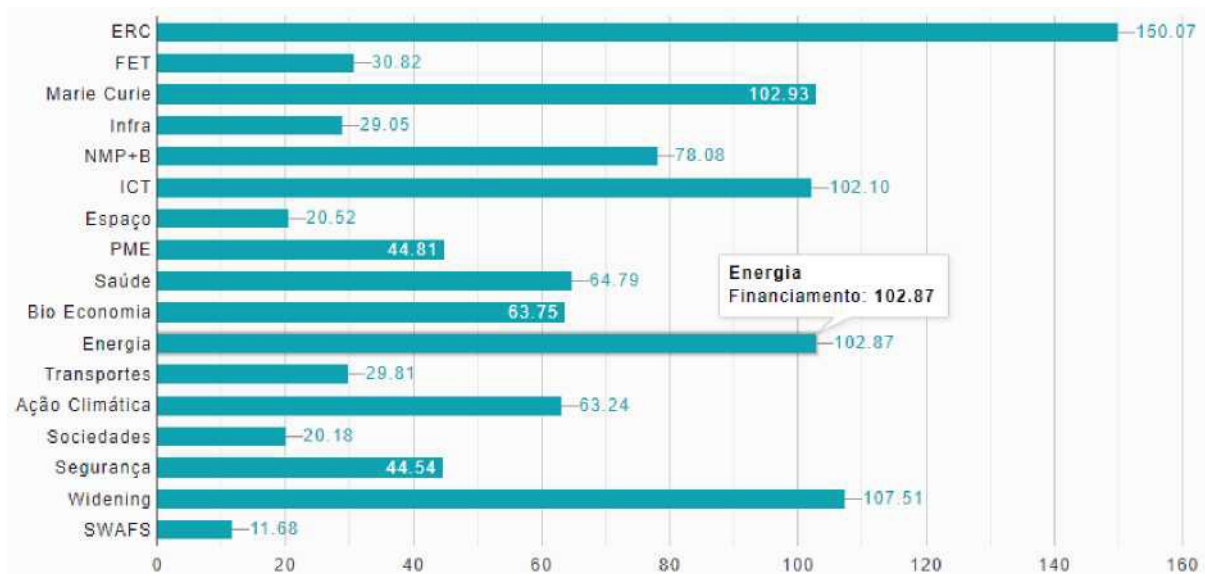
1.9.3. Continued support for participation in the Innovation Fund

Promote this programme and create the conditions for the participation of national companies in the programme. [Planned date: 2020-2025]

1.9.4. Continued support for participation in Horizon Europe and LIFE, among others

Promote these programmes and create conditions for the participation of national companies in them. [Planned date: 2021-2027]

Portugal's participation in H2020 (MEUR), by theme:



(In: <https://pq-ue.ani.pt/h2020/participacao-pt/>)

The promotion of the new Framework Programme (2021-2027) is coordinated by ANI in the framework of PERIN – Portugal in Europe Research and Innovation Network (<https://pq-ue.ani.pt/h-europa/estrutura/>)

1.9.5. Support innovation projects for the recirculation of carbon dioxide and synthetic gas-generation – New measure to reduce emissions, increase shares of renewable and endogenous energy and circularity, projects will be promoted and supported to capture carbon dioxide emissions from the purification of landfill gas and biogas from anaerobic digestion and gasification plants, with a view to their valorisation and use as raw material for the production of synthetic gasses or use in chemical, construction and/or food industries (use in greenhouses) [expected date: 2023-2030]

1.9.6. Support innovation projects promoting the 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 (NG, H₂, biomethane) in the gas grid as well as management between production and injection and consumption in each geographical area. The accommodation of different gases shall be done using gas quality tracking systems. It shall be possible to send the gas produced and injected into a network without sufficient consumption to other networks where such consumption exists, via the transmission system, in order to maximise the use of all production capacity. [Planned date: 2023-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; FCT diaries

SOURCES OF FUNDING

FA; LIFE; Horizon Europe; Innovation Fund; RRP

ENTITY RESPONSIBLE

MCTES; AEM; MAAC; GRA; GRM

LINE OF ACTION

2.6. Encourage 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 businesses and national bodies in research and innovation programmes that contribute to the promotion of energy efficiency.

SECTOR (S)

Industry; Services; Buildings; Residential

ACTION MEASURES

To encourage R & I in the field of energy efficiency, the following action measures are envisaged:

2.6.1. Encouraging Energy Efficiency Research and Innovation

Promote energy efficiency projects in new residential buildings and thermal and energy refurbishment (encouraging the uptake of sustainable solutions, local resources, innovative materials), solutions and strategies for the integration of renewable energy systems, storage and consumption and information management. [Planned date: 2020-2030]

- Recovery and Resilience Plan – Component 11 (PRR-C11): Decarbonisation of Industry

Coordination: IAPMEI

- Recovery and Resilience Plan – Component 13 (PRR-C13): Residential buildings

Coordination: Environmental Fund

2.6.2. Promote coordination with the Thematic Research and Innovation Agendas run by the Fundação para a Ciência e Tecnologia (Foundation for Science and Technology).

The FCT Agendas aim to mobilise experts from R & D institutions, businesses and public authorities in identifying challenges and opportunities within the national science and technology system, in a medium and long term perspective, contributing to the development of R & I responding to problems or needs of different sectors of society. This link extends to Collaborative Laboratories, as they aim to implement research and innovation agendas. [Planned date: 2020-2030]

CONTRIBUTION TO 5 DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

n.a.

SOURCES OF FUNDING

FEE; FCT; Community funds; RRP

ENTITY RESPONSIBLE

MCTES; GRA DGEG; LNEG; IAPMEI; DGEG; APA; Environmental Fund

LINE OF ACTION

3.8. Incentivising R & I in renewable energy, storage, hydrogen, advanced biofuels and other 100 % renewable fuels

DESCRIPTION

The aim is to support the development of technologies to develop new solutions for the use of renewable energy sources, as well as to support the participation of businesses and national bodies in research and innovation programmes that contribute to the promotion of renewable energy.

SECTOR (S)

Energy; Transport

ACTION MEASURES

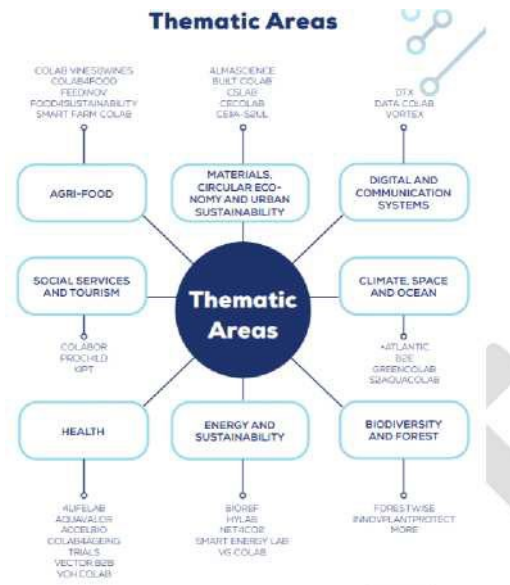
To incentivise R & I in renewable energy, storage, hydrogen, advanced biofuels and other 100 % renewable fuels, the following action measures are envisaged:

3.8.1. Promote coordination with the Thematic Research and Innovation Agendas run by the Fundação para a Ciência e Tecnologia (Foundation for Science and Technology).

The TCF Agendas aim to mobilise experts from R & I institutions, businesses and public authorities in identifying challenges and opportunities within the national science and technology system, in a medium and long term perspective, contributing to the development of R & I responding to problems or needs of different sectors of society. In support of R & I projects contributing to the promotion of renewable energy, the following Agendas should be highlighted: Sustainable Energy and Urban Science Systems and Cities for the Future. This link extends to Collaborative Laboratories, as they aim to implement research and innovation agendas.

- Thematic Agendas: A large majority has been achieved.

- Collaborative Laboratories: Different CoLabs contribute to this measure. Of the 35 CoLabs in operation, at least 17 are active in areas of particular relevance to the PNEC2030: 5 CoLabs in 'Energy and Sustainability', 5 CoLabs in 'Materials, Circular Economy, and Urban Sustainability', 4 CoLabs in 'Climate, Space and Ocean', and 3 CoLabs in 'Biodiversity and Forest'.



(In: https://www.ani.pt/media/7080/en_brochura_colab_2022.pdf)

[Planned date: 2020-2030]

3.8.2. Promote national R & I programmes to support technological development

Of the programmes to be developed, focus on: Pre-competitive low carbon technologies, such as Solar Concentrated (CSP), Geothermal Profudent Energy and Onda Ocean Energy; Energy storage; Hydrogen as an energy carrier; 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): Mobilising agendas and Green Agendas for Enterprise Innovation; Coordination: IAPMEI (MEM); 53 pre-selected project proposals; total investment: EUR 7 675,19 MILLION; investment in R & DT: 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, investment accounted for 27 % and 25 % respectively.
- Recovery and Resilience Plan – Component 11 (PRR-C11): Support for Decarbonisation in Industry; Coordination: IAPMEI (MEM); It involved a 1th call with a volume of support of EUR 965 million and EUR 715 million was 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): Production of hydrogen and other renewable gases; Coordination: Environmental Fund; involved a 1th call with a volume of support of EUR 102 million; the top 25 projects were supported.

Projects will also be promoted for the development of studies to characterise the potential of harnessing and integrating renewable energy into the urban environment, low-carbon solutions, strategies and technologies at different scales (building, district, city, region) and for various typologies.

Measures should also be promoted to support:

-) C & T development – supported by a life-cycle strategy (from raw material to end-of-life management), and the competitiveness of value chains associated with strategic ‘Net-Zero’ technologies (in the framework of the future Delegated Regulation ‘NZIA’), in the following areas: Electrolysers, gasifiers; Wind turbines (onshore; offshore); Solar photovoltaic panels; RFNBO fuels; Alternative fuels; Capture and storage of CO₂.
- The protection of intellectual property and innovation in the areas defined above. Over the period 2020-2022, the number of patent applications submitted to the INPI could have a large margin of increase, taking into account applications registered in 5 areas, as reported in ‘ReportENER’.

[Planned date: 2020-2030]

3.8.3. Promote a collaborative laboratory for renewable gases.

Since there is a 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 advisory and R & D projects. This will involve companies in the sector, research centres and universities in a collaborative laboratory contributing 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. [Planned date: 2020-2025]

3.8.4. Promote the training of specialised technicians

The development of activities linked to renewable energy, storage, hydrogen, biogas and biomethane, synthetic gas, advanced biofuels and other 100 % renewable fuels will require meeting specialised training needs covering various levels of training and therefore, in partnership with the entities responsible for the education system and vocational training, training needs should be identified on the basis of the expectations for the development of the sector. [Planned date: 2020-2025]

3.8.5. Promoting links between research centres and between research centres and industry in the framework of an integrated technological development policy – New measure

Ensure an observatory of R & I activities on 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

PRINCIPAL INSTRUMENTS

PAESC-RAM; PAESI-Madeira; PAESI-Porto Santo

SOURCES OF FUNDING

FCT; Horizon Europe; Innovation Fund; The Structural Funds; InnovFin Energy Demo Projects; RRP

ENTITY RESPONSIBLE

MCTES; GRM; GRA; MES

LINE OF ACTION

6.8. Promote R & I projects supporting sustainable agricultural and forestry management

DESCRIPTION

Support the development of low-carbon and resource-efficient technologies, processes, practices, products and services in the agriculture and forestry sector and promote the collection of more and better basic information to better know and manage the country's agro-forestry territory.

SECTOR (S)

Agriculture; Forests; Circular Economy

ACTION MEASURES

In order to promote R & I projects supporting sustainable agroforestry management, the following action measures are envisaged:

6.8.1. Promote coordination with the Thematic Research and Innovation Agendas run by the Fundação para a Ciência e Tecnologia (Foundation for Science and Technology).

The FCT Agendas aim to mobilise experts from R & I institutions, businesses and public authorities in identifying challenges and opportunities in the national science and technology system, in a medium and long term perspective, contributing for the development of R & I responding to problems or needs of different sectors of society. For support

R & I projects contributing to the decarbonisation of the agricultural and forestry sector are to be highlighted in the Agro-Food, Forestry and Biodiversity Agenda. This link extends to Collaborative Laboratories, as they aim to implement research and innovation agendas. [Planned date: 2020-2030]

6.8.2. Systematically collect, process and make available agricultural and forestry sector information

The lack of information on some key aspects is recognised, which increases uncertainties and risks and hampers the development and implementation of policies for the sector and their monitoring and evaluation. In a globalised world, quality information is a process that creates key value for the development and competitiveness of any sector, and there is a need for strong investment in the production/availability and use of information. [Planned date: 2020-2030]

6.8.3. Implement a permanent National Forest Inventory System

Forest inventory is one of the main sources of information for monitoring sequestration and GHG emissions, but also the information base for informed forestry policies, and should therefore migrate to a permanent system allowing frequent updates, and close monitoring is not possible at the current intervals of 10 years. [Planned date: 2020-2030]

6.8.4. Implement a land use and land use change update system – action taken

A mapping system to track land use developments and identify major land-use change dynamics is one of the key elements 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. [Planned date: 2020-2030]

6.8.5. Improving information on the structure and ownership of ownership

The implementation of agricultural and forestry policies, including incentive and penalty systems, requires information about the owners and size of land parcels, and it is therefore essential to create and improve information, in particular in areas of the country where it is non-existent or profoundly outdated. The extension of the simplified register to the entire national territory, the updating and vectorisation of the geometric register and the rapid updating of land register information should be promoted whenever there is a change in the ownership or size of the land. [Planned date: 2020-2030]

6.8.6. Developing agricultural and forestry innovation and research

Promote the implementation of the Innovation Agenda for Agriculture 2020-2030 (Earth Futura) in the most mitigation oriented components. Strengthen the horizontal and vertical integration of the sectors and sub-sectors, promoting links between industries, research and production. The process of production and funding of research, development and demonstration should increase the ability of agricultural and forestry actors to influence the subjects 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 the management and exploitation of forest stands (including through genetic improvement, forestry techniques/models, experimentation of new species, biotic and abiotic agents, invasive), especially in a context of adaptation to climate change, as well as those that can lead to innovation and diversification of the uses of wood and non-wood products through a focus on advanced technologies, new production technologies in highly efficient processes.

These lines should be supported by research, experimental development, extension and innovation programmes, which draw on and guide the various instruments available at national and EU level. It refers to PEPAC support to Innovation Operational Groups, support from the national CAP Network for activities to build and develop agricultural demonstration networks (Agridem Network), technical visits between national producers and from several Member States, activities connecting the 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 agriculture and related fields. Reference should also be made to the Competence Centres and Collaborative Laboratories. Component 5 – Enterprise Capitalisation and Innovation, as part of the Resilience Dimension of the RRP supports a set 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 increased carbon sequestration in soil, using digital technologies for precision management, including fertilisers, water and energy, exploiting the potential of remote and proximity detection (sensors) and launching a capacity-building programme in agriculture 4.0 and digital literacy. [Planned date: 2020-2030]

6.8.7. Encourage research and innovation in the field of decarbonisation and energy efficiency of the agro-forestry sector

Promote I & I projects to develop tools for monitoring the effects of good agricultural and forestry practices, using digital technologies (remote sensing, satellites, sensors, models, software, etc.) and projects to develop/adjust cultural practices for CA mitigation (carbon sequestration, emission reduction). [Planned date: 2020-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; ENF; RDP 2020; PEPAC; PNPOT

SOURCES OF FUNDING

FCT; EAGF; EAFRD; ERDF; Horizon Europe; RRP

ENTITY RESPONSIBLE

MCTES; AEM; MAAC; GRA

LINE OF ACTION

7.5. Promoting R & I projects supporting an innovative and competitive low-carbon industry

DESCRIPTION

Support the development of research and innovation for industry and manufacturing with a view to the development and uptake of advanced technological materials and processes.

SECTOR (S)

Energy; Industry

ACTION MEASURES

To promote R & I projects supporting the transition to a more innovative, competitive and clean and/or low-carbon industry, the following action measure is envisaged:

7.5.1. Promote coordination with the Thematic Research and Innovation Agendas run by the Fundação para a Ciência e Tecnologia (Foundation for Science and Technology).

The FCT Agendas aim to mobilise experts from R & D institutions, businesses and public authorities in identifying challenges and opportunities within the national science and technology system, in a medium and long term perspective, contributing to the development of R & I responding to problems or needs of different sectors of society. In support of R & I projects contributing to the decarbonisation of the industrial sector, the Industry and Manufacturing Agenda focuses on the following themes: Advanced materials; Advanced technological processes; Efficient management of resources and processes; Robotics and intelligent manufacturing systems; Development of collaborative networks and human-centred industrial production. This link extends to Collaborative Laboratories, as they aim to implement research and innovation agendas. [Planned date: 2020-2030]

CONTRIBUTION TO NECP DIMENSIONS

Decarbonisation; Energy Efficiency; I & I & c

PRINCIPAL INSTRUMENTS

RNC2050; FCT diaries

SOURCES OF FUNDING

RRP

ENTITY RESPONSIBLE

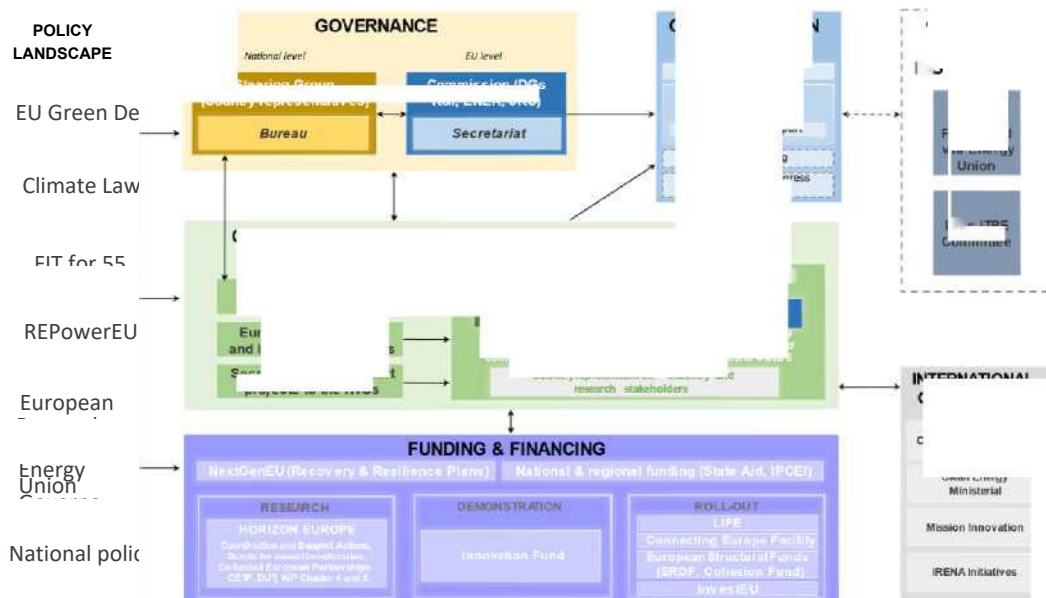
MCTES; GRA; MAAC; WPM; IAPMEI

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

The European R & I strategy for energy, including the *European Strategic Energy Technology Plan (SET-Plan)*³³, *Horizon Europe*³⁴, integrates R & I energy targets for the time horizon 2020-2030.

As a ‘SET Plan’ country, and through a joint effort between the DGEG (MAAC) and the FCT and ANI (MCTES), Portugal actively participates at different levels, namely:

- a) The implementation of the IWG (*Implementation Working Groups*), where collaboration between expert groups in the framework of implementation plans (IPS) is developed;
- b) 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, particularly in the S & T development in the generation of renewable energy, in the production of renewable energy carriers, and in energy efficiency in end-use sectors to benefit from the achievement of 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 point 5.3 (i).

4. STATE OF PLAY OF EXISTING POLICIES AND MEASURES AND PROJECTIONS

The strategic objectives of the NECP are to ensure a trajectory to reduce national GHG emissions in order to achieve the 2050 carbon neutrality objective, promoting the energy transition through a strong focus on renewable energy and energy efficiency, as well as the integration of mitigation objectives into sectoral policies (*mainstreaming*). However, while decarbonising the national economy is a priority, it should be stressed that alongside emission reductions, carbon sequestration will also need to be increased in view of the neutrality commitment, which translates into a neutral balance between GHG emissions and sequestration of these gases by the various sinks – as set out in the Climate Basic Law.

The scenarios analysed and the modelling carried out, which is still under review until the submission of the final

³³<https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan#>

³⁴https://ec.europa.eu/info/designing-next-research-and-innovation-framework-programme/what-shapes-next-framework-programme_en

version of the NECP, make it possible to confirm the existence of trajectories in line with the country's objectives and to infer a set of guidelines and lines of action for sectoral policies that contribute to the GHG emission reduction, renewable energy and energy efficiency objectives set out in this plan.

In this proposal for the revision of the NECP, a new modelling of the national energy system has been carried out and will continue under review until the final version of the NECP, with a view to studying different scenarios for GHG emission reduction, renewable energy production, primary and final energy consumption in the economy, evolution of the energy mix and key associated technologies. This document presents results for an existing policy and measures scenario (WEM) and a preliminary additional policy and measures scenario (WAM).

In addition, and for the review of other sectors, notably for the waste sector, agriculture (non-energy component), and for land use, land use change and forestry (LULUCF) activities, modelling work is still ongoing, so that past projections in terms of greenhouse gas emissions are used in this version (adjusted only to the global warming potentials corresponding to AR5).

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 their macroeconomic and demographic variables presented have been updated, taking into account the latest available GDP and population data, and in view of the relevant changes due to the effects of the COVID-19 pandemic and the economic crisis that has occurred.

The GDP projections used follow the best available information to date, namely the (provisional) GDP figure 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 2022³⁵ with a small open economy, Portugal is particularly exposed to the economic consequences of Russia's invasion of Ukraine, which continue to manifest itself in the price of energy and food, as well as adverse effects on inflation. This leads to much more moderate growth following high growth associated with the recovery of the economy in 2021 and 2022 in 2023.

From 2025 onwards, the harmonised values recommended by the Commission for this purpose pursuant to Part 2 of Annex I to Regulation (EU) 2018/1999 on the Governance of the Energy Union have been considered. These figures are based on the GDP per capita of the latest Ageing Report³⁶ and Eurostat population growth (EUROPOP2019). On the basis of these data, 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, diverging by MS, taking into account their specificities including the active population in Portugal that is expected to decline in view of population projections. The figures provided by the European Commission do not take into account the current effects of the war in Ukraine and inflation, but it is the only study available with long-term projections, thus justifying the decision to use them.

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 figures for historical data (2020-2021) from the latest publication of Eurostat's demographic dataset.

Table 32 – Main assumptions used in modelling the national energy system (GDP and population)

	2020	2025	2030
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³⁵ https://www.cfp.pt/uploads/publicacoes_ficheiros/cfp-rel-8-2022.pdf

³⁶ https://economy-finance.ec.europa.eu/system/files/2021-10/ip148_en.pdf

GDP (rate of change)]	0.4 % (' 15- '20)	3.1 % (' 20- '30)	0.8 % (' 25- '30)
Population (million)	10,29	10,27	10,13

ii. Sectoral changes expected to impact the energy system and GHG emissions

As regards sectoral changes that may have an impact on the energy system and GHG emissions, for the 2030 horizon, the GVA structure is estimated to remain broadly unchanged compared to the base year 2016 for the various industries considered.

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 happening 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 structure of production of goods, and logistics associated with the production, distribution and consumption of goods essentially retains current characteristics.

Table 33 – 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	

Contrary to the WEM scenario, a significant restructuring of the national industrial fabric was considered in the WAM scenario (with additional measures, or *With additional measures*) with the emergence of new, mainly energy-related industries, notably green hydrogen, and a marked growth in economic activities linked to digitalisation and data storage. Although the impact of these projects on national growth and economic structure was not analysed, their demand for energy services was considered in the modelling exercise and is subsequently reflected in the increase in primary energy consumption.

iii. Global energy trends, international fossil fuel prices, carbon price in the European Emissions Trading System (ETS)

As regards the value of CO₂ allowances, two approaches have been taken: I. until 2025, the values recommended by the European Commission for this purpose have been taken into account; II. After this date, no carbon price was imposed from the outset, but the same results from a 'shadow price' generated by modelling by imposing a compatible restriction such as a -55 % GHG emission reduction in 2030 compared to 2005, in order to meet national mitigation targets and in line with carbon neutrality.

The last two years have seen a high degree of volatility in energy prices, largely driven by the global instability associated with 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 regarding the future development of international fuel prices will remain in the coming years.

Table 34 – Main assumptions used in the modelling of the national energy system (Prices) [Recommendations of the European Commission for reporting projections in 2023]

	2025	2030	2040
CO ₂ allowances (EUR/ton) ^{a, b}	80	—	—
Oil (EUR/GJ) ^a	15,4	15,4	16,3
Coal (EUR/GJ) ^a	3,1	3,1	3,3
Natural gas (EUR/GJ) ^a	13,2	11,3	11,3

^a Values made available to Member States by the European Commission as part of the preparation of their Climate Energy Plans

^b As Portugal incorporates the CO₂ rate through its tax on petroleum products, a CO₂ rate of EUR 78/t was also considered in 2025 in the non-ETS sectors. The value of the carbon tax 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

With regard to technological cost developments, 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. The costs considered in the modelling, which may still be subject to adjustment, are set out in the annex for the main technologies as well as their sources of information.

