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PRELIMINARY DRAFT UPDATE

CONSOLIDATED NATIONAL PLAN OF CYPRUS ON ENERGY AND CLIMATE OF CYPRUS

2023

Nicosia, v. 1.8, 27/7/2023

Table Of Contents

Part 1

SECTION A: NATIONAL PLAN

1. PROJECT OVERVIEW AND DRAFTING PROCESS

1.1. Short presentation

i. Political, economic, environmental, and social context of the plan

The global health crisis of 2020, the economic fallout of the war in Ukraine and the protracted high import inflation of the last year have created significant challenges for the Cypriot economy. Proofing the health system and supporting vulnerable groups of the population, businesses and self-employed people were among the priorities of the government. The need to promote energy security by diversifying energy sources became even more pronounced with the war in Ukraine, while continued price increases have forced the government to take additional measures to curb the inflation phenomenon.

The government's continued commitment to pursuing prudent fiscal policies and pursuing required structural reforms has brought the economy back on a growth path in 2021, reaching 6.6 % GDP growth. The positive performance of the economy continued in 2022, above the EU average, showing a positive growth rate of 5.4 % of GDP and a downward trend in the unemployment rate.

Despite the successful response to the successive crises and the flexibility shown by the state to respond to them, significant challenges remain, related to achieving environmentally sustainable economic growth and digital transformation, the high level of non-performing loans relative to other EU Member States, despite their significant decline over time, a better link between education and training and labour market needs and relatively low levels of productivity.

Continuing systematic and coordinated efforts, both by the state and by all actors of economic and social activity, to improve the conditions for stability, competitiveness and resilience of the economy, is particularly important.

In this context, the government is moving forward with the adoption and implementation of a new integrated and long-term sustainable development model, consisting of practical actions with economic, social and environmental aspects. The aim of the new model is to make Cyprus one of the best places to live, work and operate.

Making effective use of EU financial tools is a priority for the government in its efforts to address the economic and social impact of the recent crises it has faced, as well as in efforts towards the green transition while leaving no one behind. In particular, the Recovery and Resilience Plan and the RePowerEU chapter promote significant green investments that overall aim to change the growth model of the Cypriot economy towards the green transition, and in a way that is consistent with the new, more ambitious objectives of the Green Deal and in particular the 'Fit-for-55' legislative package.

The European Green Deal has given a strong boost to raising the level of ambition for energy and climate, leaving no one behind. With the European Climate Law, the objectives of achieving climate neutrality at EU level by 2050 and reducing net greenhouse gas emissions by at least -55 % by 2030 compared to 1990 have become a legal obligation. These targets are significantly more ambitious than those on which Member States relied for the preparation of the initial NECPs.

Current situation

The first Cypriot National Plan was submitted to the European Commission in 2020, after approval by the

Council of Ministers[1]. In order to prepare the National Plan, the National Governance System for Climate and Energy was established and operated[2], which then became the National Governance System for the Green Deal[3].

Although the full implementation of the National Plan was expected to achieve the above objectives, on the basis of recent emission inventories, there appeared to be a significant divergence. In particular, according to the greenhouse gas emission inventory report of March 2023, for the year 2021, which is the first year of the implementation period of the national plan and Regulation (EC) No 2018/842[4] on national reduction targets, actual emissions were found to exceed the relative distribution for 2021 by 202 Gg CO_2 eq (4 275 Gg CO_{eq} while the target is 4 073 Gg CO_2 eq.). This overshoot from a preliminary analysis is due to the failure to implement effective policies and measures in particular in the areas of transport and waste management.

Need for revision

In accordance with the Governance Regulation[5], Member States may submit a revised draft National Energy and Climate Plan 2021-2030 by 30/6/2023 and a final National Energy and Climate Plan by 30/6/2024, if there are significant changes/developments. Taking into account the significant improvement in the economy (higher GDP growth than expected), the deviation of real emissions from their expected evolution in relation to the obligations and targets pursued and the new national energy and climate targets undertaken through the Fit-for-55 legislative package, and given our institutional obligation, a[6]revision of the National Plan was launched in October 2022.

Among other things, the revised National Plan should include the appropriate policies and measures to enable the Republic to successfully meet the following new objectives, as set out in the new legislative package 'Fit-for-55':

- A new greenhouse gas emission reduction target of 32 % by 2030 compared to 2005, as set out in the new relevant Regulation[7].
- Increase CO_2 removals from the land use, land use change and forestry sector to 352 Gg (from around 300 Gg currently[8])
- Appropriate contribution to the mandatory target of at least 42.5 % of renewable energy sources (RES) in the EU's gross final consumption by 2030
    - the mandatory target of an annual increase of at least 0.8 % in the period 2021 to 2025 and 1.1 % in the period 2026 to 2030 in the RES share in the heating and cooling sector,
    - contribution to the EU indicative target for renewable energy use in buildings of at least 49 % in 2030;
    - the indicative target of an annual increase in the share of RES use in industry by 1.6 %, the mandatory target for the use of renewable fuels of non-biological origin (green hydrogen) to 42 % of hydrogen to be used for final energy and non-energy purposes in industry by 2030 and 60 % by 2035.

1Decision of the Council of Ministers 88.819, 15/1/2020
2Decision of the Council of Ministers No 83.709, 15/11/2017
3Decision of the Council of Ministers No 90.370, 13/11/2020
4Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013
5Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, for amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Union Parliament and of the Council, Directives 94/22/EC, 2009/31/EC, 98/70/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council
6Committee meeting DG Green Deal Governance System 11/10/22
7Regulation (EU) 2023/857 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and Regulation (EU) 2018/1999, Official Journal of the EU 26.4.2023 L 111/1 14
The8 last year of inventory is 2021, when removals were 235 Gg but were due to the large fire in the mountainous Larnaca. Previous years have been around 300 Gg.

- Obligations to fuel suppliers in transport for:
  - share of RES in transport of at least 29 % in 2030, **or**
    the amount of renewable fuels and renewable electricity supplied to the transport sector leads to a reduction in greenhouse gas intensity of at least 14.5 % by 2030, compared to a baseline of 94 g CO_2/MJ.
- The combined share of advanced biofuels, biogas and renewable fuels of non-biological origin in the energy supplied to the transport sector is at least 1 % in 2025 and 5.5 % in 2030, of which at least 1 % are from renewable fuels of non-biological origin in 2030

- Energy efficiency: An appropriate contribution to the mandatory 11.7 % energy efficiency improvement target at EU level by 2030:
  - Indicative national contribution to the EU target: 'Primary energy consumption in 2030 up to 2,03 Mtoe and final energy consumption in 2030 up to 1,80 Mtoe (a decrease of 11.4 % and 11.5 % respectively compared to the corresponding European Commission forecast for Cyprus in 2020).
  - Achieving a mandatory cumulative end-use energy savings target of 349,049 ktoe in the years 2021-2030, with measures going beyond what is required by European legislation and an obligation of 67,360 ktoe (19.3 % of the target) to be achieved by implementing energy efficiency measures for consumers affected by poverty; reducing final energy consumption in public bodies (public and wider public sector) by 1.9 % per year compared to 2021 (indicative by 2027, mandatory from 2028)
  - The obligation of annual renovation of 3 % of the total surface area of public buildings is extended to all buildings owned and occupied by public bodies (public and wider public sector)

Therefore, it is noted that, in addition, there is a need to design additional policies and measures that will contribute to low emission growth in a way that sets the right foundations for reaching the national long-term zero emission target for 2050.

Analysis of impacts

With the help of external consultants, including the Cyprus Institute, 2 Scenaria were prepared and evaluated as follows:

(a) **Scenario with Existing Measures (SMM)**, with total investments of EUR 17,572 billion, of which only EUR 1,988 billion relate to public expenditure and come from European funds, i.e. Recovery and Resilience Plan (EUR 350 million), Structural Funds (EUR 271 million), Just Transition Fund (EUR 179 million), Connecting Europe Facility for the Interconnector electricity interconnection project (EUR 657 million) and part of the State budget for public transport (EUR 530 million). It should be noted that a large part concerns private investment in transport, clean vehicles, sustainable fuels, etc., amounting to EUR 11,546 billion.

(b) **Scenario with Additional Measures (AFM**), with a total investment of EUR 17,714 billion, in which the total additional public investment compared to the MIB amounts to EUR 540 million. Part of the additional investment of EUR 343 million is available and comes from RePower EU (EUR 94 million), the Just Transition Fund (EUR 96 million), the Social Climate Fund (EUR 100 million) and the State Budget for Public Transport (EUR 53 million). It should also be noted that a series of new measures amounting to EUR 58 million are planned in the waste, agriculture and livestock sectors. As regards private expenditure, the largest part relates to private transport and is estimated at EUR 10,572 billion.

If all planned projects are implemented, this will result in a 10 % reduction in GHG emissions in the BMP and 23 % in the SWP, instead of 32 % of the new national target in the sectors covered by the Effort Sharing Regulation (ESR). Part of the 23 % reduction in the FPS is due to the adoption of the new ETS for heating, motor and light industrial fuels, which will apply from 2027 onwards. Due to the new ETS, the retail price of fossil fuels is expected to increase, resulting in little savings in the end-use of energy, as well as a greater shift towards

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9Special Derogation for Cyprus and Malta, for new annual energy savings from 1 January 2024 to 31 December 2030 equivalent to 0.45 % of the average final use energy consumption of the most recent three-year road before 1 January 2019 (instead of 1.9 %)

electrification, helping to reduce emissions in the ESR.

According to the impact assessment, the implementation of the measures will have a positive effect on employment in the long term and reduce air pollutant emissions, improving the quality of life and reducing the cost of pollution.

Please note that it is subject to assessment to be included in the AFM, additional policies and for which it was not possible at this stage to assess their contribution to emission reductions. The measures concern tax reform, the contribution of the National Rural Development Plan and targeted research and innovation. The implementation of these measures is expected to result in an additional contribution to the reduction of greenhouse gas emissions (beyond 23 %).

As regards the impact on the cost of living, provided that low gas prices apply from 2026 onwards, a very slight increase in generation costs is expected by 2-3 % in 2030 in the AFM compared to the CPM. As regards liquid fuels in the energy end-use sectors, due to the planned start of implementation of the new Emissions Trading System for motor, heating and light industrial fuels from 2027, a 9-13 % increase in retail fuel prices is expected in the scenario with additional measures, which will require attention for vulnerable households. At the same time, a total of EUR 174 million from the Social Climate Fund will be available from 2026 to compensate vulnerable households and businesses or to finance actions to mitigate the negative effects of increases in energy costs.

In addition to finding resources, it is necessary to have administrative support and the number of technicians required to implement the measures in order to achieve the objectives. Insufficient technical and administrative capacity severely limits the implementation of these measures, notably energy upgrades of public and private buildings.

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

Implementing energy policy while achieving climate and environmental objectives requires a radical transformation of the energy system over the next decade and thus significant investments in energy infrastructure as well as energy efficiency. Significant investments are planned for renewable energy, gas import and use, increased energy efficiency in electricity generation, energy efficiency in households, businesses, the public and water sectors, transport infrastructure and sustainable mobility, as well as technological research.

The national targets for the next decade are discussed in detail in this National Energy and Climate Plan (NECP) on an interim basis, until 2030, and should be used as the basis for an ambitious long-term strategy towards climate neutrality.

The national plan includes the five dimensions of the Energy Union, i.e. decarbonisation (which is broken down into two different sections: greenhouse gas emissions and renewable energy), energy efficiency, security of energy supply, internal energy market and research, innovation and competitiveness.

Reducing emissions is the central objective of the National Plan, as required by the relevant Regulation. While it is a major challenge, it has emerged from the analyses and measures examined that emission reductions cannot be achieved if the policies assessed are implemented in a timely and adequate manner. New technologies, such as the use of renewable (green) hydrogen, but also important horizontal reforms such as the green tax reform, are also needed to achieve the national target.

As regards the further **promotion of RES** in the relevant chapters below, the measures and policies to enable Cyprus to achieve the national contribution towards the new European target of 42.5 % of EU gross final energy consumption, as well as the individual mandatory RES targets for 2030, are described. The main factor for the further increase of RES in the electricity sector (RES-H) is the increase in the cost of liquid fuels used for electricity generation which combined with the large increase in the purchase price of CO2 allowances have**significantly** increased the cost of production from conventional fuels. A significant contribution is also made by the various RES support schemes that have been steadily promoted since 2013, especially for self-consumers. Cyprus is one of the first countries in the EU to install residential RES systems for own consumption purposes (around 33 %). In addition, the use of RES in the heating and cooling (RES) sector is promoted through support schemes providing grants to households and with mandatory measures in new buildings. The new policy and measures described in the relevant chapters below will allow Cyprus to meet the indicative RES targets in the field of I August, provided that appropriate funding is available.

RES in the transport sector (RES-T) will be the most demanding sector. The achievement of the RES-M target is influenced by the availability of electric vehicles of all categories at affordable prices and the simultaneous penetration of RES in the RES sector in order to contribute to the desired level of electrification of transport with RES electricity. Further measures in the RES-T sector that could be exploited are the introduction of support schemes for the local production of waste-based biofuels, as well as measures for the production of renewable transport fuels for use in transport such as biomethane and renewable hydrogen.

As regards energy efficiency, the relevant chapters below describe the measures and policies that will enable Cyprus to meet its national mandatory end-use energy savings target by 2030. Cyprus will put emphasis on the buildings and industry sectors, but more emphasis will be placed on increasing energy efficiency in the transport sector, broadening the scope of measures and policies related to this sector. The national indicative contribution to the EU 2030 energy efficiency target has been increased. For this purpose, the obligations from other dimensions of the Energy Union have been taken into account, as well as national characteristics and the 'cost-effective' energy efficiency potential in all sectors.

In the field of energy security, the arrival of natural gas through the imports of Liquefied Natural Gas (LNG) and the development of the infrastructure necessary for the import of natural gas into Cyprus (through the project of common interest 'EUROPusGas2EU'), will end Cyprus' energy isolation, diversify the country's energy mix and contribute to its energy security. In addition, Cyprus is actively promoting two other important Projects of Common Interest, 'EuroAsia Interconnector' and the 'EastMed Pipeline', which will contribute to ending energy isolation.

As regards the electricity market, it is expected that in the two years 2024-2026, key electricity generation projects will be operational, such as[the] 6 EAC plant at the Vasilikos power plant, with a capacity of 160 MW, and the new private power plant in Mari, with a total capacity of 260 MW, which will have the energy they will produce on the basis of the electricity market rules in force, thus contributing to the establishment of competition in this sector in conjunction with RES projects.

Research and Innovation (R &IES) play an important role in national efforts to improve energy efficiency and security, increase the share of renewables and tackle climate change. At the same time, targeted production of research projects providing innovative products and services can add value to businesses and provide useful information for policymakers. In line with the national target set in Innovate Cyprus, investments in R &Iwill be increased. The aim is also to increase the private share of expenditure. Public funding will only have the expected results if combined with other measures to support entrepreneurship in innovation and start-ups.

iii. Summary table of the main objectives, policies and measures of the plan

The main objectives, policies and measures included in the draft revision of the National Plan are summarised as follows.

Table 1.1. Key objectives, policies and measures of the National Plan

Sector	Objective	Policies and measures
Energy	Increase in RES usage rate	• Plan for electricity generation from RES for own consumption (net-metering, net-billing, virtual net-metering, virtual net-billing) • Provision of financial support for installation of photovoltaic and solar systems in dwellings • Installation of RES systems in public buildings, commercial and industrial premises combined with energy upgrading measures • Promotion of high-efficiency heat pumps • Sponsorship projects for electricity storage • Promotion of RES energy communities • Simplification and acceleration of authorisation procedures for RES projects, operation of a one-stop shop • Obligation of transport fuel suppliers for the use of biofuels • Plan for the production of electricity and/or biofuels from waste
	Achievement of energy efficiency targets	• Energy Efficiency Obligation Scheme on Energy Distributors • Energy upgrades in public buildings • Grant scheme for total energy upgrades in homes and businesses • Individual energy efficiency measures in dwellings • Energy upgrading of hospitals and/or hospital units • Energy efficient road lighting. • Energy saving measures in the road transport sector. • Energy efficiency in the water sector. • Installation of smart metering infrastructure • Development of a new online platform digital one stop shop for building renovation • Creation of a National Development Agency – financial instruments facilitating energy efficiency investments in enterprises • Increased capital discounts for energy upgrading of enterprises • Emissions Trading Scheme for Greenhouse Gas Emissions for fuels used in buildings, road transport and light industry • Additional policies and measures to achieve (a) mandatory new reduction targets for final energy consumption in the public sector b) mandatory implementation of energy efficiency measures for

Sector	Objective	Policies and measures
		combating energy poverty and c) new more ambitious national indicative targets for primary and final energy consumption by 2030.
	Energy Security	• Timely completion of the infrastructure to be developed/constructed for the arrival of natural gas in the form of LNG • Exploitation of hydrocarbon deposits discovered in the Cypriot EEZ. • Enhancing the flexibility of the national energy system through measures to exploit indigenous energy sources, demand response, storage.
	• Electricity interconnectivity • Key infrastructure projects for electricity transmission • Electricity modernisation projects • Electricity infrastructure projects • Introduction of system flexibility • Development of aggregation • Use of flexibility by DSO and TSO • Non-discriminatory participation of demand response in the envisaged Competitive Electricity Market • Participation of electricity storage in the electricity system • Intraday market introduction • Introduction of retail contracts	• Implementation of the electricity interconnection of Cyprus through the EuroAsia Interconnector project of common interest • Internal gas pipeline infrastructure development • Investments in transmission system projects in the decade 2023-2032 with a total estimated budget of EUR 231 million • Promoting the necessary regulatory framework: o Regulatory Decision 01/2017 o Regulatory Decision No 02/2018 o Regulatory Decision No 03/2019 o Decision No 386/2021 o Regulatory Decision No 03/2022 o Regulatory Decision No 04/2022 o Regulatory Decision on the Regulatory Statement Supplier's Mass Change Practice and Methodology' o Regulatory Decision establishing the framework with the the participation of demand response shall be allowed and promoted through aggregation. o Regulatory Decision on the Regulatory Statement Practice and Dynamic Pricing Methodology" o Regulatory Decision determining a favourable regulatory framework for citizen energy communities • Advancing the EastMed pipeline project • Defining energy poverty and its metrics for Cyprus in order to set a target for its reduction.

Sector	Objective	Policies and measures
	dynamic pricing	
Transport	Reduction of energy consumption by the transport sector	• Sustainable Urban Mobility Plans (studies and implementation) • Telematic Transport System • New Low/Zero Pollutant Bus Contracts/project for shelter stops • Tree planting along the road network • Amendment of the Motor Vehicles and Road Traffic Act • Promotion of 'The Determination of Special Measures for the Reduction of Air Pollutants and Greenhouse Gas from Road Transport Act of 2023' • Incentive scheme for the purchase and use of low/zero emission vehicles and scrapping of old polluting vehicles • Deployment of recharging infrastructure for electric vehicles • 17 actions to promote urban cycling and the micro-mobility • Techno-economic and feasibility studies for light trains • Pricing policy for urban parking • Information campaigns and public education targeting large groups • Promotion of alternative fuels (e.g. biomethane, hydrogen) • Establishment of planning obligations for sustainable development for planning permission • Upgrading urban environment and transport network design standards
Industry	Recovery of cooling gases	• Economic incentives for refrigeration recovery • Campaigns for the collection and destruction of recovered cooling gases
Livestock farming	Promotion of anaerobic digestion for livestock waste treatment	• Financial incentives through the Rural Development Plan
Waste	Proper implementation of the waste policy framework	• Increasing sorting at source of waste • Reduction of organic discharges in landfills in 2030 • Introduction of anaerobic digestion for organic waste treatment
	Biogas recovery	• Recovery of biogas from old and new health stamping sites
Liquid waste	Improving waste water management	• Increase of population connected to central sewerage systems • Increase anaerobic treatment of wastewater from food industries
Table land use	Increase in land use absorption	• Incentive schemes to increase removals from land use • Financial incentives through the Rural Development Plan
Horizontal	Reduction in greenhouse gas	• Greenhouse gas emission reduction plan for businesses

Sector	Objective	Policies and measures
	greenhouse by enterprises	
Measures under investigation	Targeted Research and Innovation	Targeted research and innovation contributing to measures to achieve national energy and climate targets
	Tax reform	Appropriate fiscally neutral green tax reform targeting, inter alia, the reduction of greenhouse gas emissions
	Contribution from the National Rural Development Plan	Implementation of measures related to agriculture and land use through the Rural Development Plan

Achievement of objectives through the National Plan

The following are achieved through the policies and measures included in the draft National Plan so far:

- A 23 % reduction in greenhouse gas emissions compared to 2005 with the AFM while the reduction in the CPM is only 10 %. It is estimated that with additional policies and measures planned next year, the gap in the achievement of Cyprus' national target will be reduced (-32 % in 2030 compared to 2005).
- Removal of 325 Gg CO_2 from LULUCF. It is estimated that with additional policies and measures to be planned next year, Cyprus' national target (352 Gg CO_2) will be achieved.
- Renewable Energy Sources
  - The share of RES in total gross energy consumption in 2030 increases to 26.5 % in the VMS, while in the CHM the share of RES reaches 24.3 %. This will be the national contribution to[10] the European target of 42.5 % in 2030.
  - The RES share in the electricity sector in 2030 increases to 31.5 % in the SPM, while in the CPM the RES share reaches 28.2 %.
  - The RES-CHP share in 2030 rises to 48.2 % in the SPM and reaches 45.2 % in the CPM. The mandatory target set in the revision of Directive (EU) 2018/2001 for this RES share, which is an annual increase of at least 0.8 % in the period from 2021 to 2025 and 1.1 % in the period from 2026 to 2030 in the proportion of RES in the I sector, is achieved in the CHP and is not met in the STM for the second five years.
  - in transport, the share of RES-M in 2030 reached 14.6 % in the AFM, while in the MB it reached 11.9 %.
  - The RES energy use rate in the buildings sector is estimated to reach around 48 % in 2030 in the LPIS. That percentage shall constitute the indicative national share of renewable energy use in buildings to achieve the overall EU level target of at least 49 % renewable energy use in buildings by 2030.
  - In industry it is estimated that in the five years from 2021 to 2025, the RES share will increase annually by an average of 1.71 % and in the five years from 2026 to 2030 the RES rate will increase by 5.34 %. It is therefore expected that the indicative target set in the revision of the RES Directive will be achieved.
- Energy efficiency
  - primary *energy consumption in 2030 up to 2,03 Mtoe and final energy consumption in 2030 up to 1,80 Mtoe (a decrease of 11.4 % and 11.5 % respectively compared to the corresponding European Commission forecast for Cyprus in 2020).*

    In the VMS, national final energy consumption is projected to reach 1,88 Mtoe in 2030, which is 4 % higher than the expected target calculated for Cyprus by the European Commission (1,80 Mtoe). As far as national primary energy consumption is concerned, the VMS is projected to reach 2,28 Mtoe in 2030, which is 12 % higher than the expected target calculated for Cyprus by the European Commission (2,03 Mtoe).

    The reduction in final and primary consumption is achieved by implementing a combination of measures and policies in the areas of buildings, industry, farming and transport. In addition, the introduction, from 2027, of the carbon tax in the non-ETS sectors contributes significantly to this

10The contribution from non-road transport has not been calculated.

reduction. The definition/quantification of additional policies and measures to achieve the increased ambition in the ES targets will be presented in the final NECP in 2024[11].

b. *Achieve a mandatory cumulative end-use energy savings target of 349,04 ktoe in 2021-2030, with measures going beyond what is required by European legislation and an obligation of 67,36 ktoe (19.3 % of the target) to be achieved by implementing energy efficiency measures for consumers affected by energy poverty.*

First, it appears that if the measures already planned are implemented on the basis of the existing programming, the mandatory cumulative target of the period can be marginally achieved. However, it is not enough to reach the share of the energy poverty target.

For the time being, no decision has been taken on the measures to reach the share of the energy poverty target.

At the time of the preparation of the draft revision of the National Plan, the national plan for meeting all obligations related to public sector obligations had not been completed. The planning for the implementation of public sector obligations will be presented in the final NECP to be submitted in 2024.

A summary of the national targets and their achievement through the draft revision of the National Plan is presented in the table below.

Table 1.2. Initial and new targets, in relation to achievement based on forecast scenarios

Pillar	**Initial objectives**		**New objectives (Fit-for-55)**		**Scenario with existing measures**	**Scenario with additional measures**
	EU	**Cyprus**	**EU**	**Cyprus**	**Cyprus**	**Cyprus**
Emission reduction (2030 compared to 2005)	— 40 %	— 24 %	— 55 %	— 32 %	— 10 %	— 23 %
Increase in removals from land use	— —	— —	310 MT	0,352 MT	0,325 MT	0,325 MT
Renewable Energy Sources (in gross final consumption)	32 %	23 % *	42.5 %	31 % – 34 %	24.3 %	26.5 %
Energy efficiency (improvement compared to expected forecast)	32.5 % in relation to the reference scenario 2007		11.7 % in relation to the reference scenario 2020			
- Primary energy consumption		2,4 Mtoe		2,03 Mtoe	2,41 Mtoe	2,28 Mtoe
- Final energy consumption		2,0 Mtoe		1,8 Mtoe	1,99 Mtoe	1,88 Mtoe
- Cumulative in final use		243,04 ktoe		349,04 ktoe	Marginal achievement	

** Please note that it is under assessment to be included in the Scenario with additional measures, additional policies and measures, for which it was not possible at this stage to assess their contribution to reducing emissions. The measures concern tax reform, the contribution of the National Rural Development Plan and targeted research and innovation. The implementation of these measures is expected to result in an additional contribution to the reduction of greenhouse gas emissions (beyond -23 %).*

1.2. Overview of current policy situation

i. National and Union energy system and policy context of the national plan

[11] Not all measures from the Circular Economy have been included.

The European Council conclusions of 24 October 2014 agreed the European Union (EU) energy and climate policy framework until 2030. In 2018, the Energy Union Governance Regulation (Regulation (EU) 2018/1999) was published to establish the regulatory framework for the governance of the Energy Union for its five dimensions (energy security, internal energy market, energy efficiency, decarbonisation, and research, innovation and competitiveness). Under the Governance Regulation, Member States must submit integrated energy and climate plans and reports to the European Commission at regular intervals.

In particular, by 1[January] 2020 and every ten years thereafter, each Member State shall submit to the European Commission an integrated national energy and climate plan. The first plan covers the period from 2021 to 2030. The following plans shall cover the ten-year period immediately following the end of the period covered by the previous plan. In addition, by 1[January] 2019 and every ten years thereafter, Member States shall prepare and submit to the Commission a draft of the integrated national energy and climate plan. The Commission may issue recommendations on the draft plans to the Member States.

In view of the above, the first Cypriot National Plan was submitted to the European Commission in 2020, after approval by the Council of Ministers12. In order to prepare the National Plan, the National Governance System for Climate and Energy was established and operated13, which then became the National Governance System for the Green Deal14.

The National Plan submitted in 2020 includes specific policies and measures which were divided into two scenarios developed for this purpose (‘With approved Policies and Measures’ and ‘With Additional Policies and Measures’) and presents our national contribution, among others, to the following objectives:

(a) Reducing EU greenhouse gas emissions by 40 % by 2030 compared to 2005 (legally binding national target for Cyprus: 24 % reduction) for sectors outside the greenhouse gas emissions trading scheme.

The figure below shows the expected evolution of emissions based on scenarios (i) without measures (BaU), (ii) approved policies and measures (WEM) and (iii) additional policies and measures (WAM), compared to the annual allocation as included in the National Plan.

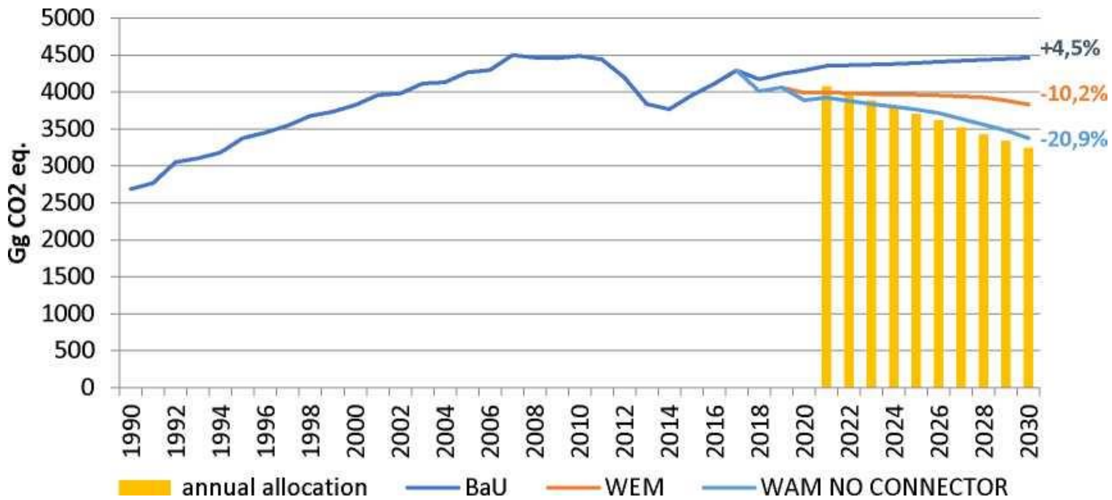


Figure 1.1. Annual emission allocations for the Republic of Cyprus for each year of the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 in relation to the emission projection scenarios

(b) Mandatory target of 32 % of renewable energy sources (RES) in EU gross final consumption by 2030 with a national contribution to the EU target: 23 % RES in gross final consumption. Individual national targets for RES: a mandatory target of 14 % RES in transport and an indicative target of 1.1 % annual increase in heating and cooling from RES.

12Decision of the Council of Ministers 88.819, 15/1/2020
13Decision of the Council of Ministers No 83.709, 15/11/2017
14Decision of the Council of Ministers No 90.370, 13/11/2020

(c) Energy efficiency: Mandatory target of 32.5 % energy efficiency improvement at EU level by 2030:

- Estimated indicative national contribution to the EU target: 'Primary energy consumption in 2030 up to 2,4 Mtoe and final energy consumption in 2030 up to 2,0 Mtoe (a decrease of 17 % and 13 % respectively compared to the corresponding European Commission forecast for Cyprus in 2007).

Achieve a mandatory cumulative end-use energy savings target of 243,04 ktoe in 2021-2030, with measures going beyond what is required by European legislation.

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

The current energy and climate policies and measures, as included in this document, are presented in the table below.

Table 1.3. Energy and climate policies and measures in place

Policies and measures	Existing measures
Increase in RES usage rate	• Project for electricity generation from RES for own consumption (net- metering, net-billing, virtual net-metering, virtual net-billing) • Financial support for installation of photovoltaic and solar systems in homes and businesses • Installation of RES systems in public buildings, commercial and industrial premises combined with energy upgrading measures • Promotion of high-efficiency heat pumps • Sponsorship projects for electricity storage • Promotion of RES energy communities • Simplification and acceleration of authorisation procedures for RES projects, operation of a one-stop shop • Obligation of transport fuel suppliers for the use of biofuels • Production of biofuels from waste • The imposition of a consumption charge on all electricity consumers, regardless of category, for each kilowatt-hour imported from the electricity grid, which is the main revenue for the RES and ES Fund, which operates subsidy schemes for the promotion of RES and E & E.
Achievement of energy efficiency targets	• Energy Efficiency Obligation Scheme on Energy Distributors • Energy upgrades in public buildings • Grant scheme for total energy upgrades in homes and businesses • Individual energy efficiency measures in dwellings • Energy upgrading of hospitals and/or hospital units • Energy efficient road lighting. • Energy saving measures in the road transport sector. • Energy efficiency in the water sector. • Installation of smart metering infrastructure • Development of a new online platform digital one stop shop for building
Security of supply	• Arrival of natural gas, through the introduction of LNG and the development of the necessary infrastructure • Enhancing the flexibility of the national energy system
Internal Energy Market	• Promoting the electricity interconnection of Cyprus through the EuroAsia Interconnector • Internal gas pipeline infrastructure development • Investments in the development and secure operation of the electricity transmission system • Promoting the necessary regulatory framework and projects for the functioning of the competitive electricity market • Advancing the EastMed pipeline project
Transport	• Sustainable Urban Mobility Plans (studies and implementation)

Policies and measures	Existing measures
	• New Low/Zero Pollutant Bus Contracts/project for shelter stops • Tree planting along the road network • Amendment of the Motor Vehicles and Road Traffic Act • Promotion of 'The Determination of Special Measures for the Reduction of Air Pollutants and Greenhouse Gas from Road Transport Act of 2023' • Incentive scheme for the purchase and use of low/zero emission vehicles and scrapping of old polluting vehicles • Deployment of recharging infrastructure for electric vehicles
Research and Innovation:	• Research funding through setting relevant priorities in research programmes • Funding in Centres of Excellence • Participation in relevant European programmes
Refrigerant gasses	Partial recovery from 2024
Anaerobic digestion for livestock waste treatment	Cows: increase to 10 % in 2030 Pigs: increase to 65 % in 2030 Poultry: increase to 25 % in 2030
Waste	(a) 60 % sorting at source in 2030 (b) 24 % of organic waste sites in 2030 (c) increase of 1 % per annum anaerobic digestion
Liquid waste	(a) 100 % population connection to central sewerage systems increase of anaerobic treatment of wastewater from food industries
Increase in land use absorption	Plant for climate: 300.000 trees in 2030
Greenhouse gas emissions reduction plan for businesses	Reducing emissions from enterprises through a financial support scheme

iii. Key issues of cross-border relevance

The key issues of cross-border interest in the fields of energy and climate focus on the transfer of know-how to policies and measures, the recognition and planning of the implementation of cross-border energy infrastructure, cooperation for the implementation of innovative and pilot energy projects, the functioning of energy markets, cooperation between information systems and cooperation under financial programmes.

Their implementation often takes place in the context of transnational agreements and transnational Memoranda of Cooperation/Consensus. These transnational partnerships and agreements are designed and finalised in close cooperation with the Ministry of Foreign Affairs.

Cyprus shall promote regional dialogue on the establishment of the necessary energy infrastructure. There is regional cooperation between Cyprus and neighbouring countries to implement three projects of common interest in the gas and electricity sectors, and the electricity interconnection between Cyprus and Egypt is being promoted (in addition to the interconnection with Israel).

The planned EastMed regional gas pipeline infrastructure between Cyprus, Israel and Greece will connect the Eastern Mediterranean with Europe and strengthen energy

security and diversification of energy sources. Through the EastMed pipeline, natural gas and later hydrogen will be able to be transported from the Eastern Mediterranean region to Europe. In addition, it will create synergies and cooperation between the countries of the Eastern Mediterranean region.

EuroAsia Interconnector is a project aimed at ending the electrical isolation of Cyprus. It is a cross-border interconnection between the electricity networks of Greece, Cyprus and Israel via a high-voltage direct current (HVDC) submarine cable. The project is in a mature phase and has made significant progress. Cooperation between Greece, Israel and Cyprus will achieve the electricity interconnection target of at least 15 % for 2030.

iv. Administrative structure of implementing national energy and climate policies

For the purposes of implementing the Regulation on the Governance of the Energy Union and Climate Action [(EU) 2018/1999]15 and in particular to set the necessary foundations for a credible, inclusive, cost-effective, transparent and predictable governance ensuring the achievement of 2030 objectives and the long-term objectives of the Energy Union in line with the 2015 Paris Agreement on Climate Change, the Council of Ministers adopted a new structure for climate and energy governance (15/11/2017 Decision No 83.709). This structure evolved in 2020 into the 'National Governance System for the Implementation of the Green Deal', with the inclusion of 5 additional working groups (biodiversity conservation, from farm to fork, circular economy, zero pollution and finance/sustainability) related to the Green Deal. It was subsequently amended to include a new Technical Committee on Hydrogen.

The core of the "National Governance System for the Implementation of the Green Deal" is a Ministerial Committee, co-chaired by the Minister of Finance and the Minister of Agriculture, Rural Development and Environment. The Committee shall be composed of the two co-chairmen and the Minister for Energy, Commerce and Industry, the Minister for Transport, Communications and Works, the Minister for Foreign Affairs and the Deputy Minister for Research, Innovation and Digitalisation. This Committee recommends to the Council of Ministers policies and measures related to the topics included under the Green Deal, including energy and climate policies and measures (e.g. National Energy and Climate Plan (NECP), Long Term Policy for Low Emission Growth). At the following level, the Committee of Directors General of the same Ministries is the intermediate step between the Ministerial Committee and the specialised Technical Committees.

15Regulation (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, amending Regulations (EC) No 663/2009 and (EC) No 715/2 009 of the European Parliament and of the Council, Directives 94/22/EC, 2010/31/EU, 98/70/EC, 2009/31/EC, 2009/73/EC, 2012/EE 27/EE and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Council Regulation (EU) No 525/2013, the European Parliament and the Council

COUNCIL OF MINISTERS

MINISTERIAL COMMITTEE

Minister of Agriculture, Rural Development and Environment (co-chair) Minister of Energy, Commerce and Industry (co-chair) Minister of Finance (co-chair)
Minister of Foreign Affairs
Minister of Transport, Communications and Works Deputy Minister of Research, Innovation and Digital Policy

COMMITTEE OF PERMANENT SECRETARIES

Permanent Secretary of Ministry of Agriculture, Rural Development and Environment (co-chair)
Permanent Secretary of Ministry of Energy, Commerce and Industry (co-chair)
Permanent Secretary of Ministry of Finance (co-chair)
Permanent Secretary of Ministry of Foreign Affairs
Permanent Secretary of Ministry of Transport, Communications and Works
Permanent Secretary of Deputy Ministry of Research, Innovation and Digital Policy

COORDINATION / SECRETARIAT

Directorate General for European Programmes, Coordination and Development
Department of Environment

TCI	TC2	TC3	TC4	TC5	TC6	TC7	TC8	TC9	TC10	TC11	TC12	TC13
Decarbonisation Chair: Department of Environment	Energy Efficiency Chair: Energy Service	Energy Security Chair: Energy Service	Internal Energy Market Chair: Energy Service	Research, Innovation, Competitivenes s biodiesel Digitisation Chair: OMRID *	Renewable Energy Sources Chair: Energy Service	Sustainability-driven Smart Mobility Chair: MTCW§§§§	Preservation of biodiversity Chair: Department of Environment	'Farm-to-Fork' Chair: Department of Agriculture	Circular Economy Chair: Department of Environment, DMRID, Meci *	Zero Pollution Chair: Department of Environment	Financing/ sustainability Chair: DGEPCD	Hydrogen Chair: Energy Service

§§§§where: DMRID= Deputy Ministry of Research, Innovation and Digital Policy; MTCW = Ministry of Transport, Communicationsand Works; Meci = Ministry of Energy, Commerce and Industry DGEPCD= Directorate General for European Programmes, Coordination and Development

Figure 1.2. Diagram of the National Governance System for the Implementation of the Green Deal

Technical Committees for Energy and Climate

The Secretariat of the System is jointly within the Directorate-General for Development (Ministry of Finance) and the Department of Environment. This system is shown in Figure 1.2.

In the case of the NECP, the Ministerial Committee submits the NECP to the Council of Ministers, which takes the final decision for its approval. The proposal of the NECP is being prepared by the Committee of Directors-General. The Committee of Directors-General shall also monitor the implementation of the NECP and make proposals for revisions where necessary. The Technical Committees directly involved in preparing/revising/implementing/monitoring the NECP are the decarbonisation TE, renewable energy sources, TE energy efficiency, the internal energy market, the energy security, the transport and the hydrogene TE.

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

i. Involvement of the national parliament

In March and June 2023, presentations were made on the revision of the National Energy and Climate Plan, during which a detailed presentation was made on the Governance Regulation, the country's new obligations in the field of energy and climate, the mechanism for drawing up the Plan and a description of the measures and policies envisaged to achieve the relevant energy and climate targets, as well as the amount of investment needed to achieve these objectives. The final draft of the NECP will be sent for information to the House of Representatives as soon as it is submitted to the European Commission. The House of Representatives will be involved in the design of the National Plan during the preparation of the Final Plan.

ii. Involvement of local and regional authorities

Local authorities will be invited to participate in the design of the National Plan during the preparation of the Final Plan.

iii. Consultations of stakeholders, including the social partners, and engagement of civil society and the general public

The consultation process for updating the draft NECP started with the publication of an information document on 13/12/2022 in the notices on the website of the Department of Environment, giving the public the opportunity to comment on the new obligations and targets and taking into account the content of the NECP submitted in 2020.

Since the launch of the consultation, 46 contributions have been received from stakeholder associations, civil society organisations and businesses active in the energy sector.

The main issues raised during the public consultation are presented in the table below by sector. Following the assessment of the consultation comments, the draft update of the Plan was prepared.

The main issues raised during the public consultation were:

- General/decarbonisation
    - Additional incentives for investment in businesses and households
    - Developing new measures and policies to achieve the new ambitious national green transition targets imposed by the implementation of the Fit for 55 and REPowerEU package
    - Developing an appropriate support mechanism for biogas/energy plants
    - Promoting the circular economy as a priority for the state
- Transport

- Promotion of the use of electric scooters, electric buses and car sharing applications
- Use of green hydrogen and other alternative fuels in transport
- Direct implementation of projects to modernise, upgrade and digitise the electricity grid
- Ensure that there are adequate subsidy plans for the purchase of electric vehicles and hybrid plug-in vehicles and incentives including the replacement of old (polluting) vehicles

- Renewable Energy Sources
  - More emphasis on energy storage
  - Greater RES penetration combined with electricity interconnection
  - direct operation of the competitive electricity market, which will help promote private investment in RES projects, introduce healthy competition in the electricity market, ensure better services/prices for consumers
  - Use of green hydrogen and other alternative fuels for electricity generation
  - Take into account the integrated spatial policy for the development of RES projects
- Energy efficiency
  - Strengthening the role and activities of Energy Service Providers
  - To make it compulsory to carry out an energy audit of public sector buildings with a view to their energy upgrading
- Horizontal
  - Creation of a Special Fund, bringing together the revenues generated from the auctions of greenhouse gas emission allowances, to be used to deliver environmental solutions and innovations that contribute to the reduction of gaseous emissions
  - Study the possibility of giving political direction by 2030 to study the possible integration of other uses of natural gas into final energy consumption for the period 2025-2050.
  - Develop legislative, fiscal and administrative proposals to contribute to the holistic approach to energy security of the CCT. Jointly discuss and evaluate the measures in the electricity and gas market.

The 'official' presentation of the preliminary draft update of the NECP took place during a full day event on 28July 2023, during which the proposed policies and measures were presented in detail, together with the impact assessment. The public debate on the National Plan will be concluded with the submission of the final National Plan to the European Commission in June 2024.

iv. Consultations of other Member States

Several consultations were held with other Member States in the context of the development of the NECP. Details are provided in the relevant sectors.

v. Iterative process with the Commission

D/E

1.4. Regional cooperation in preparing the plan

1. Elements subject to joint or coordinated planning with other Member States

There is currently regional cooperation between Cyprus and Greece, Israel and Egypt, in the context of the implementation of Regulation (EU) 2022/869 on trans-European energy networks (TEN-E). There is cooperation during the process of including projects in each list of PCIs, when EKE implementing bodies apply for funding from European schemes, before and during project authorisation, and will continue to exist at the start of their operations.

More specifically, Cyprus, Greece and Israel signed a Memorandum of Understanding on the promotion and timely implementation of the EuroAsia Interconnector in 2021. Cyprus, Greece and Israel also signed an Interstate Agreement on the EastMed Pipeline CSR, which was ratified by all three countries in 2020. A bilateral Memorandum of Understanding between Cyprus and Egypt and a Tripartite Memorandum of Understanding between Cyprus, Greece and Egypt were signed in 2021 on the electrical interconnection of the electricity systems of the sub-reporting countries.

2. NATIONAL OBJECTIVES AND TARGETS

In accordance with the Governance Regulation[1], Member States submit a revised draft National Energy and Climate Plan 2021-2030 by 30/6/2023 and a final National Energy and Climate Plan by 30/6/2024. The revision for Cyprus is deemed necessary due to the institutional obligation to the relevant Governance Regulation, the failure to meet existing national targets and obligations so far, and the revision of the national energy and climate targets under the new European Institutional Framework (Fit-for-55):

- A new greenhouse gas emission reduction target of 32 % by 2030 compared to 2005, as set out in the new relevant Regulation[16].
- Increase CO_2 removals from the land use, land use change and forestry sector to 352 Gg (from around 300 Gg currently1718)

— An appropriate contribution to the mandatory target of at least 42.5 % of renewable energy sources (RES) in the EU's gross final consumption by 2030. An indicative target of an additional 2.5 % increase, i.e. an overall RES share of 45 % at EU level in 2030, is also introduced. Individual national targets for RES:

the mandatory target of an annual increase of at least 0.8 % in the period 2021 to 2025 and 1.1 % in the period 2026 to 2030 in the RES share in the heating and cooling sector,

- contribution to the EU indicative target for renewable energy use in buildings of at least 49 % in 2030;

the indicative target of an annual increase in the share of RES use in industry by 1.6 %, the mandatory target for the use of renewable fuels of non-biological origin (green hydrogen) to 42 % of hydrogen to be used for final energy and non-energy purposes in industry by 2030 and 60 % by 2035.

- Obligations to fuel suppliers in transport for:
  - share of RES in transport of at least 29 % in 2030, **<u>or</u>**

    the amount of renewable fuels and renewable electricity supplied to the transport sector leads to a reduction in greenhouse gas intensity of at least 14.5 % by 2030, compared to a baseline of 94 g CO_2/MJ.
- The combined share of advanced biofuels and biogas and renewable fuels of non-biological origin in the energy supplied to the transport sector is at least 1 % in 2025 and 5.5 % in 2030, of which at least 1 % shall be from renewable fuels of non-biological origin in 2030.
- Indicative target of 1.2 % renewable fuels of non-biological origin in the total amount of energy supplied to shipping in 2030.

— Energy efficiency: An appropriate contribution to the mandatory 11.7 % energy efficiency improvement target at EU level by 2030:

- Indicative national contribution to the EU target: 'Primary energy consumption in 2030 up to 2,03 Mtoe and final energy consumption in 2030 up to 1,80 Mtoe (a decrease of 11.4 % and 11.5 % respectively compared to the corresponding European Commission forecast for Cyprus in 2020).
- Achieving a mandatory cumulative end-use energy savings target of 349,0419 ktoe in 2021-2030, with measures going beyond what is required by European legislation and an obligation of 67,36

17Regulation (EU) 2023/857 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and Regulation (EU) 2018/1999, Official Journal of the EU 26.4.2023 L 111/1 14

The18 last year of inventory is 2021, when removals were 235 Gg but were due to the large fire in the mountainous Larnaca. Previous years have been around 300 Gg.

19Special Derogation for Cyprus and Malta, for new annual energy savings from 1 January 2024 to 31 December 2030 equivalent to 0.45 % of the average final use energy consumption of the most recent three-year road before 1 January 2019 (instead of 1.9 %)

ktoe (19.3 % of the target) to be achieved by implementing efficiency measures for consumers affected by energy poverty.
  - Reduction of final energy consumption in public bodies (public and wider public sector) by 1.9 % per year compared to 2021 (indicative up to 2027, mandatory from 2028)
  - The obligation of annual renovation of 3 % of the total surface area of public buildings is extended to all buildings owned and occupied by public bodies (public and wider public sector).

It should be noted that, in addition, there is a need to design policies and measures that contribute to low emission growth in a way that sets the right foundations for reaching the national long-term zero emission target for 2050.

In order to revise the national targets and targets up to 2030, based on the new European Union's 'Fit for 55' policy with a central target of at least a 55 % net greenhouse gas emission reduction by 2030, the following scenarios have been developed:

- Expected Evolution (BaU) – this scenario assumes that historical trends persist until the end of the modelling horizon.
- With existing measures (RMS) – this scenario takes into account already adopted policies and measures and assesses their impact on GHG emissions.
- Additional measures (FPS) – this scenario takes into account planned and additional policies and measures, which should indicate an effort to comply with the new national energy and climate targets.

2.1. Decarbonisation dimension

2.1.1. GHG emissions and removals i.

Current situation

The most important greenhouse gas emitting sector in Cyprus is the electricity sector, followed by the transport sector. Emissions from cement production are also significant (see Figure 2.1). Electricity production and cement production are however included in the Greenhouse Gas Emissions Trading Scheme and therefore any measures taken to reduce their emissions do not count towards the national target to achieve the target set under Regulation (EU) 2018/842.

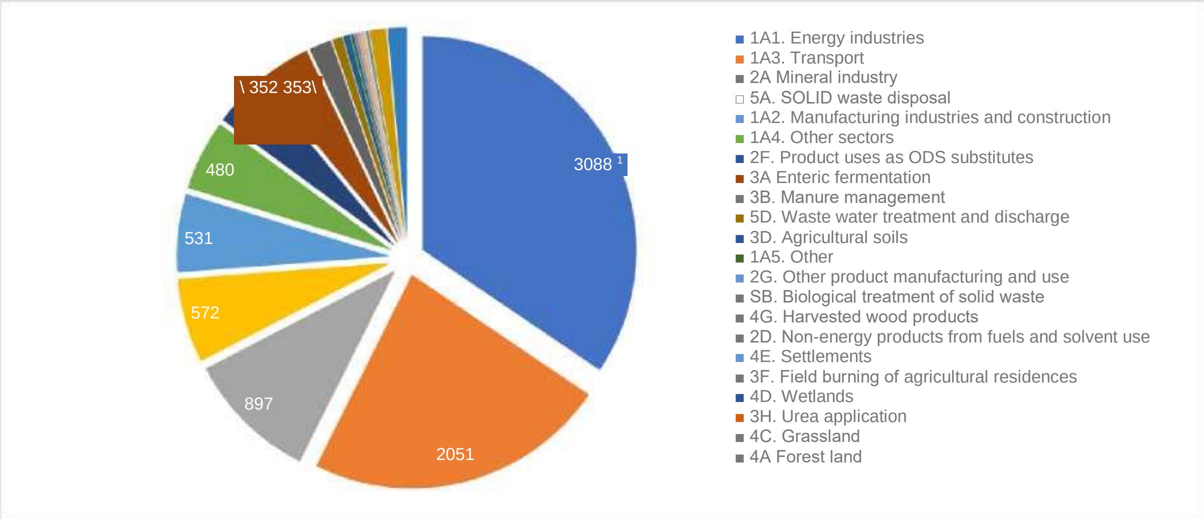


Figure 2.1. Greenhouse gas emissions in Cyprus 2021
(<u>Source</u>: Department of Environment, Annual Greenhouse Gas Emission Inventory Report 2023 to the Secretariat of the United Nations Framework Convention on Climate Change, May 2023)

The sector with the largest contribution to greenhouse gas emissions falling under the national target to achieve the target set under Regulation (EU) 2018/842 is transport (47 %), namely road transport (see Figure 2.2). Followed by solid waste (14 %) and energy for domestic use, services and agriculture (11 %). The contribution of F-gases (9 %) and intestinal fermentation (8 %) is also significant.

Therefore, waste, and fluorinated greenhouse gases, are the focus of national planning on sectors other than energy. The land use, land use change and forestry (LULUCF) sector is also important. However, the policies and objectives for this sector will be presented in the final revision of the National Plan to be submitted in 2024.

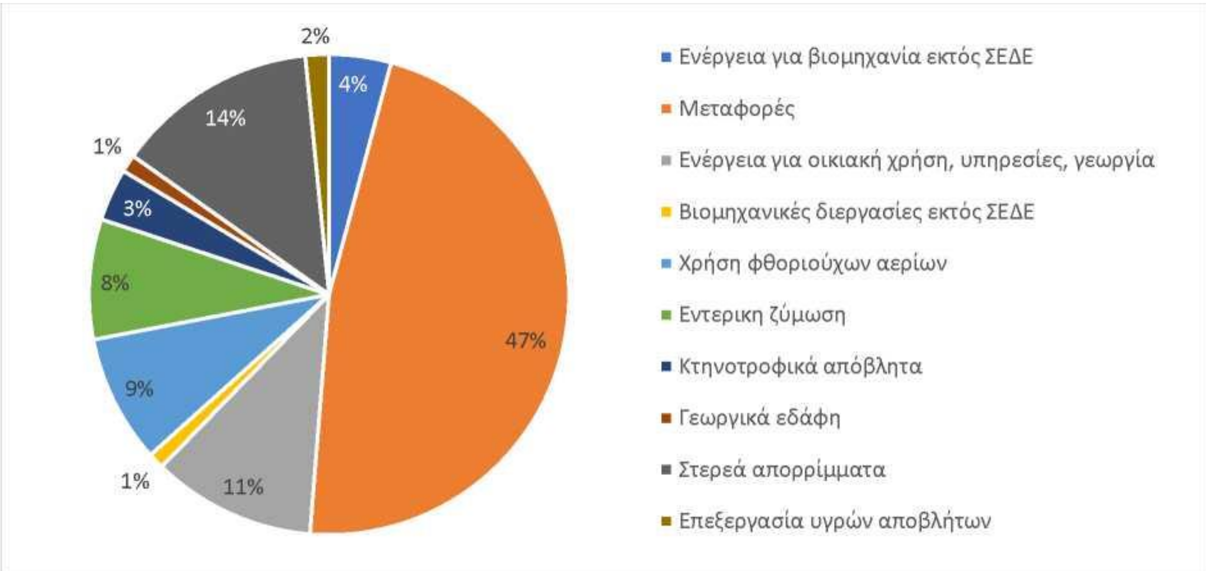


Figure 2.2. 2021 greenhouse gas emissions in Cyprus that count towards the national target for the achievement of the target set under Regulation (EU) 2018/842
(<u>Source</u>: Department of Environment, Annual Greenhouse Gas Emission Inventory Report 2023 to the Secretariat of the United Nations Framework Convention on Climate Change, May 2023)

Analysis of Scripts

Of the scenarios considered, the emission reduction achieved in 2030 compared to 2005 is 23 % in the VMS compared to 10 % in the BMB for emissions that count towards the national target for the achievement of the target set under Regulation (EU) 2018/842. It is recalled that under the current NECP emission reductions can be achieved in 2030 at 21 % compared to 2005. Figure 2.3 below shows the evolution of emission reductions through the implementation of policies and measures up to 2030 in the MBs and AFMs, compared to the expected evolution scenario. Figure 2.4 shows the evolution of the removal of emissions from the LULUCF sector.