4.2. Decarbonisation dimension

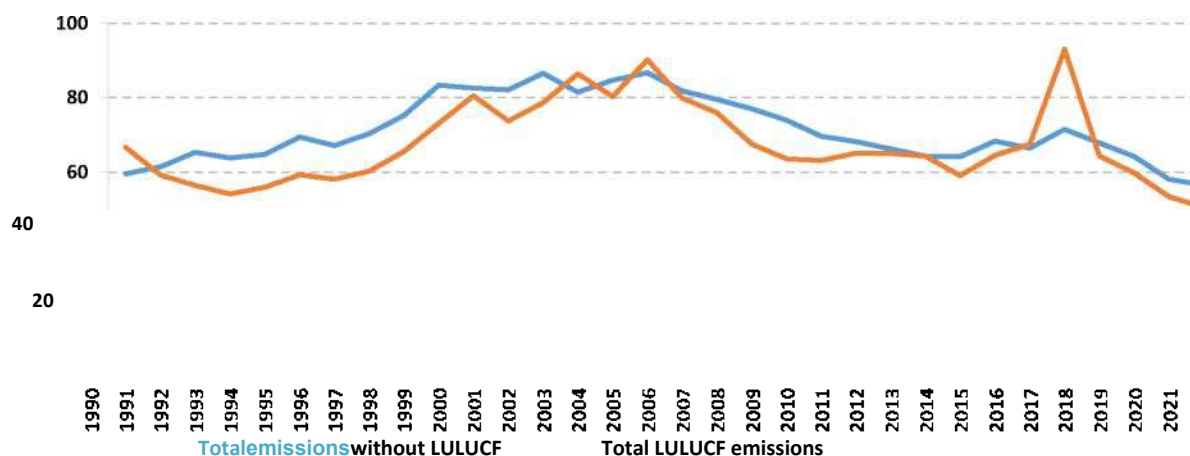
4.2.1. GHG emissions and removals

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, from which a significant and sustained decline took place and has since consolidated a path towards the decarbonisation of the national economy. Indeed, in 2005 there was an increase in emissions of around 46 % compared to 1990 levels. According to the latest update of the 2023 National Emission Inventory (for the year 2021), GHG emissions, without accounting for land use change and forestry (LULUCF) emissions, are estimated at around 56.5 Mt CO_{2eq}, representing a decrease of 5.1 % compared to 1990 and 2.8 % compared to 2020.

Considering LULUCF, total emissions in 2021 are estimated at 50.5 Mt CO_{2eq}, corresponding to a decrease of 24.3 % compared to 1990 and a reduction of 5.5 % compared to 2020.

Figure 183 – Evolution of national GHG emissions 1990-2021 (Mt CO_{2eq}) [Source: APA]



Under the European Emissions Reduction Effort Sharing Agreement 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 sectors that are not covered by the EU ETS³⁷, and annual emission limits have also been set for sectors not covered by the EU ETS in that period. The total emissions recorded in 2020 confirmed both the achievement of the national targets under the European Effort Sharing Agreement as well as 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.

The figure below reflects the evolution of national emissions between 1990 and 2021 identifying, from 2005 onwards, the contribution of the ETS and non-ETS sectors.

³⁷Non-ETS sectors include emission sources such as: small industry; transport; residential sector and services; agriculture; wastes.

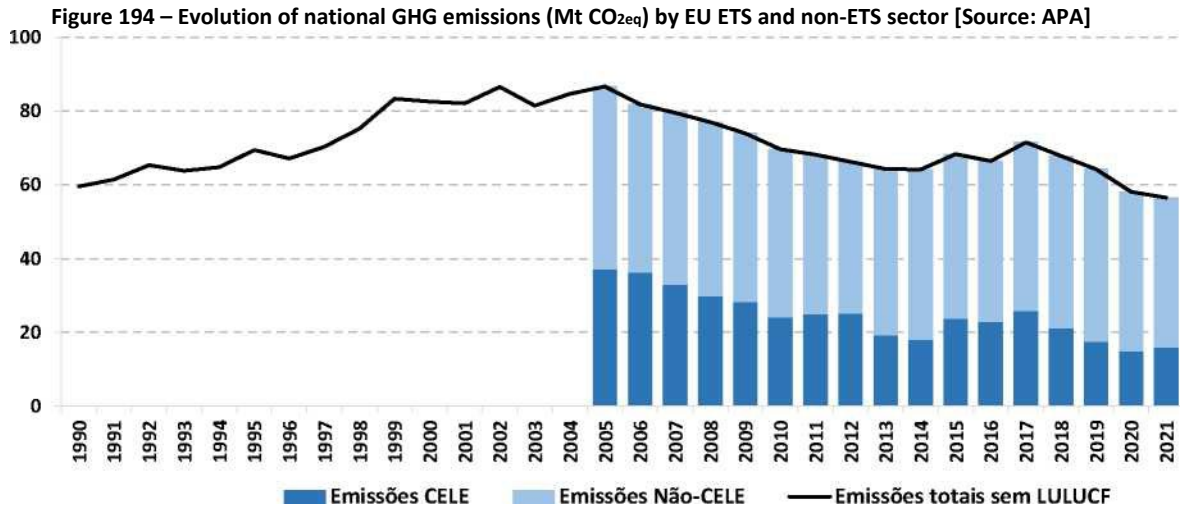
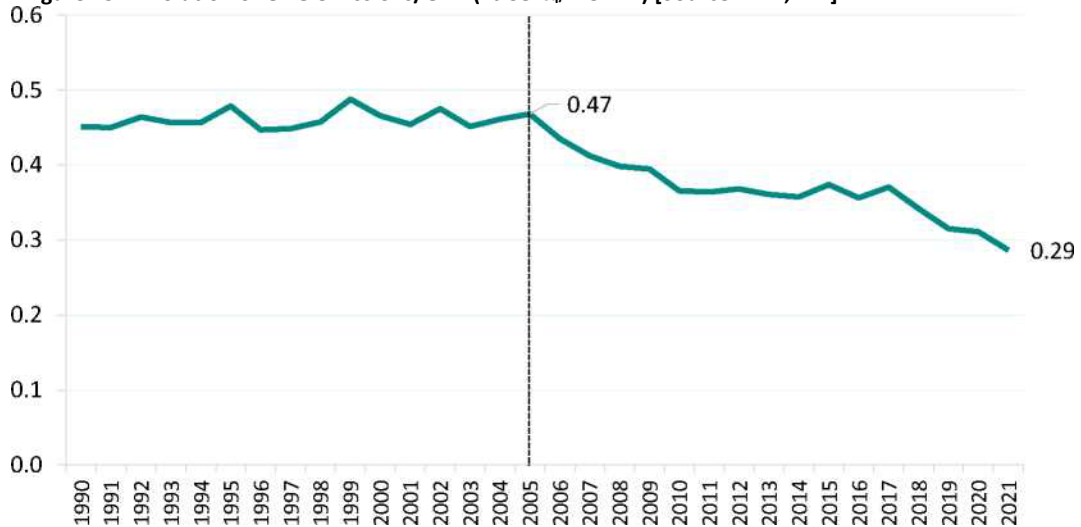


Figure 25 – Evolution of GHG emissions/GDP (kt CO_{2eq}/nEUR M) [Source: APA; INE]



An analysis of GHG emissions per unit of GDP shows that a process of decoupling GDP from emissions, resulting from the decarbonisation of the economy, was initiated in 2005, i.e. an economy with less carbon emitted per unit of wealth produced.

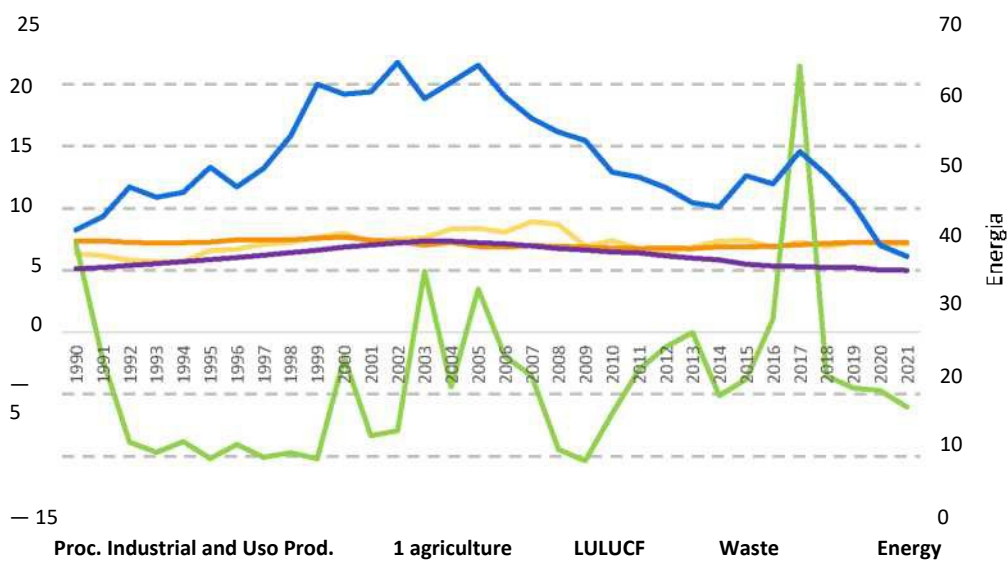
A number of factors underpin this trend, such as the growth of less polluting energy sources such as natural gas (compared to coal), the construction of combined cycle plants and more efficient cogeneration units.

Other causes are the very significant growth of electricity from renewable energy sources (mainly wind and hydro) and the implementation of energy efficiency measures. Improvements in efficiency in the transport sector (through the renewal of the car fleet) and in the housing sector (through building certification) could also explain these trends.

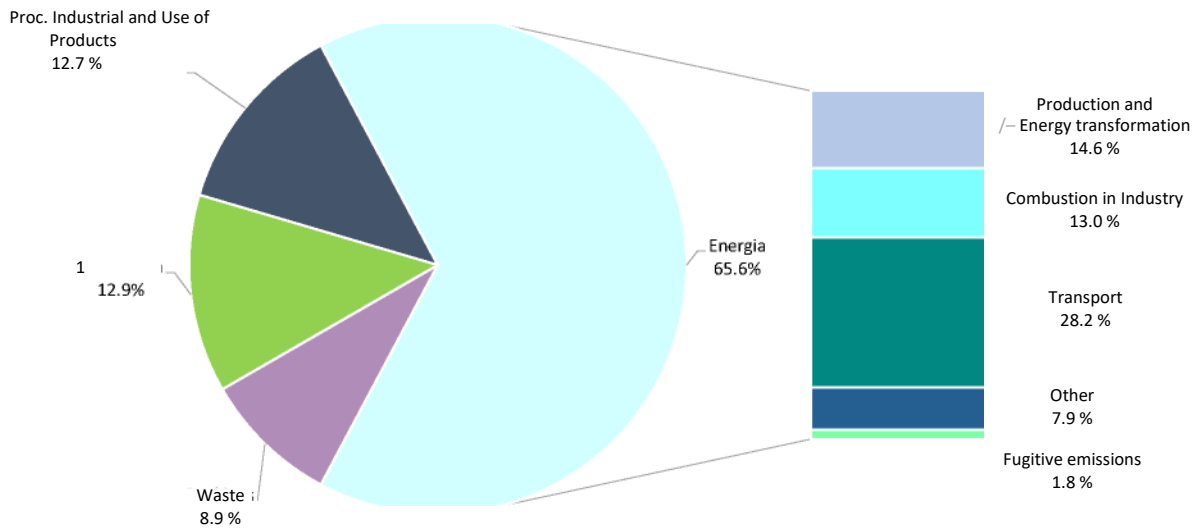
The use of coal for electricity production, which was reduced sharply after 2018 (-79 % in 2020 compared to 2018 and -55 % compared to 2019), and which ended definitively at the end of 2021, was another factor contributing to the decrease in carbon intensity.

Public policies on climate change are now an integral part of a number of sectoral policies in Portugal. Indeed, in areas such as energy and industry covered by the EU ETS, the ‘carbon dimension’ is part of companies’ strategic and economic considerations. In the agricultural and forestry area, there is also a growing awareness of the important contribution the sector can make in terms of mitigating GHG emissions, with the sink potential of some activities being seen as an economic, social and environmental added value. In areas with major challenges such as transport, steps have been taken towards decarbonising vehicle fleets, the network for electric mobility has been developed and electric vehicle support schemes have been introduced with the aim of strengthening incentives for electric vehicle penetration.

Figure 20 – Developments in sectoral emissions 1990-2021 (Mt CO_{2eq}) [Source: APA]



The energy sector, which includes transport, accounted for 66 % of national emissions in 2021, with a reduction of 4.1 % compared to 2020. In this sector, transport and energy production are the most important sources accounting for respectively around 28 % and 15 % of total emissions.

Figure 21 – Sectoral CO_{2eq} emissions in 2021 [Source: APA]

Combustion in industry, accounting for around 13 % of national emissions, decreased by 4 % in 2021 compared to 2020. Fugitive emissions, which account for 2 % of total emissions in 2021, are down by 6 % compared to 2020.

Industrial process and product use (IPPU) sectors, and agriculture each account for approximately 13 % of emissions. Waste accounted for 9 % of national emissions in 2021. These sectors show minor negative variations compared to 2020 (IPPU -1.1 %, agriculture -0.2 % and waste -0.1 %).

The increase in emissions associated with industrial processes compared to 1990 (13 %) is related to the growth of F-gas emissions, in particular for stationary air conditioning and commercial refrigeration.

The reduction of emissions from the waste sector in recent years is linked to the energy recovery of biogas in waste and waste water treatment systems, as well as to the focus on Mechanical and Biological Treatment, which aim at reducing municipal waste in landfills and increasing the amount of recyclable waste recovered. The focus is now on the separate collection of a number of fractions of municipal waste and their separate treatment, with less contamination of the collected waste expected, allowing more material recovery and reintroduction into the economy, and consequently diversion of landfill waste. The quality of the waste collected is a key factor in quality recycling, thus also producing better quality secondary raw materials, resulting in a higher level of consumer confidence.

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)

Work on the revision of the PNEC2030 is taking place in parallel with the review of RNC2050, ensuring that short-term trajectories are consistent with the long-term perspective towards carbon neutrality. The review exercise of GHG emission projections focused in this first phase on reviewing the sectors of activity corresponding to the energy system, including the power generation sector, transport sector, industry and buildings. In a second phase to be presented in the final NECP, to be submitted by June 2024, GHG emission projections from the remaining sectors, agriculture, forestry and other land uses and waste and wastewater will be reviewed. This exercise will also allow to infer, the implications associated with the frontloading of the 2045 climate neutrality target, in line with the guidance set out in the Climate Law.

The new modelling exercise foresees, like the previous one that supported the development of NECP 2030 and RNC

2050, some of the expected impacts of climate change towards 2050, including changes in technology efficiency, demand for services and resource availability (e.g. reduced water availability or increased cooling needs).

The preliminary results of this exercise allowed the re-examination of the national emission reduction potential, confirming the technical and economic feasibility of pursuing a decarbonisation trajectory towards 2030 towards carbon neutrality in 2050.

The sectoral analysis of emission trajectories confirms that all sectors have a significant GHG emission reduction potential, although the rates of reduction 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 behaviours of the sectors over the considered time horizon.

The methodologies for estimating GHG emissions below are the same as in the NIR (*National Inventory Report*). For each of the sectors of activity, a specific methodology for projecting the respective activity variables was adopted, but supported by the same socio-economic reference framework, to ensure the consistency of the projections obtained and to infer the critical factors that determine the differences between scenarios. It should also be noted that for the purposes of the projections presented in the existing policy scenario, the policy instruments and measures approved and published by 30 June 2022 have been taken into account. The following is an overview of the preliminary results obtained in terms of sectoral GHG emissions for 2030 and 2040 under the existing policy scenario.

Table 35 – GHG emissions projections by sector – Existing policy scenario (kt CO_{2eq})

	Existing policy scenario			
	2005	2020	2030	2040
1. Energy	62 595	37 185	24 611	7 483
Energy industries, including electricity and heat production and refining (1A1)	25 508	10 375	3 525	1 227
Manufacturing and construction industries (1A2)	10 613	7 621	6 048	2 204
Fugitive emissions (1B)	631	1 092	1 009	721
Transport (1A3)	19 947	14 831	11 442	2 720
Services (1A4a)	3 037	968	932	0
Residential (1A4b)	2 784	2 230	1 655	611
2. Industrial processes and product uses (2)	8 378	7 213	3 418	1 535
3. Agriculture (3 and 1A4c)	8 290	8 617	8 151	8 215
4. LULUCF (4)	3 489	– 4 707	– 9 567	– 10 715
5. Waste and Waste Water (5)	7 226	5 015	3 668	2 597
Total without LULUCF	86 489	58 029	39 848	19 830
Total LULUCF	89 979	53 322	30 280	9 115

The Portuguese Government committed itself in 2016 to ensure that its emissions are neutral by the end of 2050, so far adopting 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 With Existing Measures (WEM) scenario already incorporates a number of measures aimed at achieving these objectives.

As can be seen even under an existing policy scenario, and without the updated projections for all sectors, a sharp reduction in GHG emissions is already envisaged in the coming decades, with cost-effective potential for Portugal to achieve total emission reductions of around 54 % in 2030 compared to 2005, amounting to 77 % in 2040 (without LULUCF).

In 2030 this reduction is largely due to the closure of coal-fired power plants for electricity production and the strengthening of the role of renewables in the national energy *mix*, with a stronger impulse in solar photovoltaic. Thus, in 2030 the energy sector, where the energy component associated with the agriculture sector is not being included, has a GHG emission reduction potential of around 61 % compared to 2005 (and about 88 % reduction in 2040).

Major changes are also expected in the transport and mobility sector, with a high penetration of electric vehicles, which has the potential to reduce emissions from the sector by around 43 % in 2030 compared to 2005 and by around 86 % in 2040.

The services sector also has a strong potential to reduce GHG emissions, contributing to reductions of 69 % and 100 % respectively in 2030 and 2040, as a result of increased energy efficiency.

The residential and manufacturing and construction sectors have a lower decarbonisation potential over this time horizon, still pointing to a reduction of 41 % in 2030 (around 78 % and, 2040) and 43 % (around 79 % in 2040) respectively.

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.

For the waste sector, agriculture (non-energy component), and for land use, land use change and forestry (LULUCF) activities, as well as F-Gases emissions, modelling work is still ongoing and the previous table therefore reflects past projections in terms of GHG emissions (adjusted only to the global warming potentials corresponding to AR5).

However, based on the results of the previous modelling exercise, and with regard to the waste sector, a significant reduction potential was already expected in the previous year as a result of the required compliance with the Landfill Directive, which restricts deposition to only 10 % in 2035. In this case, the existing policy scenario already assumes the achievement of the target set in the Landfill Directive, so the projections of this sector were at the time identical in both the existing policy scenario and the additional policy scenario.

In terms of F-Gases, the relevance of which in terms of emissions has been increasing in recent years, emission reductions of around 20 % in 2030 and 52 % in 2040 were already planned in the previous year. As with the waste sector, also in the F-Gases sector, the targets set out in the Kigali Amendment are assumed to be met, so the projections of this sector are identical both in the existing policy scenario and in the additional policy scenario.

This data is still preliminary and will be adjusted in the final version of the NECP.

4.2.2. Energy from renewable sources

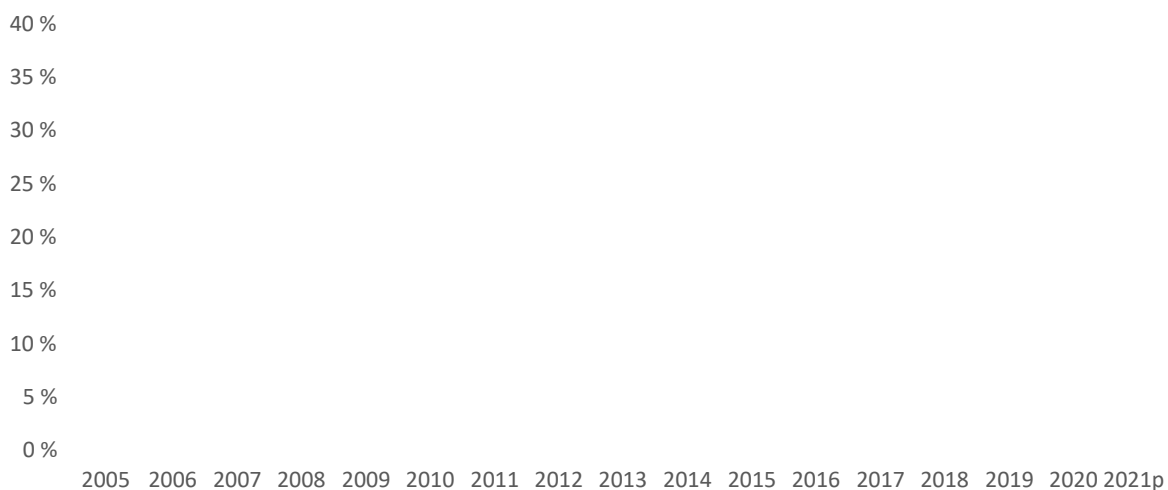
II. Current share of renewable energy in gross final energy consumption and in different sectors (heating and cooling, electricity and transport), as well as per technology in each of these sectors

Under 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 (NREAP) 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 into gross final energy consumption was 33.9 %, 3,3 percentage points (pps) higher than in the previous year, which means that Portugal has largely exceeded 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.

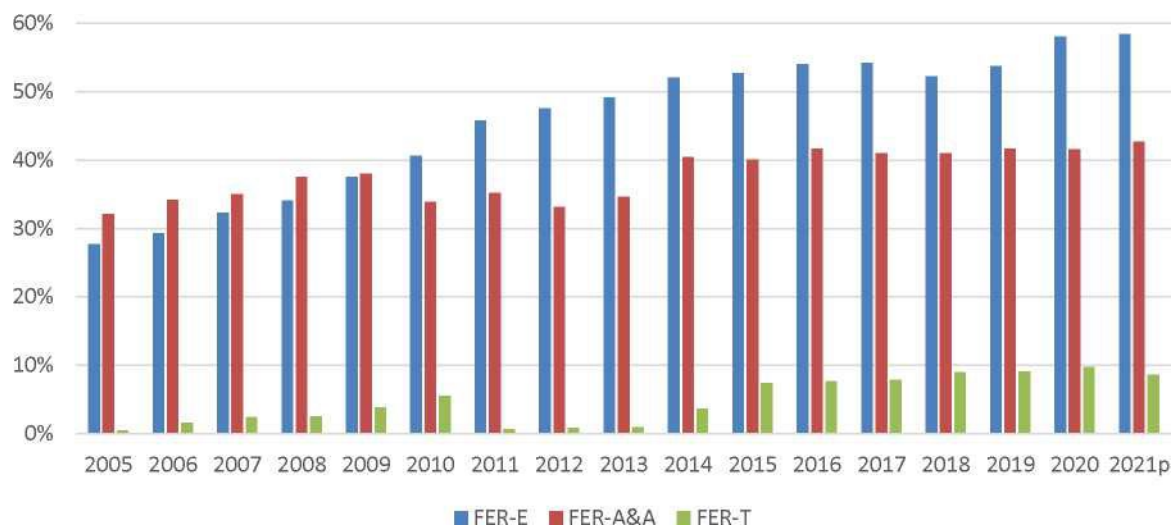
The figure below illustrates the evolution of the share of renewable energy sources in gross final energy consumption between 2005 and 2021.

Figure 22 – Evolution of the incorporation of renewable sources in gross final energy consumption in Portugal [Source: DGEG]



At sectoral level, in 2021 the incorporation of renewables in the electricity sector (RES-E) was 58.4 %, with an increase of 0,4 percentage points compared to 2020, in the heating and heating sector (FER-A & A) was 42.7 %, with an increase of 1,2 percentage points compared with 2020, and in the transport sector (RES-T) it was 8.6 %, with a decrease of 1,1 percentage points compared to 2020. The figure below illustrates the evolution of the share of renewable energy sources in gross final energy consumption by sector between 2005 and 2021.

Figure 23 – 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)

Table t below shows the projections of developments based on existing policies and measures in gross final energy consumption in Portugal.

Table 36 – Developments projections based on existing policies and measures (WEM scenario) in gross final consumption of energy in Portugal

	2025	2030
RES-E	78 %	81 %
FER-A & a	45 %	46 %
RES-T	9 %	21 %
Overall RES share	47 %	49 %

The table below 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 37 – Developments 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
Gross final consumption of electricity from RES	3 718	3 977
Gross final consumption of RES for heating and cooling	2 844	2 789
Gross final consumption of energy from RES in transport	374	568

	2025	2030
Total gross RES consumption	6 936	7 333
Transfer of RES to other Member States	0	0
Transfer of RES from other Member States and 3 rd countries	0	0
Target adjusted RES consumption	6 936	7 333

At the level of the heating and catering sector, the breakdown is given in the table below.