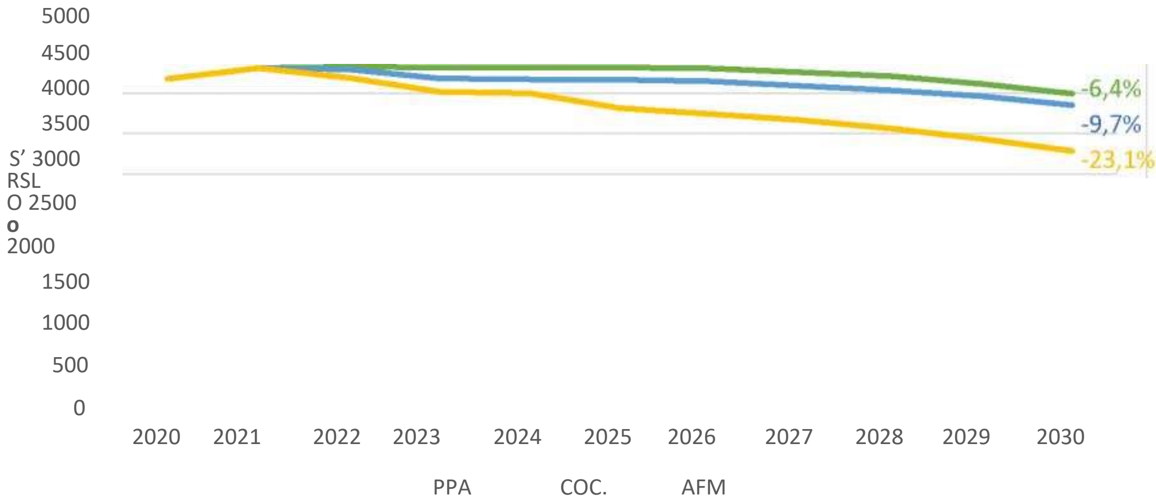


Figure 2.3. Evolution of emission reduction through implementation of policies and measures up to 2030 in MBs and AFMs, compared to the expected evolution scenario

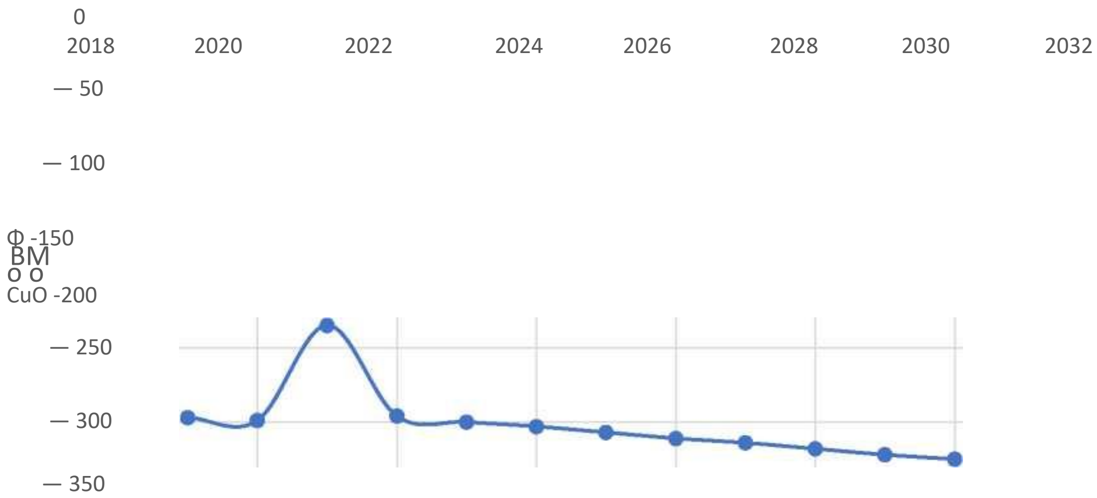


Figure 2.4. Evolution of removals of emissions from LULUCF

i. The elements set out in Article 4(a) (1)

Regulation (EU) 2018/842

Cyprus' binding national greenhouse gas emission target pursuant to the amendment of Regulation (EU) 2018/842 is -32 % by 2030 compared to 2005,[20]and concerns the energy sector, industrial processes and product use, agriculture and waste, as determined pursuant to Regulation (EU) 2018/1999, excluding greenhouse gas emissions from the activities listed in Annex I to Directive 2003/87/EC.

Regulation (EU) 2018/841

The commitments of Cyprus in relation to the land use, land use change and forestry ('LULUCF') sector, which contribute to achieving the objectives of the Paris Agreement and the Union's greenhouse gas emission reduction target for the period from 2021 to 2030 as set out in Regulation (EU) 2018/841, are -352 kt r. Co_2 in 2030 net greenhouse gas removals.

Methane Strategy

The European Commission presented an EU strategy to reduce methane emissions in 2021. This strategy sets out measures to reduce methane emissions in Europe and internationally. It presents legislative and non-legislative actions in the energy, agriculture and waste sectors, which account for around 95 % of methane emissions related to human activity worldwide.

To reduce methane emissions in the energy sector, an obligation to improve the detection and repair of leaks in gas infrastructure has been proposed and legislation to ban normal combustion and ventilation practices will be considered. The proposal for a Regulation is currently under discussion.

At this stage, efforts are being made to improve the reporting of emissions from agriculture through better data collection and the promotion of emission reduction opportunities supported by the Common Agricultural Policy. The main focus is on sharing best practices on innovative methane abatement technologies, animal nutrition and breeding management. Targeted research on technology, nature-based solutions and dietary changes are also promoted. The use of organic human and agricultural waste and residual streams for the production of biogas, bio-materials and biochemicals shall also be considered.

In the waste sector, consideration is being given to improving the management of landfill gas from old and new sites, making use of its potential for energy use while reducing emissions. Minimising the disposal of biodegradable waste in landfills is crucial to avoid methane formation and this has been taken into account in national plans.

ii. Where applicable, other national objectives and targets consistent with the Paris Agreement and the existing long-term strategies. Where applicable for the contribution to the overall Union commitment of reducing the GHG emissions, other objectives and targets, including sector targets and adaptation goals, if available

Circular economy

As part of the circular economy package, amendments to the European Waste Directives, including the Waste, Packaging and Packaging Waste and Landfill Directives, entered into force in 2018, setting ambitious long-term targets and increased obligations to reduce waste generation, increase sorting at source, increase the reuse and recycling of waste and significantly reduce waste destined for landfilling. In particular, by 2025 there should be separate collection of organic waste and separate collection of recyclable streams should be significantly increased as the preparation for recycling and reuse of

20Regulation (EU) 2023/857 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and Regulation (EU) 2018/1999, Official Journal of the EU 26.4.2023 L 111/1 14 municipal waste should reach 55 % by 2025, 60 % by 2030 and 65 % by 2035. The aim is that, by 2035, the total quantities of municipal waste landfilled should be reduced to 10 % of the total amounts generated.

Table 2.1. Waste management objectives

Directive (EU) 2018/851 amending the Waste Directive	**2025**	**2030**	**2035**
Preparing for re-use and recycling of municipal waste	55 %	60 %	65 %
Biodegradable waste By 31/12/2023 biodegradable waste shall either be separated and recycled at source or collected separately and shall not be mixed with other types of waste			
Hazardous waste By 1^{January} 2025, separate collection shall be established for hazardous fractions of waste generated by households.			
Directive (EU) 2018/850 amending the Landfill Directive			
By 2035, the amount of municipal waste discarded shall be reduced to 10 % or less of the total amount of municipal waste generated (by weight)			
Directive (EU) 2018/852 amending the Packaging Directive	**2025**	**2030**	
Recycling of packaging waste	65 %	70 %	
• Plastic	50 %	55 %	
• Wood	25 %	30 %	
• Ferrous metals	70 %	80 %	
• Aluminium	50 %	60 %	
• Glass	70 %	75 %	
• Paper and paperboard	75 %	85 %	

In response to the increased obligations arising from the circular economy package and in order to achieve the targets set, the Council of Ministers adopted in July 2022 the new 2022-2028 Municipal Waste Management Plan (SDS), which includes a total of 65 measures aimed at increasing reuse and recycling, strengthening separate collection and upgrading the infrastructure for the management of organic and mixed waste. In particular, the SDS includes measures in the following areas:

(a) Reducing waste generation
(b) Increasing reuse, preparing for re-use and recycling
(c) Strengthening separate collection of municipal waste
(D) Strengthening extended producer responsibility schemes
(e) Upgrading and strengthening the infrastructure for the management of recyclable waste, organic waste from separate collection and mixed waste:

- Infrastructure for the management of organic waste at the Kosii and Pentakomou IWMAs
- Infrastructure for the management of mixed waste at the Kosii and Penakomou IWMF
- Infrastructure for energy recovery from waste

legislative measures (extension of extended producer responsibility, separate collection, end-of-waste status, etc.)
(g) Financial measures and tools (landfill tax, guarantee schemes, I pay for as long as I go, etc.)
(h) Improving waste data management
(I) Strengthening inspections and enforcement
(j) Strengthening the administrative capacity of stakeholders (intermediate body between central and local government, etc.)
information and awareness raising

Under the Solid Waste Management Plan (SMMP) 2022-2028 and with the aim of enhancing separate collection, reuse and recycling, a number of projects are being implemented, with an estimated budget of EUR 82 million, co-financed by the LIFE Programme, the Recovery and Resilience Fund, the Structural Funds and the EEA/Norway Mechanism:

- Life IP CYzero WASTE (EUR 14.8 million) for sorting at source and separate collection of municipal solid waste with actions at local authorities.
- Procurement of 50 community-owned domestic composters – EUR 7.0 million from the Recovery and Resilience Plan (RRP)
- Installation of 2 reuse centres in Nicosia and Limassol and shops selling re-use goods – EUR 4.0 million from LPIS
- Procurement, installation, maintenance of 50 green stands – EUR 3.3 million from LPIS
- Study on the establishment of a central and local government coordination body for waste management – EUR 950.000 from SEAT (EU Cohesion Policy Funds)
- Programme for the reduction of solid municipal waste from coastal hotels and similar facilities in Limassol – Paphos – EUR 8.8 million from THALIA
- Implementation of a sorting system at source in mountainous Cyprus – EUR 1.5 million from Thalia
- Integrated IT monitoring system – EUR 1.41 million from THALIA
- Separate collection and management of household hazardous waste from mobile units – EUR 0.5 million from EEA/Norway facility
- Plan for the recovery of waste from separate collection – EUR 15 million from Thalia

Adaptation to climate change

The National Strategy for Adaptation to Climate Change was adopted by the Cypriot Government in 2017 by decision of the Council of Ministers (Decision No 82.555). To implement the strategy, an action plan has been drawn up, the implementation of which will entail the implementation of measures which will be promoted by the relevant ministries/authorities within their budgets. The selected important areas where climate change is important for Cyprus are the following: water resources, agriculture, coastal zones, tourism, biodiversity, energy, fisheries and aquaculture, soils, forests, public health and

infrastructure. The national plan is assessed and revised annually when preparing a report on the implementation of the measures to the Council of Ministers.

Taking into account the new EU Strategy on Adaptation to Climate Change, as well as the new scientific evidence resulting from the scientific work carried out in the context of the Cyprus Climate Change Initiative (2018-2022), Cyprus' national climate change strategy is under revision. To this end, technical assistance has been received for the assignment of work to external consultants with EU funding. The contract is expected to be signed in September 2023 with a deadline for implementation by the end of 2025.

By updating the National Adaptation Strategy, new adaptation targets will be set in line with the EU strategy. The risk assessment will also be updated to re-assess the potential impacts related to climate change in Cyprus, so that they can be integrated into investment and planning decisions in both the public and private sectors.

Gaseous Pollution[21]

Air pollution is currently one of the biggest environmental challenges. At EU level, air pollution is estimated to cause around 367.000 premature deaths for the year 2020, while the corresponding figure for Cyprus is estimated at 800 premature deaths per year (560 due to $PM_{2.5}$, 180 due to NO_2 and 60 due to O_3)[22].

21Source: Department of Labour Inspection, Cyprus National Air Pollution Control Programme 2023, Version 1.0, Papadopoulos Christos, April 2023

22 EEA Air Quality Publication, 2022a – Cyprus, https://www.eea.europa.eu/publications/air-quality-in-europe-

Efforts for clean air in Cyprus are showing positive results, showing a downward trend in air pollutant emissions. To a very large extent, these positive effects are caused by international regulations (LRTAP Convention, EMEP Protocols and EU Directives). Cyprus currently complies with all EU air quality limit values and NED NERCs, except SO_x.

For the Air Quality Directive, the only exception is the O3 long-term target for the protection of human health, where exceedances exceed 25 per year, as well as AOT 40[23]. The relative O3 exceedances of the target value are mainly due to climatic conditions in Cyprus, where high ambient temperatures and high solar radiation contribute to O3 production as well as the transboundary pollution of O3 precursors from the Eastern Mediterranean and other neighbouring countries. In addition, Cyprus has problems with PM_{10} concentrations mainly due to natural sources. However, following the exclusion of PM_{10}, no exceedances are observed. Nevertheless, additional efforts will be made to minimise the anthropogenic part of PM_{10} emissions.

Cyprus recognises the importance of clean air for the health and well-being of its citizens and its environment and is aware of its international obligations in this area. As the population and the economy grow and sectors grow, there are both challenges and opportunities that need to be recognised when it comes to managing future air quality. In this context, Cyprus is fully committed to further develop measures and initiatives to strengthen and protect air quality alongside broader national policy priorities related to development. As a starting point, NEC ceilings support this overall national ambition by requiring reductions in absolute emission levels in each sector of Cyprus over time. These improvements, together with additional measures and local initiatives, will also support ongoing successes in managing air quality levels in line with the Air Quality Directives.

The regulatory framework for reducing air pollution in Cyprus is set out below:

(a) International commitments to reduce air pollution

The policy framework for international cooperation to reduce air pollution is threefold: the Air Quality Directives, the NEC Directive and the Convention on Long-Range Transboundary Air Pollution (LRTAP Convention). In this regard, specific targets are set for concentrations of harmful substances into the atmosphere and the emission of air pollutants, respectively. This general regulation is supported by national and international legislation dealing with the mitigation of air pollution by source. This may be, for example, the setting of maximum emission limit values for certain substances from specific types of undertakings or installations.

National Emission Ceilings (NEC) Directive

As mentioned above, Cyprus is committed through the NEC Directive to reduce emissions of air pollutants NO_x, SO_x, NH_3, non-methane VOC and $PM_{2.5}$. This commitment is set as an emission reduction target compared to base year emissions (2005). Cyprus' commitments are shown in Table 2.2 for the period from 2020 to 2029 and for the period from 2030 onwards.

Long-range Transboundary Air Pollution (LRTAP)

Cyprus is a party to the LRTAP Convention, which aims to limit air pollution in a large region composed of the EU, Eastern Europe, the Caucasus, Central Asia, the US and Canada. The Convention has eight protocols setting out requirements for the inventory of emissions and the reduction of many substances, including heavy metals and bituminous compounds. The most recently updated Protocol is the Gothenburg Protocol containing emission reduction commitments for the same substances covered by the NEC Directive for the years after 2020. The NEC Directive is the implementation of the Gothenburg Protocol by the EU, but it goes a step further and also has an emission reduction target for 2030, setting

2022

23Accepted Ozone Exposure over a threshold of 40 Parts Per Billion strict targets.

(b) Air Quality directives

The Air Quality Directives[24] set objectives and limit values for the atmospheric concentration of certain substances, as well as a requirement to monitor air pollution. The air quality directives aim to ensure that the air we breathe is so clean that it is not a threat to human health. Therefore, measuring stations have been established throughout Cyprus, measuring air pollution on a continuous basis. These measurements are published every hour on a dedicated webpage to inform citizens about air quality[25]. The Air Quality Directives set, inter alia, limit values for PM_{10}, $PM_{2,5}$, SO_x, CO, O_3, NO_x and NO_2. The national monopoly has been brought into line with the provisions of the Air Quality Directives with the Air Quality Law of 2010[26] and its amendments (2017[27], 2020[28]) and the relevant Regulations[29].

Air quality monitoring in Cyprus is carried out by the Department of Labour Inspection, which reports to the Cypriot Ministry of Labour and Social Insurance.

(c) Source Specific Regulation

The Air Quality Directives, the National Emission Ceilings Directive and the LRTAP Convention are supported by extensive legislation to control pollutants at source, which contributes to compliance with the emission limit values set out in the Directives and the Convention. These are, for example, the regulation of pollutants emitted by wooden containers, vehicles, ships and industrial installations. This Regulation covers both EU and national obligations.

Table 2.2. National emission reduction commitments with base year 2005

	So_x	No_x	NMVOC	NH_3	$PM_{2,5}$
2020-2029 (M)	83 %	44 %	45 %	10 %	46 %
From 2030 (M)	93 %	55 %	50 %	20 %	70 %

Carbon Capture and Storage/valorisation

To address the decarbonisation challenge, a portfolio of technologies and approaches is needed, while supporting sustainable and competitive industries. Carbon Capture, Use and Storage (CCUS) can play a crucial role in this sustainable transformation and is believed to be a method that can mitigate large stationary CO2 emitters **that** are historically difficult to manage. CCUS projects have been ongoing in all sectors for many years, but challenges remain.

The adoption of the EU Green Deal, the Climate Law and subsequent proposals to increase energy and climate targets for 2030 have made carbon capture and storage technologies an important part of the EU's decarbonisation effort.

Cyprus is currently participating in the discussions of the European Commission on CCS technologies applied in other MS and is exploring the possibility of opening its territory or part of it for exploration of suitable geological formations. In view of the future offshore production drilling activities in its EEZ, discussions are taking place with stakeholders on the possible use of CCS technologies from CO_2 to be produced during hydrocarbon production activities and the preparation of a national plan for CCS.

European Mission: Climate Neutral and Smart Limassol by 2030

24Directive 2008/50/EC on ambient air quality and cleaner air for Europe
25 https://www.airquality.dli.mlsi.gov.cy/
26The Air Quality Law of 2010 (Law 77 (I)/2010)
27The Air Quality (Amendment) Law of 2017 (Law 3 (I)/2017)
28The Air Quality (Amendment) Law of 2020 (Law 20 (I)/2020)
29RAA 111/2007, RAA 327/2010, RAA 37/2017 and RAA 38/2017

The European Mission: 100 climate Neutral and Smart Cities by 2030 is a Horizon Europe innovation that requires the selected cities to prepare and submit to the European Commission the Climate City Convention which will act as a strategy to accelerate the European Commission's Climate Neutrality targets by 2050.

The participation of the Municipality of Limassol in the European Mission: 100 climate Neutral and Smart Cities by 2030 are divided into three phases: (A) 2021-2022. Preparation of an application for expression of interest and selection as sending city (B) 2022-2023. Preparation and registration of the EU Climate City Convention for Mission Label (C) 2024-2030 Implementation of actions – Evaluation and Adaptation.

During the drafting period of the NECP – the Municipality of Limassol works in the design and preparation of the City of Climate Contract with the extended participation of central government, local authorities, private bodies, NGOs and citizens.

More details on the action are available in **Annex 1**.

2.1.2. Renewable energy

i. The elements set out in Article 4(a) (2)

Current situation

In 2021, the share of energy from renewable energy sources (RES) in the Republic of Cyprus' gross final consumption of energy reached 18.42 %[30], exceeding the indicative trajectory set in the previous NECP for 14.8 % in 2021, as well as the baseline reference share of 13 % provided for in Article 3 (4) of Directive[31]2018/2001/EU. There was a 9.12 % increase in the share of energy from RES in 2021 compared to 16.88 % in 2020.

In addition, the share of RES in 2021 in the power sector stood at 14.84 %, in the heating and cooling sector at 41.34 % and in transport at 7.19 %.

Figure 2.5 below shows the evolution of the share of RES use in Cyprus's total energy consumption over the past 10 years (in accordance with the provisions of Directive (EU) 2018/2001) and Figure 2.6 shows the share of RES per sector (electricity generation, heating and cooling, and transport).

30https://ec.europa.eu/eurostat/databrowser/view/NRG_IND_REN/default/table?lang=en
31Directive (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.

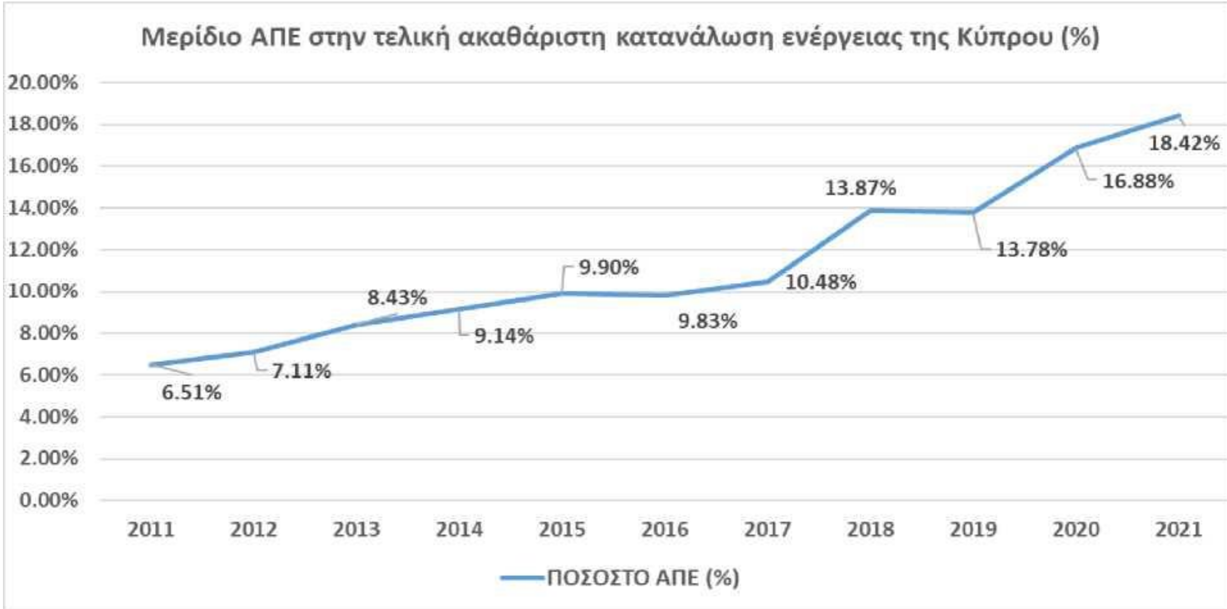


Figure 2.5. Share of RES use in Cyprus' total energy consumption in 2011-2021.

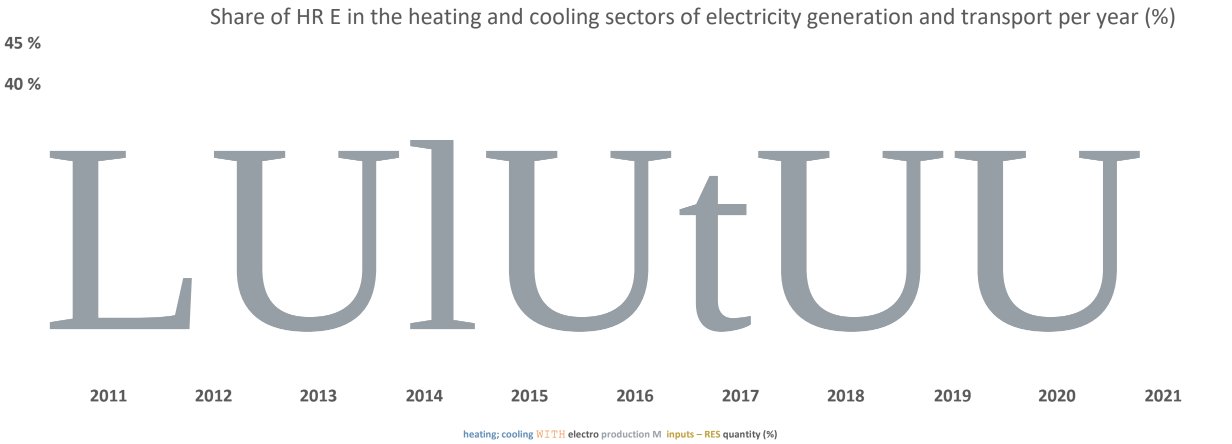


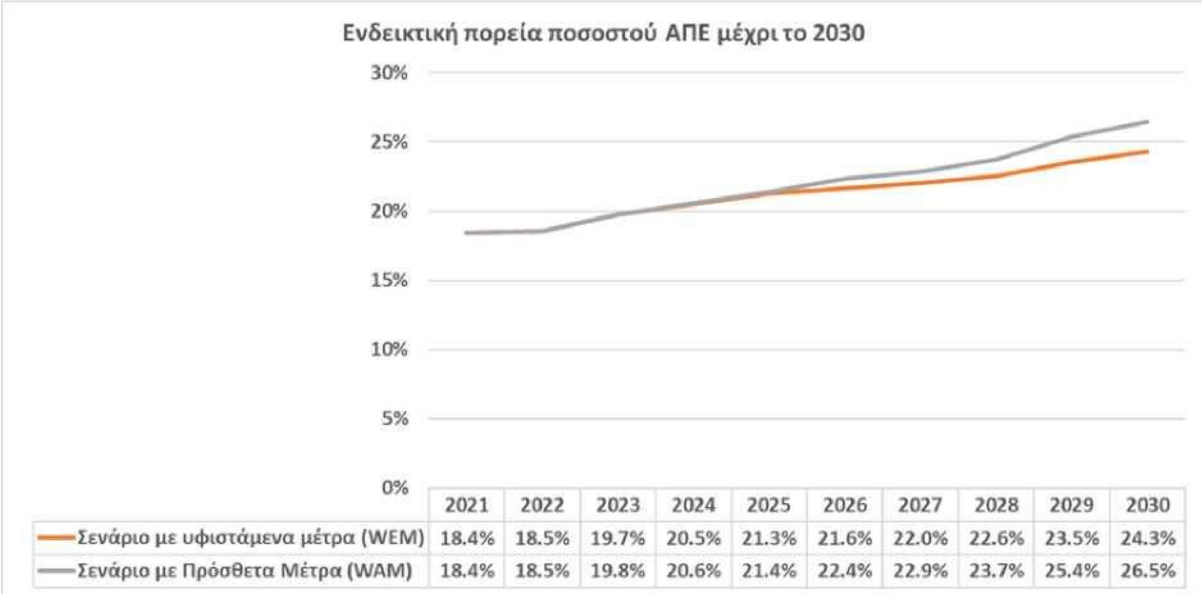
Figure 2.6. Share of RES in the heating and cooling, electricity and transport sectors in the period 20112021.

Analysis of Scripts

Of the scenarios examined, the share of RES in final gross consumption in 2030 rises to 26.5 % in the SWM, while in the GEM the share of RES reaches 24.3 %.

According to the existing NECP Cyprus' RES target for 2030 is to achieve at least 23 % RES in final energy consumption, this target is the existing national contribution to the EU RES target in 2030. Based on the Snares, the existing national RES target is increased by 15.2 % in the SPM and by 5.65 % in the SMM.

Figure 2.7 below shows the evolution of the percentage of renewable energy use in Cyprus's total energy consumption up to 2030 in the SEMs and SEMs.



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Σενάριο με υφιστάμενα μέτρα (WEM)	18.4%	18.5%	19.7%	20.5%	21.3%	21.6%	22.0%	22.6%	23.5%	24.3%
Σενάριο με Πρόσθετα Μέτρα (WAM)	18.4%	18.5%	19.8%	20.6%	21.4%	22.4%	22.9%	23.7%	25.4%	26.5%

Figure 2.7. Indicative RES trajectory to 2030 in SPM Scenario

Figure 2.8 shows the indicative RES trajectory until 2030 in the VMS in relation to the benchmarks for achieving an increase in the share of RES in 2022, 2025 and 2027 in accordance with Article 4 (a) (2) of Regulation (EU) 2018/199932. All three benchmarks are met in the AFM, which provides for a 26.5 % RES rate in 2030.

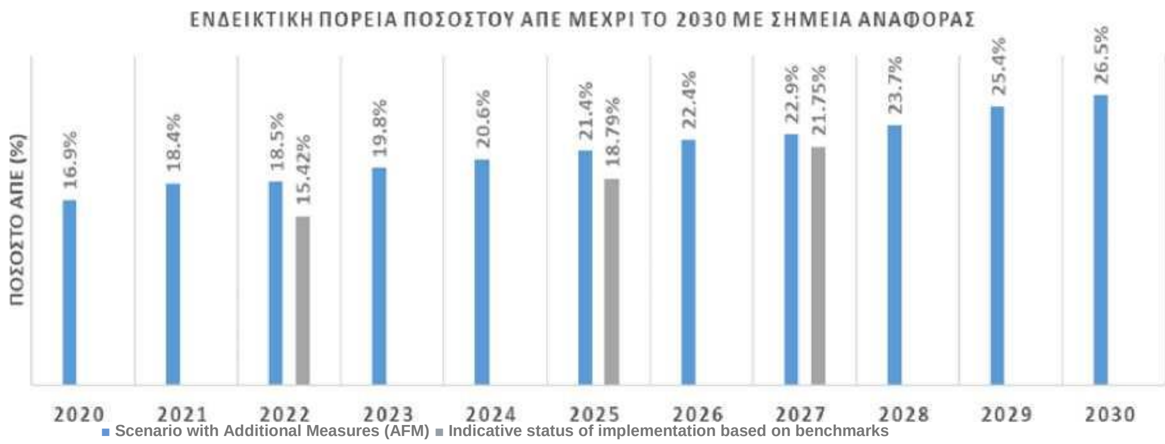


Figure 2.8. Indicative trajectory of increasing RES share in the AFM, in relation to the reference points of Regulation (EU) 2018/1999.

Figure 2.9 shows the evolution of the RES share in the electricity, heating and cooling and transport sectors up to 2030 in the basic scenario with additional measures (SPM).

32Regulation (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.

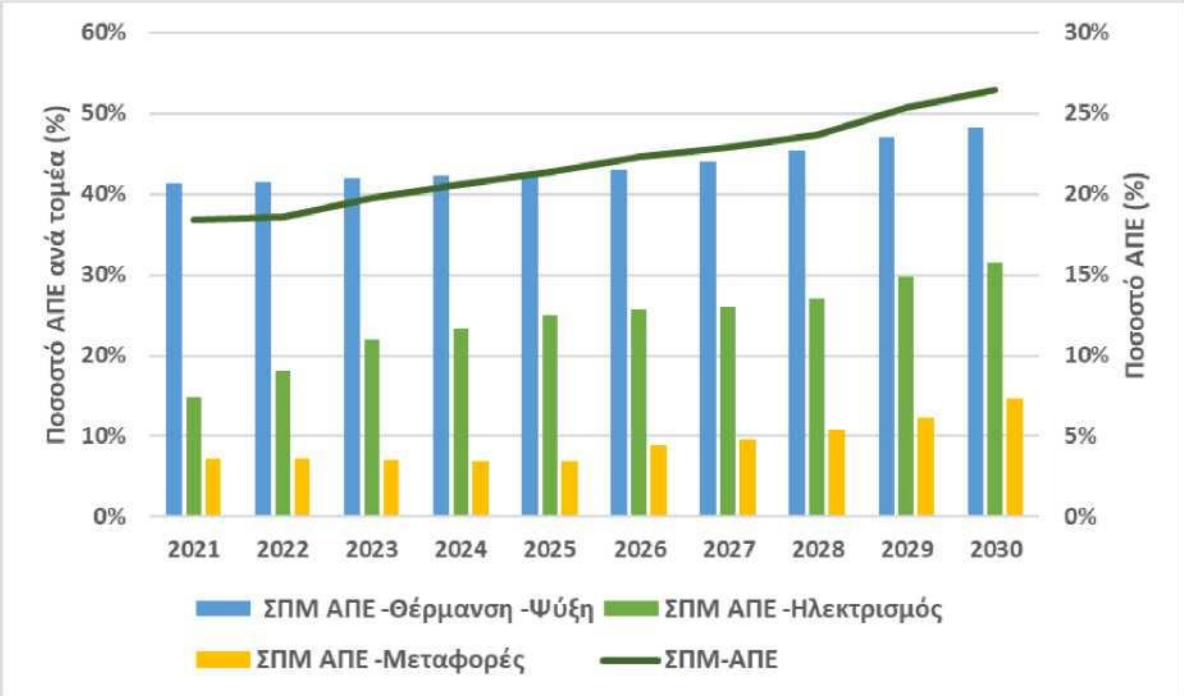


Figure 2.9. Indicative growth trajectory for RES in the heating and cooling of electricity and transport sectors in the AFM

Table 2.3. Trajectory of the share of renewable energy from 2021 to 2030 per sector in the scenarios AFM

Script	Scenario with existing measures (SAM)				Scenario with Additional Measures (AFM)			
	EOM	RES – Electricity	RES – Heating – Cooling	RES – Transport	EOM	RES – Electricity	RES – Heating/Cooling	RES – Transport
2021	18.4 %	14.8 %	41.3 %	7.4 %	18.4 %	14.8 %	41.3 %	7.4 %
2022	18.5 %	18.0 %	41.6 %	7.3 %	18.5 %	18.1 %	41.6 %	7.3 %
2023	19.7 %	21.9 %	42.0 %	6.9 %	19.8 %	21.9 %	42.1 %	7.3 %
2024	20.5 %	23.3 %	42.2 %	6.8 %	20.6 %	23.3 %	42.3 %	7.3 %
2025	21.3 %	25.4 %	42.5 %	6.7 %	21.4 %	25.1 %	42.6 %	7.3 %
2026	21.6 %	25.8 %	42.9 %	7.0 %	22.4 %	25.6 %	43.0 %	8.9 %
2027	22.0 %	25.9 %	43.2 %	7.9 %	22.9 %	26.0 %	44.0 %	9.6 %
2028	22.6 %	26.3 %	43.6 %	8.9 %	23.7 %	27.0 %	45.3 %	10.7 %
2029	23.5 %	27.4 %	44.7 %	10.2 %	25.4 %	29.7 %	47.1 %	12.2 %
2030	**24.3 %**	28.2 %	45.2 %	11.9 %	**26.5 %**	31.5 %	48.2 %	14.6 %

Assumptions

The analysed scenarios used data from local sources and from studies conducted33, through technical assistance from the SRSS (DG Reform) and assumptions based on literature and databases (PRIMES, POTEnCIA-IDEES).

In all scenarios it is assumed that natural gas will become available for use in the electricity sector in mid-2024 (instead of by the end of 2021 considered in the previous NECP). In the early stages, natural gas will only be used for electricity generation and will gradually be supplied to other industrial users.

Cyprus' electricity system remains isolated without interconnection with neighbouring states until 2029 where the EuroAsia Interconnector electricity interconnection project is expected to be completed and commercially operational. It should be noted that the electricity interconnection will allow the installation of more RES projects and reduce the levels of curtailment of the production of photovoltaic

33https://www.energy.gov.cy/gr/ενημέρωση/στρατηγικός-σχεδιασμός/εθνικό-στρατηγικό-σχέδιο-για-την-energy-and-climate-2021-2030 and wind farms.

Electricity

Current situation

In the electricity sector in 2021, the share of RES stood at 14.84 %, an increase of 2,8 percentage points compared to the RES share in the sector in 2020 (12.04 %).

This proportion of RES in the electricity generation sector is due to photovoltaic systems installed for self-consumption purposes under the 'Plan for electricity derived from RES for own consumption' and for commercial purposes as part of plans for inclusion in the competitive electricity market or the transitional regulation of the electricity market. In addition, six (6) wind farms, 14 biomass/biogas plants and a large number of photovoltaic systems have been installed under previous grant plans providing for a feed-in-tariff.

The total installed capacity of RES systems in the electricity sector up to 31/01/2023 is shown in Table 2.4.

Table 2.4. Total installed capacity of RES systems in the electricity sector

RES technology/Project category	Number of systems	Installed capacity (MW)
PHOTOVOLTAIC SYSTEMS		
Plan for electricity generation from RES for consumption		
Net-metering	38.797	174,78
Net-billing	416	27,82
Self-production	56	2,15
Stand-alone PHB systems (not network-connected)		1,94
A plan for the production of electricity from renewable energy sources, leading ultimately to the inclusion of the projects in the competitive electricity market.	34	19,44
Plan for the production of electricity from RES in the context of the transitional regulation of the electricity market, culminating in the projects on the competitive electricity market	112	189,08
Feed-in-tariff project	1875	77,34
Total photovoltaic systems	**41.290**	**492,55**
INDUSTRIAL AND BIOGAS UNITS		
Feed-in-tariff project	14	9,71
Net-billing	1	2,41
Total Biomass biogas plants	**15**	**12,12**
AEOLAIA PARKAS		
Feed-in-tariff project	6	157,5
TOTAL	**41.311**	**662.17**

Analysis of Scripts

Of the scenarios examined, the RES share in the electricity sector in 2030 rises to 31.5 % in the AFM, while in the GEM the share of RES reaches 28.2 %. Figure 2.10 shows the evolution of the composition of electricity generation up to 2030 and the contribution of available technologies to the SPM and Figure 2.11 shows the evolution of installed capacity (MW) of RES technologies.

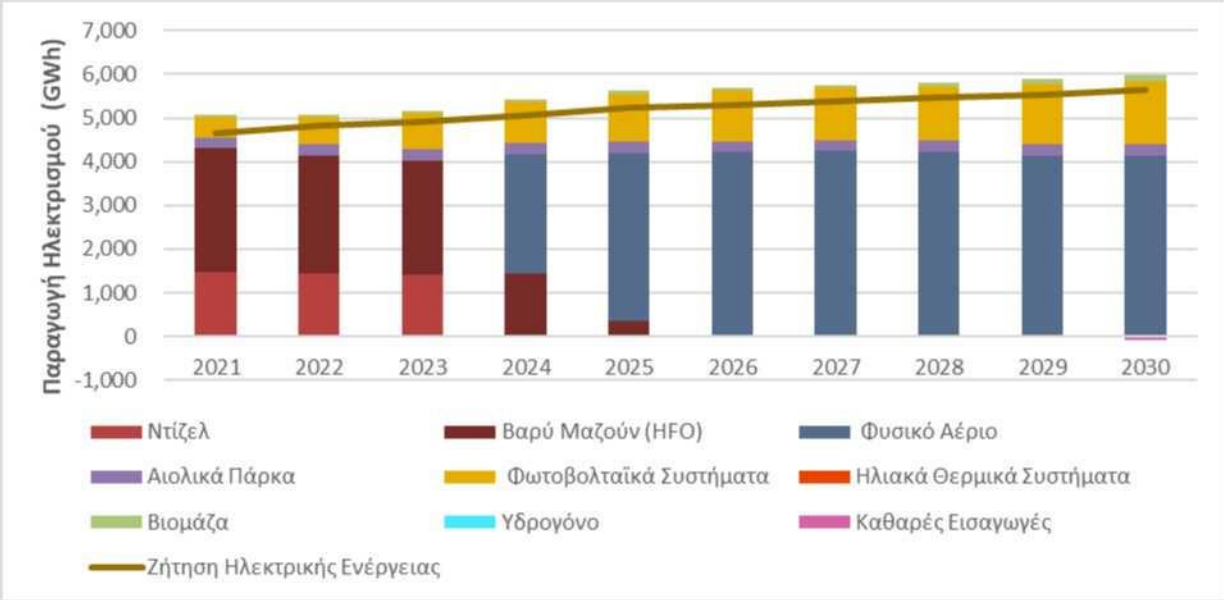


Figure 2.10. Evolution of electricity generation up to 2030 in the FPS

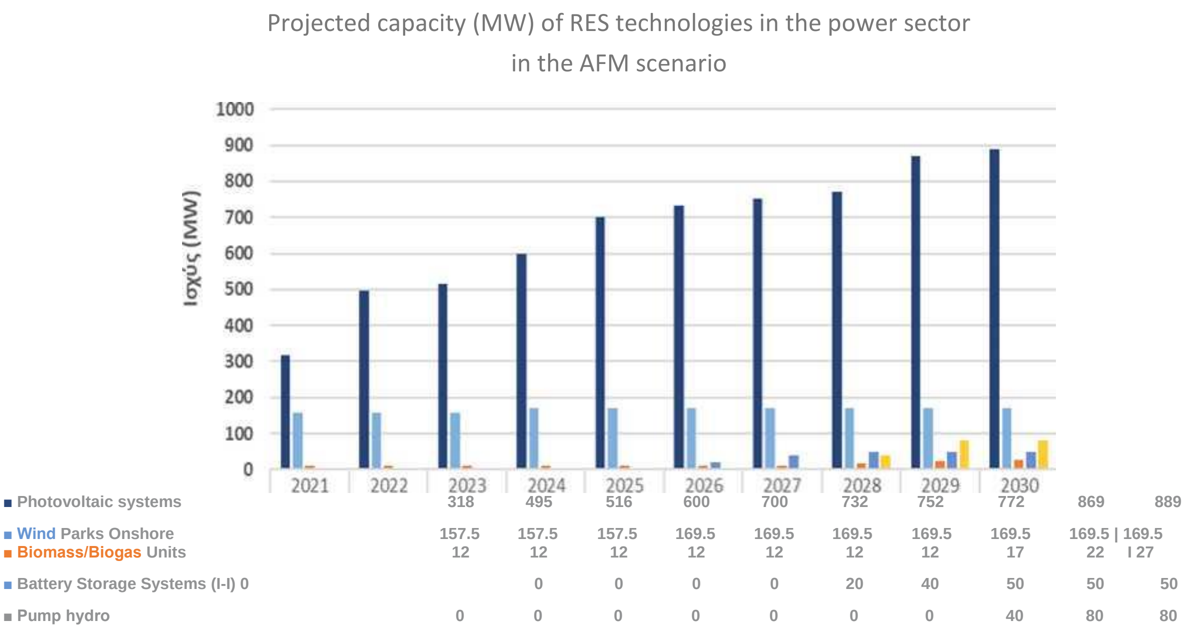


Figure 2.11. Evolution of installed capacity (MW) of RES technologies in the SPM

The evolution of the power generation sector is determined by the introduction of the use of natural gas in 2024 replacing the consumption of fuel oil (HFO) and diesel. At the same time, the continued electrification of the heating and cooling sector and the increase in the use of electric vehicles are increasing electricity demand in the coming years.

The percentage of RES and H will continue to come from photovoltaic systems, wind farms and biomass/biogas plants. However, it is expected that the further increase in the RES/H ratio in the coming years will come almost exclusively from the increased installation of photovoltaic systems, which is the most competitive technology from the other available RES technologies in Cyprus. By 2026, PV systems with a total capacity of at least 732 MW are expected to be in operation, in line with the power of the PV systems already installed and that of the PV systems that have already been authorised and have also paid the conditions for connection to the grid. The total installed capacity of the PV systems is expected to reach, in 2030, at least 889 MW, in the VMS (Figure 2.11).

As regards wind farms, a new 12 MW park is expected to be installed in 2024, which has already been licensed and the connection conditions have been met, increasing the total capacity of wind farms to 169.5 MW. Also in 2030, the installed capacity of biomass/biogas plants for electricity generation purposes increases to 27 MW with the installation of new plants in the end of the decade.

The development of solar thermal power systems (Concentrate Solar Power) with a storage system (molten salt) is expected to take place well beyond 2030. The use of hydrogen in the power sector is not expected by 2030 in any of the scenarios considered.

Also, the installation of offshore wind farms is expected to take place in 2049 reaching 100 MW by 2050 in the LMP scenario. In the context of relevant taxiing studies on further analysis of the potential for developing offshore RES projects in the exclusive economic zone of the CAR, the above capacity and implementation timetables may be revised in the final revised NECP. To this end, technical assistance is underway to improve and/or create the necessary legal framework, including the permit granting process and financial incentives (sponsorship plans) for the deployment of ORE by 2030.

Storage systems

The increased penetration of decentralised RES units, mainly PV systems, requires the development of electricity storage systems for the purposes of reducing electricity cut-outs and electricity system stability, bearing in mind that Cyprus remains unconnected to the electricity grids of neighbouring countries until 2029. By then, the electricity interconnection between Cyprus and the electricity system of Israel and Crete is expected to be completed with the EuroAsia Interconnector project, which will also help to reduce the electricity cut-offs from RES, which become necessary during periods of low electricity demand and high RES generation.

The draft revised NECP foresees the installation of Lithium-Ion battery storage systems, without specifying whether they should be installed centrally, i.e. at transport-distribution level (in front of the meter) or behind the meter at consumer level or directly connected to RES systems. In the AFM the installation of such plants is expected to start in 2026, reaching 50 MW in 2030, allowing for at least 4 hours storage for central storage systems and at least 2 hours for decentralised storage. Please note that the installation of these systems is directly linked to the installation of RES systems, in accordance with the recent regulatory decision of the CERA, which states, inter alia, that 'RES producers interested in being included in the Transitional Electricity Market Regulation of Cyprus should have the technical capacity to plan and flexibly their production so as to avoid the loss of energy that arises when their generation is restricted by orders of the TSO and/or DSO for the purposes of the proper functioning of the system as a result of the spread of generation and due to the small and isolated and therefore vulnerable electricity system in Cyprus'.

In addition, in the scenarios examined, two pumped hydro plants with a capacity of 40 MW each, with a potential for 8 hours of storage, are planned to be installed in the period 2028-2029. To this end, a study is ongoing, which aims to prepare all the necessary procedures for launching a tender for the implementation (after optimisation) of the above project.

Renewal of RES power plants

RES projects shall ensure an operating licence or exemption licence from the Regulatory Authority for Energy (CERA) for a period of 30 years. Most of the RES projects in operation are expected to expire after 2030. Therefore, it is not expected that the renewal of the permit for a significant number of RES projects will be required by 2030.

The existing RES projects with a total capacity of 244.57 MW, which have been included in feed-in-tariff projects, have a subsidy agreement for 15 or 20 years and most of them became operational after 2010. It is estimated that by 2030, the grant agreement will be terminated for 9 biomass/biogas projects with a total capacity of 5.71 MW, and for photovoltaic systems with a total capacity of around 70 MW. After the expiry of the grant agreement, these projects are expected to continue to operate within the framework of the self-consumption plan (mainly the PV systems placed on roofs of homes or businesses) or to be integrated into the competitive electricity market. Also, in some grant agreements, it is possible for an additional five years to extend the sale of the energy produced to the Electricity Authority – Procurement, to the avoidance costs determined by CERA, without receiving a subsidy. A number of small power PV systems (up to 5 kW) installed in the period 2005-2008 have already been transferred to the billing category after the expiry of the grant agreement.

The PV systems and one biomass system that have been included in theconsumption plan categories have a compensation agreement of 10 or 15 years. These systems after the end of the contract are expected to continue operating in accordance with the electricityconsumption scheme in force during that period.

Restrictions – Obstacles

Through studies carried out during the process of preparing the previous NECP, the penetration of RES/H reaches the maximum in a very early period in 2023-2024, due to technical constraints related to the isolated nature of the electricity system in Cyprus, as well as the fact that the national grid is designed to serve large central power plants rather than many decentralised plants, as is currently the case with RES penetration.

Therefore, after 2023 – 2024, and until the grid is redesigned, the further penetration of RES into electricity generation for commercial systems (non-self-consumption) will be possible in combination with storage technologies, in order to avoid interruptions in production, which increases the cost of such investments and makes them less competitive than conventional gas-fired plants. As mentioned in the previous NECP, with the electricity interconnection, the share of RES in electricity generation can exceed 50 % in 2030, while without an electrical interconnection the RES/H penetration can reach only 30 %.

Also, due to the small size of Cyprus' market, the cost of most RES systems is comparatively higher than in other European States. At the same time, high land costs, combined with the limited availability of suitable land, limit the widespread development of RES-E projects.

Weather-refrigerated

Current situation

In the heating and cooling sector, the RES share in 2021 reached 41.34 %, exceeding the indicative trajectory set in the NECP for 32.6 % in 2021. There has also been a 11.12 % increase in the share of RES in the sector in 2020 (37.12 %).

Most of the RES share in the heating and cooling sector is due to solar energy through the widespread use of solar thermal systems for water heating. Also important is the contribution from the use of heat pumps and the use of biomass (wood products) for heating purposes and the use of waste-based biomass in industry (cement factory). In addition, the contribution of RES cooling with heat pumps is significant, in accordance with the provisions of Delegated Regulation (EU) 2022/759.34

Analysis of Scripts

The share of RES in the heating and cooling sector is projected to continue to grow throughout the period 2022-2030. Of the scenarios examined, the share of RES-H in 2030 increases to 48.2 % in the baseline scenario 'Scenario with Additional Measures (SPM)', while in the 'Scenario with Existing Measures (FAM)' the share of RES-C% Y reaches 45.2 %.

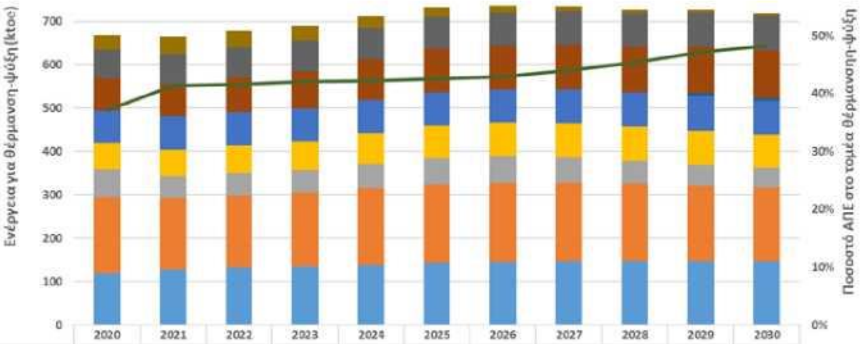
The increase in the share of RES-CHP until 2030 is mainly due to solar thermal systems for hot water for use and heat pumps in buildings. Energy efficiency measures in the heating and cooling sector also play an important role.

Some pilot projects on Cumulative Solar Collection (CSP) technology for heat storage and solar cooling have been developed with very promising results, but due to high costs they are not expected to make a particular contribution to the sector by 2030.

Information on the technical and financial characteristics of the options for further increasing the RES rate is presented in the study 'Revision of Cyprus Energy and Climate Plan- D4.4 – Evaluation of the efficiency and cost-effectiveness of RES technologies in heating and cooling', available on the Energy Service's website.

Figure 2.12 shows the forms of energy and the evolution of the RES share in the heating and cooling sector until 2030 in the CHP.

34Commission Regulation (EU) 2022/759 of 14 December 2021 amending Annex VII to Directive (EU) 2018/2001 of the European Parliament and of the Council as regards a methodology for the calculation of the amount of renewable energy used for cooling and district cooling



	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Απόβλητα (μέρος μη ΑΠΕ)	35	40	37	33	27	21	16	11	8	5	4
Αντλίες θερμότητας - (θερμότητα περιβάλλοντος -Ψύξη ΑΠΕ)	66	69	70	71	73	74	76	77	79	80	81
Ηλιακά συστήματα	74	76	80	86	93	99	102	103	105	107	109
Τηλεθέρμανση-Τηλεψύξη	0	0	0	0	0	0	0	0	0	6	6
Γεωθερμία	0	0	0	0	0	0	0	0	0	0	1
Βιομάζα	75	77	77	76	76	77	76	78	79	79	78
Υγραέριο LPG	61	61	63	66	71	76	78	78	78	77	77
Πετρελαϊκό κοκ	64	50	51	52	56	59	61	58	53	49	45
Πετρέλαιο θέρμανσης /light fuel oil/Gas Oil/diesel	174	164	167	170	176	182	183	182	179	174	170
Ηλεκτρισμός	120	128	132	135	139	143	145	146	147	147	147
RES share	37.1%	41.3%	41.6%	42.1%	42.3%	42.6%	43.0%	44.0%	45.3%	47.1%	48.2%

Figure 2.12. Energy sources and the evolution of the RES share in the heating and cooling sector until 2030 in the VMS

Heat pumps and split units are the most competitive technology in the H-Y sector in buildings, increasing their share by displacing oil boilers and electric heaters. Heat pumps and split air conditioners also cover almost all cooling demand in buildings. An important role in increasing the use of heat pumps/split units is also played by the extensive installation of self-consumption PV systems that reduces their operating costs. At the same time, solar thermal energy continues to play a predominant role for the purpose of heating water for use.