Table 38 – Developments projections based on existing policies and measures (WEM Scenario) of the total actual contribution (final energy consumption) of each renewable energy technology in Portugal in the heating and catering sector (ktoe)

	2025	2030
Biomass	1 127	1 196
Heat pumps	813	854
Heat from thermal solar	157	178
Heat from cogeneration	736	488
Renewable gases	5	71
TOTAL	2 840	2 787

At the level of the transport sector, the breakdown is given in the table below.

Table 39 – Developments projections based on existing policies and measures (WEM Scenario) of the total actual contribution (final energy consumption) of each renewable energy technology in Portugal in the transport sector (ktoe)

	2025	2030
Biofuels 1nd generation	33,5	40,2
Advanced biofuels	293	306
Renewable hydrogen	0	61
Electricity	61	198
TOTAL	387	605

4.3. Dimension Energy Efficiency

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Energy consumption during 2021 continued to be influenced by the COVID-19 pandemic, which caused changes in Portuguese habits in all sectors of activity, consumption in general, and consequently energy consumption.

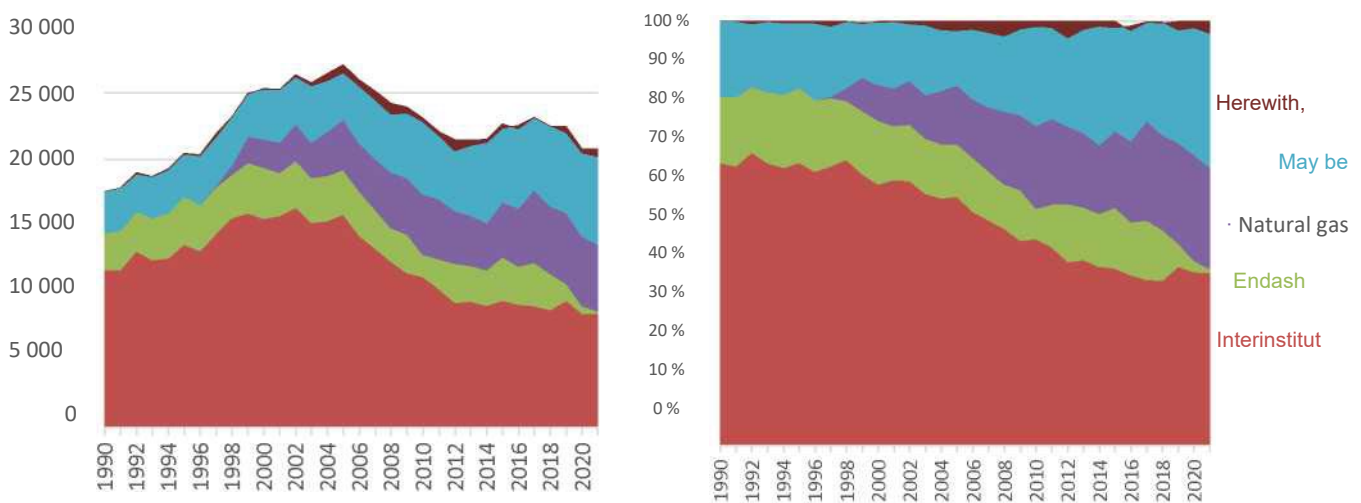
Primary Energy Consumption (CEP) in 2021 stabilised compared to 2020, when it fell by 7.5 % compared with consumption in 2019.

In terms of consumption of primary energy sources, oil plays the main role in the energy consumption mix in Portugal, with a contribution of 40.6 % from CEP in 2021, followed by natural gas with 23.9 %, renewable energy with 31.6 % and coal with 0.9 %. With the introduction of Natural Gas in 1997 and the increase and diversification of renewable energy sources, the weight of Petroleum in CEP has been declining in recent years.

In 2021, the CEP for fossil coal decreased by 65.4 % compared to the previous year, due to lower use in thermal power plants, with coal-fired power generation ending in November 2021.

The figure below illustrates the evolution of total primary energy consumption by source type between 1990 and 2021.

Figure 24 – Evolution of total primary energy consumption (ktoe) by source type in Portugal 1990-2021 [Source: DGEG]



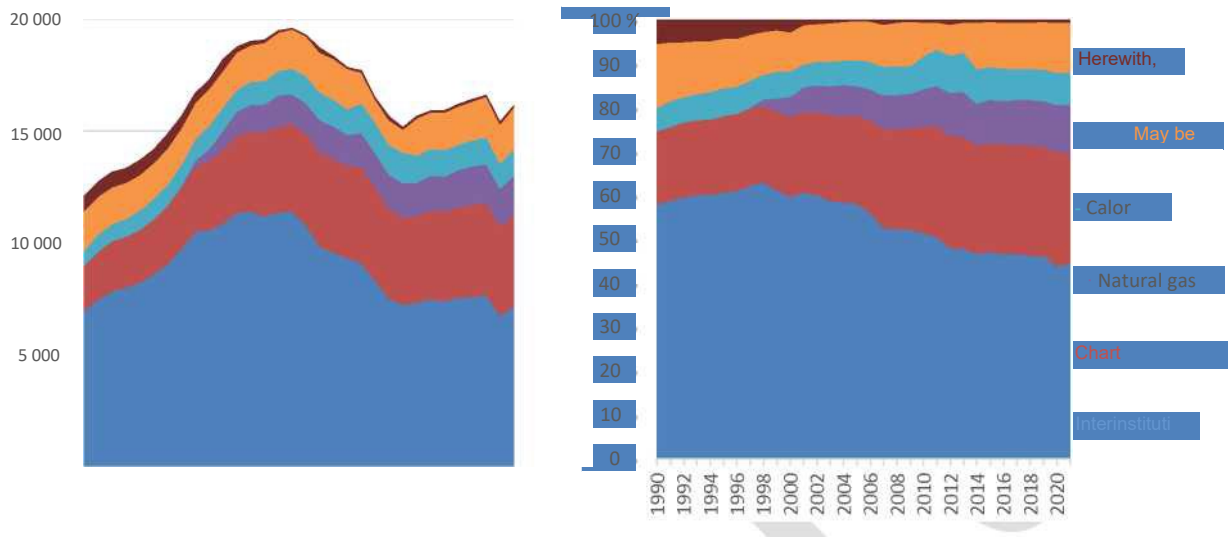
As regards final energy consumption (CEF), Portugal recorded consumption of 16 148 ktoe in 2021, with an increase of 4.8 % compared to 2020, mainly due to the increase in consumption of road fuels and air transport, compared to the recovery in 2020 due to the COVID-19 pandemic, but a decrease of 2.7 % compared to 2019. In 2020 there was a reduction in the CEF of 7.2 % compared to 2019. In the period 2010-2021, the EFC recorded a tcma of -0.8 %. Among the factors that have contributed to the reduction of the CEF in recent years is the promotion of energy efficiency with a particular focus on the industrial and domestic sectors through the adoption of more efficient solutions, as well as the slowdown of the economy which has generally affected consumption in the various sectors of the economy.³⁸

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 44.4 % of final consumption in 2021, followed by electricity with 25.2 %, natural gas with 11 %, Calor with 7.4 %, renewable fuels with 11.5 % including consumption of wood and plant waste, solar thermal, Biogás, Calor Bombas and other renewable energy sources, and other energy sources which accounted for less than 1 %. Recent years have seen a progressive reduction in the share of oil in final energy consumption, while natural gas and

³⁸Provisional data for 2021. Data between 2014 and 2021 already include the contribution of heat pumps

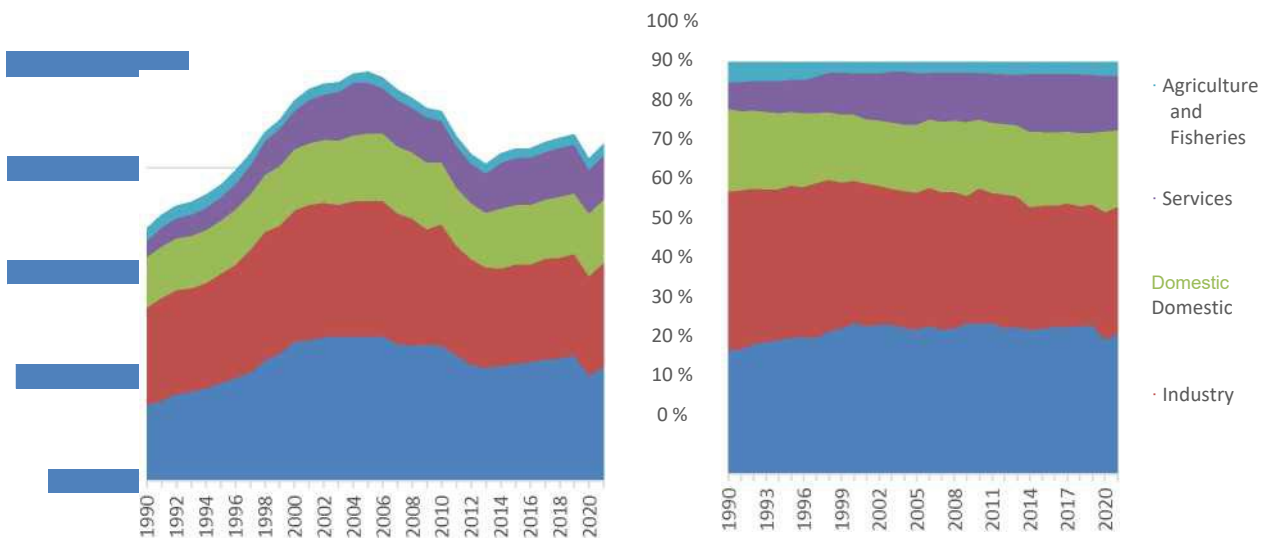
electricity have seen an increase in the final energy consumption mix. The figure below illustrates the evolution of final energy consumption by source type between 1990 and 2021.

Figure 25 – Evolution of total final energy consumption by source type in Portugal (ktoe) [Source: DGEG]



In sectoral terms, in 2021, the transport sector is the most energy consuming sector in Portugal accounting for 34 % of final energy consumption, followed by Industry (31 %), the domestic sector (19 %), the services sector (13 %) and finally the agriculture and fisheries sector (3 %). The structure of consumption by sector of activity has remained broadly unchanged over the last decade, with only slight year-on-year swings, as shown in the following figure³⁹.

Figure 26 – Evolution of total final energy consumption by sector of activity in Portugal (ktoe) [Source: DGEG]

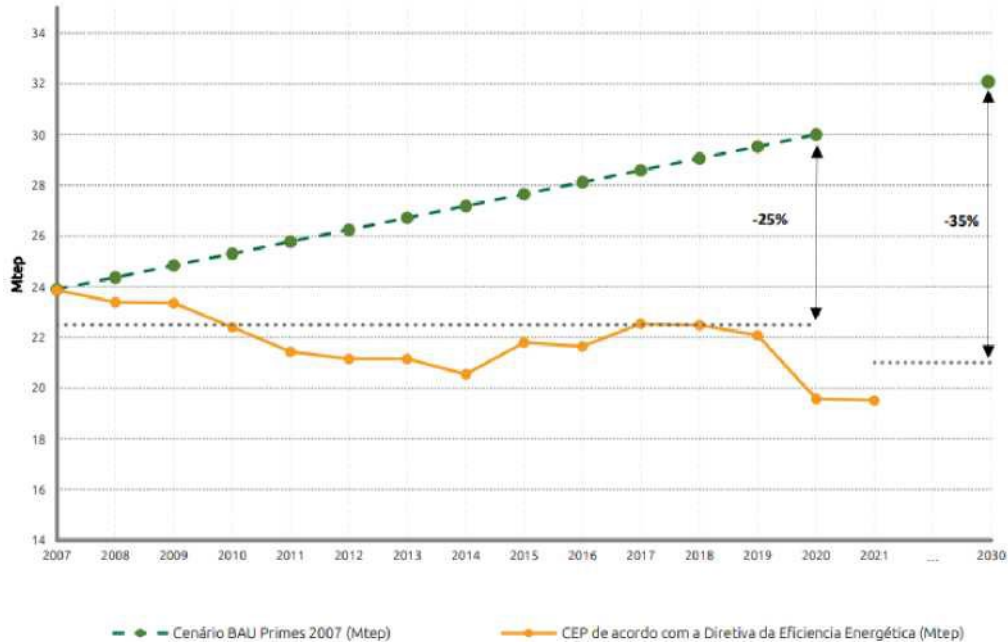


For the 2020 horizon, and in the light of Directive 2012/27/EU of the European Parliament and of the Council of 25 October on energy efficiency, the target was reset to a cap on primary energy consumption in 2020 (based on projections of the PRIMES model for the European Commission in 2007) equivalent

³⁹Provisional data for 2021. Data between 2014 and 2021 already include the contribution of heat pumps

to a reduction of 20 % (to 24,0 Mtoe excluding non-energy uses), and a more ambitious reduction target of 25 % was subsequently adopted by Portugal (to 22,5 Mtoe excluding non-energy uses). The evolution of primary energy consumption without non-energy uses, including consumption in international aviation (reference for measuring the achievement of the energy efficiency target, shows that in 2021, the value is in line with the figure for the continuation of the reduction path after 2020 and taking into account the 2030 target.

Figure 27 – Evolution of Portugal's energy efficiency target for 2020 – 2030 (ktoe) [Source: DGEG]



The energy intensity of primary energy savings in 2021 was 106 toe/MEUR' 2016, with a reduction of 5 % compared to 2020 and a reduction of 27 % compared to 2005, the year in which energy intensity reached the highest in recent years (146 toe/MEUR' 2016). From 2006 onwards, there is a decoupling between primary energy consumption and gross domestic product (GDP).

Figure 28 – Evolution of the energy intensity of primary energy savings in Portugal (toe/MEUR' 2016) [Source: DGEG, INE]

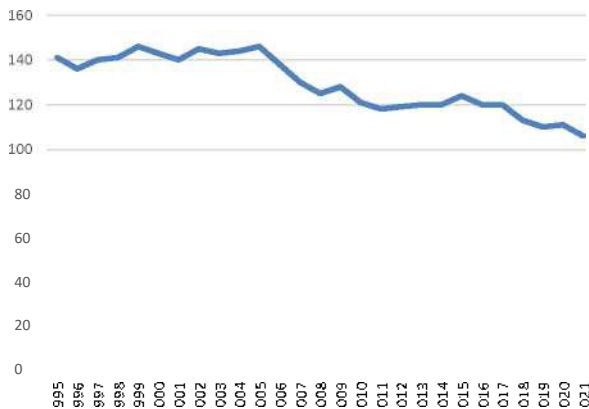
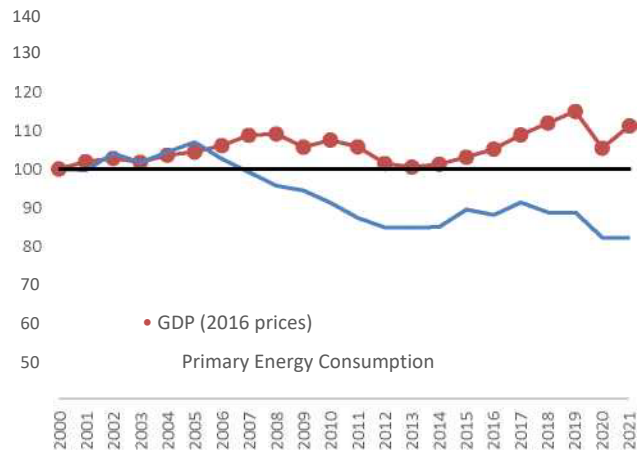


Figure 29 – Evolution of primary energy consumption and GDP in Portugal (2000 = 100) [Source: DGEG, INE]



With regard to the energy intensity of final energy savings, in 2021 it stood at 82 toe/MEUR' 2016, with a reduction of 23 % in 2020 compared with 2003-2005, when energy intensity reached the highest in recent years (106 toe/MEUR' 2016). Similarly, from 2006 onwards there is a decoupling between final energy consumption and GDP.

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

Figure 30 – Evolution of the economy's energy intensity in final energy in Portugal (toe/MEUR' 2016) [Source: DGEG, INE]

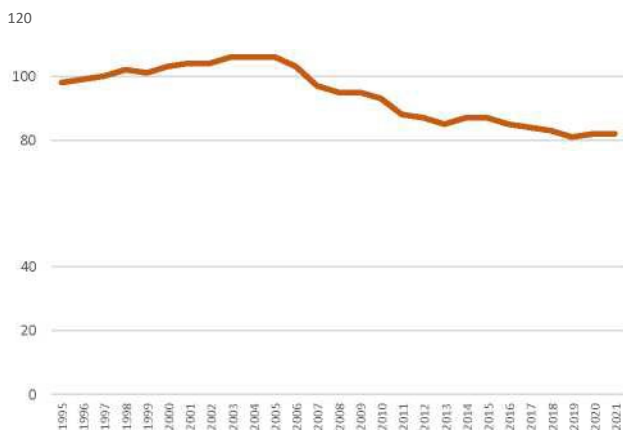
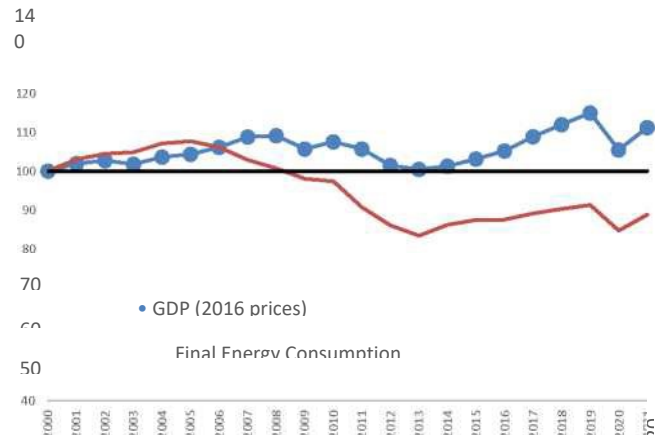


Figure 31 – Evolution of Final Energy Consumption and GDP in Portugal (2000 = 100) [Source: DGEG, INE]



Pursuant to Article 14 of Directive 2012/27/EU of 25 October 2012 on energy efficiency, in December 2016 Portugal carried out 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.

Thus, the study 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 of the Directive have been drawn up and a critical analysis of them prepared.

On the basis of a brief description of the current situation of cogeneration in Portugal, an analysis of the technical potential for cogeneration and efficient heating and cooling networks, as well as an analysis of the economic potential

and an estimate of the evolution of that potential have been made.

With the publication of the new Energy Efficiency Directive, EU Directive 2018/2002 started work on a similar study, based on the new provisions on energy efficiency, in particular those applied to high-efficiency cogeneration.

II.1 Energy requirements – heating and cooling demand

The demand for heating and cooling was determined taking into account the average values for the needs of each sector, thus defining the heat substitutable by high-efficiency cogeneration.

Agriculture and Fisheries sector:

The energy consumption associated with this sector is very heterogeneous. Diesel consumption is predominant for both agricultural machinery and forestry, as well as for fishing. Electricity plays an important role in the processing and storage of products.

Agricultural production will have as its preferred areas the most active areas where both the climate and soils are most conducive to such activity, and fisheries-related activities are limited to the coastal strip.

Industry sector:

The industry sector is not considered to be dependent on climatic variations from one region to another, as most of the thermal needs are due to the manufacturing process and production itself, so the energy consumption patterns of the various sub-sectors of industry should be taken into account.

Unlike the agriculture and fisheries sector, the weight of heat in the industry is greater than cold. Most of the production processes require or produce heat, so there is a large proportion of consumption spent on the production of that heat that can be replaced by cogeneration.

Services sector:

The services sector is quite heterogeneous, ranging from small retail 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 range of variation that makes it difficult to measure the standard thermal needs by sub-sector. Consumption for air conditioning is also very much influenced by the climate 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 cooling demand predominates in this sector, with rather low heating needs.

Residential sector:

The consumption of the residential sector in Portugal is very low compared to the consumption of other European countries, with particular relevance to consumption for heating and even space cooling. This is due to the softening of the Portuguese climate and the fact that in many situations thermal comfort conditions are not provided, but there are asymmetries throughout the national territory.

In terms of final consumption, kitchens account for 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 done with LPG. The share dedicated to lighting is reduced, with only 4.5 % of consumption and consumption for space cooling is negligible.

The reduced duration and importance of hot stations, coupled with financial constraints, will also explain the low number of dwellings with central heating installation 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 noteworthy. Except in new high-density developments, or in the vicinity of service buildings already with

cogeneration, which is expected to be minor cases, there is not enough 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 falling sharply, at an average rate of -4.4 % per year since 2009, linked to the increase in energy efficiency resulting from multiple measures implemented and improved equipment, as well as higher energy rates and prices. The improvement in efficiency appears to be greater for space heating, with a reduction of around 31.7 % from 2000 to 2013 and about 28.8 % reduction in cuisine and hot water (HWW).

However, the resumption of economic activity, the growth of housing needs, and the growth in the number of electrical equipment are expected to boost energy demand in buildings again.

Technical potential of high-efficiency cogeneration

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. Applying the assumptions and reference values associated with the Directive, taking into account the fuels used by each unit, and grid losses associated with the location voltage level, results in estimated overall primary energy savings of 30 740 TJ (0,73 Mtoe), corresponding to savings of 33.5 %.

The following table shows the technical potential of cogeneration for the production of heat (estimated on the basis of the maximum percentages of substitution and the values of consumption of substitutable heat) of about 2,7 Mtoe of potentially usable heat. Estimates of cold consumption in industry, residential sector and services are given 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 co-generation.

Assuming the average T/E ratio and the average number of operating hours in the existing co-generations in 2014 (2,57 and 4 349 h respectively), the electricity generated and the installed electrical power would correspond to 12 TWh (2.8 GW) only to meet the heat demand and 17.3 TWh to 22 TWh (4.0 GW to 5.1 GW) to also meet cold demand.

However, realising this full potential is unrealistic as it does not take into account the operating regimes of cogeneration units, the need to stop for maintenance, or basic aspects such as minimum operating powers. Thus, the technical potential will certainly outweigh the achievable potential.

Table 40 – Calculation of the heat and cold potential to be supplied by cogeneration [Source: DGEG, Study of the potential for high-efficiency cogeneration in Portugal, 2016]

Sector	Total General	Total substitutable thermal energy	Substitution potential		Cold consumption (estimate)
	toe	toe	(%)	toe	toe
Final Consumption	15 166 780	3 930 121	66.21 %	2 602 023	520 053
Agriculture and pears	427 875	15 124			
1 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	
Chemistry and Plastics	432 372	227 840	100.00 %	227 840	
Ceramics	268 395	217 841	7.00 %	15 249	
Glass and Glass Articles	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	
Iron and steel industry	165 875	54 540	30.00 %	16 362	
Clothing, Footwear and Curtumes	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	
Metallo-electro-mechanical	243 859	69 488	69.00 %	47 947	
Other Manufacturing	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, Fisheries	1 941 205	374 346	81.00 %	303 220	343 593

Thus, for the purpose of identifying the potential for CHP satisfaction, the following sub-sectors are considered:

- Manufacturing sub-sectors with the highest potential for satisfaction, either with the values of heat consumption or the part of replaceable heat: Food, Drinks and Tobacco, Textiles, Paper and Paper, Chemistry and Plastics, Madeira and Wood Articles, Rubber.
- Services sub-sectors where the use of cogeneration is already significant, corresponding to about 40 % of the electricity and thermal energy consumption (without road fuels) of this sector.

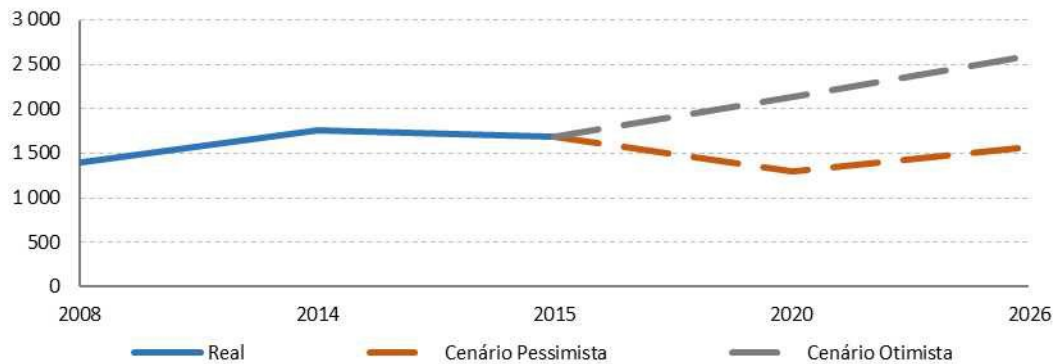
The resulting consumption is about 1,8 Mtoe of potentially usable heat and 0,25 Mtoe of cold consumption, which would correspond to between 2,4 Mtoe and 2,9 Mtoe of thermal output of co-generation, or, based on the same assumptions, 11 TWh to 13 TWh of generation (29 % of national consumption) and 2.4 GW to 3.0 GW of installed capacity, thus representing an increase of 700 MW to 1 300 MW compared to the currently installed capacity of 1 759 MW.