RES target in the heating/cooling sector (Article 23 (1) of Directive (EU)/2018/2001)

According to the scenarios examined in the period 2021 to 2025, the RES-CHP share increases on average by 2.87 % per year in the AFM and 3.02 % in the FAM. Subsequently, in the period 2026 to 2030, the share of RES-T increases on average by 2.52 % per year in the AFM and 1.05 % in the FMA. It therefore appears that the mandatory target set in the revision of Directive (EU) 2018/2001 for RES, for an annual increase of at least 0.8 % in the period from 2021 to 2025 and 1.1 % in the period from 2026 to 2030 in the renewable energy sector, is achieved in the CHP, while it is not achieved in the STM for the second five years. Also, the indicative additional increase of 0.8 % in the period 20212025 and 0.5 % in the period 2026-2030 is achieved in the AFM. The overall average increase over the decade in the RES-I rate is 2.7 % in the SPA, exceeding the indicative target of 1.6 %.

Figure 2.13 shows the progress and annual increase in the RES share in the heating and cooling sector up to 2030 in the VMS.

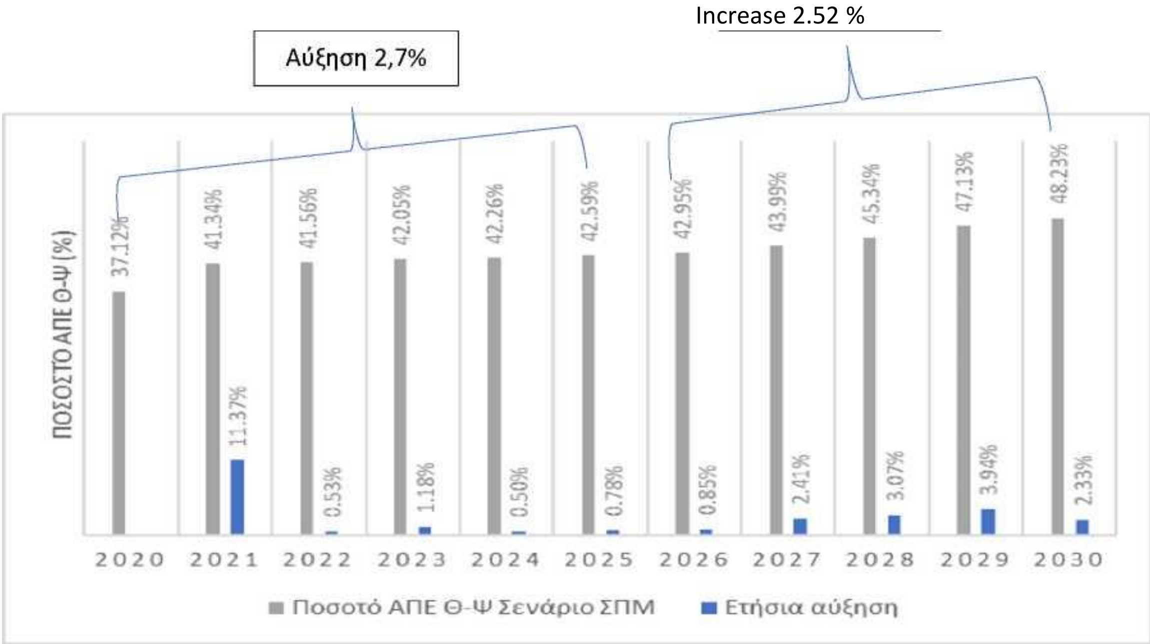


Figure 2.13. Progress and annual increase in the RES share in the heating and cooling sector until 2030 in the VMS.

<u>Transport</u>

According to the STM, a share of RES in the final energy consumption of transport in 2030 is achieved at 11.9 %, while Article 25 of Directive (EU)/2018/2001 sets a share of RES in the final energy consumption of transport at 14 % by 2030. The VMS addresses the achievement of the transport targets set in the revised RES Directive that provides for a share of RES in transport of at least 29 % in 2030 or the amount of renewable fuels and renewable electricity supplied to the transport sector leads to a reduction in greenhouse gas intensity of at least 14.5 % by 2030, compared to a baseline of 94 g CO_2/MJ. Figure 2.14 shows the progress and annual increase in the RES share and the reduction of greenhouse gas intensity in the transport sector by 2030 in the VMS.

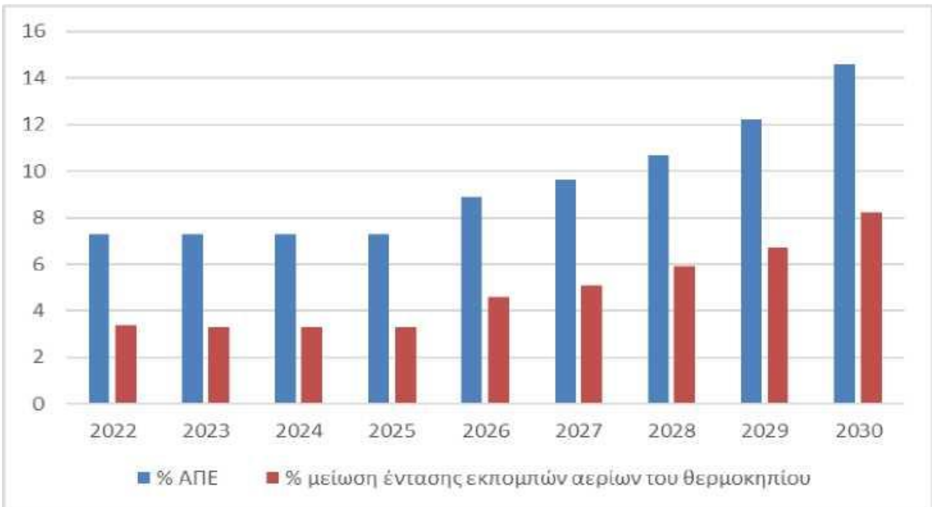


Figure 2.14. Progress and annual increase in RES share and reduction of GHG intensity in the transport sector by 2030 in the AFM

The share of RES in transport remains at 7.3 % until 2025 and has been increasing since 2026 due to the addition of biofuels also to petrol. Although the number of electric vehicles is increasing at low levels, its impact on this target is very small. From 2027 onwards, the increase in the target is due to the further penetration of the electric vehicle and the addition of biofuels to aviation fuels. The GHG intensity reduction target follows a similar trajectory. In 2030, the ETS achieves a 14.6 % share of RES in transport and a 8.2 % reduction in greenhouse gas intensity.

Although the targets are not met, there is a possibility to add further advanced biofuels that double count towards the target in 2030 to reach the target of a combined share of advanced biofuels and biogas and renewable fuels of non-biological origin in the energy supplied to the transport sector at 5.5 % in. The target of at least 1 % of this share, i.e. 5.5 % from renewable fuels of non-biological origin in 2030, is not met as their contribution is limited to 0.05 %. In this case, the share of RES in transport is 19.8 % and the GHG intensity reduction to 10.8 %. Please note that the above calculations do not calculate any contribution from biofuels and other renewable fuels that may be used in shipping, which can be calculated in the final NECP.

The availability of advanced biofuels, i.e. those produced from the feedstocks listed in Annex IX to Directive (EU) 2018/2001, is gradually increasing, although their price is significantly higher than that of other biofuels. The adoption of the new Energy Tax Directive allowing for a very low rate of excise duty on advanced biofuels and waste-based biofuels and an increase in the excise duty rate for fossil fuels combined with the implementation of the green tax reform will lead to a reduction in the final price of advanced biofuels, which should facilitate their further penetration in the transport sector.

ii. Estimated trajectories for the sectorial share of renewable energy in final energy consumption from 2021 to 2030 in the electricity, heating and cooling, and transport sectors

See point 2.1.2. i

iii. Estimated trajectories of renewable energy technology that the Member State intends to use to achieve the overall and sectoral trajectories for energy from renewable sources from the 2021 until in 2030, including expected total gross final energy consumption by technology and sector in millions Toe and of comprehensive; planned installed capacity (divided by new capacity and renewal of renewable power plants) by technology and sector in MW

See point 2.1.2. i

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

At this stage biofuels are used in road transport through an obligation on fuel suppliers (petrol and diesel) to blend biofuels with conventional fuels to reach a certain target, which is a share of biofuels in total annual sales of petrol and diesel, based on energy content. Biogas is also used for heat and power generation purposes in 15 plants (mainly pig farms), use of biomass (wood products) for residential heating purposes and biomass from waste for heat production in industrial plants (cement plant).

There is no domestic biofuel production and no forest biomass is used or projected to be used in Cyprus for energy purposes (except for small quantities of wood used in fireplaces). Local production of waste-based biofuels will also be promoted through support programmes, which are expected to be operational in the coming years. Therefore no LULUCF impacts are expected.

Figure 2.15 shows the estimated bioenergy demand path up to 2030 in the heating, electricity and transport sectors in the AFM.

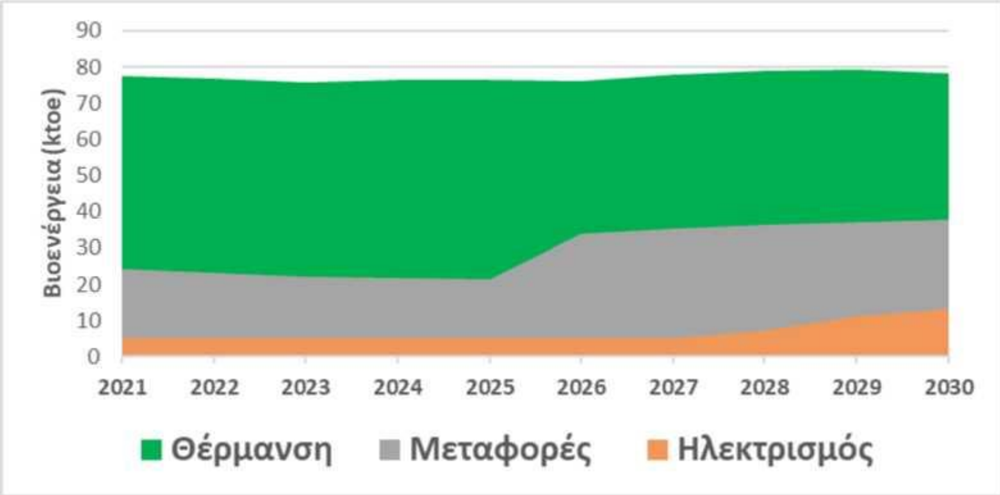


Figure 2.15. Estimated bioenergy demand path to 2030 in the heating, electricity and transport sectors in the AFM

v. Where applicable, other national trajectories and objectives, including those that are long term or sectoral (e.g. share of renewable energy in district heating, renewable energy use in buildings, renewable energy produced by cities, renewable energy communities and renewables self-consumers, energy recovered from the sludge acquired through the treatment of wastewater)

Renewable Energy Sources in Buildings

According to the current minimum energy performance requirements, almost all new buildings and buildings being renovated must be buildings with a relative zero energy consumption, with at least 25 % of their total primary energy consumption coming from renewable sources. In practice, the RES rate in new buildings exceeds 25 % due to the fact that in most cases a photovoltaic own-consumption system with capacity covering almost all of the building's electricity demand is installed. In addition, almost all existing homes in Cyprus have solar water heating systems.

On 01/07/20, the Minister for the Interior issued Decree 1/2020 (Use of Renewable Energy Sources in relation to various types of developments), on the basis of Article 6 of the Town and Country Planning Act. The Decree sets out incentives and/or requirements to encourage the use of RES in different types of developments. According to the Decree, new buildings and buildings being renovated are allowed to increase their building rate by 5 % in cases where they are energy class A and at least 25 % of their total energy needs are covered by renewable sources, provided that the application for planning permits was submitted before 30 June 2020 or is energy class A and that the maximum primary energy consumption does not exceed 50 kWh per square metre per year, provided that the application for planning permission is submitted between 1 July 2020 and 31 March 2024.

In the AFM, the share of RES energy use in the buildings sector is estimated to be around 47.94 % in 2030, with the largest contribution coming from the exploitation of solar energy for electricity generation through photovoltaic systems and for water heating purposes through solar systems.

That percentage shall constitute the indicative national share of renewable energy use in buildings to achieve the overall EU level target of at least 49 % renewable energy use in buildings by 2030.

Use of renewable energy in industry

The share of energy from RES in total energy consumption in industry is estimated to reach 30.15 % in 2030, in the CPM. This will be mainly due to the use of biomass and waste energy for industrial heat production combined with an increase in the use of electricity from photovoltaic systems.

In the AFM it is estimated that in the five-year period from 2021 to 2025, the share of RES in industry will increase annually by an average of 1.71 % and in the five years 2026 to 2030 it will increase by 5.34 %.

It is therefore expected that the indicative target set in the revision of the RES Directive of an average annual increase in the rate of renewable energy use in industry of 1.6 % will be achieved.

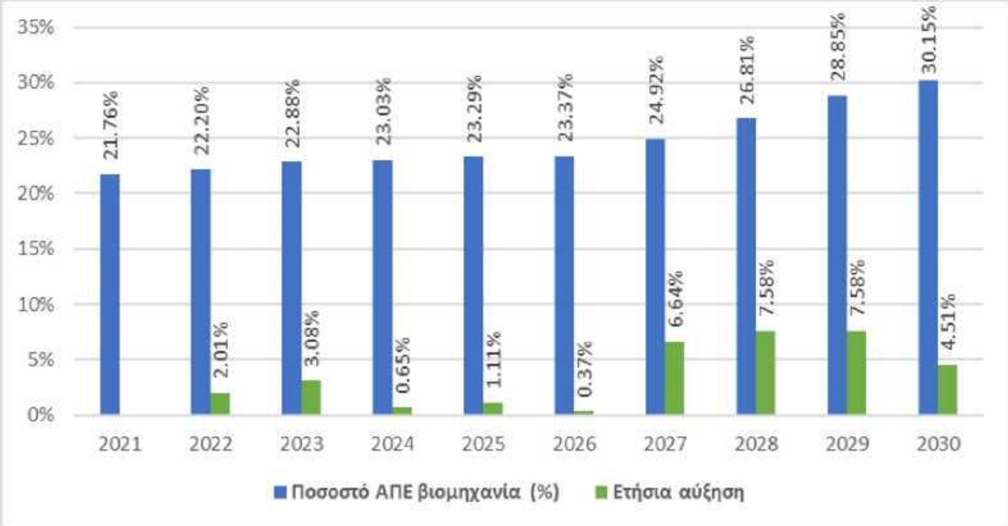


Figure 2.16. Progress and annual increase in the rate of RES use in industry up to 2030 in the VMS.

The scenarios examined predict that there will be no use of hydrogen for energy or non-energy purposes in domestic industry by 2030.

District heating – cooling

The NRP refers to the installation of a district heating/cooling system in 2029, with a very small contribution to the RES share in the heating and cooling sector.

Studies already carried out show that it is not cost-effective to develop district heating and cooling systems in Cyprus. The potential for such investments exists only in two tourist areas, but no such development is economically viable without financial support. More efficient options such as heat pumps and solar systems make it impossible to install such networks.

2.2. Dimension energy efficiency

1. The elements listed in Article 4(b)

Current situation

As regards the progress made in 2021 towards the energy efficiency dimension targets for the period 2021 – 2030 as set out in the 2020 NECP and resulting from the implementation of the Energy Efficiency Directive 2012/27/EU, the following applies:

- The Primary Energy Consumption (PEC) for 2021 was 2,31Mtoe based on available Eurostat data and is lower than the corresponding forecast of 2,50 Mtoe set in the NECP. It should be recalled that Greece's indicative target for 2030 is that Primary Energy Consumption (PEC) in 2030 should not exceed 2,4 Mtoe.
- The final energy consumption (FEC) for 2021 was 1,68 Mtoe based on available Eurostat data and is lower than the corresponding forecast of 1,90 Mtoe set in the NECP. It should be recalled that the country's indicative target for 2030 is that the final energy consumption (FEC) in 2030 should not exceed 2,0 Mtoe.
- For the mandatory cumulative end-use energy savings target of 243,04 Ktoe for the period 2021 – 2030, the energy savings achieved in 2021 amount to 54,40 Ktoe, compared to 53,85 Ktoe set for that year in the NECP. The measures with the highest contribution are taxation of motor fuels in addition to the minimum levels of taxation set by the relevant European Directive, the consumption tax on electricity, the replacement of street lighting lamps, the savings plans to increase the number of homes and some of the subsidy schemes of the RES and E & E Fund.

- Thecompulsory E & E of 1,31 Gwh or 0,1127 Ktoe for 2021 in the buildings of central government authorities, as evidenced by Article 5 of the Directive, has been achieved by 470 %. The contribution of the measures implemented by the Department of Public Works (renovations of public buildings) Department of Electromechanical Services (individual E & E measures) and the Energy Service (horizontal measures) in 2021 amounts to 0,530 Ktoe.

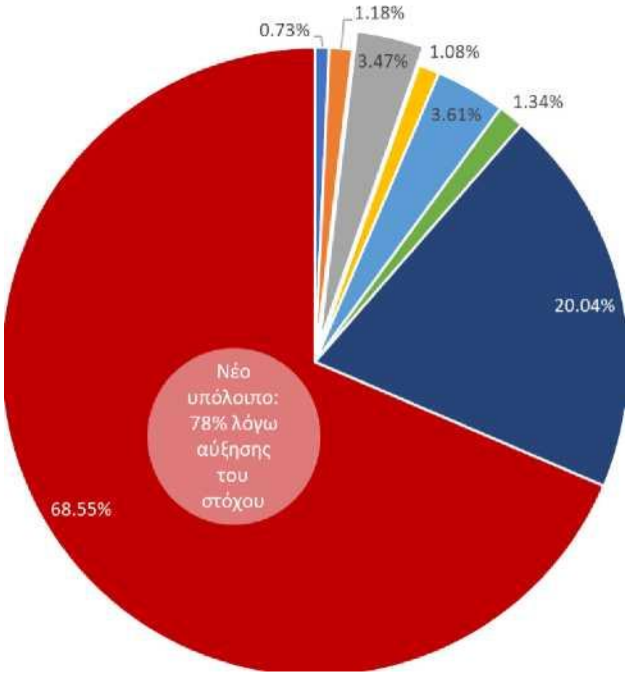


Figure 2.17. Contribution of the 2021 measures/actions to the mandatory cumulative end-use energy saving target of 243,04 ktoe for the period 2021-2030

Revision of primary and final energy consumption projections

New projections for energy consumption have taken into account:

- The updated energy balances for 2019 and 2020, as well as the most recent energy balance for 2021 from Eurostat.
- The latest developments in the use of natural gas for electricity generation. According to the latest data, gas penetration seems to occur in the second half of 2024, as described in paragraph 3.3.i (Energy Security).
- The Cypriot Ministry of Finance macroeconomic forecasts published in October 2022. According to these, economic growth is projected to be stronger than before by 2030. For example, GDP in 2030 is expected to reach EUR 29,4 billion (in 2010 prices), while the official macroeconomic forecast used in the previous NECP reported a GDP of EUR 27,2 billion (in 2010 prices) in 2030.
- The figures below illustrate the projected evolution of final energy and electricity demand under the two scenarios with Existing Measures and Additional Measures.

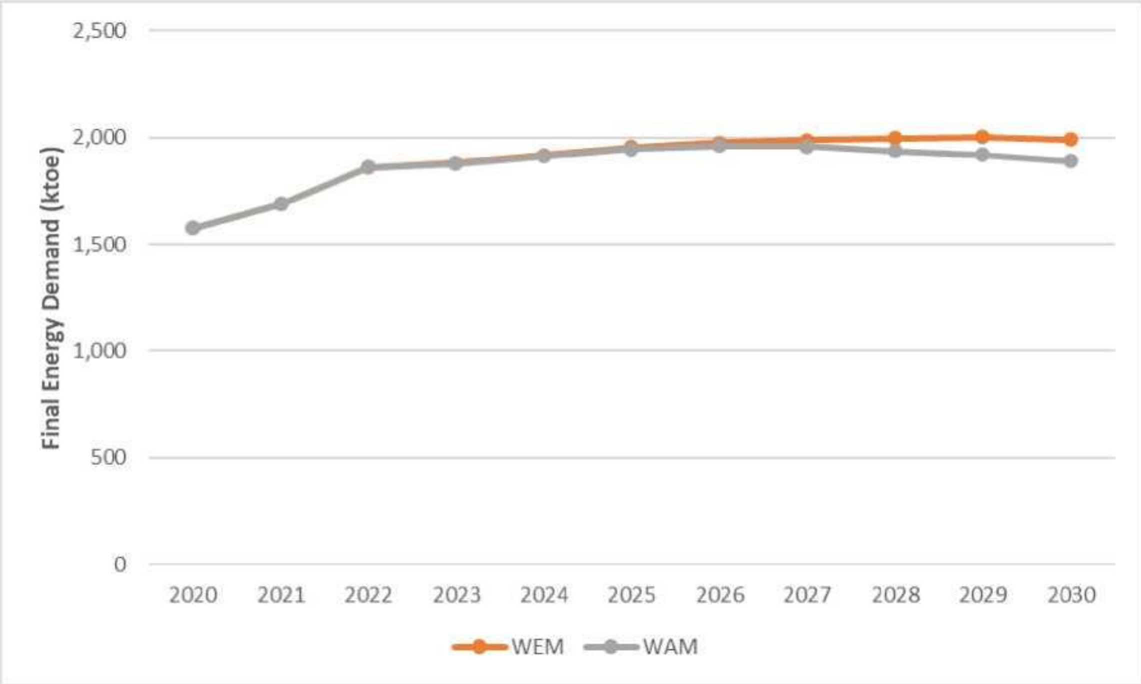


Figure 2.18. Forecast final energy demand in Cyprus (ktoe)

Figure 2.19. Forecast final electricity demand in Cyprus (million kWh)

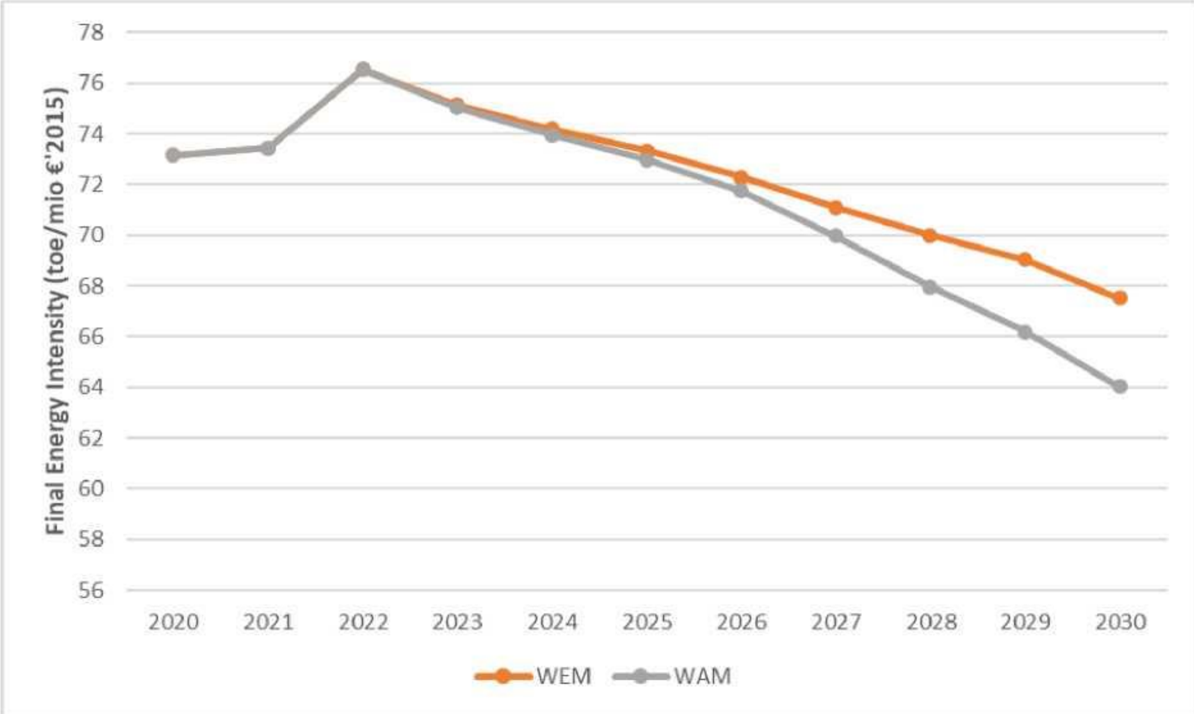


Figure 2.20. Forecast final energy intensity of the economy in Cyprus (toe/MEURO '2010)

The updated primary energy demand forecasts in Cyprus combine the final energy demand forecasts with those for the power generation sector, which were carried out as part of the ongoing technical assistance study carried out for the Energy Service in 2022-2023. The projections have been made using the OSeMOSYS energy system model, as described in more detail in the Impact Assessment chapter.

For the calculation of primary energy demand in electricity production, the efficiency parameters of the electricity generation system presented in Table 2.5 were used and are based on the technical specifications of existing and future power plants in Cyprus.

Table 2.5. Basic parameters of the generation as predicted by the OSeMOSYS optimisation model.

	Average efficiency of all electricity production	Thermal efficiency of power generating modules		
	Scenario with planned policies and measures (gas end-2021)	Steam turbine units using fuel oil (average)	CCGT unit using diesel	Gas-fired CCGT unit
2020	42.2 %	31.3 %	45.1 %	— —
2021	42.5 %	34.8 %	45.1 %	— —
2022	43.4 %	37.0 %	45.1 %	— —
2023	44.5 %	37.0 %	45.1 %	— —
2024	52.4 %	37.0 %	— —	49.3 %
2025	58.0 %	37.0 %	— —	49.8 %
2026	58.2 %	— —	— —	50.0 %
2027	58.3 %	— —	— —	50.2 %
2028	58.3 %	— —	— —	51.0 %

2029	57.1 %	— —	— —	51.2 %
2030	57.2 %	— —	— —	50.1 %

In the scenario with additional measures (CHP), the national final energy consumption is projected to reach 1,88 Mtoe in 2030, which is 4 % higher than the expected target calculated for Cyprus by the European Commission (1,80 Mtoe). As far as national primary energy consumption is concerned, the LAP is projected to reach 2,28Mtoe in 2030, which is 12 % higher than the target calculated for Cyprus by the European Commission (2,03 Mtoe).