Some future development of this potential can still be expected in the direction of a slight decrease, due to the expected sharp reduction in consumption for the subsectors of the Paper and Paper Industry (-7.3 %) and the Textile Industry (-19.4 %), precisely the two sub-sectors most relevant in the context of cogeneration, as well as a decrease in air conditioning consumption in the services sector (-10.9 %), despite a slight growth in the overall consumption of that sector (1.7 %). Thus, in 2025 the achievable potential will be 2,2 Mtoe to 2,7 Mtoe of thermal generation of the cogeneration, or 10 TWh to 12 TWh of electricity generation and 2.3 GW to 2.8 GW of installed electrical power.

Economic potential of high-efficiency cogeneration

The figure below presents the chart of the evolution of economic potential for the period 2008 to 2026.

Figure 32 – Development scenarios for the economic potential of cogeneration up to 2026 (MWe) [Source: Study of the potential for high-efficiency cogeneration in Portugal, 2016]



Bearing in mind 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 development 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 the projections for the development of total primary energy consumption towards 2030, it could be expected that, in view of the policies and measures planned to be implemented over the period 2020-2030, in particular the focus on renewable energies and the decommissioning of coal, consumption would continue on a declining path. However, the estimated increase in primary energy consumption reflects, on the one hand, the decarbonisation of the existing power 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 as a result of the decommissioning of coal-fired thermal power plants, this energy carrier will no longer be present in the primary energy consumption mix, contributing significantly to the reduction of the energy bill. By 2030, Renewables will have the greatest weight in the energy mix, with more than 60 %.

Figure 39 – Estimated evolution of primary energy consumption towards 2030 (ktoe)

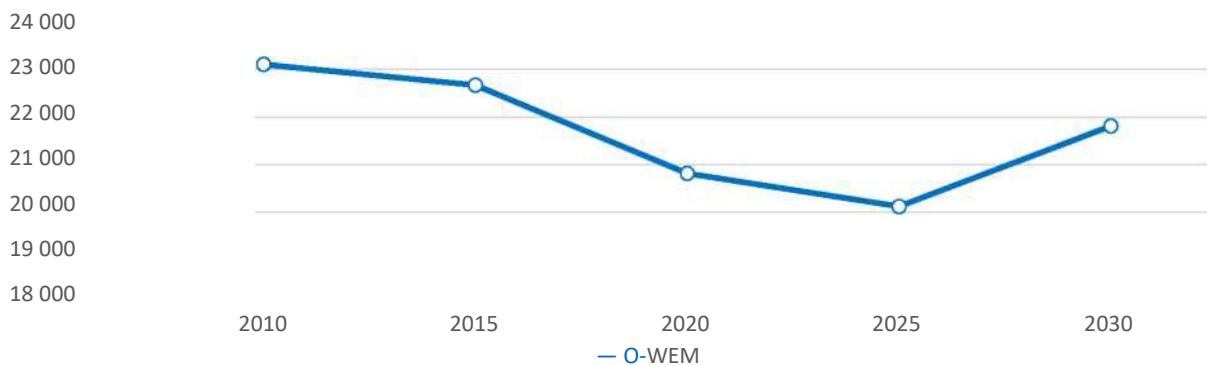
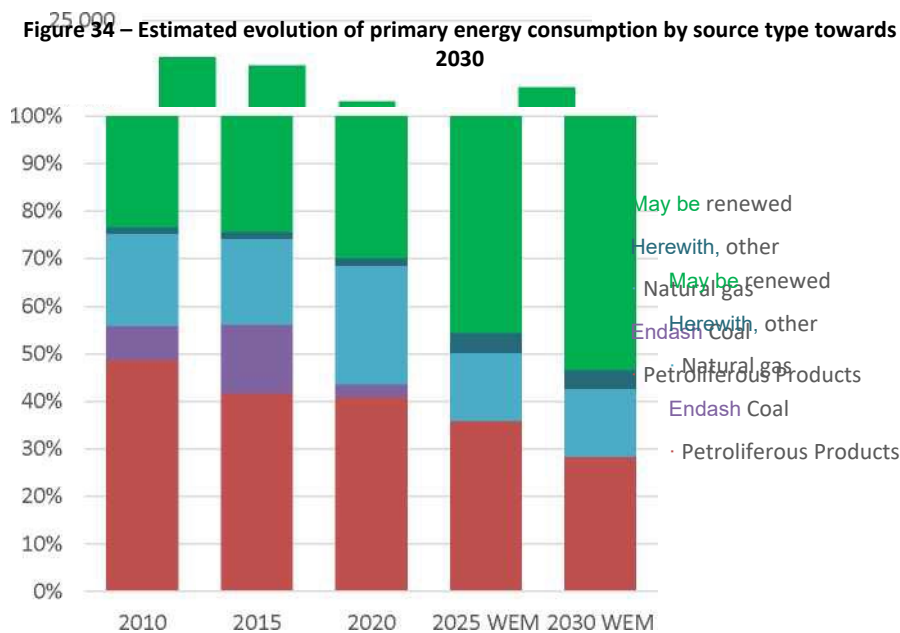


Figure 33 – Estimated evolution of primary energy consumption by source type towards 2030 (ktoe)



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 Directive* (EPBD) requires Member States to apply a comparative methodology for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements with a view to keeping 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, apartment blocks and multi-dwelling buildings, office buildings, and 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 118/2013 of 20 August 2009 establishing the National Building Certification System (SCE), the Regulation on the Energy Performance of Housing Buildings (REH) and the Regulation on the Energy Performance of Commercial and Services Buildings (RECS).

With a view to meeting 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 advantages for the overall cost of optimal solutions;
- Cost-optimal solutions found are solutions with lower thermal insulation rates than those envisaged by legislation;
- The most demanding solar glass-solutions with external shading correspond to the lowest energy

consumption;

- However, the most efficient cost-optimal solutions are double-glazed solutions with colourless glass and external shading;
- Cooling needs are significantly reduced when using LED bulbs, as well as the share of lighting consumption;
- The air-conditioning system with lower energy consumption 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 with the lowest energy consumption.

It should be noted that the reference building was constructed on the basis of the certificates analysed from hotels with construction prior to 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 non-insulation solutions are cost-optimal.

It is believed that the result that the heat recovery solution does not offer optimal cost advantages is due to two key factors:

- Increased air-conditioning needs for the cooling season;
- Design at the height of the building, which imposes higher losses in the exhaust load and consequent increase in the consumption of fans.

On the basis of the methodology used, for scenarios of average energy costs, discount rate of 3 %, and an economic life cycle of 20 years, the overall cost results for the selected variants were determined. The cost-optimal variant has an overall financial cost of between EUR 388/m² in Faro and EUR 425/m² in Porto.

From a 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 between 33 % and 35 %. This indicates that a review of the constructive solutions and minimum requirements for deep renovations of hotels built before 1990 is appropriate, and there is room to increase the regulatory requirements of the National Building Certification System (SCE) for substantial renovations of hotel buildings.

The Energy Performance of Buildings Directive is under review 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 objective of reducing greenhouse gas (GHG) emissions by at least 55 % by 2030 compared to 1990, which aims to put the EU on the path to climate neutrality by 2050.

4.4. Energy Security Dimension

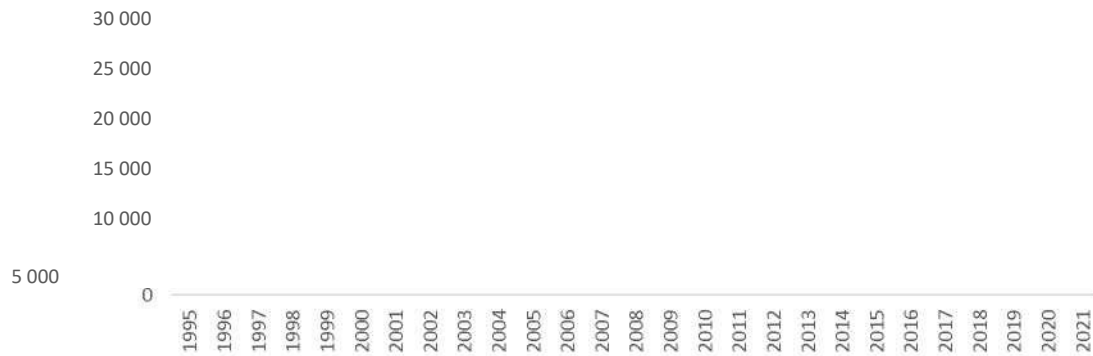
1. Current energy mix, domestic energy resources, import dependency, including relevant risks

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.

With the exception of the slight increase between 2020 and 2021, Portugal's energy Importator Saldo has been decreasing in recent years. This reduction, which has a positive impact on reducing external energy dependency and consequently reducing Portugal's energy bill, was driven by an increase in domestic energy production, in particular from indigenous renewable sources, which led to a reduction in imports of coal (until 2021, the year of closure of coal power plants) and natural gas for electricity production. The increase in the production capacity of the domestic refineries, which allowed a greater response to domestic consumption, also contributed to the reduction of imports of oil products and consequently reduced the import balance.

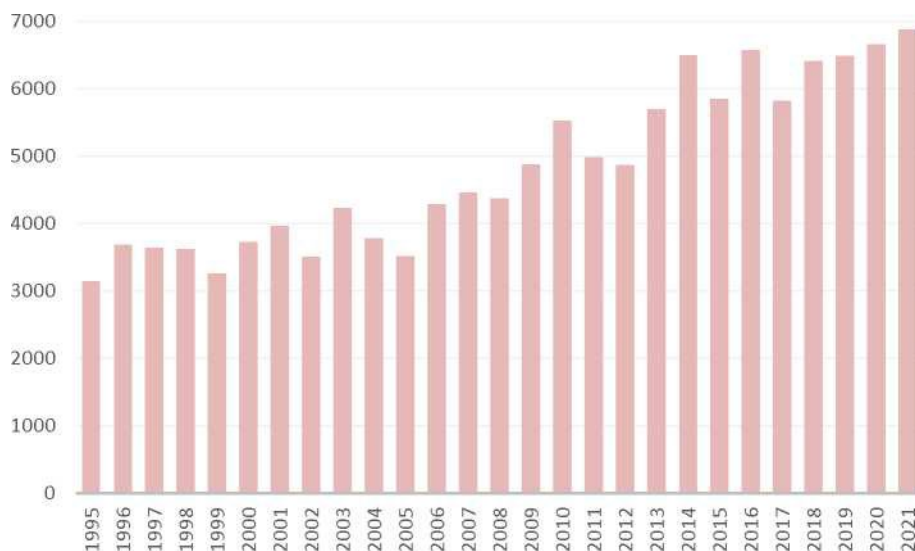
Figure 35 – Evolution of Importator and Energy Balance in Portugal (ktoe) [Source: DGEG]



Domestic energy production has been increasing in recent years, with a tcma of 3.9 % in the period 2012-2021, confirming the growth in the previous decade (4.0 % in the period 2002-2011). 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.

Domestic energy production in 2021 was 6 882 ktoe, with an increase of 3.4 % compared to 2020, mainly due to the higher contribution of wind and photovoltaic production. Domestic energy production accounted for around 33 % of primary energy consumption in 2021 (+ 1 pps compared to 2020), while in the last decade, 2012-2021, domestic production represented on average around 28 % of primary energy consumption compared with an average of 18 % in the period 2012-2021.

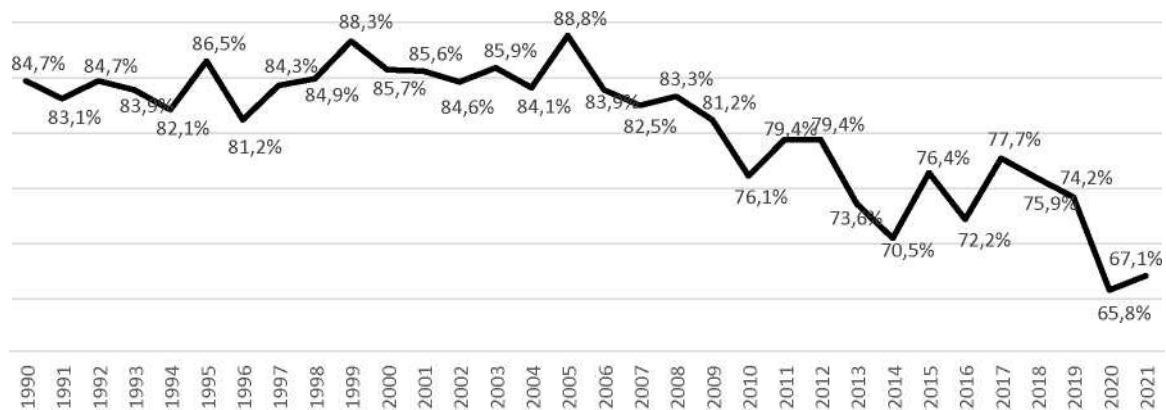
Figure 36 – Evolution of domestic energy production in Portugal (ktoe) [Source: DGEG]



1.2. Energy dependence

One of the main challenges and objectives of the current national energy policy is to reduce external energy dependency. Historically, Portugal has a high energy dependency, with an average of 83.0 % in the decade between 2002 and 2011, as a result of the lack of national production of fossil energy sources, such as oil or natural gas, which have a very significant weight in final energy consumption. The focus on renewable energy and energy efficiency, with a higher focus in recent years, has allowed Portugal to reduce its energy dependency to below 80 %, with an average of 73 % over the ten-year period 2012-2021. However, the variability of the hydrological regime, coupled with a large water component in the national electricity generating system, negatively influences energy dependency in dry years, as was the case in 2012, 2015 or 2017.

In 2020, energy dependency reached 65.8 %, the historically lowest figure, with a reduction of 8,4 pps compared to 2019. This reduction was mainly due to the fall in final energy consumption due to the impact of the COVID-19 pandemic, reduced imports of coal for electricity production and increased domestic production of energy from renewable sources. In 2021, energy dependency was 67.1 %, the increase compared to 2020 being mainly due to the increase in the import balance.

Figure 37 – Evolution of Portugal’s External Energy Dependency [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, carries out the National Risk Assessment affecting the security of supply of the National Gas System, with the cooperation of the National Gas Transmission Network Operator. This assessment shall be carried out every four years, unless circumstances require more frequent updates, and shall take into account relevant national and regional circumstances, such as market size, network configuration, input and exit flows of the Member State, 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 exceptionally high demand scenarios and contexts of disruption of gas supply arising from the failure of major supply infrastructures are developed.

The national risk scenarios identified in the latest 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 the 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, LNG Storage and Terminals Infrastructure;
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 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 levels of crisis, assigning responsibilities to the actors in the National Gas System to deal with the identified risk events and safeguard supply. In accordance with this Regulation, a common risk assessment, with a regional dimension, is drawn up to identify and study the main risks affecting the security of gas supply in certain regions of the EU, known as risk groups, and Portugal is part of the gas supply risk groups of 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 (PRP),

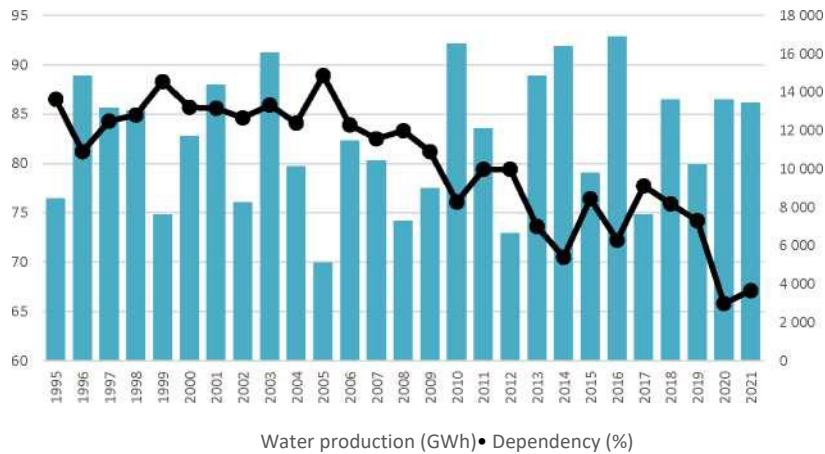
which sets out measures to prevent, prepare for and mitigate electricity crises resulting from the risks identified for the sector, at national and EU level, while defining and characterising crisis levels as well as information flows and obligations imposed on the various actors in the system. based on regional electricity crisis scenarios identified by the European Network of Transmission System Operators for Electricity and national electricity crisis scenarios identified by DGEG, in collaboration with the Electricity Transmission System Operator, after consultation with the Electricity Distribution System Operator, the National Regulatory Authority and the relevant electricity producers.

The national electricity crisis scenarios identified in the PRP, revised and submitted to the European Commission in January 2023, are as follows:

1. Failure at the Sines LNG Terminal;
2. Prolonged international failure of gas supply;
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 on 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).

Electricity production in Portugal has historically made a high contribution from hydropower plants. In 2021, the weight of water in gross electricity production was 26 %, approximately the same as in 2020. Thus, as identified in the PRP, drought represents one of the most relevant risks for the national electricity system. Overall, 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 by 2021) for electricity production, also resulting in a reduction in the energy bill. The diversification of renewable sources for electricity production, in particular wind, and the construction of new reversible hydroelectric plants, i.e. equipped with pumping equipment. These facilities make it possible to exploit the surplus of renewable production in hours of lower consumption to store energy for subsequent use, which has partially mitigated the impact of drought on the power generation system. The figure below illustrates the evolution of energy dependency compared to gross hydropower production.

Figure 38 – Relationship between Outside Energy Dependence and Water Electricity Production [Source: DGEG]



I.4. National Electroproducer System

In 2021, the national electricity generating system recorded a gross electricity production of 51.0 TWh, with a decrease of approximately 4.0 % compared to 2020. Of the total electricity generation, in 2021 around 65 % came from renewable energy sources (+ 5 pps compared to 2020), with a higher focus on water and wind, which together accounted for around 52 % of all national electricity production, followed by non-renewable thermal, with approximately 35 % of national production. Following the trend from 2019, Portugal recorded a positive import balance of approximately 4.8 TWh in 2021.

In the renewable component of electricity generation, in 2021 water contributed around 41 % of total renewable production, followed by wind with 40 %, biomass⁴⁰ with 12 %, solar photovoltaic with 7 % and geothermal energy, which is produced only in the Autonomous Region of the Azores, with 1 %.

Figure 39 – Evolution of Gross Electricity Production and Balance Importer in Portugal (GWh) [Source: DGEG]

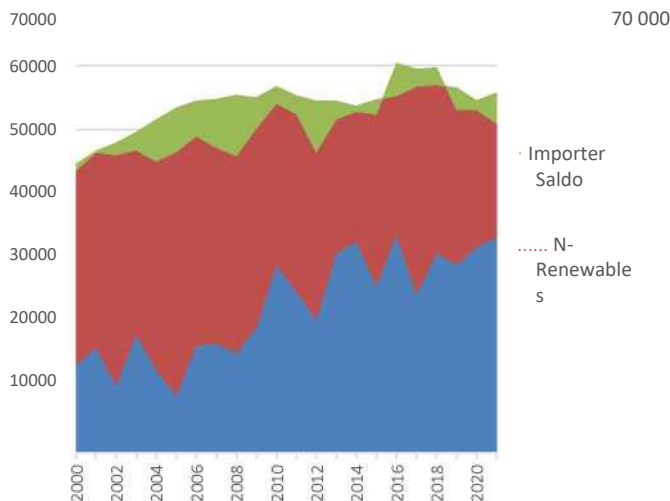
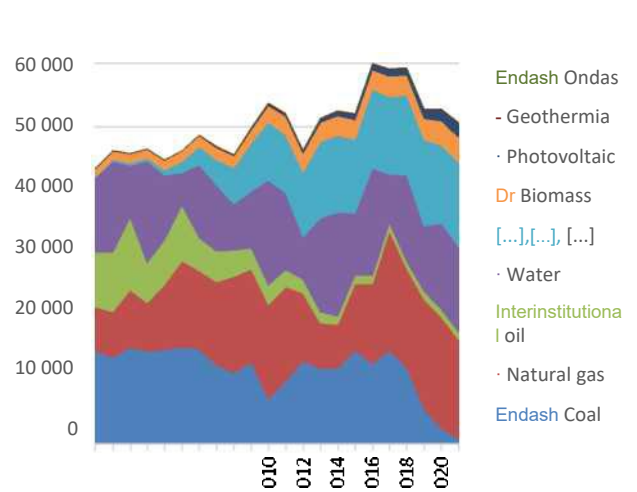


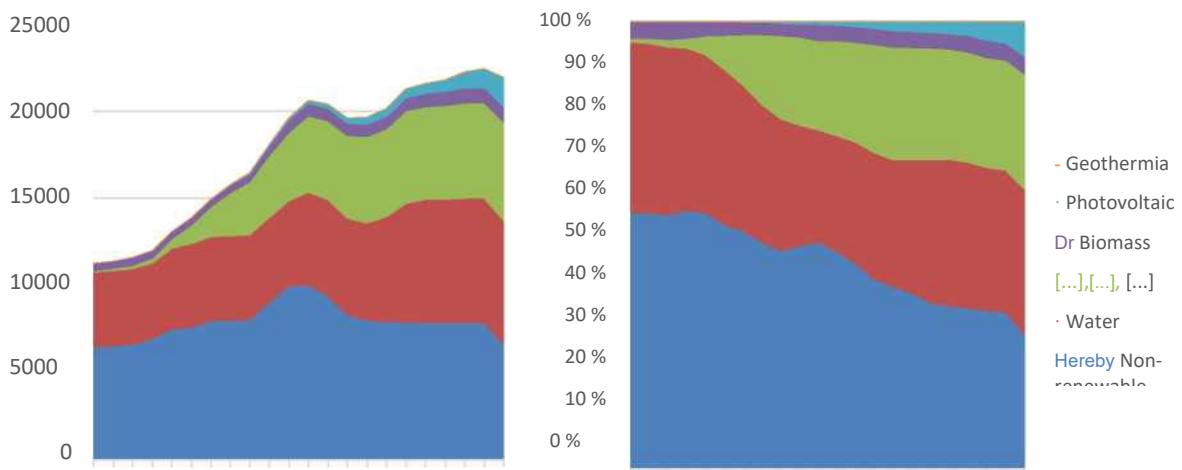
Figure 40 – Evolution of Gross Electricity Production in Portugal (GWh) [Source: DGEG]



As regards installed capacity, for electricity generation, Portugal recorded a total of around 21 GW in 2021, of which approximately 15 GW, or around 72 %, relate to renewable based technologies. There was an increase of approximately 5.2 % compared to 2020, equivalent to around 765 MW, mainly as a result of the entry into operation of new solar photovoltaic and wind capacity. Of the total installed capacity, about 33 % (7 126 MW) corresponds to hydropower plants, which include a relevant reversible pumping component, which allows to absorb excess electricity production at times of lower consumption and store renewable energy and accounts for about 38 % of total water capacity. Wind accounts for about 26 % of installed capacity (5 643 MW), natural gas around 24 % (5 019 MW), solar photovoltaic approximately 8 % (1 701 MW),⁴¹ biomass around 4 % (865 MW), other non-renewable sources⁴² approximately 4 % (953 MW) and other⁴³ renewables around 0.2 % (34 MW).

In the decade 2012-2021, the total installed capacity in Portugal for electricity generation increased by around 917 MW, as a result of an increase of around 4.3 GW of renewable capacity and a decrease of around 3.4 GW of non-renewable capacity.

Figure 41 – Evolution of installed capacity for electricity production in Portugal by source type (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 power generation sector in Portugal, the following table shows the evolution of expected installed capacity, broken down by technology, for the 2030 horizon in order to meet the targets set for this sector and with impacts on other sectors.

⁴¹Includes plant/forest waste, sulphite liqueurs, biogas and municipal waste

⁴²Includes fuel oil, refinery gas, gas oil, industrial waste and propane

⁴³Includes Geothermia and Ondas

Table 41 – Prospects of evolution of installed capacity for electricity production by technology in Portugal by 2030

(GW)	2025	2030
Water	8,1	8,1
<i>of which pumped</i>	3,6	3,6
Wind	5,8	9,3
Onshore wind	5,8	9,0
Offshore wind	0,0	0,3
Solar Photovoltaic	7,5	13,2
of which centralised	5,2	8,9
of which decentralised	2,3	4,3
Concentrated thermal solar	0,0	0,0
Biomass/Biogas and Waste	1,2	1,1
Other renewables	0,0	0,0
Geothermia	0,0	0,0
Waves	0,0	0,0
Coal	0,0	0,0
Natural gas	4,9	3,9
Petroleum Products	0,6	0,5
TOTAL	28	36

4.5. Internal Energy Market dimension

4.5.1. Electricity interconnections

i. Current interconnection level and main interconnectors

As regards 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 interconnection capacity available for commercial purposes. In 2021 there was an average value of commercial interconnection capacity in the order of 3 004 MW from Portugal-Spain (exporter) and in the order of 3 745 MW from Spain-Portugal (importer), as shown in the graph below.