Table 2.6. Trajectory of primary energy consumption (Mtoe) based on VMS, 2021-2040

	Primary energy consumption (Mtoe)
2022	2,4
2023	2,4
2024	2,4
2025	2,3
2026	2,4
2027	2,4
2028	2,3
2029	2,3
2030	2,3

Table 2.7. Comparison of final and primary energy between the existing NECP and the revised NECP

Projections for 2030	Existing NECP	Revised NECP	Increase in the level of ambition (% reduction)
Primary energy consumption	2,4	2,3	4.2 %
Final energy consumption	2,0	1,9	5 %

The reduction in final and primary consumption is achieved by implementing a combination of measures and policies in the areas of buildings, industry, farming and transport. In addition, the introduction, from 2027, of the carbon tax in the non-ETS sectors contributes significantly to this reduction.

The definition/quantification of additional policies and measures to achieve the increased ambition of the ES target will be presented in the final NECP in 2024.

In addition, Cyprus has made comprehensive projections and scenarios allowing an assessment of the trajectory of primary and final energy consumption for each sector by 2040. The results are outlined in Table 2.8.

The distinction between road and air transport is shown in Table 2.9.

Table 2.8. Sectoral energy demand forecasts for the years 2021-2040 – with planned policies and measures

Forecasts by sector (Mtoe)	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Primary energy consumption	2,4	2,4	2,3	2,3	2,3	2,2	2,2	2,2	2,2
Total final energy consumption	1,8	1,9	1,9	1,9	1,9	1,9	1,8	1,8	1,8
Final energy consumption – industry	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Final energy consumption – households	0,3	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4
Final energy consumption – agriculture	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,04
Final energy consumption – transport	0,9	0,9	0,9	0,9	1,0	1,0	1,0	1,0	0,9
Final energy consumption – services	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,3	0,3

Table 2.9. Sectoral energy projections in the transport sector for 2021-2040 – with planned policies and measures

Final energy consumption (Mtoe)	2022	2023	2024	2025	2026	2027	2028	2029	2030
Road Transport	0,6	0,6	0,6	0,6	0,6	0,6	0,5	0,5	0,5
Air Transport	0,3	0,3	0,3	0,4	0,4	0,4	0,4	0,4	0,4

Methodology and conversion factors used

The methodology for forecasting final energy demand is based on a combination of energy forecasting and optimisation models developed and combined at the Cyprus Institute. The models measure the future annual energy consumption in each major economic sector in Cyprus (agriculture, cement industry, other industry, households, services, road passenger transport, road freight and air transport) as a function of future macroeconomic variables and energy prices. They also calculate the fuel shares in each sector, depending on the technological costs (investment, operation, maintenance and fuel costs), the penetration potential of different technologies and the technical constraints for the uptake of new technologies, and allows the calculation of future final energy consumption by sector and fuel. Chapter IV of the study on the energy efficiency potential in Cyprus[31] describes the mathematical wording for calculating the total energy demand per sector. The final energy demand was then converted into primary energy demand, taking into account the conversion table in Annex IV to Directive 2012/27/EU (national harmonisation through RAA 438/2015), except for electricity demand, where the efficiency factors in Table 2.5 were used. More details are available on the website of the Energy Service353637.

The principle of energy efficiency as a matter of priority

The 'energy efficiency first principle' has been addressed in the preparation of the revised NECP by prioritising policies and measures that improve the efficiency of the energy system and taking into account that other decarbonisation measures can only be taken into account after energy efficiency actions are deemed impracticable or very costly.

The AFM shall comply with the principle of energy efficiency as a matter of priority for the following reasons:

- The measures in the AFM scenario are sufficient to comply with the country's energy efficiency obligations, as required by Article 7 (Article 8 of the recast EED) of the Energy Efficiency Directive. This means that appropriate measures have been taken into account.
- As a result of energy efficiency measures, Cyprus' energy supply will be lower compared to the CPM. This means that energy efficiency has indeed been prioritised compared to, for example, the stronger deployment of renewables.

- All cost-effective policies and measures related to energy efficiency have been included in the AFM. These measures have a negative or close to zero total cost of living and are therefore cost-effective. In addition, other energy efficiency measures are not recommended because they have a very high cost per tonne of carbon reduction (e.g. renovating very old buildings to become nearly zero energy buildings), or considered unrealistic (e.g. increasing the number of energy renovations of buildings by 2030, reaching unprecedented renovation levels that would require very high financial and human resources for their implementation).
- It is particularly important to note that the AFM provides for energy efficiency measures in transport (modal shift towards public and non-motorised transport and electrification of cars), which include very significant investments, at significant levels for the size of the Cypriot economy. This underlines

[31] study on Energy Efficiency Potential in Cyprus 'An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050'

37 https://www.energy.gov.cy/gr/ενημέρωση/στρατηγικός-σχεδιασμός/εθνικό-στρατηγικό-σχέδιο-για-την-energy-and-climate-2021-2030

how strongly the principle of energy efficiency has been taken into account as a matter of priority.

- In addition to the cost-effectiveness argument mentioned above, further prioritisation of demand-side measures, such as energy efficiency improvements, would put Cyprus at risk of not fulfilling two key Energy Union objectives related to energy supply: the renewable energy target and emissions reduction of the ETS sectors – which in the case of Cyprus is mainly energy generation. Therefore, the electricity supply measures provided for in the AFM are indeed those strictly necessary for Cyprus to fulfil the above-mentioned commitments.
- As a result of the above, energy efficiency measures in all end-uses of the Cypriot economy, as provided for in the AFM and to the extent that they will be fully developed, can significantly improve the security of the country's energy supply.
- The only further policy worth considering is the implementation of a green tax reform that includes carbon pricing in non-ETS sectors of the Cypriot economy. Decisions on green tax reform will be presented in the next revision of the NECP in 2024.

Projects and developments that could increase energy consumption by 2030

The Government, in cooperation with licensees, is working to implement the research programme in the Exclusive Economic Zone of the Republic of Cyprus with a view to exploiting the natural gas fields (existing and future). If one or both of the projects described below were to be implemented, the country's primary final energy consumption could potentially increase by 2030:

Production from the discovered gas fields (Aphrodite, Calypso, glaucus, Cronos, Zeus): Cyprus has so far discovered five natural gas fields. The start of natural gas production from the Aphrodite field, which was first discovered and for which there is an approved Development and Production Plan, is expected in 2027-2028. According to the approved Development and Production Plan, production will last 18 years and the field is estimated to produce 800 MMscfd (million cubic feet in standard conditions per day). There is no information on energy needs during the development and operational phases. As regards the remaining deposits, these are in the process of being assessed and there is no evidence on how to develop at this stage.

Vasilikos Natural Gas (LNG) Liquefaction Station: One of the options for the development of the natural gas fields discovered in the Cypriot EEZ is the construction of an LNG plant (onshore or floating). This type of plant consumes large amounts of energy, after cooling the natural gas at very low temperatures (- 160 ^{o}C). According to a study carried out in 2013 for an LNG land station, the estimated consumption was estimated at approximately 110 MW for a train with a capacity of 5 MTPA and 200 MW for 10 MTPA (2 x 5 MTPA). The quantities discovered so far in Cyprus do not justify the construction of such LNG plant capacity. Although it is decided to construct an LNG plant in Cyprus (onshore or floating), the necessary studies will be carried out to demonstrate capacity and energy needs (measures for GHG emission removals should be justified).

As a result, it is estimated that if an LNG plant is in operation in Cyprus, there will be a significant increase in projected national primary and final energy consumption by 2030. This will have a negative impact on the achievement of the national energy efficiency targets in 2030. Given the above uncertainties regarding its implementation and the quantities produced, an LNG facility cannot be integrated into the national scenario with planned policies and measures.

Cumulative amount of energy savings to be achieved over the period 2021-2030 in accordance with Article 7 of Directive 2012/27/EU on the energy savings obligation (Articles 8-10 of the recast Directive)

By way of derogation from Article 8 of the recast Energy Efficiency Directive, Cyprus should achieve in the period 2021 – 2030 cumulative end-use energy savings equivalent to:

1. New annual energy savings from 1 January 2021 to 31 December 2023 equivalent to 0.24 % of the average energy consumption in the final use of the most recent three-year period before 1 January 2019.

2. New annual energy savings from 1 January 2024 to 31 December 2030 equivalent to 0.45 % of the average energy consumption in the final use of the most recent three-year period before 1 January 2019.

On the basis of the above provisions, the cumulative amount of end-use energy savings for the period 2021-2030 is 349,04 ktoe. In addition, the new provisions of the Directive state that 19.3 % of this target or 67,36 ktoe should be achieved by implementing measures among people affected by energy poverty, vulnerable customers, people in low-income households and people living in social housing.

More information on the data and methodology used to calculate the cumulative target and the share of the target to be achieved among people affected by energy poverty will be included in the final NECP to be submitted to the European Commission in June 2024.

ii. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators, an evidence-based estimate of expected energy savings and wider benefits, and their contributions to the Union's energy efficiency targets as included in the roadmaps set out in the long-term renovation strategies for the national stock of residential and non-residential buildings, both public and private, in accordance with Article 2a of Directive 2010/31/EU

The draft Long-term Building Renovation Strategy is available on the Energy Service's website38. The final document of the Long-term Building Renovation Strategy will be submitted together with the final National Energy and Climate Plan.

iii. Where applicable, 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 with regard to heating and cooling

National strategy for energy efficiency in the transport sector

The energy efficiency targets for transport, in line with Directive (EU) 2023/851, are as follows:

According to the Cyprus National Strategic Plan for Land Transport (NTS), the target share of travel for 2030 will be distributed among the different means of transport as follows: 82 % of journeys by private vehicle, 10 % by public transport (buses), 5 % by micromobility means (bicycles, electric scooters, etc.) and 3 % by pedestrian transport.

With regard to this target, compared to the previous NECP, there is an increase in estimated journeys by private vehicles (from 75 % to 82 %) and a corresponding decrease in travel by alternative means of transport (from 25 % to 18 %). This differentiation results first of all from the higher growth rate projected in the Ministry of Finance's macroeconomic forecast (October 2022). GDP, which is a key factor in the increase in the number of private vehicles, is projected to be around EUR 2 billion higher in 2030 than in the previous NECP. Moreover, according to the monitoring of the progress of the planned measures, there was a divergence in the pace of implementation due to external factors (pandemic 2020, war in Russia, etc.). Finally, the implementation of the tramway in the first, which was instrumental in achieving the target modal share target and was expected to become operational in 2028, has been delayed, with an estimated shift in this time horizon beyond 2030.

According to the General Policy Framework for the Promotion of the Use of Electropowered Vehicles, it is foreseen that 8 % of the passenger car fleet (85000 new and used vehicles) of categories M1, N1 and L should be purely electric by 2030. In addition, a target of 25 % of new vehicle registrations in 2025 and 100 % in 2030 is set for pure electric vehicles.

National strategy for energy efficiency in the heating and cooling sectors

A comprehensive assessment of the energy saving potential in heating and cooling was notified to the European Commission on 30/7/21. The technology identified with the greatest economic potential to meet the heating and cooling requirement in the residential, tertiary and agricultural sectors comes from heat pumps combined with photovoltaic panels, while the technology with the greatest economic potential to meet the hot water requirement is solar thermal systems. In industrial processes, there is the greatest economic potential in the use of CHP plants mainly fuelled by LPG.

To promote these technologies, relevant support measures have been included in the measures and policies described in Chapter 3.2 below.

38 https://meci.gov.cy/gr/ενημέρωση/στρατηγικός-σχεδιασμός/μακροπρόθεσμη-στρατηγική-ανακαίνισης-buildings

2.3. Dimension energy security

i. The elements listed in Article 4(c)

Cyprus is a small isolated energy system with no interconnections with other Member States or third countries, with a high dependence on petroleum products to meet its energy needs. More than 85 % of Cyprus' internal energy consumption comes from petroleum products and the rest from renewable energy sources, while natural gas has not yet been included in its energy mix as the relevant infrastructure is under construction. Given this, and in addition, Cyprus is not directly interconnected with an interconnected natural gas system of any other Member State, Cyprus does not apply the obligations to reduce gas demand by 15 % and to fill natural gas storage by 80 % in 2022 and 90 % in 2023 set out respectively by Regulation (EU) 2022/1369 concerning coordinated measures to reduce gas demand and Regulation (EU) 2022/1032 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 concerning gas storage. Fossil fuels imported from Russia are very limited, charcoal for the cement industry and small quantities of LPG and gas oil, which are already imported from other countries. As regards charcoal, the cement industry is already implementing a programme to replace it with domestic and imported solid biomass mainly derived from waste.

Cyprus imports around 2,35 million MT per year (2021) of fossil fuels (refined petroleum products and coal) to meet domestic needs. Most petroleum products are imported from neighbouring countries such as Greece and Israel. The possibility to diversify the current energy supply is very limited due to the small quantities of petroleum products imported into Cyprus due to the size of its internal market, lower transport costs from neighbouring countries and the availability of oil products with the required standards due to similar climatic conditions.

Further the flexibility of the energy system will be increased by further increasing renewable energy sources, especially for the electricity system, through storage and demand response, as well as by exploiting indigenous hydrocarbon resources.

ii. National objectives with regard to increasing: the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems

The objective is to bring natural gas, through imports of liquefied natural gas (LNG), as well as pipeline gas, and to develop the necessary infrastructure for the import of natural gas into Cyprus by the beginning of 2024, through the project of common interest 'EUROPusGas2EU'. This project, as well as the projects of common interest (PCIs) EuroAsia Interconnector and EastMed Pipeline concerning cross-border electricity and gas transmission infrastructure respectively, will contribute to diversifying energy sources and corridors as well as improving the resilience of Cyprus' energy system and neighbouring systems, and will remove the island's energy isolation (see 2.4.1 and 2.4.2.i for a more detailed description).

iii. Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

Cyprus imports petroleum products from neighbouring countries (see 2.3.i.), including third countries, with which it has developed and continues to develop important regional energy cooperation. Therefore, no target can be set to reduce energy dependency on imports from third countries.

As mentioned in 2.3.i Cyprus does not consume natural gas and the small quantities of fossil fuels coming from Russia were replaced by imports from other countries (petroleum products), while coal and coke consumed by the cement industry are gradually being replaced by renewable sources, mainly biomass.

iv. 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

The use of indigenous energy sources, such as hydrocarbon and RES reserves, will help to increase the flexibility of the national energy system and secure energy supply. The promotion of RES and DSR and energy storage targets are included in sections 2.1.2 and 2.4.3 respectively.

Cyprus has so far developed a total of nine (9) exploratory drilling activities in its Exclusive Economic Zone and has made the following discoveries:

v. Aphrodite (2011) – Block 12
vi. Calypso (2018) – Block 6
vii. Glaucus (2019) – Block 10
viii. Cronos (2022) – Block 6
ix. ZEUS (2022) – Block 6

After approving the submitted Development and Production Plan, the Republic of Cyprus granted an exploitation licence on 7 November 2019 to the joint venture Chevron Cyprus Limited/NewMed Energy Limited Partnership/BG Cyprus Limited (Shell) for the Aphrodite gas deposit for 25 years. According to the approved Development and Production Plan, gas production will start 3 – 4 years after the final investment decision (FID) is taken. The gas produced will be transported to Egypt via an underwater pipeline and will be liquefied at the Idku liquefaction terminal in Egypt. It will then be exported by liquefied natural gas carriers to Europe and to the global market according to demand. Part of the gas will be sold on the Egyptian domestic market. Following the acquisition of Noble Energy Inc. by Chevron, the Consortium decided to re-evaluate the Development and Production Plan with a view to optimising it through synergies with existing infrastructure in the region, mainly Egypt. This work was completed in May and the amended Development and Production Plan was submitted to the Republic of Cyprus for assessment.

The Eni/TotalEnergies consortium is currently assessing the discoveries of Calypso, Cronos and Zeus in Box 6 and intends to proceed with fast track development as soon as possible. The ExxonMobil/QatarEnergy consortium is in the process of evaluating the discovery of glaucus and has proceeded with the exploration of an evaluation well in 2022. Production from these discoveries is expected to start in 3 – 5 years.

Hydrocarbon exploration activities in the Exclusive Economic Zone of Cyprus are ongoing and a number of exploratory drilling is planned in the next two to three years, with the aim of discovering new deposits and increasing the hydrocarbon potential of Cyprus.

2.4. Dimension internal energy market

2.4.1. Electricity interconnectivity

1) The level of electricity interconnectivity that the Member State aims for in 2030 in consideration of the electricity interconnection target for 2030 of at least 15 %, with a strategy with the level from 2021 onwards defined in close cooperation with affected Member States, taking into account the 2020 interconnection target of 10 % and the following indicators of the urgency of action:

2) price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones;

3) nominal transmission capacity of interconnectors below 30 % of peak load;

4) nominal transmission capacity of interconnectors below 30 % of installed renewable

generation.

Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs

At this stage, Cyprus's energy system is isolated with 0 % electricity interconnection with other countries. The electricity interconnection target shall be at least 15 % for 2030. The interconnection rate for Cyprus is 35.1 % and is calculated as the nominal interconnection capacity divided by the installed generation and RES: 1000/2851 = 35,1. As regards the three indicators of the urgency of the action, Cyprus aims, through the operation of the EuroAsia Interconnector PCI, at the following percentages for 2030.

Table 2.10. Indicators of the urgency of the action

Objective	Urgency indicators	Percentage at this stage	Percentage with EuroAsia Interconnector implemented
Nominal transmission capacity of interconnectors to peak load in 2030	Less than 30 %	0%	66.9 %
Nominal transmission capacity of the interconnectors of installed renewable energy production in 2030	Less than 30 %	0%	82.7 %

As regards the urgency indicator of the action relating to the price difference on the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones, the following shall apply, taking into account the alleged electricity prices:

The price difference between Cyprus and Israel and between Cyprus and Greece exceeds the threshold of EUR 2/MWh.

Alleged average electricity prices in Greece and Israel and estimated prices in Cyprus in the SPS (EUR 2016/MWh) are shown in the table below (will be revised in the final NECP).

Table 2.11. Alleged average electricity prices in Greece and Israel and calculated prices in Cyprus

Country	2025	2030
Greece	73,5	74,2
Israel	63,0	75,9
Cyprus	*85,6*	*92,2*

2.4.2. Energy transmission infrastructure

1. 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

Key electricity transmission infrastructure projects

In total, 61 electricity transmission projects are planned for the period 2023-2032 to build new and upgrade existing infrastructure. The list of projects is included in the 2023-2032 ten-year transmission network development plan.

The electricity interconnection between the electricity networks of Greece, Cyprus and Israel "EuroAsia Interconnector", which is also a project of common interest, with a nominal capacity of 1 000 MW, is in the licensing phase. Its total cost is EUR 2,6 billion. In particular, the cost of the interconnection between Cyprus and Greece (Crete) amounts to EUR 1.575 billion, and the cost of the interconnection between Cyprus and Israel is EUR 1 billion. The interconnection between Cyprus and Greece is expected to be operational by 2029 at the latest.

Key gas transmission infrastructure projects

The EastMed Pipeline gas pipeline with a capacity of 20 bcm/y and also a project of common interest should link the European market to new discoveries in the Levant basin and link the gas markets of Israel, Cyprus and Greece. The project is in the process of being authorised and the project is in operation in 2027. Its total cost is approximately EUR 6 billion. It is the only project of common interest of Cyprus, in the natural gas sector, which can maintain this status until Cyprus is interconnected to the EU gas network, based on the derogation (Cyprus and Malta) in the new Regulation (EU) 2022/869 on Trans-European Energy Networks (TEN-E). The project is expected to be mature for the transport of hydrogen and other low-carbon gases, as well as for its transformation into a hydrogen pipeline by 2036 or when market conditions allow.

Modernisation projects related to electricity transmission

In addition to the projects included in the 2023-2032 TYPASM, modernisation projects in the electricity transmission system with the aim of accelerating the transition to a green economy have been approved for funding by the Just Transition Fund under the 2021-2027 programme. In particular, the following projects are foreseen:

1. Installation of smart compensation (SSSC) on a number of transmission substations: The installation of smart compensation will help to channel production into the transmission system without overloading lines due to a change in production from RES. It will facilitate investments in RES, full exploitation of existing infrastructure in the transmission system and avoid building new connections which, in addition to costs, also require lengthy permitting/planning procedures.

2. Upgrading of transmission lines using the method of reducting: Due to the materials constructed, these pipelines have the capacity to operate at high temperatures (up to 200 °C) compared to conventional ones (70 °C). With this replacement, transmission lines will roughly double electricity transmission capacity and thus allow for greater RES penetration into the transmission system without the installation of new transmission lines. There are benefits far beyond 2030.

II. Where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)

Electricity infrastructure projects

The implementation of the electricity interconnection between Cyprus and Egypt isbeing promoted. This electricity interconnection enhances the security of energy supply not only of the countries involved, but also of Europe, as it will create a transmission channel for significant amounts of electricity to and from the Eastern Mediterranean. The electricity interconnection project is an important component of the strategy to accelerate the development of the Eastern Mediterranean Energy Corridor, providing an alternative source of energy supply from the region to the European continent and vice versa. It can also contribute to the integration of a higher share of RES into the systems of the countries involved. Itis expected that the next steps will be to carry out technical studies and then launch a tender procedure for potential implementing bodies for the Cyprus – Egypt interconnection.

Gas infrastructure projects

1. Based on the CERA Decision, the internal natural gas transmission network will initially be designed and developed within a radius of five (5) kilometres from the termination point of the liquefied natural gas regasification facilities (the 'BalkusGas2EU' project) located in the Vassilikos region, to the power plants wishing to be supplied with natural gas. The network is expected to be extended beyond 5 km at a later stage.

2. The Afrodit-Egypt pipeline is designed to export gas produced from the Afroditi field to gas buyers in Egypt. The pipeline will transport natural gas from Afroditi to the LNG terminal in Idku. In 2018, an intergovernmental agreement was signed between Cyprus and Egypt to facilitate the project.

The length of the pipe will be approximately 240-340 mm, depending on the point of paralysis. The diameter of the pipeline is expected to be between 24 and 28 inches. The capacity of the pipeline shall be 800 mmscfd. The tipping point and the gas buyers have not been finalised, but the potential purchasers of the gas will be the owners of Egypt's LNG facilities in Idku, as well as domestic consumers.

2.4.3. Market integration

i. National objectives related to other aspects of the internal energy market such as increasing system flexibility, in particular related to the promotion of competitively determined electricity prices in line with relevant sectoral law, market integration and coupling, aimed at increasing the tradeable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, and real-time price signals, including a timeframe for when the objectives shall be met

Introduction of system flexibility

Currently, the electricity market in Cyprus cannot support either flexibility services or aggregation and demand response. Flexibility services, aggregators and demand response will be able to participate through a fully functioning competitive electricity market (PAR). In particular, by Decision No 72/2022 of 18/3/2022, the CERA implements the relevant provisions of the Electricity Market Rules and the Transmission and Distribution Rules on 30September 2024. As regards the introduction of system flexibility from energy storage facilities, CERA gave instructions to the TMCC to amend the Transitional Regulation Rules so that energy storage facilities upstream of the meter can operate after 31May 2023. In view of the above, specific support plans may be carried out and studied in order to achieve the objectives set for system flexibility through the previous NECP (JRC study).

Development of aggregation

The Electricity Market Rules (KAE) allow for the concentration of generation from RES and HECHP with a total cumulative size of between 1 MW and 20 MW, from electricity storage facilities with a total cumulative total (maximum discharge/charging capacity of an electricity storage facility) greater than or equal to 1 MW/1 MW and less than 20 MW/20 MW respectively, and a demand response with a maximum capacity of 1000 kVA or more each. The Electricity Market Regulation Acts of 2021 and 2022 extend the scope of aggregation so that loads or energy generated by more than one customer can be combined for sale, purchase or auction in any electricity market. The KARs should be revised and amended to implement Article 122 concerning the exercise of the activity of active customers through aggregation, including through the revision of capacity thresholds for generation, storage and absorption facilities in relation to their participation in demand response schemes.

Use of flexibility by DSO and TSO

In accordance with Article 50 of the Electricity Market Regulation Laws of 2021 and 2022, CERA shall define the regulatory framework which allows and incentivises DSO to procure flexibility services, including congestion management, with a view to improving efficiency in the operation and development of the distribution system. The DSO may procure services from sources, such as distributed generation, demand response or energy storage, and consider energy efficiency measures, where such services reduce in a cost-effective manner the need to upgrade or replace electricity capacity, with a view to enhancing the efficient and secure operation of the distribution system. The DSO shall prepare in a transparent and participatory process, including all relevant system users and the TSOC, and submit to CERA for approval the specifications for the flexibility services provided and, where applicable, standardised market products for those services at least at national level.

It is intended that, by the end of 2030, they participate in providing flexibility, through storage, of electric vehicles with a total power/capacity of at least 10 MW/20MWh on the understanding that this is technically and economically feasible.

Non-discriminatory participation of demand response in the envisaged Competitive Electricity Market

The approved consolidated version of the Electricity Market Rules (version 2.2.0), December 2021, allows the operation of a demand response representative, who may represent any number of demand response loads, as portfolios, without any restriction on the maximum absorption capacity and/or the consumption history of each demand response load. A demand response agent shall be entitled to participate in the individual markets of the wholesale market, representing portfolios of demand response loads with a cumulative maximum absorption capacity greater than or equal to 1000 kVA each.

The objective is that before the end of 2030, through demand response, a total capacity of at least 50 MW from industrial end customers shall participate, through their direct participation in the pre-day and intraday markets or earlier by the preparation of specific support plans and implementation framework.

Participation of electricity storage in the electricity system

On 5/7/2019, the CERA published its Regulatory Decision No 03/2019 on the establishment of basic regulatory authorities for the operation of electricity storage facilities upstream of the meter in the wholesale electricity market (RAA 224/2019) in the Government Gazette of the Republic of Cyprus, which ensures the non-discriminatory participation of electricity storage facilities upstream of the meter in the operation of the competitive electricity market. The approved consolidated version of the Electricity Market Rules (version 2.2.2), December 2021, approved by CERA Decision No 4/2022 of 5/1/2022, complies with the provisions of the above-mentioned Regulatory Decision, except for two points: (a) on the submission of block bids on the pre-day market and (b) on the combination of storage stations with RES plants.

The objectives for the installation of storage systems have been set out above (Table 2.11).

Intraday market introduction

Currently, the transitional electricity market is open to independent suppliers and generators that can only enter into bilateral contracts for energy, which are settled on a monthly basis (instead of half hours as foreseen in the target model). All balancing services and related services are provided by EAC Production (through EAC Supply).

A fully operational AAH is scheduled to become commercially operational at a later stage to be determined by CERA. The AAH shall consist of the forward and pre-daily market, the Integrated Programming Procedure and the Balancing Market. Intraday trading is needed to minimise the exposure of market participants to imbalances. If the interconnection between Cyprus and Greece is carried out through the Euroasia interconnector, a cross-border intraday market will be created with continuous trading up to one hour before delivery.