Figure 49 – Evolution of the average annual value of the Portugal-Spain Interconnection commercial capacity (MW)

[Source:
REN]

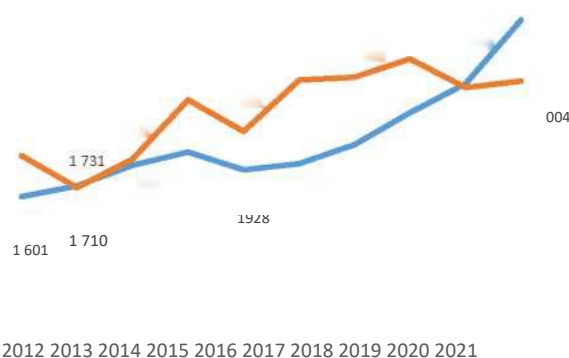
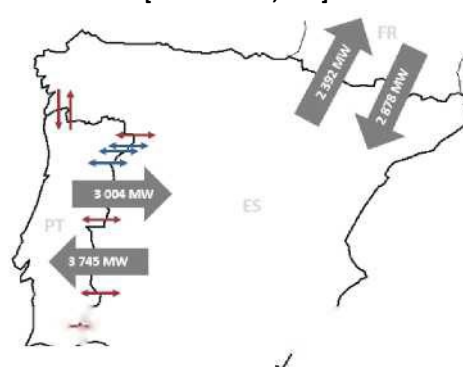
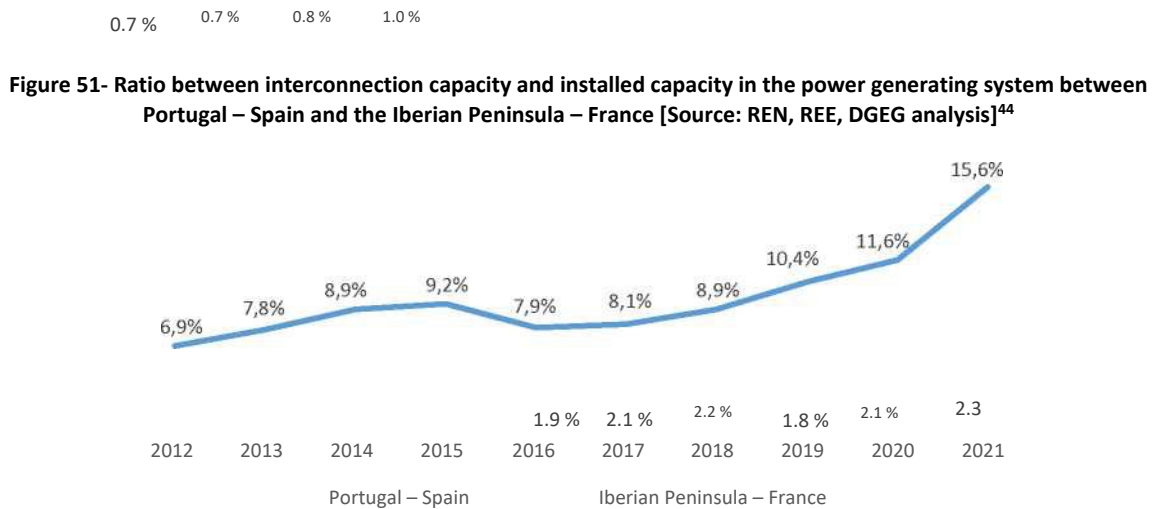


Figure 50 – Electrical interconnections in the Iberian Peninsula [Source: REN, REE]



To meet the common target set by the European Commission of 10 % electricity interconnections in 2020 and 15 % in 2030, Portugal has seen positive developments. However, this is not the case for the level of interconnection between the Iberian Peninsula and France which in 2020 fell well short of the 10 % target, 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 remaining bottleneck in the interconnection between Spain and France through 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 final objectives of the NECP, which this gives rise to.



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 interconnection capacity to be made available to market participants to address congestion in their own bidding zones or as a means of managing flows resulting from internal transactions into bidding zones, while minimum levels of available capacity for cross-zonal trade are established. Pursuant to paragraph 9 of that Article, the National Electricity Transmission System Operator has requested ERSE to derogate from paragraph 8 on the grounds that it is necessary to maintain operational security and the derogation has been approved by that regulatory authority.

ii. Projections of interconnector expansion requirements at least until 2040 (including for the year 2030)

As defined in RMSA-E 2022, taking into account expected network developments and others yet to be identified, the following evolution of commercial interconnection capacity (in MW) is envisaged:

Table 42 – Forecast indicative minimum values for commercial interconnection capacity [Source: REN]

	Portugal – > Spain	Spain – > Portugal
2023	2 700 MW	2 700 MW
2025	3 200 MW	3 600 MW
2030	3 500 MW	4 200 MW

⁴⁴ the Portugal – Spain ratio 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 of Portugal and Spain and also considers 100 % of the commercial interconnection capacity (NTC).

	Portugal – > Spain	Spain – > Portugal
2035	3 500 MW	4 200 MW
2040	4 000* MW	4 700* MW

* Capacities indicated for 2040 correspond to values identified as *Target Capacities* for the Portugal-Spain border in the TYNDP 2018 – *Ten Year Network Development Plan* studies. However, the necessary grid reinforcements in Portugal and Spain to reach these capacity figures are not yet identified.

4.5.2. Energy transmission infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

1.1. Electricity

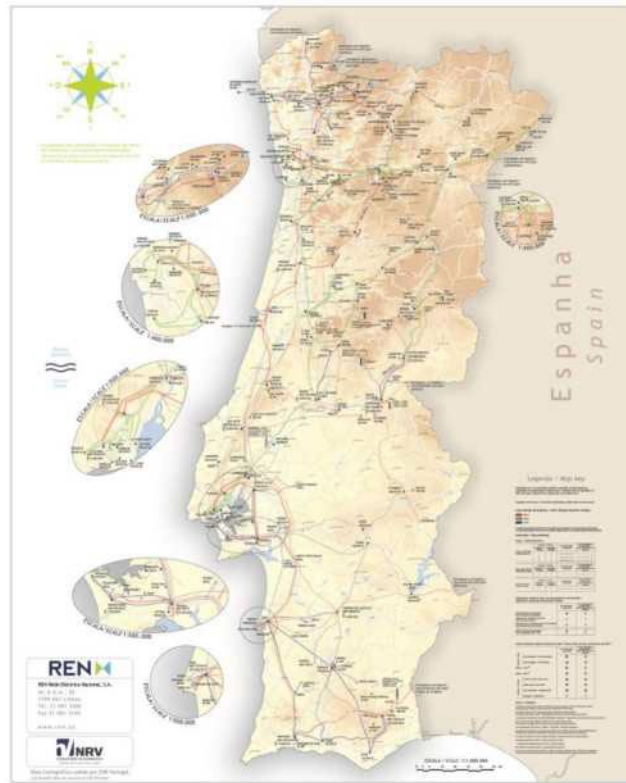
The National Electricity Transmission Network (RNT) comprises the installations implemented on mainland national territory which transport energy from the power centres to the high consumption density sites, as well as interconnections with Spain, through very high voltage lines and installations and equipment that match 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 MVA, and has 70 substations, 14 shut-off stations, 2 breakers and 1 switchover in service. The evolution of the NTS is illustrated in the following table and figure.

Table 43 – 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 %
Processing Power (AMM)	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 following figure illustrates the map of the NTS.

Figure 42 – Map of the National Electricity Transmission Network in 2022 [Source: <https://datahub.ren.pt/pt/redes/>]



1.2. Natural gas

The National Network for Transmission, Storage and Terminals of Liquefied Natural Gas (RNTIAT) consists of all infrastructure for the reception and transport of natural gas (NG) by pipeline, underground storage and reception, storage and regasification of liquefied natural gas (LNG). The RNTIAT consists of the National Natural Gas Transmission Network (RNTGN), the Sines Natural Gas Terminal (LNG) and the Carriço Underground Storage (AS) in Pombal.

The RNTGN is the infrastructure used for the reception, transport and delivery of high pressure NG in Portugal, from entry points to exit points, consisting of two main axes: a South-North axis linking the Sines LNG Terminal with the Valença do Minho interconnection, ensuring that NG is supplied to the coastal strip of Portugal, where the most densely populated localities are located, and has a bypass for Mangualde; and an East-West axis between the interconnection at Campo Maior and the Carriço AS, presenting a bypass for Guarda. In 2013, the link between the two axes was completed, linking Mangualde to Guarda, which made it possible to improve the satisfaction of demand in the central and northern parts of the country. The total delivery points (Grms – *Gas Regulation and Metering Station*) of the RNTGN have an output capacity of 707 GWh/day, equivalent to 2 470 km³(n)/h. The following main equipment is part of the RNTGN: 1 375 km of main pipeline and high-pressure sidings intended for the transport of natural gas; 85 gas balancing and measuring stations at delivery points (Grms); 66 junction stations (*JCT*); 45 block *Valve Station (BV)*; 5 T-Interconnection Stations (*ICJCT*); 2 *Custody Transfer Station(CTS)*.

NG can be delivered directly to customers connected at high pressure, to the distribution networks forming the national NG distribution network, to the interconnected system of the Spanish gasist system and to the Carriço AS for injection into the caverns of that infrastructure.

The most recent RNTGN developments have 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 supplied.

There are two interconnections between the RNTGN and the Spanish transmission system: Camp Maior – Badajoz and Valença do Minho – Tuy. Both interconnection points have entry and exit capacity and in total the aggregated 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 until September 2027.

Table 44 – Capacities of NG interconnections between Portugal and Spain [Source: REN]

Interconnection	Daily capacity
Field Maior	Entry capacity: 134 GWh/day, equivalent to 470 km ³ (n)/h Outgoing capacity: 55 GWh/day, equivalent to 193 km ³ (n)/h
Valença do Minho	Entry capacity: 10 GWh/day, equivalent to 35 km ³ (n)/h Outgoing capacity: 25 GWh/day, equivalent to 88 km ³ (n)/h

The Sines Natural Gas Terminal (LNG Terminal) is strategically located on the European Atlantic coast and is part of all infrastructure for the reception and shipment of tankers, storage and re-gasification of LNG to the transport network, as well as LNG loading on tankers. The main characteristics of the Sines LNG Terminal include:

- **Reception and unloading of tankers:** The facility includes a berth for ships, articulated discharge arms and discharge lines, recirculation and return of LNG vapour. The discharge capacity is 10 000 m³per hour LNG for tankers with volumes between 40 000 and 216 000 m³ LNG.
- **LNG storage:** After unloading, LNG is stored in tanks. The storage capacity is 2 569 GWh, corresponding to two tanks of 120 000 m³ LNG and a 150 000 m³ LNG tank.
- **Regasification for RNTGN:** Regasification is a physical LNG vaporisation process using thermal gas exchange with sea water 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 m³(n)/h). The rated emission capacity is 321 GWh/day (equivalent to 1 125 000 m³(n)/h) with a peak capacity of 1 350 000 m³(n)/h.
- **LNG filling bays:** The Sines LNG Terminal allows LNG tankers to be loaded, enabling them to be supplied to the autonomous regasification units (AGUs) located in areas of Portugal which cannot be supplied by the high-pressure natural gas network. For this activity, TLNG has three filling bays with a total capacity of 175 m³per hour of LNG.
- **Loading of tankers:** LNG infrastructure also enables Gas-in, cooling and total or partial loading of tankers, using the same port facility and ship unloading equipment. The capacity for this activity is 1 500 m³perhour of LNG.

The expansion of the Sines LNG Terminal, completed in July 2012, resulted in an increase in useful storage capacity by 62.5 % to 390 000 m³ LNG, an increase in gas capacity to the grid by 50 % to 1 350 000 m³ per^{hour}, the adaptation of the Jetty for the reception of large capacity tankers, as well as the implementation of a set of procedural reinforcements aimed at maximising the availability of the infrastructure and a high standard of safety of operation. As a result, the Sines Terminal now offers favourable conditions of access to more agents, providing greater flexibility in the management of imported volumes and creating unique conditions for receiving LNG vessels from more remote and diversified sources, contributing to the competitiveness of the sector in Portugal and to the security of supply of the SNGN.

With regard to the Underground Storage of Carriço, NG is stored under high pressure in caverns created within a saline massif at depths of more than 1 000 metres. There are currently 6 wells in operation, with a total storage capacity of 3 839 GWh (322.6 Mm³), using the same surface gas station, which allows two-way flow movement, i.e. injecting gas from the transmission network to caverns and extracting gas from caverns to the transmission network. The Carriço AS currently has an injection capacity of 24 GWh/day (83 km³(n)/h) and an extraction capacity of 129 GWh/day (450 km³(n)/h) with an operational volume of gas in the cavities greater than 60 % of the storage capacity of the Carriço AS and 71 GWh/day (250 km³(n)/h), with an operating volume of gas in the cavities less than 60 % of the storage capacity of the Carriço AS. This infrastructure is essential to build up the security stocks needed to secure supply to the country in the event of a supply crisis, and it also provides conditions for the logistics and commercial optimisation of commercial agents active in the sector at both national and Iberian level.

The following figure illustrates the map of RNTIAT.

Figure 43 – Map of the National Network for Transmission, Storage and Terminals of Liquefied Natural Gas in 2017 [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 for electricity interconnections, a wide range of network expansion actions and projects are planned. These include:

- The '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 interconnection, is currently being completed. This project has the status of Project of Common Interest (PCI) of the European Commission, featuring in the 5th list of PCIs, approved in November 2021 and published in the Official Journal of the EU in April 2022⁴⁴. The Ribeira da Pena substation and the section Vieira do Minho – Ribeira de Pena were contracted in 2021;
- In 2024, the new interconnection between Portugal and Spain is planned to be organised through a 400 kV line between Ponte de Lima (Minho) and Fontefría (Galicia), a project also recognised by the European Commission as PIC45. The section Ponte de Lima-Vila Nova de Famalicão was commissioned in 2021.
- A 400 kV line to be established between the current Pedralva substation and the future Sobrado substation, which is also recognised as a PIC by the European Commission⁴⁶, is planned until 2029, which, in addition to increasing interconnection capacity values, will facilitate the flow of renewable electricity;
- For the 2030 horizon, a series of very long-term analyses have already been carried out by the Transmission

⁴⁴PIC 2.16.3 – Internal line between Vieira do Minho, Ribeira de Pena and Feira

⁴⁵PIC 2.17 – Portugal-Spain Interconnection: Beariz-Fontefría (ES), Fontefría (ES) – Ponte de Lima (PT)

⁴⁶2.16.1 internal line between Pedralva and Sobrado (PT), formerly Pedralva and Alfena (PT)

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 values of interconnection capacity of 3 500 MW in Portugal→Spain and 4 200 MW in Spain→Portugal;

- In a longer term perspective, 2040, commercial interconnection capacities could be 4 000 MW in Portugal→Spain and 4 700 MW in Spain→Portugal, values identified as “*Target Capacities*” for the Portugal-Spain border in studies carried out in the framework of TYNDP 2018, any grid reinforcements or new interconnectors needed to reach these interconnection capacity figures are not yet identified.

In the electricity sector, there are also other projects linked to the strengthening of internal transmission and distribution grids for the integration and accommodation of renewable electricity production and to meet the needs of large consumers, in particular:

- 2025-2026: Strengthening of the NTS to 400 kV in the Minho area;
- 2026-2027: Offshore energy reception of V. Castelo – Phase 2;
- 2026-2028: Link to 220 kV Vila Pouca de Aguiar-Carrapatelo;
- 2027-2029: Connection to 400 kV Ribeira de Pena – Lagoaça;
- 2029-2030: Offshore energy reception 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 the national energy policy, in particular in terms of internal market integration and security of supply, and the search for a more robust, efficient and interconnected national gas system, Portugal seeks to develop its transmission and distribution network, 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 complete decarbonisation of the national gas system, maximising the use of assets.

In order to respond to this, there is a wide range of actions and projects of particular importance (some of which are already indicated in point 2.4.2 of this Plan):

- In order to enhance the security of gas supply, it is envisaged to increase the storage capacity of the Carriço AS in two caverns with an additional capacity of 1.2 TWh. These falls are expected to be in operation in 2028 and 2029 and will be adapted for storage of 100 % H₂;
- It is planned to make investments in the Sines LNG Terminal that will allow LNG to be transferred between ships by allowing the return of up to 8 bcm/year of this fuel (from 2023) and the improvement of conditions for sailing boats, allowing, on the one hand, to reduce berthing limitations in harder sea conditions and, on the other hand, to increase the geometry of ships (planned for 2026);
- Making investments in existing infrastructure, whether at the level of the gas transmission or distribution network, enabling the reception of renewable gases and transport of natural and renewable gases, especially biomethane, as well as increasing blends of H₂;
- As part of the European Green Hydrogen Transport Corridor, two new sections between Figueira da Foz and Cantanhede will be built by 2030, with connection to the Carriço AS (50 km), and the Portuguese section of the CelZa interconnection project (162 km), which is part of the H2Med. At the same time, the current 100 % H₂ transmission 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

1.1. Electricity Market

In Portugal, since September 2006, all electricity customers in mainland Portugal have been able to effectively choose their electricity supplier. In 2022, the Free Market (ML) accounted for 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-resort trader (SRB) and represent around 974 customers. It is the responsibility of household customers to a large proportion of customers who still remain 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. In accordance with Regulation (EC) 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 to the portfolio of a supplier of last resort, given the atypical context of market conditions.

Table 45 – 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
	Free Market	Regulated Market
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, resulting in 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 has set 31 December 2020 as the deadline for the expiry of transitional tariffs for supplies of electricity in MT and BT.

In the meantime, in the State Budget Law for 2020, it is foreseen to extend the deadline for the expiry of the transitional tariffs for electricity supplies at NLV to 31 December 2025.

The table below shows the six-monthly trend in the average electricity prices for Portugal in households and industry in the most representative consumption band DC and IB respectively.

As regards electricity prices (Prices including all taxes) charged in Portugal in 2022, and in the case of the domestic sector, the average annual price was EUR 0,2210/kWh (DC band), with 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 46 – Electricity prices by sector in Portugal (EUR/kWh) [Source: DGEG]

Domestic (DC band47)	Industry (IB band48)
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472 500 kWh < Consumption < 5 000 kWh

4820 MWh < Consumption < 500 MWh

		Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices including all taxes	Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices including all taxes
2021	1st SEM.	0,1131	0,1732	0,2089	0,0955	0,1400	0,1706
	2st SEM.	0,1164	0,1810	0,2170	0,1071	0,1518	0,1844
2022	1st SEM.	0,1688	0,1831	0,2199	0,1446	0,1415	0,1725
	2st SEM.	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 NG supplier. The process of liberalising the NG market has made it possible for all major consumers (annual consumption of more than NG 1^{million}) to enter the free market. Also, the vast majority of industrial consumers (annual consumption between 10 000 m³ and 1 m³ NG) opted for the most favourable conditions offered by suppliers on the market. Similarly, developments in the residential customer segment show significant and increasing adherence to market offers.

In the overall retail market with around 1,5 million customers, the free market has around 1,2 million consumers at the end of 2022, representing around 76 % of the total customers in the NG market in Portugal.

Table 47 – Number of customers on the domestic NG market by type of customer in ten. 2022 [source: ERSE]

	Free Market	Regulated Market
Big 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, resulting in 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 suppliers of last resort to supply NG to final customers with annual consumption of less than or equal to 10 000 m³ who do not exercise the right to switch to a supplier on the free market.

Currently, the SRB has now applied transitional tariffs to end customers for natural gas that are still being supplied on the regulated market and have not chosen a new supplier. These tariffs are foreseen to be applied until 31 December 2025, when the transitional period ends (Ministerial Implementing Order No 83/2020 of 1 April).

In order to combat the increase in prices, the Government adopted exceptional measures and, by means of Decree-Law No 57-B/2022 of 6 December, allowed final customers with annual consumption of less than or equal to 10 000 m³ to return to the regulated natural gas sales tariff regime of the regulated market.

The table below shows the six-monthly trend in the average prices of NG for Portugal in the domestic and industrial sectors in the most representative consumption band, D1 and I4 respectively.

As regards the prices of NG (prices inclusive of all taxes) charged 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 large markets.

Table 48 – Natural gas prices by sector in Portugal (EUR/GJ) [Source: DGEG]

		Domestic (Banda D150)			Industry (Banda I451)		
		Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices including all taxes	Prices excluding taxes and levies	Prices excluding VAT and other recoverable taxes	Prices including 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 public sale price (PMVP) of simple road petrol was EUR 1,796/litre in 2022, with an increase of 26 % compared to 2021. The PMVP of single Gasolina 95 was EUR 1,850/litre, with an increase of 14 % compared to 2021.

Table 49 – Price of simple road petrol 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 + Other52	0,509	0,511	0,384	0.4 %	— 25.0 %
PMVP	1,244	1,423	1,796	14.4 %	26.2 %

Table 50 – Price of single petrol 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 + Other53	0,664	0,663	0,530	— 0.1 %	— 20.0 %
PMVP	1,387	1,619	1,850	16.8 %	14.3 %

As part of the mitigation measures approved by the Government, in order to cope with the extraordinary context of rising fuel prices, a mechanism has been established for an extraordinary and temporary reduction of the UPI unit rates applicable on the mainland to 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 be applied to economically vulnerable end customers was introduced, approved by Decree-Law No 138-A/2010 of 28 December, the aim of which, as part of the process of liberalising the energy sector and protecting consumers, was to guarantee access for all consumers to the essential service of supplying electricity, irrespective of which supplier. That guarantee gave rise to the need to ensure supplies, in particular to economically vulnerable customers. Also, the increasing and volatile international energy costs and

5020 GJ < Consumption < 200 GJ

51100 000 GJ < Consumption < 1 000 000 GJ

Petroleum Products52 Tax (ISP), Road Service Contribution (CSR) and Carbon Rate

53Road Service Contribution and CO2 Value

the intention to continue further harmonisation within the electricity market 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 households and other economically vulnerable groups of consumers by means of a tariff model which guarantees them a trend in tariff stability, including through the use of discounts.

In 2014, there was a concern to ensure effective access for customers considered to be the most deprived among the final consumers of electricity at low voltage, the aim was to extend the number of beneficiaries of the social tariff for electricity to about 500 thousand holders of electricity supply contracts and to create the conditions for the rebate applied to beneficiaries to be higher than was the case. With a view to extending the number of beneficial owners of the Social Energy Tariff, the social discounts for access to the essential service of electricity and natural gas, implemented by Decree-Law No 138-A/2010 of 28 December 2006, as amended by Decree-Law No 172/2014 of 14 November 2006, for electricity, and Decree-Law No 101/2011 of 30 September 2009 for natural gas, were automatically granted to economically more vulnerable final customers following the legislative redesign applicable by Law No 7-A/2016 of 30 March 2009. This procedure contributed to the number of beneficiaries going from 154 648 in March 2016 to 820 527 in September 2017 according to the data available to date by ERSE. This measure, initially launched on 28 December 2010 by Decree-Law 138-A/2010, has been automatically granted, as from 1 July 2016, to customers who meet the criteria of economic and/or social vulnerability, as verified 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 2009, 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, extending eligibility to all situations of unemployment.

With the publication of Decree-Law No 15/2022 of 14 January 2006 (establishing the organisation and operation of the National Electricity System), the social tariff for electricity was incorporated into this law.

The system of automatic recognition for the award of the social energy tariff removes the obligation for customers 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 instrument without administrative and financial effort, thus resulting in a procedure of greater social justice. It should also be noted that for many households this rebate results in savings of tens of euros per year. The automatic recognition mechanism is carried out by an IT system of the DGEG, which cross-checks data, in accordance with the protocols concluded governing access to and transmission of information between the various actors 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.

With regard to Electric Energy, the discount to be applied to tariffs for access to electricity networks, applicable from 1 January 2023, provided for in Order No 12461/2022 of 25 October, must correspond to a value allowing a discount of 33.8 % on the transitional tariffs for the sale to final customers of electricity, excluding VAT, other applicable taxes, levies, fees and default interest. As regards natural gas, the discount to be applied to the tariffs for access to the natural gas networks, applicable from 1 October 2022 in force for the 2022-2023 gas year, provided for in Order No 4049/2022 of 7 April, must correspond to a 31.2 % discount on the transitional tariffs for the sale to final customers of natural gas, excluding VAT, other taxes, levies, charges and late payment interest applicable, and its application is not taken into account for the purposes of other support currently in force.

Each year, the amount of the discount referred to in the preceding paragraph shall be determined by order of the member of the government responsible for energy, after hearing ERSE.

Table 51 – Number of consumers with a Social Energy Tariff in Portugal [Source: DGEG]

	2016	2017	2018	2019*	2020*	2021*	2022*
Electricity	786 598	777 085	770 094	776 805	752 956	762 325	757 232
Natural gas	36 819	34 403	35 412	34 502	34 709	52 344	50 541

Total	823 417	811 488	805 506	811 307	787 665	814 669	807 773
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* data from the DGEG's Customs Social Tariff IT system, relating to the automatic processing of December.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

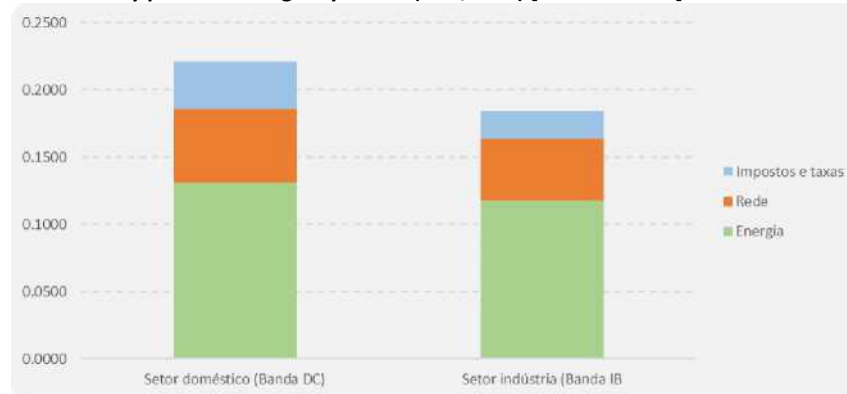
Not available.

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 considering the DC band, in 2022 the weight of the energy price was 59.4 %, that of the network accounted for 24.6 % and, finally, that of the levies and taxes accounted for 15.9 % of the value of sales to final consumers (-30,2 pps compared to 2021), as a result of the significant reduction in the 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 accounted for 24.6 % and finally that of the levies and taxes represented 11.4 % in the value of sales to the final consumer (-31,5 pps compared to 2021), again as a result of the significant reduction in CIEG.

Figure 54 – Structure of electricity price in Portugal by sector (EUR/kWh) [Source: DGEG]



iv. Description of energy subsidies, including for fossil fuels

Although there are a number of taxes which directly or indirectly affect energy, the taxes on petroleum and energy products gain prominence, which is why it is emphasised 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, transposing Council Directives 2008/118/EC of 16 December 2008 concerning the general arrangements for excise duty ('Horizontal Directive') and the Directives ('Verticais') on the harmonisation of excise duties which provide for the excise duty on petroleum and energy products (ISP).

Petroleum and energy products shall be subject to the tax:

- Any other products intended for use, offered for sale or used as motor fuel;
- Other hydrocarbons, with the exception of peat, intended for use, offered for sale or used as fuel;

Shall mean electricity falling within CN code 2716.

The CIEC also sets out the products benefiting from full 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 are contained in Article 6 of the CIEC, exemptions and reduced rates of taxation are provided for.

Addition on CO₂ emissions ('carbon rate')

In 2015, a 'carbon tax' 55 was introduced through the 'Green Taxation Act' (through an addition to the PSI), which applies to sectors not covered by the European Emissions Trading (ETS).

This addition, which was included in the CIEC, through the addition of a new Article 92a, aims to promote a low-carbon economy, to combat climate change and reduce external energy dependency.

To this end, in addition to the applicable ISP rate, the following products are also subject to the addition of a fee and according to additional factors, which reflect the emission factor of each product, provided that they are subject to and not exempted from PSI:

Gasoline;

- Oil and oil coloured and marked;

Sea gas oil (covers diesel, 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;

W/ w fuel oil;

- Petroleum coke;

Interinstitutional coal and coke.

The exemption of a given product from ISP automatically determines that it is not subject to the addition of CO₂ emissions (Article 92a (4)).

In accordance with the calculation formula currently in force, laid down in Article 92a (2) of the CIEC, the value of the fee to be applied in each year (n), to which the additional factor provided for in Article 1a of the CIEC 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 in the context of the European Emissions Trading System, between 1 October of year n-2 and 30 September of year n-1.

The additions factors, the evolution of the carbon rate (reference price of CO₂) and the additions per fuel type are those mirrored in the table below.

Table 52 – Advertising factors, evolution of the carbon rate and additions by fuel type

Value of the addition in each year

Fuel	Unit	Addition factor	2015	2016	2017	2018	2019	2020	2021	2022
Petrol	EUR/1000	2,27165	11,56	15,15	15,56	15,56	28,94	53,66	54,34	54,34
Oil	EUR/1000	2,45365	12,49	16,37	16,81	16,81	31,26	57,96	58,69	58,69
Diesel oil	EUR/1000	2,47486	12,60	16,51	16,95	16,95	31,53	58,46	59,20	59,20
LPG	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 CO ₂	EUR/t CO ₂		5,09	6,67	6,85	6,85	12,74	23,62	23,92	23,92

In 2022, as an inflation mitigation measure and alongside other fiscal measures aimed at containing the increase in fuel prices, fuel taxes, in particular the ISP, were reduced and the carbon rate update was suspended, which was in force until May 2023, the date from which the gradual unfreezing of the carbon rate update started.

Analysis of tax expenditure for ISP exemptions

Tax expenditure is a transfer of public resources by reducing the tax liability vis-à-vis the rules-based taxation system that reflects the political priorities of a given country⁵⁶. This advantage conferred on the use of fossil fuels constitutes

⁵⁵Law No 82-D/2014 of 31 December 2013

The Tax⁵⁶ Benefits in Portugal. Prepared by the Working Group on the Study of Tax Benefits (2019)

a subsidy.

Tax expenditure on Petroleum and Energy Products in 2017 was worth EUR 441 million, of which approximately EUR 256 million corresponds to tax expenditure on ISP and some EUR 186 million corresponds to the tax expenditure associated with the additional tax on the ISP, that is to say, the carbon tax, as a result of the ISP exemptions.

In 2020 this figure amounted to EUR 413,5 million, EUR 257,7 million in 2021 and EUR 237 million in 2022 (provisional implementation figures), according to the report accompanying the 2023 State budget.

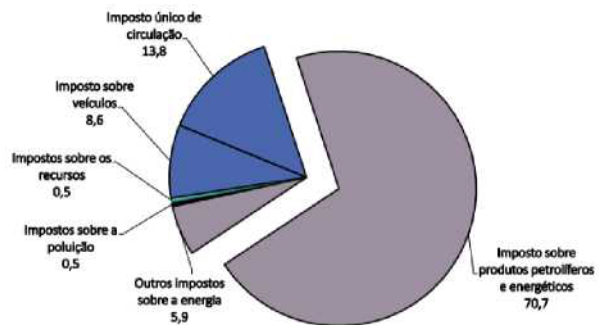
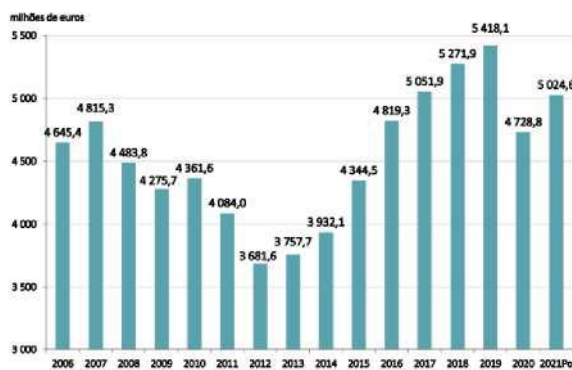
Environmental taxes and levies

According to the National Statistical Institute (INE), in 2021 the value of environmental taxes⁵⁷ amounted to around EUR 5 billion, corresponding to 6.6 % of the total revenue from taxes and social contributions collected (7.4 % in 2018, 7.3 % in 2019 and 6.8 % in 2020). This represented an increase of 6.3 % compared with 2020, compared with the change of +7.5 % observed for total revenue from taxes and social contributions, mainly reflecting the pick-up in fuel consumption, as the tax revenue associated with the purchase of motor vehicles decreased further.

Between 2020 and 2021, the tax on petroleum and energy products gained relative importance in environmental taxes from 69.8 % to 70.7 %. Other energy taxes, which include greenhouse gas emission allowances, have also increased their weight from 5.6 % to 5.9 %. In the opposite direction, the vehicle tax has lost importance, reaching now 8.6 % of all environmental taxes (9.5 % in 2020), and there was again a fall (-3.4 %) in the revenue from this tax in 2021. That reduction was not due to the conduct of the tax base (in fact, there was even an increase in registered vehicles) but to changes in the calculation of the tax. In anticipation of the judgment of the Court of Justice of the European Union on the non-inclusion of the environmental component of the ISV applicable to second-hand vehicles imported from other Member States for depreciation purposes¹, the tax authority amended the formula for calculating the ISV of such vehicles, leading to a reduction in revenue from that tax.

In 2021, the set of taxes on the acquisition and use of motor vehicles (tax on petroleum and energy products, vehicle tax and single road tax) accounted for around 93.1 % of all environmental taxes, slightly less than in 2020 (93.6 %). Conversely, revenue from greenhouse gas emission allowances continued to gain relative weight in total revenue from environmental taxes, with an increase in revenues from greenhouse gas emissions allowances in 2021 compared to the previous year.

Figure 55 – Evolution of taxes with environmental relevance Figure 56 – Taxes with environmental relevance by category in absolute value [Source: INE – Tax revenue statistics]



em 2021 [Fonte: INE]

According to the information available for 2021, the share of these taxes in total tax revenue including social contributions was higher in Portugal (6.7 %) compared to the EU average (5.6 %). In the same year, the share of environmental taxes on GDP in Portugal (2.4 %) was higher than the EU28 average (2.24 %).

These taxes include taxes on energy, transport, pollution and taxes on resources. However, the relevance of three taxes is highlighted: the tax on petroleum and energy products, the vehicle tax and the single road tax, which made up 75.4 % of the environmental taxes in 2020, below the European average (77.5 %).

⁵⁷Under 'Taxes of environmental relevance', the revenue obtained by the general government from the taxation of products and services for which the tax base could have a negative impact on the environment is identified. In this way, all taxes on these tax bases are environmental taxes.

As regards rates of environmental relevance⁵⁸, in 2020, the last year for which this information is available, they reached EUR 1,66 billion (0.8 % of GDP), increasing by 5.5 % compared to 2019, mainly reflecting the increase in the collection and treatment of solid waste (+ 3.9 %), health and sanitation rates (+ 5.5 %) and the rate of waste management (+ 21 %). Revenues from the glass, paper, plastic, metal and wood packaging recycling system increased by 19.3 %, reflecting the full operation of the three collection systems for glass, paper, plastic, metal and wood packaging.

By category, energy taxes accounted for 76.6 % of total revenue from environmental taxes in 2021. Transport taxes accounted for 22.4 %. Resource and pollution taxes had an insignificant expression in the structure of environmental taxes (both 0.5 %).

4.6. Dimension Research, innovation and competitiveness

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 in implementing neutral and/or low-carbon technologies in its energy *mix*, in particular as regards European commitments, in particular 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, in promoting integration into new energy markets, and in promoting cooperation between countries allowing for the sharing of resources.

Over the last decade Portugal has pursued a policy of promoting renewable energy in the framework of commitments made at EU level, focusing in particular on water, wind, biomass, solar and geothermal energy, aware 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 energy from renewable sources.

This transition process required a mandatory paradigm shift in energy production, making it crucial 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 cross-border competition, supporting the creation of innovative energy service companies.

It has been a driving force for the development of the national economy. It has created a new employment-generating industrial and business sector, promoting regional development, driving exports of goods and services, driving innovation and research, able to attract international investment and stimulate the internationalisation of national companies. It has also significantly reduced external energy dependency.

In the framework of research and innovation, the implementation of international groups in the framework of the European Strategic Energy Technology *Plan (SET Plan)* in areas of carbon neutral and/or low-carbon technology for the application of technologies enabling effective decarbonisation at low costs, 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 Portuguese Multi-Level Strategy, which has promoted activity structured by themes and involvement of different *stakeholders*, in particular 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 promote inter-institutional cooperation and collaborative work.

However, further technological efforts, notably in solar and ocean energy, and the development of a broad portfolio of cost-effective renewable technologies will be necessary 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

⁵⁸A rate differs from a tax in the sense that public administrations use the revenue collected to establish some kind of regulatory function (such as checking the skills or qualifications of the entities involved or establishing management systems in various areas which tend, in the course of their activity, to cause negative externalities to society).

terms of greenhouse gas emissions and lower costs.

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 fluctuating and residual. The evolution of expenditure by predefined thematic areas in the period 2014-2021 is shown in Table 39, with total national expenditure at 1.68 % of GDP in 2021 accounting for energy expenditure 0.1 % of GDP.

Table 53 – National expenditure in R & I by thematic area (2014 – 2021) [Source: DGEEC, 2022. National Science and Technology Potential Survey 2021]

Year	Indicator	Total National	Thematic Area				
			Energy	Raw materials & Materials	Technology Output & Industry Process	Technology Prod. & Industry 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	2 585 100	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

Year	Indicator	Total National	Thematic Area				
			Energy	Raw materials & Materials	Technology Production & Industry Process	Technology Prod. & Industry Product	Water & Environment
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

Still overall, Table 40 illustrates the levels of spending by implementation sector and thematic area in 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 interest to Energy.

Table 54 – National expenditure on R & I by implementation sector and thematic area (2019 – 2021) [Source: DGEEC, 2022. Survey the National Scientific and Technological Potential 2021]

Year	Enforcement Sector	Indicator	Total National	Energy	Raw materials & Materials	Production & Industry Process technology	Technology Prod. & Industry 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 the existence of national competence in renewable energy technologies, but of modest expression in the registration of intellectual property resulting from R & I activity. This type of accounting excludes nuclear fusion and fission technologies because they are not considered under current and future national energy policy. The registration of patents prior to 2020 is shown in the following table:

Table 55 – 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	Production of Hydrogen	21
Wind generator	3	Solar collector	25	Tidal energy	8	Biofuel	6	Hydraulic energy	8	—	—	Store the suite de 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 de concentrates the	5	Oscillating water column	3	Biomethane	2	—	—	—	—	—	—

In the period 2020-2022, the INPI had the following patenting by renewable energy source (incl. utility models):

Table 56 – Patents registered by renewable energy source (2020-22) [Source: INPI, 2023]

Renewable energy source	No of registered patents
E. solar	4
E. Wind	2
Biomass	7
E. Water	1
E. geothermal	0

It is worth noting the growing importance of human resources in R & I activity, which is observed in the different implementation sectors. The table below shows the breakdown of research staff by sector of execution into Full Time Equivalent Units (FTE).

Table 57 – Breakdown of research staff by execution sector in the period: 2014-2021 [source: DGEEC, 2022. National Science and Technology Potential Survey 2021]

	Total	Companies		State		Tertiary 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 PLANNED POLICIES AND MEASURES

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 in accordance with Directive (EU) 2016/2284 in the framework of planned policies and measures

With regard to the projections for the development of total primary energy consumption towards 2030, it could be expected that, in view of the policies and measures planned to be implemented over the period 2020-2030, in particular the focus on renewable energies and the decommissioning of coal, consumption would continue on a declining path. However, the estimated increase in 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 as a result of the decommissioning of coal-fired thermal power plants, this energy carrier will no longer be present in the primary energy consumption mix, contributing significantly to the reduction of the energy bill. By 2030, Renewables will have the greatest weight in the energy mix, with more than 60 %.

Figure 57 – Estimated evolution of primary energy consumption towards 2030 (ktoe)



Figure 58 – Estimated evolution of primary energy consumption by source type towards 2030 (ktoe)

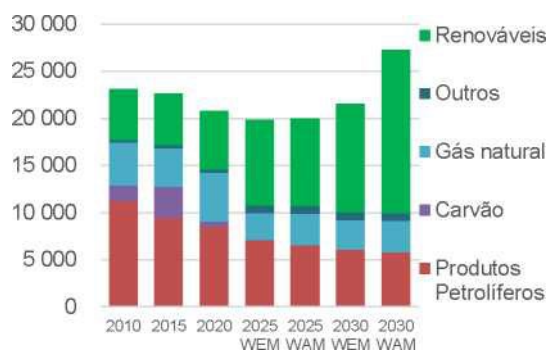
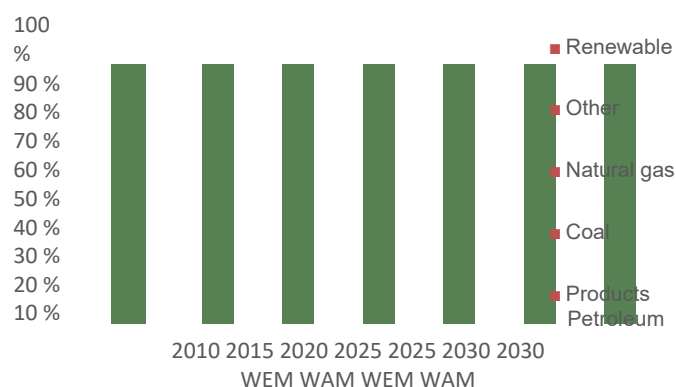


Figure 59 – Estimated evolution of primary energy consumption by source type towards 2030

With regard to the projections for the evolution of total final energy consumption towards 2030, the electricity consumption dedicated to the new green industry is expected to increase in the light of the policies and measures envisaged for this horizon. In addition to this, this estimate of increasing 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, appearing as new energy carriers, and heat consumption is expected to remain stable in the coming years. The opposite path will be oil products and natural gas, which will see their weight in the reduced energy mix in the current decade in line with the electrification of the economy and penetration of renewable gases such as Hydrogen.

It should be mentioned that the growing importance of renewable gases, in particular hydrogen, is beginning to gain a significant expression in the scenarios studied, as a result of the country's strong commitment to this energy carrier.

Figure 60 – Estimated evolution of final energy consumption towards 2030 (ktoe)

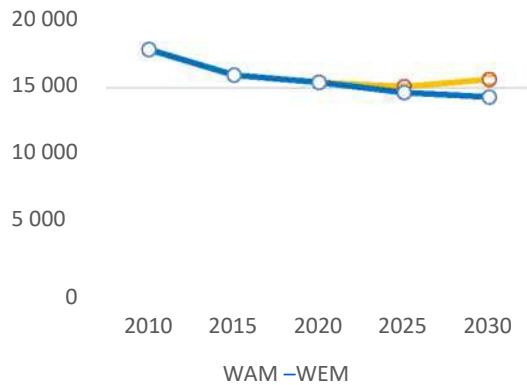


Figure 61 – Estimated evolution of energy consumption final by type of source in horizon 2030 (ktoe)

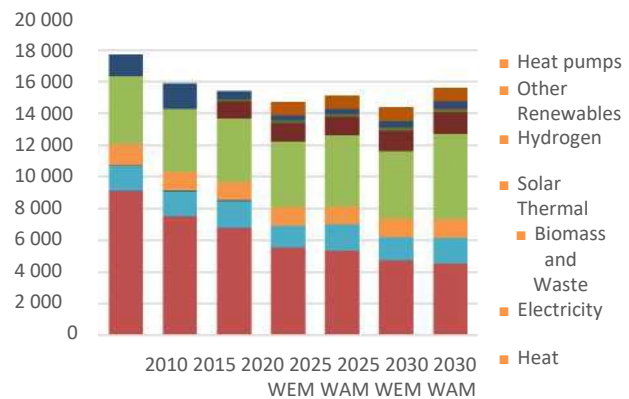
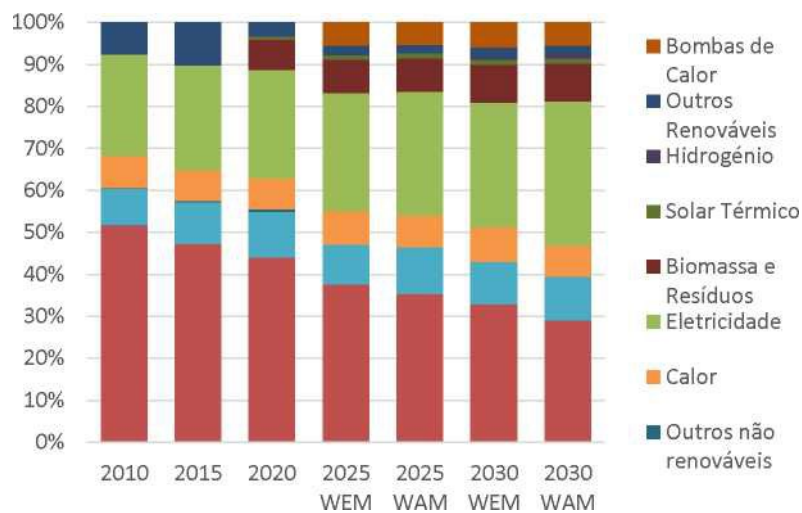


Figure 62 – Estimated evolution of final energy consumption by type of source towards 2030



Work on the revision of the PNEC2030 is taking place in parallel with the review of RNC2050, ensuring that short-term trajectories are consistent with the long-term perspective towards carbon neutrality. The review exercise of GHG emission projections focused in this first phase on reviewing the sectors of activity corresponding to the energy system, including the power generation and refining sector, transport, industry, buildings and agriculture (in the energy component). As a second step, the final version of the NECP to be submitted by June 2024 will review GHG emission projections from the remaining sectors, agriculture, forestry and other land uses and waste and waste water. This exercise will also allow to infer, the implications associated with the frontloading of the 2045 climate neutrality target, in line with the guidance set out in the Climate Law.

This new modelling exercise foresees, like the previous one that supported the development of NECP 2030 and RNC 2050, some of the expected impacts of climate change towards 2050, including changes in technology efficiency, demand for services and resource availability (e.g. reduced water availability or increased space cooling needs).

The preliminary results of this exercise allowed the re-examination of the national emission reduction potential, confirming the technical and economic feasibility of pursuing a decarbonisation trajectory towards 2030 towards carbon neutrality in 2050. The sectoral analysis of emission trajectories confirms that all sectors have a significant

GHG emission reduction potential, although the rates of reduction can be differentiated.

The analysis of the behaviour of the different sectors under the conditions set out in the With Existing Measures (WEM) scenario, as well as in the additional policy scenario (WAM), will help to identify critical factors, trends and behaviours of them over the considered time horizon.

The methodologies for estimating GHG emissions below are the same as in the NIR (*National Inventory Report*). For each of the sectors of activity, a specific methodology for projecting the respective activity variables was adopted, but supported by the same socio-economic reference framework, to ensure the consistency of the projections obtained and to infer the critical factors that determine the differences between scenarios. It should also be noted that for the purposes of the projections presented in the existing policy scenario, the policy instruments and measures approved and published by 30 June 2022 have been taken into account. The following is an overview of the preliminary results obtained in terms of sectoral GHG emissions for 2030 and 2040 under existing and additional policy scenarios, noting that for the agriculture, forestry and other land uses and waste and wastewater sectors, as well as F-Gases emissions, the estimates provided also relate to the estimates in the previous NECP (adjusted only for the global warming potentials corresponding to AR5).

Table 58 – GHG emissions projections by sector (kt CO_{2eq})

	Existing policy scenario			
	2005	2020	2030	2040
1. Energy	62 595	37 185	24 611	7 483
Energy industries, including electricity and heat production and refining (1A1)	25 508	10 375	3 525	1 227
Manufacturing and construction industries (1A2)	10 613	7 621	6 048	2 204
Fugitive emissions (1B)	631	1 092	1 009	721
Transport (1A3)	19 947	14 831	11 442	2 720
Services (1A4a)	3 037	968	932	0
Residential (1A4b)	2 784	2 230	1 655	611
2. Industrial processes and product uses (2)	8 378	7 213	3 418	1 535
3. Agriculture (3 and 1A4c)	8 290	8 617	8 151	8 215
4. LULUCF (4)	3 489	– 4 707	– 9 567	– 10 715
5. Waste and Waste Water (5)	7 226	5 015	3 668	2 597
Total without LULUCF	86 489	58 029	39 848	19 830
Total LULUCF	89 979	53 322	30 280	9 115

Existing Policy Scenario (WEM):

In 2016, the Portuguese Government undertook to ensure that its emissions were neutral by the end of 2050, so far adopting intermediate reduction targets of at least 55 % in 2030 and between 65 and 75 % in 2040 compared with 2005, resulting in even greater reductions for the energy system. In this sense, the WEM scenario already incorporates a number of measures aimed at achieving these objectives.

As can be seen, even under an existing policy scenario, and without the updated projections for all sectors, a sharp reduction in GHG emissions is already envisaged in the coming decades, with cost-effective potential for

Portugal to achieve total emission reductions of around 54 % in 2030 compared to 2005, amounting to 77 % in 2040 (without LULUCF).

In 2030, this reduction is largely due to the closure of coal-fired power plants and the strengthening of the role of renewables in the national energy mix, with a stronger impulse in solar photovoltaic. Thus, in 2030, the energy sector, without considering the energy component associated with the agricultural sector, has a GHG emission reduction potential of around 61 % compared to 2005 (and about 88 % reduction in 2040).

Major changes are also expected in the transport and mobility sector, with a high penetration of electric vehicles, which has the potential to reduce emissions from the sector by around 43 % in 2030 compared to 2005 and by around 86 % in 2040.

The services sector also has a strong potential to reduce GHG emissions, contributing to reductions of 69 % and 100 % respectively in 2030 and 2040, as a result of increased energy efficiency.

The residential and manufacturing and construction sectors have a lower decarbonisation potential over this time horizon, still pointing to a reduction of 41 % (around 78 % in 2040) and 43 % (around 79 % in 2040) respectively.

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 possibly more ambitious GHG emission reduction trajectory.

For the waste sector, agriculture (non-energy component), and for land use, land use change and forestry (LULUCF) activities, as well as F-Gases emissions, modelling work is still ongoing and the previous table therefore reflects past projections in terms of GHG emissions (adjusted only to the global warming potentials corresponding to AR5).