The aim is to introduce the intraday market stage within 24 months of the operation of the AAH, with an estimated date of operation in 2026.

Introduction of Dynamic Price Retail Contracts

According to Article 118 of the Electricity Market Regulation Laws of 2021 and 2022, final customers with a smart meter installed may request a dynamic price contract from a supplier with more than 200.000 final customers. Suppliers with fewer than 200.000 final customers are not obliged to offer dynamic price contracts.

The objective is that dynamic retail contracts are offered by at least one supplier by the end of September 2024.

ii. Where applicable, national objectives related to the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets including a timeframe for when the objectives are to be met

Allocation of generating installations using RES and high-efficiency cogeneration units (HECHP) as a priority

In accordance with Article 102 of the Electricity Market Regulation Laws of 2021 and 2022, the TSO and the DSO, when dispatching the installations referred to in paragraph (1), shall give priority to generating installations in so far as the secure operation of the national electricity system permits, provided that (a) generating installations use renewable energy sources or high-efficiency cogeneration; or (b) power generating installations use renewable energy sources or high-efficiency cogeneration and are demonstration projects for innovative technologies that obtain CERA approval.

The aim is to amend the Electricity Market Rules in good time (by the end of 2024) in order to implement the relevant provisions of the laws.

iii. Where applicable, national objectives with regard to ensuring that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters;

Advanced Metering Infrastructure (AMI)

The implementation of intelligent metering infrastructure will allow the optimisation and control of the distribution system, increase the penetration of distributed renewables, allow for RES aggregation, demand response and storage and increase the direct final participation of customers at all stages of the market (active customers). In addition, it will contribute to increasing the accuracy of load demand and electricity generation forecasts, accurate system analysis and design, demand management (instead of load shedding through the use of the 'Wave Flow Control System'), optimisation of distribution system operation, oversight control and the collection of production-related information from photovoltaic systems.

The existence of a smart meter is essential for the provision of services to the consumer, such as near real-time monitoring of energy consumption or production. The functionalities of smart meters will be defined in accordance with the requirements of Article 125 of the Electricity Market Regulation Laws of 2021 and 2022, which, inter alia, provides for the provision of information to final customers on actual time of use.

An intermediate target is to procure 50.000 cash and install 15.000 cash by Q3 2024. The overall objective is to install a total of 400.000 meters by the end of Q2 2026 with a total cost of EUR 50 million.

Remote Control and Energy Management System (SIS)/Advanced Distribution System Management System (APSSO) – SCADA/ADMS

The project involves the design, procurement, installation, configuration, testing and commissioning of a SCADA/ADMS system, as well as its integration with the SCADA/EMS system. SCADA communicates with data sending and receiving units (RTUs), which are installed in equipment at the average voltage. ADMS will provide, among other functionalities, applications related to power flow, switching command management, short-circuit analysis, short-term load and generation forecasts, RES unit management and curtailment, emergency load discharge and recovery, cyclical load management and recovery, storage, restoration, power cut-out management and power quality monitoring.

Timing: SCADA/ADMS is expected to be implemented in two phases, 1is under implementation and will be completed in 2024, while the second will be completed in 2029 Target to install a total of 1500 sending and receiving units (RTUs). Phase 1 is estimated at EUR 38.6 million, of which EUR 27 million from the Just Transition Fund.

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 are to be met

Strategic reserve

Within the Electricity Market Rules, provision is made for 'Seats of Unsafe Situations' to meet the demand requirements of the system and ancillary services during stressed conditions. The "Seal of Unsafe Situations" is a capacity mechanism in the form of a "strategic reserve". The units participating in this mechanism will remain outside the AAH (when it is in place) and will only be activated if demand is not met through the pre-day and intraday market phases and the TBU has exhausted all resources to balance the system. The TSOC will conduct annual auctions to procure a strategic reserve. The strategic reserve will be technology-neutral, i.e. it will allow for the participation of demand response, storage systems as well as RES units with the necessary technical capabilities. This mechanism was pre-notified to DG Competition (Case No SA. 53729), from which the green light is expected for its notification.

v. Where applicable, national objectives to protect energy consumers and improve the competitiveness of the retail energy sector

<u>Protection of energy consumers</u>

Independent tender comparison tools

In accordance with Article 121 of the Electricity Market Regulation Laws of 2021 and 2022, CERA manages, or entrusts through a transparent procedure, the management of a bid comparison tool in order to assess the merits of the various offers of energy suppliers available on the market. The comparison tool will provide clear, concise and comprehensive information, including the available offers of the whole market. The information shall be reliable, impartial and transparent. The comparison tool will be managed either by a national authority or by a private company.

Timing: The independent comparison tool is expected to be operational after the launch of the AAH at the end of 2024 and the estimated cost of EUR 40.000.

Customers' right to switch suppliers within three weeks

In accordance with Article 119 of the Electricity Market Regulation Laws of 2021 and 2022, if customers wish, provided that they comply with the terms of the contracts, they may switch supplier or market participant active in aggregation within the shortest possible period of time and at most from the date of application, within three (3) weeks.

The aim is that from January 2026, the technical process of switching suppliers should last up to twenty-four (24) hours and is possible on any working day.

Energy Communities of Citizens

In accordance with Article 123 of the Electricity Market Regulation Laws of 2021 and 2022, citizens' energy communities are allowed to operate and participate in them voluntarily.

The aim is that the Citizens' Energy Communities should be able to operate by the end of 2024.

<u>Improving the competitiveness of the retail energy sector</u>

This requires that consumers and businesses be given more choice of suppliers, products and prices. The aim is to create a competitive environment in which retail energy prices are formed for the benefit of final customers. In this context, the legal framework is amended to provide more protection for vulnerable consumers.

2.4.4. Energy poverty

1. Where applicable, national objectives with regard to energy poverty including a timeframe for when the objectives are to be met

Currently, the categories of vulnerable customers are defined in the 2025 Decree on the Determination of Energy Poverty and Categories of Vulnerable Consumers and Measures to Combat Energy Poverty and the Protection of Vulnerable Consumers (RAA 289/2015) as follows:

1. Recipients of public assistance from the Social Welfare Services of the Ministry of Labour, Welfare and Social Insurance.
2. Beneficiaries of the guaranteed minimum income provided by the Social Welfare Management Service of the Ministry of Labour, Welfare and Social Insurance.
3. A five-member family or family with 3 or more dependent children who receive child benefit benefit from the Social Benefits Management Service of the Ministry of Labour, Welfare and Social Insurance and with an annual gross family income of up to EUR 51,258. The income criterion of EUR 51,258 is increased by EUR 5,126 for each additional child in excess of four.
4. Beneficiaries of the allowance for low-income pensioners provided by the Social Welfare Management Service of the Ministry of Labour, Welfare and Social Insurance, provided that they have reached the age of 70 and do not live with another person under the age of 70.
5. Beneficiaries of severe disability benefit from the Department for the Social Integration of Persons with Disabilities of the Ministry of Labour, Welfare and Social Insurance.
6. Beneficiaries of the care allowance for quadrillegic persons of the Ministry of Labour, Welfare and Social Security by the Department for the Social Integration of Persons with Disabilities of the Ministry of Labour, Welfare and Social Insurance.
7. Recipients of the care allowance for persons with disabilities of paraplegic persons from the Department for the Social Integration of Persons with Disabilities of the Ministry of Labour, Welfare and Social Insurance of the Ministry of Labour, Welfare and Social Security.
8. Beneficiaries of a special allowance for blind persons from the Department for the Social Integration of Persons with Disabilities of the Ministry of Labour, Welfare and Social Insurance

Categories 1 and 2 above fall within the definition of energy poverty in accordance with the aforementioned Ministerial Decree.

In addition, this Decree sets out the measures to protect vulnerable categories of electricity customers as follows:

(a) Reduced prices for electricity tariffs (special electricity tariff) based on Ministerial Decision (RAA 286/2016).

(b) Financial incentives for installing a photovoltaic system with the metering netting method.

(c) Financial incentives to improve the energy efficiency of their homes.

(D) Ensure continuity of electricity supply, during critical periods to vulnerable consumers where uninterrupted electricity supply is essential for reasons related to their health.

In August 2022, as part of emergency measures to deal with the energy crisis, a ministerial decision extended the categories of vulnerable consumers. In particular, the following categories have been added, which are only beneficiaries of the increased grants from the Ministry of Energy, Commerce and Industry:

1. Family units with dependent children up to the age of 18 who receive Child Allowance from the Welfare Benefit Management Service with an annual gross family income of up to EUR 19.500.
2. Recipients of a grant for the handling of haematopolised kidney patients.
3. Injured persons who are entitled to a special monthly pension from the Parents Relief Fund.
4. Renal peritoneal dialysis.
5. People with multiple sclerosis (multiple sclerosis).
6. People suffering from larynx cancer who have undergone laryngetomy.
7. People who have undergone a heart transplant.
8. People with Raynaud syndrome.

Based on the provisions of Directive (EU) 2019/944 concerning common rules for the internal market in electricity, "each Member State shall define the concept of vulnerable customers, where reference may be made to energy poverty, including the prohibition of disconnection of such customers in critical times". The description of energy poverty included in the 'Electricity Market Regulation Laws of 2021 and 2022' is as follows:

'*The concept of vulnerable customers shall be defined by decree of the Minister, after consultation with the Minister for Labour, Welfare and Social Security and the Minister for Health, in which reference may be made to energy poverty, as well as, inter alia, the prohibition on disconnecting such consumers at critical times and may include income levels, the share of energy expenditure of disposable income, energy efficiency of homes, critical dependence on electrical equipment for health reasons, age, geographical location and other criteria*'.

On the basis of the above, 3 new Decrees have been prepared to define the criteria for energy poverty, define the concept of vulnerable customers and categories of vulnerable customers and define measures to tackle energy poverty and protect vulnerable customers. In addition, a ministerial decision has been prepared on an obligation to provide a public service, which refers to the measure providing special electricity pricing to vulnerable consumers. These Decrees and Decision are subject to legal checking.

Furthermore, the new proposal for an Energy Efficiency Directive (document 7446/23) defines energy poverty and directs Member States to use specific indicators to measure energy poverty, in particular the average of the following indicators:

- Inability to keep the house adequately warm
- Late payment of utility bills
- Population living in a dwelling with leaking, wet walls, floors or foundations or detached frames or floors
- The population in risk of poverty

Based on the above indicators, the energy poverty rate in 2019 in Cyprus, according to Eurostat, stood at **19.3 % of the total population**.

The current definition of energy poverty is limited to income criteria only and does not take into account energy efficiency considerations. For this reason, consultants have recently been commissioned to carry out a study to determine energy poverty and its metrics for Cyprus, which will take into account the new EU legislative framework (definition of energy poverty in the proposal for an energy efficiency directive, social climate fund, EU recommendations), as well as the specificities of Cyprus. This will make it possible to measure energy poverty and monitor the impact of measures taken to combat it and the achievement of its reduction targets.

In conclusion, the most important milestone is to revise the definition of energy poverty in Cyprus and define its metrics. It will then be possible to calculate the energy poverty rate and set quantitative targets for reducing the phenomenon. The first part is expected to be implemented by the end of 2023.

2.5. Dimension research, innovation and competitiveness

i. National objectives and funding targets for public and, where available, private research and innovation relating to the Energy Union including, where appropriate, a timeframe for when the objectives are to be met

The National Council for Research and Innovation adopted in May 2019 the Cyprus Research and Innovation Strategy Framework 2019-2023, entitled 'Innovative Cyprus'. The current strategic framework has the following vision:

"Cyprus will be a dynamic and competitive economy driven by research, scientific excellence, innovation,

technological development and entrepreneurship, and become a regional focal point in these key areas"

On 1March 2020, the Deputy Ministry of Research, Innovation and Digital Policy (hereinafter "the Deputy Ministry") was established to become a central body with coordination and horizontal responsibilities for strengthening and modernising the information society, promoting the digital transition, further developing the research and innovation ecosystem and strengthening digital security. The Deputy Ministry in its strategy attaches the utmost importance to addressing digital and societal challenges, including energy and environmental challenges. At the same time, alignment with the broader framework for modernisation and reform initiatives of the Government is being promoted.

On 30 March 2023, the Council of Ministers adopted the revised Smart Specialisation Strategy (Smart Specialisation Strategy), which sets out the priorities for Research and Innovation for the period 2023 – 2030. The TEU identifies and analyses priority areas where Cyprus has a competitive advantage and can be a focal point for economic growth, as well as areas that pose societal and economic challenges, with the ultimate aim, by investing in research and innovation (R &I-), of improving the quality of life of citizens.

The priority areas identified by the EES for the period are divided into 4 sections, as follows:

- **Module A** – Technological priority areas: includes Digital Technologies and Innovative Materials
- **Section B** – Ecosystems: they include the agri-food, shipping and renewable energy sectors.
- **Section C** – Emerging ecosystems: currently only the Space Sector
- **Section D** – Enablers: they include the health and environment sectors

In general, the above categories directly or indirectly the objectives of the National Energy and Climate Plan, as all sections include the dimension of addressing social and economic challenges. The renewable energy, environment, maritime and agricultural sectors include sub-categories related to the development of green technologies, resource efficiency, energy saving and pollutant reduction.

Within the framework of the National Governance System for Energy and Climate, the Deputy Ministry participates in the elaboration of the Circular Economy Action Plan and prepares recommendations on how R & I will contribute to the achievement of the national objectives of the European Green Deal.

It also chairs and coordinates the activities of the Technical Committee for Research, Innovation, Competitiveness and Digitalisation, whose mission is to prepare recommendations to shape the priorities of the National Energy and Climate Action Plan that require research and technological background (e.g. promotion of research activity and technological solutions). In addition, information on funding opportunities is promoted through the Technical Commission through national resources and European programmes and funds.

In the context of the work of the Technical Commission, the Deputy Ministry in cooperation with the National Climate Change Network (Climate KIC), the OEB and the Energy Bureau of Cyprus have carried out an interactive workshop, with the aim of identifying and mapping the needs and potential for harnessing R &I, where participants discussed the challenges and objectives of the NECP in relation to energy and climate (challenges included technical/technological, social, regulatory, resource needs, etc.), and the role of R &Iin helping to achieve the objectives of the NECP. The results are expected to contribute to the formulation of national policy and funding programmes for R &Ifor the next period.

A similar procedure was carried out in 2019, with the results indicated in Table 2.12.

Thedetailed information received can be found in Annex 2. The process of stakeholder involvement and consultation is ongoing, and through continuous substantive needs reflection, the R & D objectives underpinning the NECP are being regularly developed and updated.

Table 2.12: Overview of stakeholder involvement

Stakeholder organisation	NECP areas of interest
Agricultural Research Institute	Land use change, waste, use of renewable energy in agriculture, adaptation to climate change
Union of Cyprus Municipalities	Energy communities, local transport
Cyprus Energy Regulatory Authority	Internal market, interconnection, further integration of renewables
Water Development Department	Energy grid, desalination, water recycling, use of renewable energy sources
Transmission system operator	Grid stability, grid flexibility, further penetration of renewables
Deputy Ministry of Tourism	Energy use in hotels, waste generation and water use by the tourism industry, new forms of sustainable tourism
Cyprus Institute – Research Centre for Energy, Environment and Water	Projections on climate change, air quality, renewable energy (e.g. CSP), water use in agriculture, desalination and renewable energy
Frederick University	Transport, renewable fuels
Vasilikos cement industry	Carbon mitigation, alternative fuels, use of renewable energy sources
Federation of Cyprus Employers and Industrialists	Carbon mitigation, circular economy, waste management, sustainable business and industrial practices
ISOTECH Ltd. Environmental research and advice	Waste management, air quality, coastal activities
RISETech Media	Innovation, entrepreneurship and competitiveness
MarineEM	Offshore energy and submarine technologies, competitiveness in the maritime sector
University of Cyprus, FOSS Sustainable Energy Research Centre	Solar power, grid flexibility, smart grids, building integration
University of Nicosia, Marine and Coal Laboratory	Renewable energy, ocean energy
TEPAS, Sustainable Energy Laboratory	Renewable energy, energy efficiency, entrepreneurship
Cyprus Electricity Authority	Renewable energy generation, smart grids and smart metering
Department of Public Works	Transport, sustainable mobility, electric vehicles

ii. Where available, national 2050 objectives related to the promotion of clean energy technologies and, where appropriate, national objectives, including long-term targets (2050) for deployment of low-carbon technologies, including for decarbonising energy and carbon-intensive industrial sectors and, where applicable, for related carbon transport and storage infrastructure

The projected scenario for 2050 shows that Cyprus will become an exporting country in electricity generation mainly produced from solar energy. At the same time, gas will be available for reserve purposes and security of energy supply. The preliminary results of the model show that, in addition to photovoltaics, other technologies, such as aggregated solar thermal systems, will contribute to the dominance of RES in the energy system. However, it has been noted that emerging technologies such as hydrogen and carbon capture and storage have not been taken into account in the above scenario due to a lack of available data. Nevertheless, the a high penetration of RES will allow electrification in the transport sector and heat treatment, which will benefit hard-to-decarbonise sectors such as the cement industry and toilet mills.

This scenario provides an indication of how clean energy technologies need to evolve to better respond to the transformation needs of the country's energy system. Some of them, such as solar thermal technologies and photovoltaics, already fall within the priorities of the smart specialisation strategy, but also other technologies that also fall under the ETS and will play an important role in the long term, such as electrification of transport with renewable energy sources, storage and electrification of high-heat production processes that are not adequately addressed. The Smart Specialisation Strategy will contribute to the priority areas for research and innovation actions of the Research and Innovation Foundation.

In addition, the ETS focuses on renewable energy sources, green hydrogen, including inter alia energy storage, and the use of renewable energy sources for hydrogen production. It also includes the integration of PV into constructions of buildings, greenhouses, vehicles or other structures to improve design and efficiency as well as the monitoring of energy production, smart control and optimisation of small PV systems, monitoring of photovoltaic systems for maintenance and production forecasting.

iii. Where applicable, national objectives with regard to competitiveness

Addressing the challenges is to decouple economic activity from the use of fossil fuels by increasing energy efficiency first and then by maximising the use of RES. The development of innovative energy saving technologies and systems in the built environment, transport and industry will contribute to this goal.

For the industrial sector, the new industrial policy for 2019-2030 sets out the following vision39:

Building a strong, flexible, intelligent and technologically advanced industry with related services that will significantly contribute to the growth and competitiveness of the Cypriot economy and the well-being of citizens.

The above-mentioned vision is implemented by six strategic pillars:

1. Infrastructure for Sustainable Development/Production.
2. Improving the industrial/business environment.
3. Digitising industry.
4. Developing new skills and enhancing/upgrading existing skills.
5. Improving access to finance.
6. Improving market access/publishing, exports and investment.

Through the implementation of the six strategic pillars, the aim is to overcome the key challenges facing industry. According to the New Industrial Policy, one of these challenges is "reduced competitiveness, mainly due to low productivity, high production costs and more generally increased costs in the supply chain due to the small size of the market, the insularity of the economy and geographical and energy isolation, limited resources, low innovation capacity, insufficient use and application of quality standards, lack of holistic industrial policy and adequate infrastructure".

The action plan on "Modern professional development for the green and digital transitions" will also start to be implemented and aims to promote green and digital skills and quality and safety at work. The Action Plan will be implemented in cooperation with the Ministry of Education, the Deputy Minister for Research and the Commissioner for the Environment.

In addition, in the NATIONAL ACTION PLAN 2021-2025, digital skills are at the centre. The vision of the Action Plan is to create a digitally mature society across the whole spectrum of business and social fabric

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39Ministry of Energy, Commerce and Industry, 'Cyprus New Industrial Policy 2019 – 2030 – Action Plan 2019 – 2022' that can respond and participate actively in the digital economy and society emerging as part of Cyprus' holistic Digital Strategy 2021-2025.

3. POLICIES AND MEASURES

3.1. Decarbonisation dimension

3.1.1. It GHG emissions and removals

1. Policies and measures to achieve the target set under Regulation (EU) 2018/842 as referred in point 2.1.1 and policies and measures to comply with Regulation (EU) 2018/841, covering all key emitting sectors and sectors for the enhancement of removals, with an outlook to the long-term vision and goal to become a low emission economy and achieving a balance between emissions and removals in accordance with the Paris Agreement

The policies and measures included in the draft revision of the National Plan and taken into account in the greenhouse gas emission projections scenarios are summarised in Table 3.1.

Additional measures to be planned until the final national plan is finalised concern the following:
(a) Incentive scheme to increase removals from land use
(b) Targeted Research and Innovation
(c) Tax reform
(D) Contribution of actions under the National Rural Development Plan

<u>Incentive scheme to increase removals from land use</u>

The Department of Forests has been implementing since 2019 a plan to increase the production of forest trees from nurseries for planting in non-forest areas. The campaign is entitled 'Plant for Climate' and targets public or private organisations such as municipalities, churches, schools, NGOs and businesses that want to forest public or private land and that will agree to be responsible for providing the resources and care (e.g. water) of these areas for at least three years. After assessing the applications, the Department of Forests provides the trees free of charge, taking into account the area of the plot and the specificities of the site. The plants supplied are selected from a specific list of mainly native, non-invasive species suitable for the climatic conditions of Cyprus, such as: *Pinus brutia, Cupressus semperivines, Quercus spp., Juniperus spp., Tamarix spp., Laurus nobilis, Ceratonia silique, Myrtus nobilis, Nerium oleders* and *Rosmarinus officinalis*. The project started from around 70.000 trees in 2020 and is projected to reach 300.000 trees planted annually in 2030.

Additional measures to increase removals from land use are under consideration, while the Ministry of Agriculture, Rural Development and Environment, in cooperation with the Ministry of Interior, is considering finding state land for afforestation.

Table 3.1. Policies and measures included in the draft revision of the National Plan

Policies and measures	Existing measures	Further measures
Increase in RES usage rate	• Plan for electricity generation from RES for own consumption (net-metering, net-billing, virtual net-metering, virtual net-billing) • Provision of financial support for installation of photovoltaic and solar systems in dwellings • Installation of RES systems in public buildings, commercial and industrial premises combined with energy upgrading measures • Promotion of high-efficiency heat pumps • Sponsorship projects for electricity storage • Promotion of RES energy communities • Simplification and acceleration of authorisation procedures for RES projects, operation of a one-stop shop • Obligation of transport fuel suppliers for the use of biofuels • Production of biofuels from waste	Examine the possibility of developing offshore RES projects and renewable hydrogen production.
Achievement of energy efficiency targets	• Energy Efficiency Obligation Scheme on Energy Distributors • Energy upgrades in public buildings • Grant scheme for total energy upgrades in homes and businesses • Individual efficiency measures in dwellings • Energy upgrading of hospitals and/or hospital units • Energy efficient road lighting. • Energy saving measures in the road transport sector. • Energy efficiency in the water sector. • Installation of smart metering infrastructure • Development of a new online platform digital one stop shop for building renovation	• Creation of a National Development Agency – financial instruments facilitating energy efficiency investments in enterprises • Increased capital discounts for energy upgrading of enterprises • Emissions Trading Scheme for Greenhouse Gas Emissions for fuels used in buildings, road transport and light industry • Promotion of the installation of HECHP units in accordance with the economic potential identified in the comprehensive assessment (see sub-chapter 4.6 (iv)) Additional policies and measures to achieve (a) the mandatory new targets for reducing final energy consumption in the public sector, (b) mandatory implementation of efficiency measures to combat poverty and (c) new more ambitious national indicative targets for primary and final energy consumption by 2030.

Policies and measures	Existing measures	Further measures
Sustainable Urban Mobility Implementation Plans	• Sustainable Urban Mobility Plans (studies and implementation) • Telematic Transport System • New Low/Zero Pollutant Bus Contracts/project for shelter stops • Tree planting along the road network • Amendment of the Motor Vehicles and Road Traffic Act • Promotion of 'The Determination of Special Measures for the Reduction of Air Pollutants and Greenhouse Gas from Road Transport Act of 2023' • Incentive scheme for the purchase and use of low/zero emission vehicles and scrapping of old polluting vehicles • Deployment of recharging infrastructure for electric vehicles	• 17 actions to promote urban cycling and the micro-mobility • Techno-economic and feasibility studies for light trains • Pricing policy for urban parking • Information campaigns and public education targeting large groups • Promotion of alternative fuels (e.g. biomethane, hydrogen) • Establishment of planning obligations for sustainable development for planning permission • Upgrading urban environment and transport network design standards
Refrigerant gasses	From 2024, 5 % recovery in 2030	From 2024, 10 % recovery in 2030 Improvement of emission inventory
Anaerobic digestion for livestock waste treatment	Cows: increase to 10 % in 2030 Pigs: increase to 65 % in 2030 Poultry: increase to 25 % in 2030	Cows increase to 15 % in 2030 Pigs: increase to 70 % in 2030 Poultry: increase to 30 % in 2030
Waste	(a) 60 % sorting at source in 2030 (b) 24 % of organic waste sites in 2030 (c) 20 % biogas recovery from inactive landfills increase of 1 % per annum anaerobic digestion	(a) 30 % biogas recovery from inactive landfills (b) recovery of biogas equivalent to 150 Gg $CO_{2\ eq}$ per year from Sub-rehabilitation landfill since 2025
Liquid waste	(a) 100 % population connection to central sewerage systems (b) increase of anaerobic treatment of wastewater from food industries	
Increase in land use absorption	Plant for climate: 300.000 trees in 2030	
Greenhouse gas emissions reduction plan for businesses		355 kt CO_2 decrease in emissions from enterprises

Targeted Research and Innovation

The research and innovation sector is assessed to be more likely to contribute to the achievement of national emission reduction targets. However, the additional policies and measures to be implemented are still under preparation.

Tax reform

The green tax reform has been deemed necessary to address the weaknesses identified in the management of environmental issues on the basis of the EU 2020 country-specific recommendations for Cyprus, with a focus on three areas: waste management, water resources and climate change/air pollution. As a result, it was included in the Recovery and Resilience Plan, providing for a study, planning and implementation of the reform, with contributions from experts, through technical assistance from the European Commission.

This study, completed in November 2022, has shown that the implementation of the reform is expected to make a significant contribution to the achievement of the national GHG emission reduction targets. On the basis of the study, preliminary draft laws have been prepared and are currently in consultation with the stakeholders directly involved. It is expected that the consultation will have been completed by the time of submission of the final revision of the National Plan and that the proposals of the Ministry of Finance will be advanced.

National Rural Development Plan

The National Rural Development Plan includes a significant number of actions related to agriculture, livestock farming and land use. The contribution of the actions included in the Plan which could contribute to reducing the country's emissions is currently under assessment. The Plan concerns the years 2023-2027 and was formally adopted by the European Commission in December 2022. Its implementation has started gradually since the beginning of 2023.

More information on policies and measures that are expected to lead to emission reductions that are not included in the energy sector can be found in the following paragraphs.