However, based on the results of the previous modelling exercise, and for the waste sector, the existing policy scenario already assumes the achievement of the target set in the Landfill Directive, so the projections of this sector are identical in both the existing policy scenario and the additional policy scenario.

As regards the LULUCF sector, it should be noted that the figures provided do not yet reflect the methodological review carried out in the national inventories and will be reflected in the final version of the NECP.

For the agriculture sector, the figures of the previous year indicated very minor reduction potentials in 2030, while taking into account the effect of cropland and pastures, further reductions are expected in that period.

In terms of F-Gases, the relevance of which in terms of emissions has been increasing in recent years, emission reductions of around 20 % in 2030 and 52 % in 2040 were already planned in the previous year. As with the waste sector, also in the F-Gases sector, the targets set out in the Kigali Amendment are assumed to be met, so the projections of this sector are identical both in the existing policy scenario and in the additional policy scenario.

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 have been considered. It should be noted, however, that this scenario of additional policies is associated with a very significant increase in energy demand resulting from several green industrial projects, while others are expected to be implemented in Portugal in the current decade. Thus, the results in terms of reducing GHG emissions from the energy system reflect the achievement of these projects. Although the results of the projections of both scenarios seem rather similar, it should be borne in mind that in the WAM scenario energy demand is much higher. However, it should be noted that the projects in question are based on the use of renewable energy and bring significant gains in terms of diversification of energy carriers towards *phase-out* of fossil fuel use.

In this scenario, and although the contribution of the remaining sectors has yet to be assessed, preliminary results point to a GHG emission reduction potential of around 55 % compared to 2005, amounting to 78 % in 2040 (without LULUCF), implying virtually full decarbonisation of electricity generation, and a strong reduction in emissions from mobility and transport and buildings by the end of the next decade.

In the case of transport, under this scenario, GHG emissions are expected to be reduced by almost half of what is

expected in 2030, with values for 2030 and 2040 of 46 % and 88 % respectively.

For the manufacturing and construction industry, reductions of around 45 % are expected in 2030 to 86 % in 2040, compared to expected improvements in process efficiency and in the use of cleaner fuels, incorporating more CDR and biomass, electrification and renewable gases, including green hydrogen.

In this context, it should be noted that the role of sink of forests and other land uses needs to be strengthened, and effective agroforestry management is a key factor in achieving the objective of neutrality in 2050.

For the waste sector, agriculture (non-energy component), and for land use, land use change and forestry (LULUCF) activities, including F-G emissions, and as with the existing policy scenario, modelling work is still ongoing for these sectors, the only change reflected in the table below, was the adjustment of the global warming potentials corresponding to AR5.

Table 59 – Potential GHG emission reductions compared to 2005 (%)

	EXISTING POLICY SCENARIO		ADDITIONAL POLICY SCENARIO	
	2030	2040	2030	2040
1. Energy	– 61 %	– 88 %	– 61 %	– 90 %
Energy industries, including electricity and heat production and refining (1A1)	– 86 %	– 95 %	– 83 %	– 95 %
Manufacturing and construction industries (1A2)	– 43 %	– 79 %	– 45 %	– 86 %
Fugitive emissions (1B)	60 %	14 %	45 %	– 29 %
Transport (1A3)	– 43 %	– 86 %	– 46 %	– 88 %
Services (1A4a)	– 69 %	– 100 %	– 64 %	– 90 %
Residential (1A4b)	– 41 %	– 78 %	– 35 %	– 86 %
2. Industrial processes and product uses (2)	– 59 %	– 82 %	– 60 %	– 74 %
	EXISTING POLICY SCENARIO		ADDITIONAL POLICY SCENARIO	
	2030	2040	2030	2040
3. Agriculture (3 and 1A4c)	– 2 %	– 1 %	– 4 %	– 5 %
5. Waste and Waste Water (5)	– 49 %	– 64 %	– 49 %	– 64 %
Total without LULUCF	– 54 %	– 77 %	– 55 %	– 78 %

Preliminary results also indicate that a trajectory of emission reductions of 90 % in 2050 compared to 2005 levels will lead to significant effects on renewables and energy efficiency and is thus expected to reach very high levels of renewables in final energy consumption.

These data are still preliminary results, which will be adjusted in the final version of the NECP.

ii. Assessment of interactions between policies (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 energy saving 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 Intergovernmental Panel on Climate Change's special report on the impacts of global warming of 1,5" indicates that ensuring this upper limit of global average temperature increase will lead in practice to significantly reducing the risks and impacts of climate change.

According to most studies, countries in southern Europe have greater vulnerabilities and fewer opportunities with climate change compared to other sub-regions on the European continent, and will suffer more from heat-related human mortality, water restrictions, habitat loss, cooling energy needs and rural fires. As an example of this, PESETA II59 has shown that the economic losses associated with the impacts of climate change have a very asymmetrical geographical spread, with a clear vision for the southern regions of Europe. In a scenario where the average temperature rises to 2 °C by the end of the century, this study concludes that welfare losses in terms of GDP range from 0.2 % in the Northern European region to 3 % for Southern Europe, to the last third of this century.

Portugal has seen the negative effects of climate change impacts in recent years, with the highest intensity and frequency of extreme weather events, such as intense weather events, frequent droughts, large rural fires, heat waves, as well as deteriorating coastal erosion.

In order to implement adaptation to these effects in an integrated manner and to prepare the country for possible more severe future scenarios, Portugal has a National Adaptation Strategy since 2010 (ENAAAC), supported on a sound scientific basis, which was revised in 2015 (ENAAAC 2020), focusing mainly on improving links between areas, particularly those of a cross-cutting nature, on integration into sectoral policies, and on the implementation of adaptation measures.

Recognising that the impacts of climate change have a strong territorial component, it follows that the implementation of adaptation should be carried out by local actors, which was one of the central aspects that led to the establishment of the Adapt programme. Funded by the EEA Grants and the Environmental Fund, it was an important milestone in the national adaptation process, leading to structuring projects such as Climadapt.local, which resulted in 27 municipal adaptation strategies and the Climate Portal, a climate cenarisation information base for Portugal. This programme has been a driver of many other projects, funded by European and national financial instruments, both in 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, the role of the Mission Adaptation to Climate Change being highlighted in this context60.

With a view precisely to putting emphasis on the implementation of adaptation measures, mobilising the various current financial instruments and defining the framework for the future, the Action Programme on Adaptation to Climate Change (P-3AC) was adopted in 2019 with a view to 2030, which sets out the priority areas for action in response to the main vulnerabilities and impacts identified for the national territory to climate change:

- Increasing the frequency and intensity of rural fires;
- Increase: of frequency and intensity de wavesde heat;
- Increase: of frequency and intensity de periods dedroughts which exacerbate water scarcity;
- Increase: of susceptibility to desertification;
- Increase: of maximum temperature;
- Increasing the frequency and intensity of extreme precipitation events;
- Sea-level rise;

59 Available here: <https://op.europa.eu/en/publication-detail/-/publication/0cc1b6b3-99ba-11ea-aac4-01aa75ed71a1/language-en>

60 Available here: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en

- Increased frequency and intensity of extreme events causing coastal galgading and erosion.

To counter the impacts and vulnerabilities of the national territory, the set of interventions with a direct impact on the territory was listed in 8 action lines and 1 line dedicated to supporting tools, 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 – structuring interventions in agricultural and forestry areas;
2. Implementation of techniques to conserve and improve soil fertility;
3. Implementation of good water management practices in agriculture, industry and the urban sector to prevent the impacts of 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 increase in maximum temperature;
6. Prevention of the installation and expansion of invasive alien species of vector-borne diseases and agricultural and forestry diseases and pests;
7. Reduction or minimisation of risks associated with flood and flood events;
8. Increasing coastal resilience and protection in areas at high risk of erosion and galgification and flooding;
9. Development of decision support tools, capacity building and awareness-raising.

In order to address the challenge of monitoring the effectiveness of adaptation measures in Portugal, P-3AC established quantitative targets for a set of indicators.

It should also be noted as relevant under this programme that there are a number 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), naturally-based solutions (green urban 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 thus reduce vulnerability to pressures from extreme events.

On the other hand, the impacts of climate change have also been taken into account in mitigation options, notably with regard to future water availability, heating and cooling needs and the risk of rural fires. This is how renewable energy projections accommodate 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 been estimated that water production will be reduced in combination with a decline in the average Hydraulicity Index of around 20%.

The highest cooling needs have also been taken into account in energy demand scenarios, in particular in the residential and services sectors.

In this respect, it is also particularly important 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 scenario of worsening the effects of climate change.

It is therefore 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 GHG levels in the atmosphere do not exceed a certain threshold, from which adaptation is no longer possible and society as we know it will no longer exist. The synergies between mitigation and adaptation that exist in a variety of measures are another sign that there is a real need for integrated action between the two strands across all components of society.

It should also be noted that the National Roadmap for Adaptation 2100 (RNA 2100) is under development, which aims to systematise and update the existing knowledge of Portugal's climate vulnerabilities, as well as to estimate the costs of economic sectors to adapt to the expected impacts of climate change in 2100. The project started in September 2020 and is expected to be completed in December 2023.

To achieve these objectives, the RNA 2100 project will generate a set of projections related to the impacts of climate change on the Portuguese economy in 2100, which will be carried out through three separate climate scenarios (RCP 2.6, RCP 4.5 and RCP 8.5). The risk assessment will also take into account the macroeconomic scope and its impacts and adaptation measures, as well as the costs of inaction.

The RNA 2100 will result in adaptation narratives for the various regions of Portugal with a view to revising the guidelines on adaptation to climate change for territorial planning plans and programmes, including sub-national strategies and plans.

The role of the Circular Economy

The role of the circular economy, which is the key and structuring argument of the transition that underpins 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, in particular with regard to mobility or increasing the uptake of secondary materials in the manufacturing process such as in the paper, glass and cement sectors, or the use of waste for the generation of energy sources.

The role of the circular economy and the various associated 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 objective of carbon neutrality in 2050, for which a significant impact of circularity is expected, in particular in the mobility, construction, agri-food, forestry and waste sectors.

As in the past, an assessment of the potential effects of circular strategies, e.g. on energy consumption, waste generation and carbon retention, will be carried out with the identification of the (sectoral) impact emission modelling variables.

Previous studies under RNC2050 show that in the mobility sector the circular economy transitions point to a lower use of individual transport, an increase in shared and multimodal mobility services (both in public transport and in private transport) and an increase in the occupancy rate of light vehicles.

This creates new business models that replace the supply of goods (vehicles) with the provision of services and ownership by use.

On the other hand, the increased digitalisation of supply chains (more online purchases, more reverse logistics) increases the demand for mobility of goods and also increases the pressure on this sector. It is counterbalanced that the load factor of heavy and light goods vehicles, fleet autonomy and the technological replacement rate of the fleet need to be increased, resulting in improvements in the efficiency of vehicles (passenger and goods, light and heavy). These concerns allow for more competitive business models with lower operating costs and lower impact on GHG emissions.

These changes, which are still limited at present, are beginning to gain space until 2030 and especially after that period.

Previous modelling has shown that in the agri-food sector, the adoption of more resource-efficient and regenerative agricultural practices such as water and energy, and new food consumption habits and lifestyles benefit the reduction of waste production and its organic fraction (by reducing food waste), as well as reducing emissions.

The expansion of organic farming, conservation and precision farming, as well as permanent pasture, will reduce emissions associated with the use of synthetic fertilisers and animal effluents, and will increase carbon sequestration resulting from increases in soil organic matter content (the use of compost to replace the use of synthetic nitrogen fertilisers is a measure of circularity).

Also in the forestry sector, increased active afforestation, the promotion of more resource-efficient forestry practices and risk management and the valorisation of ecosystem services leverage and underpin an increasing role for the bioeconomy, with an impact on carbon retention and net emissions. Future productivity gains could result from improved forest management practices and less fire losses.

The forest-based sector is a value chain that already has a high degree of circularity, with forests playing an

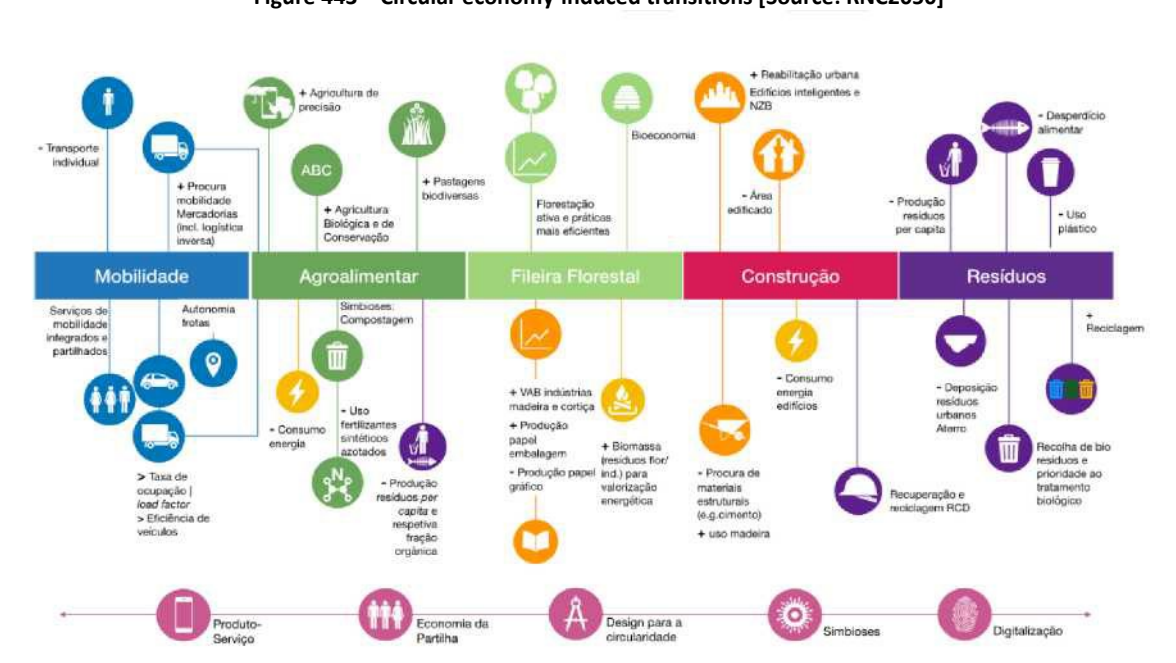
indispensable role in the decarbonisation process.

In construction, increased urban regeneration, with reuse of building components, recovered or recycled materials, and use of “empty” public built space, NZEB buildings, multifunctional 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 production 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 increased separate collection of bio-waste, an increase in multi-material separate collection, an increase in the number of separately collected streams and the development of recycling chains, along with minimising landfilling of municipal waste.

It should be noted that the review of the quantification of these circularity strategies is still ongoing at this stage.

Figure 443 – Circular economy-induced transitions [Source: RNC2050]



5.2. Macroeconomic and, to the extent feasible, health, environment, employment, education, skills and social impacts, including transitional aspects⁶¹

In terms of opportunities, a positive effect on GDP and employment can be expected and, even in a conservative scenario, the macroeconomic analysis carried out under the previous NECP 2030 and RNC2050 (which is still under review) points to an overall positive impact on GDP resulting from the almost total decarbonisation of the national energy system, leveraged by significant growth in investment and private consumption and a net, albeit marginal, gain of jobs, while there are still great opportunities for new business models and the creation of new clusters with the potential for net generation of more jobs, namely:

⁶¹In 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

- Renewable energy production; storage technologies and batteries; smart grids;
 - Electric vehicle value chain (including production, batteries, charging grid; logistics and related services associated with shared and autonomous mobility);
 - Green Hydrogen Economy Value Chain and other renewable gases;
 - Urban regeneration and associated technologies for improving the thermal comfort of buildings;
 - Automation engineering;
 - Value chain in agricultural production, including new technologies and precision farming;
 - Research, innovation and development associated with 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 are most impacted, 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, continuing the work that has been developed 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 ‘Verdes/ *Green Skills and Jobs* Work and Skills Programme’, which aims to reskill 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 obtained through avoided damage, e.g. on health and biodiversity, or their adaptation costs to climate change.

Co-benefits of decarbonisation and energy transition to air quality and public health

Many of the processes emitting GHGs are also responsible for the emission of other air pollutants that cause environmental problems such as degradation of air quality, acidification and eutrophication, causing damage to ecosystems with consequent loss of biodiversity and human health problems, in particular respiratory and cardiovascular health. 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 NO₂), sulphur dioxide (SO₂) and ground-level ozone (O₃) as the most harmful air pollutants. Ozone, unlike other pollutants, is not emitted directly but is a pollutant formed in the atmosphere in the presence of other pollutants, such as oxides of nitrogen.

As regards particulate matter, they originate from various sources, but mainly from the combustion of fossil fuels and biomass, and constitute the most harmful group of pollutants to health. The smaller these particles are, the more likely they are to penetrate deeply into the respiratory tract and the higher the risk of negative health effects. Smaller inhalable particles (PM₁₀ and PM_{2.5}) reach the lungs and the thinner PM_{2.5} even enter the bloodstream.

It should be noted that sulphur oxides currently do not represent a serious problem for air quality, as a result of various measures, such as a reduction in the sulphur content of fossil fuels.

On the other hand, nitrogen oxides come mainly from road traffic by combustion vehicles and in large cities is one of the main contributors to poor air quality. The implementation of land use planning, road traffic management measures and in particular those promoting sustainable mobility (as provided for 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 an increase in 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 Very Good and Good Air Quality Index compared to the

previous year and a 0.9 % decrease in the percentage of days classified ‘Fracó’ and ‘Mau’, indicating a slight deterioration in air quality status compared to 2020, as a result of the return to functioning of society and the economy closer to normal after the COVID-19 pandemic came to a halt.

The analysis for the period 2002-2021 shows a downward trend in the percentage of days classified as ‘Fracó’ and ‘Mau’, and decreased from around 17 % in 2005 to 1.9 % in 2021.

Despite the positive trend over the last two decades, air quality problems still persist in Portugal in some locations, mainly in densely populated urban areas, where concentrations exceeding the limit values for human health, in particular nitrogen dioxide (NO₂), are still observed. There are also areas where values above the long-term ozone target are common.

Estimates of health impacts attributable to exposure to air pollution⁶² indicate that PM_{2.5} concentrations in 2021 were responsible for around 238 000 premature deaths from long-term exposure in the EU-27. The estimated impacts of exposure to NO₂ and O₃ concentrations in the EU-27 in 2021 were respectively around 49 000 and 24 000 premature deaths per year.

Thus, although GHGs do not have a direct effect on human or ecosystem health, policies promoting their reduction are also expected to contribute to the reduction of other air pollutants in the face of convergence in their source sources.

Decarbonisation drivers will have an impact on economic activities and consequently on the generation of air pollutant emissions, and the energy transition and the carbon neutrality objective are therefore expected to bring co-benefits for improving air quality, with positive effects on human health, in particular for respiratory diseases.

This effect will be particularly relevant in cities due to the expected transformation in terms of mobility, with the strengthening of collective public transport and intermodality, the decarbonisation of fleets through the promotion of electro-mobility and the increase of active and shared mobility.

Positive impacts on ecosystems are also expected, where air pollution pressures hamper growth of vegetation and cause damage to agriculture and biodiversity, as they affect water and soil quality and consequently fauna and flora.

On the other hand, it identifies as trade-off for air quality, increased consumption of biomass for electricity production and industrial processes, and the use of alternative fuels in combustion motor vehicles with a possible impact resulting in an increase in emissions of non-methane volatile organic compounds (NMVOC), NO_x and fine particulate matter (PM_{2.5}), and others such as ammonia and methane as emerging pollutants, a situation which needs to be monitored.

As part of the ongoing review of the PNEC2030 and RNC2050, the review of emission estimates of other air pollutants will also be carried out, based on the same energy demand scenarios and some common measures for sectoral initiatives on air emissions.

Although preliminary figures are not yet available at this stage, the carbon neutrality trajectory associated with GHG emission projections is expected to be at the same time a potential for reducing emissions of other air pollutants in 2030 (compared to 2005).

In this context, and despite the need for further analysis, it is also expected that the conclusions reached that the industrial, transport and agriculture sectors, and the residential and service sectors will be the most relevant for action also in reducing emissions of other air pollutants will be maintained.

⁶² “*air quality in Europe*” – European Environment Agency Report, November 2022, available at: <https://www.eea.europa.eu/publications/air-quality-in-europe-2022>

5.3. Overview of investment needs

i. Existing investment flows and forward investment assumptions with regards to the planned policies and measures

Decarbonisation and energy transition represent a unique opportunity for the country to consolidate an inclusive and sustainable, people-centred development model 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 this work revising the NECP 2030 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.

Therefore, over the 2030 horizon, increased investment in GHG emissions reduction and energy transition will be needed, 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 is based, in the medium term, on a combination of the various policy options and measures identified above, as well as of modelled cost-effective technological options, seeking synergies between the various options.

The projections made, although preliminary, show that the planned decarbonisation and energy transition are achievable with current technologies, and the development of new technologies in the future will make it possible to achieve the objectives set faster and more effectively than is estimated today.

Decarbonisation and the energy transition will thus encourage a deeper and faster transformation of society, focusing more on the least emitting technologies, with consequences on multiple aspects of the economy, the daily life of citizens and social organisation. Thus, ultimately, the investment attributable to the objective of carbon neutrality and the energy transition is only a small fraction of the overall investment that the Portuguese economy will have to make over time in order to remain competitive.

Thus, the overall amounts of investment are also under review in view of the new prospects of increasing energy consumption from new industrial projects, while others are expected to be implemented in Portugal in the current decade.

According to its typology, this investment will also be shared between investments from households (e.g. more efficient household appliances, electric cars, insulation in homes, etc.), businesses (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 the fleet, etc.), with the private sector and households responsible for the majority of these investments.

The State will also have a key role to play in defining and adapting the regulatory, fiscal and incentive system providing clear long-term signals to facilitate and direct the investments needed for the upcoming transition and avoid stranded assets and the maintenance of subsidies considered harmful to the environment.

Overall, in the power generation sector, the gradual reduction in the use of fossil fuels and the increase in demand caused by the increasing electrification of the economy are expected to lead to significant investments in increasing renewable capacity (also taking into account that existing capacity will also reach its lifetime and need to be replaced). It is thus anticipated in this sector that much of the necessary investment will take place in the installation of solar capacity, in a first phase more focused on centralised solar plants and in a second phase in decentralised production (e.g. roofs of residential buildings and services) of photovoltaic energy and energy communities.

There are also investments in wind production, which are very focused in the first phase on onshore wind, also through retrofitting and over-equipping, and then in offshore systems, seeking to build on the existing resource in the national coastal zone with potential for this type of technology.

The mobility and transport sector will be one of those with the greatest technological substitution, which will account for a large part of the investment needs, mainly linked to the replacement of both passenger and freight vehicles. This high level of investment is due both to the need to reduce emissions by focusing on new energy carriers, such as electricity and green hydrogen, and to the relatively short lifetime of the assets involved.

In the residential and service buildings sector, most of the investment relates to the energy renovation of the national stock of existing buildings and the decarbonisation of energy consumption, including through enhanced electrification, increased energy efficiency of installed equipment and the use of renewable energy sources. Investments in building insulation will also be important, which will both increase thermal comfort and reduce the need for winter heating and cooling in summer, thus reducing energy poverty rates.

In the case of industry, where one of the main hubs for innovation is located, investments will be linked to the energy transition, with emphasis being placed on energy efficiency, renewable gases such as green hydrogen and electrification.

In addition to the investments identified as necessary in the energy system, account must also be taken of investments to be made in the agriculture and forestry sectors and in the waste and waste water sectors, which are, however, more difficult to account for 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 measures to reduce the generation of organic loads.

The development of new technologies and the improvement of existing low-carbon technologies will also require significant impetus for investment and research in innovation, which should be achieved through the adoption of an ambitious and broad-based agenda covering all stages of the technology development cycle to commercialisation.

ii. Sector or market risk factors or barriers in a national or regional context

Not available.

iii. Analysis of additional public finance support or resources to fill the gaps identified in the previous point

The Carbon Neutrality Roadmap 2050 identifies among its lines of action for 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 environment for sustainable finance and greater involvement of and monitoring of the financial system”.

Moving towards a carbon-neutral society based on a model of circularity and implementing the associated energy transition means boosting investment in the various sectors of activity, ensuring social fairness in the way this investment is implemented and financed. Investment in these areas will generate greater economic momentum and foster the creation of new jobs.

At international level, it is noted that, in order to comply with the Paris Agreement, the scale of investment required means that it must have 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 insufficient public funds for investment needs.

This is why there is an international momentum for redirecting financial flows towards the energy transition and a carbon-neutral economy and several forms of financing have already emerged in recent years.

In this context, the Action Plan on Financing Sustainable Growth, proposed by the European Commission in 2018 (COM (2018) 97 final), aims to reorient capital flows towards sustainable investments, manage financial risks stemming from climate change and promote transparency and long-term vision in economic and financial activities. It appears that the European States are gradually moving towards the issuance of Green Bonds, as these

are a clear sign 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 financing for decarbonising the economy, which sets out the commitment to allocate 25 % of the overall spending budget to climate action. In this regard, the preparation of the funding framework for the period 2021-2027 should translate the guidelines set at European level and be one of the main sources of funding for this plan.

Alongside the Multiannual Financial Framework 2021-2027, the investment programme NextGenerationEU, aimed at the EU's economic recovery from the COVID-19 pandemic, is a key source of funding for the achievement of the targets set in the European Green Deal, as around one third of the total value of EUR 1,8 billion aims at further decarbonising 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 38 % of the overall value of investment is expected to be allocated to reforms and investments that contribute to tackling climate change.

At national level, the National Investment Plan (NIP) 2030, which enshrines decarbonisation of the economy as one of the structural areas, should also be highlighted, covering more than 60 % of investment in areas contributing to these objectives, including transport and mobility, environment and energy.

At the same time, the Climate Basic Law (Law No 998/2021 of 31 December 2009) recognises that boosting sustainable finance is crucial, given the importance of the financial sector, including through private investment, in order to achieve the climate transition. Accordingly, it is set out in the above-mentioned Act that fiscal and tax policies at national level should phase out by 2030 subsidies set out in national legislation, direct or granted through tax advantages, related to fossil fuels or their use such as dedicating green tax revenues towards decarbonisation, just transition and increasing resilience and adaptive capacity to climate change and enhancing the application of the carbon rate and by applying increased taxation on the use of resources.

Tax policy also plays a prominent role in the expected transition, which should be designed to reflect real costs, address key social and environmental costs by internalising externalities, and influence behavioural change as a key determinant of 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 allowing the generation of public revenues that can be used for decarbonisation measures and ensuring a just and fair transition. Green taxation should therefore be pursued with the aim of achieving fiscal neutrality and a threefold dividend, protecting the environment and reducing external energy dependency, fostering growth and employment, and contributing to fiscal responsibility and the reduction of external imbalances.

The reform of green taxation was enshrined in Law No 82-D/2014 of 31 December 2009, amending a set of tax and environmental standards in the energy and emissions sectors, transport, water, waste, spatial planning, forests and biodiversity, and introducing a system of taxation of plastic bags.

The principle that the revenues generated by climate policies are channelled to ensure the financing of the transition to a carbon-neutral economy is basic. It should be noted that the decarbonisation of the economy benefits from a set of relevant revenues generated by climate policy, with a focus on auctioning revenues under the EU ETS scheme and allocated to the Environmental Fund, allowing to recycle revenues, for example, to finance the Support Programme for Tariff Reduction in Public Transport (PART), the Support Programme for densification and Strengthening the Public Transport Offer (PROTransP) and to reduce the tariff deficit through transfers to the National Electricity System.

In this context, the Environmental Fund, and most 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 the incentives appropriate to the objectives of this plan in its investment policies and in the supply of new financial products, so that the private sector can access the financing needed to make investments and acquisitions for a society that is tending to decarbonise.

Portugal is committed to redirecting financial flows towards promoting decarbonisation and the energy transition, in particular by fostering the development of a favourable framework for sustainable finance and greater involvement of the financial system in these themes in the current decade. In this context, the contribution of the Sustainable Finance Reflection Group, set up in 2019, coordinated by the Ministry of the Environment and Climate Action, in partnership with the Ministry of Finance and the Ministry of Economy and the Sea, and which included the main public and private actors in the financial sector in Portugal, should be noted, with the support of the Bank of Portugal.

The Reflection Group identified the key areas and a set of recommendations⁶³ included in the “Guidelines for accelerating sustainable finance in Portugal”, which identifies key areas and recommendations in this area, with different timeframes, so that the national financial sector can help speed up this transition process. The active participation and consensus reached between the 20 institutions of the Reflection Group led to the signature of the “Commitment Charter on 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, 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 board level, with a view to taking these risks and opportunities into account in the definition of their strategies;
- Promote training in sustainable finance for its staff at the various levels of the organisation (including the Board of Directors), focusing 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 these criteria and accept the possibility of creating a green SME or sustainable SME category;
- 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 greatly contribute to the success of sustainable finance in Portugal, notably by the Bank of Portugal, the Portuguese Securities Market Commission, the Insurance and Pension Fund Supervisory Authority, the Portuguese Banking Association, the Portuguese Insurance Association, the Association of Emittent Securities Companies in the Market, the Portuguese Association of Investment, Pension and Capital Funds, and the Ministry of Environment and Climate Action, the Ministry of Economy and Digital Transition and the Ministry of Finance. Finally, in order for the potential for investment and thus 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 the present review of the NECP 2030, the vision, objectives and targets and main lines of action that will determine the evolution of the national economy in the medium to long term are strengthened.

Thus, in order to achieve the objectives set out in this plan and to align the economy with a carbon neutrality trajectory, the following guidelines are laid down:

- Make full use of the current Multiannual Financial Framework 2021-2027 and other funding sources at EU level to steer the next funding cycle towards the decarbonisation of society and the energy transition, avoiding financing investments that are not in line with this objective;

⁶³ Guidelines for accelerating sustainable finance in Portugal, July 2019, available at https://www.fundoambiental.pt/ficheiros/b1-linhas_orientacao_financiamento_sustentavel_ptvf-pdf.aspx

- Align national public funds with the objectives set out in this plan, integrating criteria related to the objectives of this plan into the different funding lines;
- Orienting 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 the ongoing work at European and national level to integrate sustainable finance into the activity of financial institutions.

The Programme of the XXIII Constitutional Government identifies climate change and energy transition as one of the key strategic challenges, on which it is expected that millions of euros of investment will need to be mobilised over the current decade, requiring alignment of policies, incentives and means of financing, enabling effective emission reductions, while promoting employment and innovation. In addition to the energy transition, sustainable mobility, the circular economy and the valorisation of the territory are identified as strategic agenda themes, where the commitment to rail can be identified, the need to review green taxation mechanisms linked to pollution and resource use and the promotion of smart and sustainable cities, as important measures of these three climate change objectives.

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 seven years. Under this new budget, EU funding will be geared towards new priorities, reinforced across 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 for the Environment and Climate Action

Programme for Environment and Climate Action, focused on developing and implementing innovative ways to address environmental and climate challenges, such as clean energy transition and climate change mitigation and adaptation. 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, thus in the next multiannual financial framework the climate action area is worth more than EUR 1,9 billion, of which EUR 947 million are expected to support projects in the field of climate mitigation and adaptation and EUR 997 million will support projects targeting the Clean Energy Transition.

In addition to its direct achievements, LIFE will also act as a catalyst for other funds.

Funding will focus on environmental protection and climate change mitigation, support the clean energy transition to increase energy efficiency and renewable energy in the range of energy sources. It is one of the instruments that will support the EU in meeting its climate objectives, 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 enhanced climate change mitigation:** the programme focuses in particular on the funding needed to achieve the key policy objectives in line with the EU's long-term strategic 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;
- **Increased attention to nature protection and biodiversity:** traditional elements of LIFE, new strategic

nature protection projects specialising and targeting 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 all 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. The Sustainable Development Goals are embedded 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 that combat climate change and contribute 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 of the funds from the ERDF, the Cohesion Fund and the 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-emission transport system, and the preservation of biodiversity.

InvestEU

The InvestEU Programme (2021-2027) aims to mobilise public and private funding to pursue strategic investments in the framework of European policies. At the same time, it assumes compliance with investment sustainability requirements and helps to steer capital flows towards sustainable investment.

This programme will bring together a multitude of currently available EU financial instruments under the same roof, 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 of 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 in case the guarantee needs to be called.

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 EUR 4 billion.

The EIB will continue to be 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 to deliver on 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 the 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 enhancing 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, through its actions, 60 % of its overall allocation to climate objectives, taking into account the following coefficients:

- i) 100 % for expenditure relating to railway infrastructure, charging infrastructure, alternative and sustainable fuels, clean urban transport, electricity transmission, electricity storage, smart grids, CO₂ 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.

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 to ensure 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) 2021/2116 repealing Regulation (EU) No 1306/2013 on the financing, management and monitoring of the CAP;
- Regulation (EU) 2021/2115 establishing rules on support for national CAP Strategic Plans and repealing Regulations (EU) 1305/2013 and 1307/2013;
- Regulation (EU) 2021/2117 amending Regulation (EU) No 1308/2013 establishing a common organisation of agricultural markets; Regulation (EU) No 1151/2012 on quality schemes for agricultural products; 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 approach of the CAP, based on performance and results, is more flexible and takes into account local conditions and needs, while increasing the EU's ambitions in terms of sustainability. It has an overall budget of EUR 386,6 billion, broken down into two funds (often referred to as "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 structured around ten objectives, which also form the basis for MS to design their national strategies – the CAP Strategic Plans (PEPAC), namely: ensure a fair income for farmers; increase competitiveness; improve the position of farmers in the food chain; action against climate change; protection of the environment; preserving landscapes and biodiversity; supporting generational renewal; promote vibrant rural areas; protecting the quality of food and health; and to promote knowledge and innovation.

Portugal's strategy set out 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 whole territory, based on innovative and sustainable agricultural and forestry production. This strategy implements the CAP instruments financed by the EU through EAGF and EAFRD, through direct payments, sectoral measures for fruit and vegetables, vineyards and beekeeping, and rural development instruments.

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 driver of economic growth and jobs.

This programme, with a budget of EUR 95,5 billion, aims to generate 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 Union 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 into societal challenges, reinforces technological and industrial capacities and sets out EU-level missions with the ambitious objective of tackling some of the biggest problems in the EU, notably 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 demonstration projects for innovative low-carbon technologies, focusing on:

- Innovative low-carbon technologies and processes in carbon-intensive industries, including substitution of carbon-intensive products;
- Carbon capture and utilisation (CCU);
- Construction and maintenance of carbon capture and storage;
- Innovative renewable electricity generation;
- Energy storage.

The revenues of this fund come from the auctioning of allowances under the EU ETS, with 450 million allowances allocated between 2020 and 2030, including in addition the unspent funds from the NER 300 programme.

It is estimated that the Innovation Fund could amount to up to EUR 38 billion, depending on the carbon price at the time of monetisation of emission allowances.

The Innovation Fund is a key element to achieve the goal of a carbon-neutral Europe by 2050 and to comply with the Paris Agreement.

Modernisation Fund

Following the revision of the EU ETS Directive as part of the *Fit for 55* package, Portugal will become one of the new MS benefiting from this fund to support the modernisation of energy systems and the improvement of energy efficiency in Member States with lower GDP *per capita*. This will make it possible to finance investments in renewable energy, energy efficiency, storage and energy networks and in promoting the just transition in territories whose economy was previously based on industrial or other high-carbon emitting activities. In order 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 a State aid authorisation. In terms of distribution of support, Portugal will receive 8.8 % of the total value of this fund between 2024 and 2030, corresponding to around EUR 17 million.

Social Climate Fund

The Social Climate Fund will support the most vulnerable households, micro-enterprises and public transport users in view of 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 having access to approximately EUR 1,03 million by submitting 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 reliance 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 mechanism consists of loans, loan guarantees or heritage type financing, typically between EUR 7,5 and 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 facility is complemented by the European Investment Bank.

Just Transition Fund

Under the Just Transition Fund Portugal has, in the period 2021-2027, a total of 223,8 million 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 regions that until then are economically dependent on coal- or oil-based energy production industries. In view of the cessation of coal-fired power generation at 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 essential to promote the economic development of these three regions and the diversification of their economic activities.

Thus, in 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 renewable energy, agri-food and tourism and sustainable mobility. As such, the Fund is expected to create around 200 new jobs and support the reorientation of workers in the region affected by the closure of coal-fired power plants through training and retraining. 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 dependency on Russia by 2027. To this end, MS should add a dedicated REPowerEU chapter to their RRP 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 the clean energy transition. This programme will thus enable 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 EUR 704,4 million.

The European Investment Bank

The European Investment Bank (EIB) is the largest multilateral financial institution in the world and is among the largest contributors to climate finance. The EIB is the lending Bank of the European Union and aims to finance projects contributing to the achievement of the objectives of the European Union. The EIB has recently established itself as the European Climate Bank, following the approval of an energy lending policy which has explicitly phased out financing for fossil fuel infrastructure as of 2021. The EIB is also the largest shareholder in the *European Fund for Strategic Investments* (EFSI), which finances investments in small and medium-sized enterprises.

The EFSI is one of the three pillars of the Investment Plan for Europe and aims to overcome current market failures by addressing market failures 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

EEAs Grants are a multi-annual financial mechanism through which Iceland, Liechtenstein and Norway financially

support Member States in 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 2014-2021, the EEAs Grants aim to reduce economic and social disparities in 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. With regard to the Environment Programme, the EEA Grants have supported programmes in the field of Climate Change Mitigation and Adaptation to promote energy efficiency of buildings and reduce GHG emissions and water management and develop adaptation plans respectively. In the period 2021-2022, EEAs Grants supported with EUR 1,008 million 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 national funds aimed at supporting the decarbonisation of the economy and the energy transition, offering some financing possibilities that are available to the public and private sector.

The implementation of this plan will entail stepping up the action of the funds identified with a focus on the objectives set, together with close links between the different sources of funding, with a view also to boosting the use of European funds.

Environmental Fund (EF)

The purpose of the Environmental Fund is to support environmental policies in pursuit of the objectives of sustainable development by contributing to the fulfilment of national and international objectives and commitments, including those relating to climate change, water, waste and nature and biodiversity conservation.

This instrument funds non-refundable projects contributing to public environmental policies through applications that are made in the light of the notices. The beneficiaries of this fund may be: companies, NGOs, public authorities, municipalities, foundations among others. In each notice, the 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. Among the projects supporting the decarbonisation of the economy, the Mobility Support Programmes such as the Programme to Support the Reduction of Public Transport Charges (PART), which through a co-financing rate of 100 % of the candidate projects made available in 2021 more than EUR 141 million, the Programme to Support the densification and Strengthening of Public Transport Provision (PROTransP), which through a co-financing rate of 100 % of the applicant projects made available. 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 – construction of cycle paths under the Cyclable PT, which, through a co-financing rate of 75 %, provided EUR 3,5 million, the programme to support electric mobility in public administration, which was part of the ECO.mob programme, which provided around EUR 3,09 million and finally the Programme for Incentives for the Purchase of Nile Emission Vehicles with a total value 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-fired power plant for a total of EUR 3,5 million. In addition, in the context of climate change mitigation, the FA also provides for aid measures in favour of installations covered by the EU ETS scheme, 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 House Efficient 2020 Programme were included in the FA 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 2006 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 (ETCs) and the business fabric and to empower the more efficient use of resources, 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, created by Decree-Law No 16/2016 of 9 March 2006, as amended by Decree-Laws No 123/2021 of 30 December 2006 and No 84/2019 of 28 June 2009, aims to develop the economy of the sea, scientific and technological research, protection and monitoring of the marine environment and maritime safety, by creating or strengthening mechanisms for financing entities, activities or projects that meet the objectives laid down in the relevant legislation establishing the Blue Fund.

National Edified Rehabilitation Fund (FNRE)

The National Rehabilitation Fund for Buildings (FNRE) is a special closed-end and private underwriting investment fund aimed at the development of real estate rehabilitation projects with the predominant purpose of renting for permanent housing in order to provide housing on terms. The main objective of the FNRE is to develop and implement real estate rehabilitation projects for the promotion of renting, in particular housing, with a view to urban regeneration and repopulation of urban centres, with the aim, in the medium and long term, of increasing the value of investment. The FNRE may receive funds from the Social Security Financial Stabilisation Fund (FEFSS) and may draw on other sources and forms of funding.

Recovery and resilience plan (RRP)

In the Recovery and Resilience Plan, planned investments until 2026 for the climate transition amount to approximately EUR 3,06 billion, broken down into the following components: C10. Sea: EUR 252 MILLION, C11. Decarbonising Industry: EUR 715 MILLION, C12. Sustainable Bioeconomy: EUR 145 MILLION, C13. Energy Efficiency in Buildings: EUR 610 MILLION, C14. Hydrogen and Renewable Gases: EUR 370 million and C15. Sustainable Mobility: EUR 967 MILLION. In addition, it is important to highlight the components that incorporate investments relevant to the climate transition, namely C8. Forests: EUR 615 million and C9. Water Management: EUR 390 MILLION.

POSEUR

The Operational Programme Sustainability and Efficiency in the Use of Resources (POSEUR) corresponds to one of the 16 programmes established 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 on promoting greater resilience to climate risks and disasters (Axis 2). In this context, and with EUR 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, the same year supported projects worth 390 million climate change adaptation and risk prevention projects (Axis 2) and with a value of EUR 879 million for resource efficiency projects (Axis 3).

Portugal 2030 – Programme for Climate Action and Sustainability – Sustainable 2030 (PACS)

The PACS, created by 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 achieve carbon neutrality in 2050. This programme foresees 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 mechanisms

The Financial Instrument for Urban Rehabilitation and Revitalisation 2020 (IFRRU 2020) is a financial instrument with the aim of 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 to this end. **The Reabilitar programme to rent – affordable housing – provides** for the financing of rehabilitation operations for buildings aged 30 years and over, which after rehabilitation should be predominantly used for residential purposes, while in the case of the “affordable rent”, the tranches are intended for rental on a conditional rent basis.

The Plan to Promote Efficiency in Electric Energy Consumption (PPEC) aims to promote measures to improve the efficiency of electricity consumption through action taken by the various players in the sector (from suppliers to consumers).

FINANCING THROUGH THE PRIVATE FINANCIAL SECTOR

The international momentum around sustainable finance has led to the development of new green financial products. It can therefore be 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:

Green Bonds – Green Bonds are any type of bond instrument where the value of the debt raised will be used exclusively to finance or refinance, in part or in full, new and/or eligible green projects. The definition of eligibility of projects is normally provided by the International Capital Market Association (ICMA) Green Bond Principles. This market has been growing since 2018, when the total value of green bonds issued globally reached USD 167,3 billion, with the United States, China and France responsible for 47 % of green bonds. A political agreement between the European Parliament and the Council was reached in February 2023 on the Commission proposal for a European Green Bonds Regulation, or EU Green Bonds in English (EUGBs). This Regulation sets out a regulatory framework that will allow interested companies and public authorities to raise financial resources on the capital market to finance their green investments. In this way, 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 finance for green projects and technologies, and green bond issuance is expected to increase significantly in the future, as investors have been reacting positively to companies and countries presenting these options in capturing investments.

- **Green Loans:** Green loans are any type of loan instrument made available exclusively to finance or refinance, in whole or in part, new projects, and/or existing eligible green projects. These green loans consist of the allotment 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 set and agreed between the lender and the funded one. 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 spread in a number of international banks which offer companies the possibility to take out a green loan which, being directed at the generic operation of the company (and not at a particular technology or project as in the Green Obligation), may see its interest lower 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 in the choice of their assets. In other words, they are funds seeking to acquire shares and/or corporate bonds that have demonstrated sustainability practices. These funds are growing rapidly, with 53 % of European funds having some kind of environmental, social and governance criteria in the structuring of their portfolio. Globally, only 26 % of funds have some kind 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 philanthropists and foundations, who want to invest in projects that generate a positive environmental and social impact, and which also generate some form of financial return.
- **Blended Finance:** Another emerging concept of financing is Blended Finance and has emerged to

catalyse the mobilisation of additional capital for sustainable development-related investments. 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. commercial viability for the private investor.

The investment dynamics associated with the decarbonisation of the economy and energy transition are also an opportunity for innovation in the financial sector by creating 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 the investment and to attracting new customers.

5.4. Impacts of planned policies and measures in other Member States and on regional cooperation

i. Impacts on the energy system in neighbouring MS and other MS in the region (*)

For the energy systems, considering the objectives and targets and the related policies defined, 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 Spanish energy system (as neighbouring MS).

The impact on other EU Member States is conditioned on the level of integration of the Union’s internal market, where for this level ever increasing, 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 (defined in Chapter 2 and 3 respectively), they will bring more maturity and liquidity to these markets with positive impacts, for example on energy prices.

It should also be noted that increasing technological maturity, with a consequent reduction in investment costs for its installation, as well as the implementation of tax/tax measures, tariffs and system costs may have an impact on the functioning of markets with a consequent impact on energy sales prices.

iii. Where relevant, impacts on regional cooperation

Not available at this stage.

Annex I

Table – Cost of key electricity generation technologies considered in the TIMES_PT model (prices EUR 2016)

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/k W	EUR/GJ	EUR/GJ	EUR/GJ	EUR/GJ
Natural gas															
Conventional Coupled 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)
Combined Advanced 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)
Cycle gas combined with CO2 capture p 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															
Water wire hydropower		70	1 450,00	1 339,00	1 226,00	1 209,00	15,00	13,00	12,00	12,00					(1)
Hydroelectric 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)
Hydroelectric 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)
Hydroelectric Barrage with pumping		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 Geothermic 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)
Geothermal hydrothermic with flash		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 wind flow		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															
Waves – 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 Telhado Panel (crystalline wall) – Residential		30	1 409,00	1 345,00	1 299,00	1 245,00	31,00	31,00	31,00	31,00					(5)
Solar Telhado Panel (crystalline wall) – 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															
Reference PTC 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)
Reference PTC Central – 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 data 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). EC_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 – Cost of key transport technologies and power generation mobility considered in the TIMES_PT model (prices EUR 2016)

Vehicle category and typology	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
Petrol Hybrid Vehicle	20,51	20,51	20,51	0,62	0,62	0,62	645,2	711,7	793,7
Plugin Hybrid/Gasoline vehicle	20,47	20,21	20,21	0,20	0,20	0,20	1 000,0	1 089,9	1 186,0
Diesel 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
Petrol Hybrid Vehicle	20,77	20,78	20,79	0,62	0,62	0,62	684,9	751,9	833,3
Plugin Hybrid Vehicle/Gasoil	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 (gas) VCI	89,07	61,86	36,70	2,67	1,86	1,10	614,5	680,9	754,5
ICV to Hydrogen (liquid)	89,07	61,86	36,70	2,67	1,86	1,10	645,4	715,1	792,3
Hydrogen/Fuel Cell vehicle	44,17	32,32	23,47	0,44	0,32	0,23	862,1	947,9	1 052,6
Plugin Hybrid Vehicle/Hydrogen Gas	41,67	30,41	27,61	0,42	0,30	0,28	1 097,2	1 196,9	1 307,3
Natural Gas Hybrid Vehicle Compressed	23,00	23,00	23,00	0,69	0,69	0,69	632,9	699,3	781,3
Motto									
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 – Petroleum Vehicle	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 Vehicle	444,27	316,48	275,45	14,27	12,02	9,77	234,1	248,6	263,1
Interurban Bus – Gasolina vehicle	286,73	281,43	276,14	7,90	7,91	7,92	98,8	103,3	107,9
Bus Urbano – Petroleum Car	286,73	281,43	276,14	7,90	7,91	7,92	62,8	64,3	65,8
Urban Bus – Natural Gas Vehicle	382,30	375,24	368,19	8,45	8,31	8,16	31,7	32,4	33,2
Bus Urbano – Hydrogen/Fuel Cell Vehicle	444,27	316,48	275,45	14,27	12,02	9,77	124,9	128,2	131,5
Bus Urbano – Gasolina vehicle	286,73	281,43	276,14	7,90	7,91	7,92	50,3	51,4	52,6
Bus Urbano – Hybrid Hybrid Vehicle/Gasoil	409,79	403,19	396,59	12,44	11,89	11,71	92,8	93,7	94,0
Bus Urbano – Electric Vehicle	340,49	301,41	262,33	13,34	12,76	12,57	208,9	210,3	210,8
Heavy Goods									
Diesel vehicle	190,67	187,21	186,93	5,72	5,62	5,61	105,4	118,3	131,2
Petrol Hybrid Vehicle	208,10	208,29	208,49	6,24	6,25	6,25	107,8	118,1	127,8
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

Vehicle category and typology	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
Dimethyl vehicle Éter	217,17	213,50	209,84	6,52	6,41	6,30	105,4	118,3	126,3
Hydrogen/Fuel Cell vehicle	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
Petrol Hybrid Vehicle	212,78	212,86	212,92	6,38	6,39	6,39	93,7	105,5	115,5
Etanol vehicle	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 – Overhead contact line	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
Petrol Hybrid Vehicle	20,51	20,51	20,51	0,83	0,79	0,77	645,2	711,7	793,7
Plugin Hybrid/Gasoline vehicle	20,47	20,21	20,21	0,88	0,88	0,86	1 000,0	1 117,3	1 265,8
Diesel 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
Petrol Hybrid Vehicle	20,77	20,78	20,79	0,84	0,81	0,79	684,9	751,9	833,3
Plugin Hybrid Vehicle/Gasoil	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 (gas) VCI	89,07	61,86	36,70	0,94	0,94	0,92	614,5	680,9	754,5
ICV to Hydrogen (liquid)	89,07	61,86	36,70	0,94	0,94	0,92	645,4	715,1	792,3
Hydrogen/Fuel Cell vehicle	44,17	32,32	23,47	1,22	1,07	0,94	862,1	947,9	1 052,6
Plugin Hybrid Vehicle/Hydrogen Gas	44,17	32,32	23,47	1,01	0,96	0,94	1 353,8	1481,1	1 622,2
Natural Gas Hybrid Vehicle Compressed	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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