Refrigerant gasses

- *Cooling gas* recovery: Under current legislation, the quantities of recovered refrigerants must be managed in an environmentally sound manner. However, due to the lack of an appropriate institutional framework for their destruction, due to technical issues, the Department of Environment will proceed with the implementation of a campaign for collecting recovered refrigerants and exporting them for destruction in 2024, which is expected to contribute to reducing emissions. This action was included in both NECP scenarios (success of 10 % recovery in the FMP and 20 % in the AFM in 2030 compared to EDD).

- *Improving inventory*: Inventories shall be prepared using specific methodologies agreed at international level unless it can be demonstrated that there is a state-specific methodology. More rough methodologies may be accepted if the necessary data are not available. For example, in Cyprus, due to the lack of data required to apply the methodology for calculating emissions from the use of refrigerant gases, it was accepted to link the installed equipment and to change it with the country's GDP. However, it was found that emissions overall as well as per capita from this sector increased too much. Therefore, the proposed measure concerns the compilation of the necessary recordings in order to calculate more accurately the emissions of this sector.

Anaerobic digestion for livestock waste treatment

Livestock waste is an issue which deserves particular attention in Cyprus due to the country's livestock production rate. Due to their organic load and the enormous volume produced daily, they can cause significant harm to the environment in the short and long term through their bioaccumulation. The irrational discharge of this type of waste into natural receptors reinforces the negative effects of nitrate pollution and eutrophication. Thus, they must be disposed of in the soil or water provided that they comply with certain strict environmental conditions. However, in addition to the imperative given the above, their management may also be beneficial by converting them into energy. In particular, anaerobic treatment of such waste can transform large amounts into biogas that can be used for heating and/or electricity generation. In addition, the digested residue of this treatment can be used as a soil improver, providing stable and economic fertilisation on agricultural crops. Biomass valorisation technology for biogas production is one of the renewable energy sources. Although investments in RES in Cyprus logically focus on the solar and wind energy sector, the recovery of livestock waste is an alternative to energy, management of a real problem, pollution, and should therefore not be ignored. The first steps in this direction have already been taken, and this technology has been present in Cyprus for some years. The importance of technology is recognised through the Rural Development Plan, which subsidises capital investments for livestock farmers.

Waste

Policies and measures include national circular economy targets, namely municipal waste management (see 2.1.1.ii). It also includes the recovery of biogas from the 113 uncontrolled waste disposal sites that have terminated their operation and are in the process of being rehabilitated. Biogas recovery is planned for all 4 landfill sites that have begun remediation procedures. More specifically:

1. The compliance of the Marathunta landfill is expected to be effective by 2025 and the collection and burning (flaring) of the biogas produced is expected to lead to an average reduction of approximately 75 kton/year CO_2 eq. (2,3 kton/year CH_4)40, starting in 2025.
2. The rehabilitation of Katsiati and Vos XADA is expected to be completed by 2025 and the collection and burning (flaring) of the biogas produced is expected41 to lead to an average reduction of approximately 75 kton/year CO_2 eq. (2,3 kton/year CH_4), starting in 2025.
3. In addition, the exploitation of biogas produced for electricity production was included in all 3 above sites (points 1 and 2). In the case of Marathon, this recommendation must first be evaluated technoeconomically, since measurements have already been made to calculate its potential, and for Katsiati and Vos the rehabilitation must be completed before any measurements are made, which, as mentioned above, is expected in 2025.
4. The rehabilitation of Kosiis and Penakomou FYTY was also included. This action cannot be quantified at this stage since technical problems related to the contracts of the contractors for the two projects render any preliminary assessment unfounded.

The proposal for energy exploitation of biogas will be costed after the necessary measurements have been made. Total expenditure is estimated at EUR 5 million per site.

Liquid waste

The Water Development Department (WFD) is responsible for the implementation of Directive 91/271/EEC concerning urban waste-water treatment in order to protect public health and the aquatic environment. In the context of harmonisation with the European acquis in the field of urban waste water, on the basis of the implementation programme of the Directive, the construction of waste water systems for rural communities or municipalities included therein, with a population equivalent of more than 2 000 people, is promoted. For NECP purposes, we consider that the objective of connecting all municipalities with a population equivalent of more than 2 000 to a central sewerage system will be

40FoodLab study "Study to identify air pollutant calls from Marathon FYTA-2022"
41Estimate based on the FoodLAb study relating to the quantities of waste that ended up in Kopsiati and Vos

achieved. It is also assumed that urban waste water will also be treated through anaerobic digestion.

Carbon emission reduction sponsorship plan (CO_2)

The Allowances Plan to Encourage the Reduction of Greenhouse Gas Emissions (GHG) aims to contribute to the implementation of additional measures from existing policies and measures of the NECP and aims to encourage companies to participate in the overall transformation of the economy through decarbonisation recognising their carbon footprint. The Plan aims to provide financial incentives in the form of government sponsorship to encourage the reduction of greenhouse gas emissions through the submission of documents and studies that include concrete actions whose implementation aims to reduce greenhouse gases. It is addressed only to small and medium-sized and/or large enterprises that do not participate in the Greenhouse Gas Emission Allowance Trading Scheme. The eligible costs for which State aid will be granted are covered by Article 49 of Section 7 of the General Block Exemption Regulation and are the following:

- Monitoring plan,
- Inventory report;
- Verification and Validation Reports; and
- Drawing up an action plan that should aim at a validated reduction of at least 10 % of GHG emissions by 2030.

TheGrant Plan is implemented under Measure C2.1I4 of theRecovery and HYPERLINK "http://www.cyprus-tomorrow.gov.cy/cypresidency/kyprostoavrio.nsf/all/B37B4D3AC1DB73B6C22586DA00421E05/$file/Cyprus%20RRP%20For%20Upload%2020052021.pdf?openelement"Resilience Plan of the Republic of Cyprus (RRP) for the period 2021-2026 and will be financed by the Recovery and Resilience Facility (Regulation (EU) 2021/241). The total amount to be allocated to the needs of the project is EUR 5.000.000. The grant will be made available as follows:

(a) Large enterprises 60 % to EUR 15.000
(b) Medium-sized enterprises 70 % up to EUR 12.000
(c) Small enterprises 80 % to EUR 9.000

For the implementation of the actions described in the Action Plan, an amount of EUR 25.000.000 will be made available from national budgets until 2030.

The overall reduction resulting from the implementation of the investments recorded in the Action Plan is estimated at 335 ktCO_2 eq.

Achievement of the national GHG emission reduction target

The objective of the National Energy and Climate Plan is to achieve a 32 % reduction in greenhouse gas (GHG) emissions by 2030 compared to 2005.

The GHG emission reduction target for Cyprus in accordance with Annex I to Regulation (EU) 2018/842 is a 32 % reduction in greenhouse gas emissions by 2030 compared to 2005. The expected annual emission allocations for the years 2021 to 2030 were calculated taking into account the relevant provisions of the Regulation and are presented in Table 3.2 and Figure 3.1. The expected GHG emissions for the period 2021-2030 for the non-ETS sectors are presented in Table 3.3 and Figure 3.1. For comparison purposes, Figure 3.1 also presents the expected evolution scenario (DAR).

With the full implementation of the MIPs and FPS, reductions of 10 % and 23 % respectively in non-ETS GHG emissions can be achieved in 2030.

Table 3.2. Expected annual allocation of allowances for the years 2021-2030 for Cyprus

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

Allowances (kt CO_2eq.)	4073	3943	3813	3682	3552	3422	3292	3162	3032	2901

Table 3.3. Expected GHG emissions from 2021 to 2030 for COP and VMS

Emissions	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
COC. (kt CO_2 eq.)	4312	4295	4184	4170	4167	4147	4090	4036	3963	3851
AFM (kt CO_2 eq.)	4312	4189	4018	3999	3814	3741	3663	3559	3434	3281

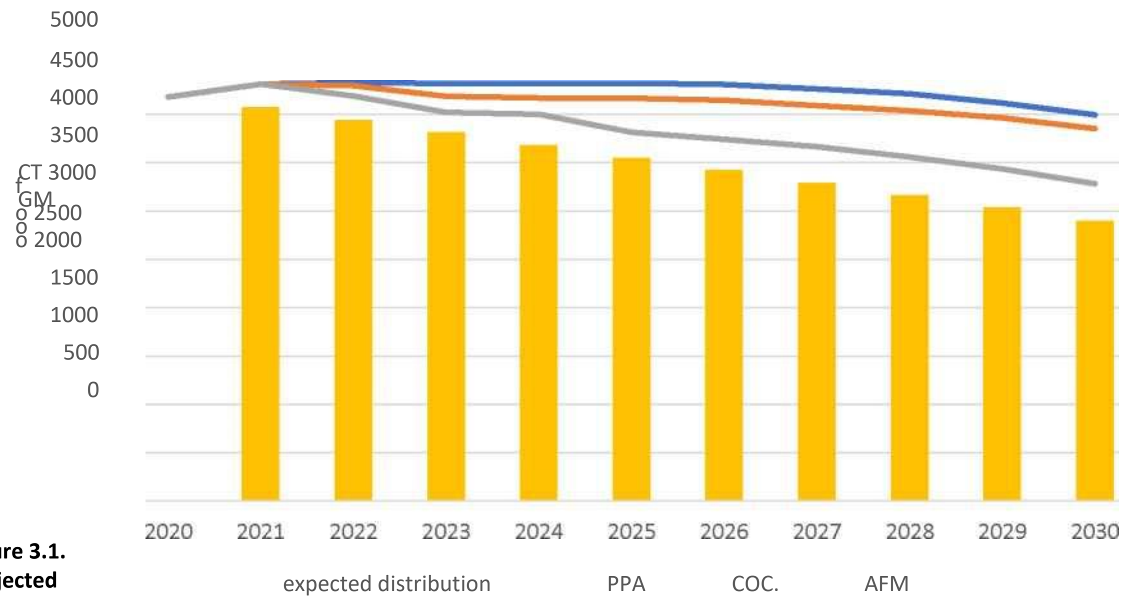


Figure 3.1. Projected evolution of greenhouse gas emissions of the non-ETS sectors according to MBs and AFMs;

According to the GHG emission projections, it appears that over the period 2021-2030 Cyprus will have a deficit in both scenarios in relation to the annual allocations expected to be allocated. Table 3.4 shows the relative annual and total deficits.

Table 3.4. CoM and GHG CHP forecasts compared to the expected allocation

kt CO_2 eq.	Expected distribution	CCM provisions	Surplus/deficit of allowances with MIB	AFM provisions	Surplus/deficit of allowances with AFM
2021	4073	4312	— 239	4312	— 239
2022	3943	4295	— 352	4189	— 246
2023	3813	4184	— 371	4018	— 205
2024	3682	4170	— 488	3999	— 317
2025	3552	4167	— 615	3814	— 262
TOTAL 20212025	**19063**	**21128**	**— 2065**	**20332**	**— 1269**
2026	3422	4147	— 725	3741	— 319
2027	3292	4090	— 798	3663	— 371
2028	3162	4036	— 874	3559	— 397
2029	3032	3963	— 931	3434	— 402
2030	2901	3851	— 950	3281	— 380
Total 20262030	**15809**	**20087**	**— 4278**	**17678**	**— 1869**

On the basis of the above, it appears that the national mandatory target for reducing greenhouse gas emissions at the end of the period is not expected to be fully met and it also appears that in each year of the period 2021-2030 emissions are exceeded in relation to annual emission allocations. This leads to the conclusion that the use of ESR flexibility mechanisms is unavoidable.

However, the use of flexibility mechanisms may be limited to a minimum if additional measures are included in the final revision of the NECP. The additional measures under consideration to achieve the -32 % reduction target are:

- Fiscally neutral green tax reform (see description above)

- Additional emission reductions from the implementation of the measures to be included in the Common Agricultural Policy.
- Design nature based solutions to increase CO_2 absorption (e.g. promoting green roofs, increasing private forests, increasing urban public green spaces, improving urban green spaces)
- An additional shift in the share of transport from private car travel to sustainable modes of transport. The share of private vehicle travel in Cyprus is currently above 90 % and with the impact of the proposed tax reform, a share of 82 % of transport for cars, 10 % for public transport, 5 % for micromobility (bicycles, scooters, etc.) and 3 % for pedestrian traffic can be achieved and is set as a national target. Any revenue from the tax reform may be used to finance part of the proposed measures.
- Increased uptake of low- or zero-emission vehicles and buses based on the impact of the proposed tax reform. Possible revenues from the tax reform can also be used to finance part of the proposed measures.
- Further tree planting along the urban and interurban network. The number of trees is expected to be determined depending on the possibility of producing trees by the Department of Forests, depending on whether planting on the slopes of the embankments/orchards, the type of soil, etc. The potential revenue from the tax reform can be used to finance the proposed measure and strengthen the involvement of local authorities.
- Strengthen the involvement of local authorities through local actions/initiatives.

ii. Where relevant, regional cooperation in this area

There is extensive regional cooperation on energy issues, which is presented in the relevant chapters.

iii. Without prejudice to the applicability of state aid rules, financing measures, including Union support and the use of Union funds, in this area at national level, where applicable

As mentioned above, a significant part of the funding for the implementation of the proposed measures, in particular in the waste, rural development and forestry sectors, comes from European Union funds and includes infrastructure and programmes that are either implemented within the current programming period (2021-2027) or will be programmed for the next programming period through the respective programming period NSRF and Rural Development. National resources will also be used outside the European funds.

In particular, the existing financial tools that will be used for the implementation of the measures are the Recovery and Resilience Fund, the 'SECURITY', the Connecting Europe and the State Budget.

Additional financial tools will also be used, such as: The new REPower EU Chapter of the Recovery and Resilience Fund, the Just Transition Fund, the Social Climate Fund and the State Budget.

3.1.2. Renewable energy

i. Policies and measures to achieve the national contribution to the Union-level binding 2030 target for renewable energy and trajectories referred to in Article 4(a) (2) and, where applicable and available, the elements referred to in point 2.1.2 of this Annex, including sector-specific and technology-specific measures

Since 2004, various support schemes and policies have been in place to promote the use of renewable energy sources, mainly in the electricity sector. However, a further increase in the share of RES and the new targets set in the revised Renewable Energy Directive will require significant investment and EU funding.

Further RES penetration in the electricity sector will be achieved through increased investments in photovoltaic systems (commercial and own-consumption systems) as well as biomass-biogas projects for energy production and a new wind farm with a capacity of 12 MW.

As can be seen from the scenarios analysed, an important factor in the further increase in RES in the electricity sector (RES-E) is the cost of producing electricity from any RES technology in relation to conventional fuels. In Cyprus, electricity generation from PV systems has become lower than conventional fuels since the previous decade (2011-2013). Thus, in Cyprus, electricity from renewable energy sources is no longer promoted through feed-in-tariff, and since 2013, a RES electricity self-consumption plan has been in place. In addition, in the period 2017-2019 special schemes were in place for the development of RES projects that will operate under the current and subsequent transitional electricity market regulation, in accordance with the new rules of the competitive electricity market, when they enter into force. Until the functioning of the competitive electricity market, the production of these RES projects shall be priced at the purchase price of electricity from RES calculated in accordance with a methodology established by CERA. Once the competitive electricity market is operational, the respective projects will only receive the market price under electricity market rules.

At the same time and until the electricity market is fully operational, the Ministry is preparing special aid schemes for hybrid RES projects (RES with storage) which will operate through one way or two way CfDs in combination with tender procedures. The framework for implementing the above projects will be announced by the end of July 2023.

For residential consumers with a building permit before 2017, a sponsorship plan providing financial support for the installation of a PV system for own-consumption purposes will continue. Increased sponsorship is given to vulnerable consumers and people living in mountainous areas. It will also continue to implement grant programmes (Savings and Upgrade Projects) for the installation of PV systems for the same consumption and for non-domestic consumers (commercial, industrial premises, municipal authorities, etc.) in combination with energy efficiency measures. Significant investments are also planned to upgrade the grid and introduce smart meters to allow further RES penetration.

In the heating and cooling sector, support schemes to provide financial incentives for installing or replacing solar domestic hot water systems continue to be implemented. Support measures will also be implemented to further promote high-efficiency heat pumps for heating and cooling. At the same time, sponsorship schemes for the energy upgrading of existing buildings continue, including subsidies for RES heating and cooling systems (solar thermal, heat pumps, geothermal systems, etc.).

In the transport sector, the obligation for transport fuel suppliers (petrol and diesel) to blend biofuels with conventional fuels continues to achieve a certain share of biofuel use in total annual sales of petrol and diesel, based on energy content. Further measures in the RES-T sector that are taxiing are the introduction of support schemes for the local production of waste-based biofuels, and the promotion of electro-mobility and RES charging.

With regard to the measures and policies set out in the previous NECP for the promotion of RES and the achievement of national targets, the plan for RES electricityconsumption is successfully pursued through the categories of net-metering and net-billing and the installation of FABs of parks as part of the plans for inclusion in the competitive electricity market and the transitional electricity market. The categories of virtual net-metering and virtual net-billing have also been implemented, allowing the installation of a PV system in a different location than the premises served.

The table below gives a summary list of the most important measures and policies for the promotion of RES.

Table 3.5. Summary list of the most important measures and policies for the promotion of RES

A/A	Measure/policy name	Description	Period of application

1	Plan for electricity generation from RES for own consumption – net-metering	Measure to install PV systems up to 10.4 kW in buildings for own consumption to cover all or part of their electricity consumption.	2013-2024
2	Plan for electricity generation from RES for own consumption – net-billing	Measure to install RES systems with a capacity of up to 8 MW for own consumption to cover all or part of their electricity consumption. It is mainly aimed at commercial and industrial consumers.	2018 – 2030
3	Plan for electricity generation from RES for own consumption – Virtual net- metering	Measure for installation of PV systems up to 10.4 kW for household consumers and up to 20 kW for professional farmers, for own consumption to cover all or part of their electricity consumption. The measure is aimed at consumers who do not have space available to install a PV system on their premises.	2021-2024
4	Plan for electricity generation from RES for own consumption – Virtual clearing of bills	Measure for installation of PV systems up to 150 kW for all consumers for own consumption to cover all or part of their electricity consumption. The measure is mainly targeted at commercial/industrial consumers who do not have space available to install a PV system on their premises.	2023-2026
5	Sponsorship scheme to encourage the use of RES in dwellings	Financial aid measure for installation of PV systems in dwellings with a building permit before 01/01/2017.	2018 – 2030

6	Sponsorship scheme to encourage the use of RES in homes for vulnerable consumers	Financial aid measure for vulnerable consumers to install PV systems in dwellings with a building permit before 01/01/2017.	2013 – 2030
7	Sponsorship scheme for the installation of a PV system for charging electric and plug-in vehicles in homes	Financial aid measure for installation of a PV system up to 2 kW, charger and storage system in existing dwellings for charging electric or hybrid vehicle. The measure contributes to the promotion of the use of electricity from RES in transport.	2020-2030
8	Sponsorship scheme for the installation or replacement of a solar system for the production of hot water for use in dwellings	Financial support measure for the installation or replacement of solar hot water production in existing dwellings with a building permit before 21/12/2007.	2004 – 2030
9	Rural Development Programme of the Ministry of Agriculture, Rural Development and Environment	Financial support measure for installation of PV systems for the production of energy for ownconsumption in agricultural enterprises. Financial support shall also be provided for the installation of an electricity storage system.	2014 – 2030
10	Certification of installers of small-scale RES systems	Installer training programmes for PV and solar thermal systems up to 30 kW	2015-2030
11	Promoting electricity storage	Promoting the use of electricity storage technologies.	2023-2030
12	Energy communities	Drawing up a regulatory framework for the promotion of energy communities in accordance with the provisions of Article 22 of RED II and operating a support scheme.	2024
13	Statistical transfer of RES	Agreement on statistical transfer with other Member States in the event of failure to meet the national RES targets or in case of renewable energy surpluses.	The measure will be implemented in case of need
14	Replacing conventional fuels with biofuels	An obligation on all transport fuel suppliers to blend biofuels with conventional transport fuels.	2011-2030
15	Simplification and acceleration of permitting procedures for RES projects	1) Carry out a study to evaluate existing licensing procedures for RES projects to optimise the legislative, regulatory and administrative framework. 2) Creation of the One-stop-shop (One-stop-shop), which concerns RES investments. 3) Preparation of a digital platform for the electronic submission and assessment of applications for authorisation of RES projects. 4) Exemption from the obligation to obtain planning and building permits for installation of solar technologies (photovoltaic and solar thermal) on roofs.	2022-2024
16	Installation of heat pumps	Economic incentives for the installation of high-efficiency heat pumps and the replacement of old oil boilers	2024-2030
17	Promotion of geothermal systems	Economic incentives to install geothermal systems	2024-2030
18	Energy upgrading of public buildings	Installation of RES systems and energy efficiency measures in public buildings	2020-2030
19	Creation of an Aid Plan for Renewable Energy Sources (RES) projects with the possibility of energy storage	Implementation of an Aid Plan for Renewable Energy Sources (RES) projects with the possibility of energy storage, which will be subject to public consultation. The budget of the Plan will range from EUR 10 million to EUR 40 million (JTF, RES and ES Fund, etc. The project will operate on the basis of Contracts for Difference (CfDs, either two-way or unilateral).	2024-2027

ii. Where relevant, specific measures for regional cooperation, as well as, as an option, the estimated excess production of energy from renewable sources which could be transferred to other Member States in order to achieve the national contribution and trajectories referred to in point 2.1.2

The possibility of concluding an agreement on a statistical transfer of RES energy with another MS, for the sale of any surpluses or the purchase of percentages to cover any deviations from the national target, will be examined at a future stage on the basis of the trend of increasing the national RES rate.

Also, in May 2023, the Republic of Cyprus submitted a preliminary interest in participating as a host State in the 'EU Financing Mechanism for Renewable Energy Projects' for the development of offshore RES projects in combination with hydrogen production. Depending on the progress of the submission of interest, further information will be provided in the final NECP to be submitted in 2024.

iii. Specific measures on financial support, where applicable, including Union support and the use of Union funds, for the promotion of the production and use of energy from renewable sources in electricity, heating and cooling, and transport

RES and Energy Saving Fund

The Renewable Energy and Energy Saving Fund was established in accordance with the provisions of Article 9 of the Promotion and Encouragement of the Use of Renewable Energy Sources Laws of 2013 to 2018 and operates in accordance with the Operation of the Renewable Energy and Energy Saving Fund Act of 2022 (Law 108 (I/2022). The revenue of the Fund comes mainly from the charge levied on all electricity consumers, based on the electricity consumed.

The Fund was the main tool from 2004 to 2019 to finance and promote both renewable energy technologies and energy efficiency measures. The Fund also finances the subsidy agreements for RES projects signed in the period 2005-2013.

The Fund mainly finances individual energy efficiency measures and installation of small RES systems, such as support schemes for the installation of own-consumption photovoltaic systems and solar thermal hot water systems used in homes.

Specific grant plans implemented by the RES and ES Fund were included in the Cyprus Recovery and Resilience Plan (C2.1I2, C2.1I3 and C2.1I3) for a total amount of EUR 30.500.000. In addition, a proposal to include these projects in RePowerEU is pending (June 2023), increasing the total budget to EUR 76.500.000.

In addition to the funding from the Cyprus Recovery and Resilience Plan referred to above, the Fund's annual revenue comes mainly from the consumption tax imposed on all electricity consumers, based on the electricity consumed. The current amount of the excise duty is provided for in a methodology (Article 11 (2) of Law 108 (I)/2022) according to which the amount of the consumption charge, levied from 1 January of each year, is calculated in euros per kilowatt-hour, rounded to four decimal places, as the ratio of the Fund's annual financial needs to the expected total annual electricity*consumption*. It is further provided that the amount of the consumption charge may not be less than 0,12 of

Eurosent per kWh42. The fee varied over time from 0,13 cents per kWh to 1 cents per kWh and was intended to cover the costs of long-term PPAS and sponsorship schemes that the Energy Service wanted to promote to achieve the RES and energy efficiency targets. A change in Electricity Duty Calculation Methodology (resetting based on new challenges and changing legislation so that projects can be implemented on the basis of the long-term strategy) will be considered and ways to combine the consumption charge with the green (neutral) tax reform once implemented will be considered.

Table 3.6. Consumption tax – Contribution to a RES and Energy Saving Fund

Year	2003-2007	2008	2010	2012	2015	2020-2022

The42 Operation of the Renewable Energy and Energy Saving Fund Act of 2022 (Law 108 (I/2022))

Levy * (EUR/kWh)	0,0013	0,0022	0,0044	0,005	0,01	0,005

imposed on all consumers for the RES and SEE Fund

iv. Where applicable, the assessment of the support for electricity from renewable sources that Member States are to carry out pursuant to Article 6(4) of Directive (EU) 2018/2001

The evaluation of support for electricity from renewable sources was carried out in the context of the technical assistance “Revision of Cyprus Energy and Climate Plan- DLV3: Report on support schemes, network charges and compensation mechanism’ from the Structural Reform Support Programme conducted by Trinomics (see Energy Service website).

The results of the study showed that in Cyprus there are appropriate conditions for the exploitation of solar energy, as well as a positive public perception of the exploitation of solar potential. The Plan for electricity generation from RES for own consumption offers consumers the possibility of producing electricity for self-consumption purposes, through the categories of offsetting, clearing of accounts, autonomous systems, as well as virtual offsets of measurements and bills, respectively.

A grant for storage systems is being considered at this stage. The use of such systems will help to absorb loads at peak times. Their implementation will first require the establishment of an appropriate regulatory framework, as well as the existence of dynamic electricity tariffs, providing the right financial incentives for their widespread use.

At the same time, the gradual replacement of metering by clearing accounts is being considered in order to further incentivise the use of storage systems.

Finally, the roll-out of smart meters is expected to start, which will help remote control of small and decentralised PV systems and better network management.

v. Specific measures to introduce one or more contact points, streamline administrative procedures, provide information and training, and facilitate the uptake of power purchase agreements

The Council of Ministers, by decision of February 2023, has defined the Unit Summary of Policies and Measures on the basis of the supporting framework that Member States must put in place in accordance with Article 21(6) and Article 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of self-consumption and renewable energy communities.

Facilitating enterprises of the Ministry of Energy, Commerce and Industry, as the Single Service Service (YEE) for the implementation of RES projects.

The responsibilities of the IAS, which is now the sole contact point of the applicant during the permit granting process, include information, coordination, guidance and facilitation of the entire administrative procedure for permitting RES energy projects.

The authorisation procedure for RES power plants shall include all procedures from receipt of the application to notification of the result and shall cover:

- all relevant administrative permits and authorisations required by the legislation in force for the construction, installation, upgrading and operation of RES energy projects, and
- the administrative procedures for approvals or authorisations for the construction of the necessary infrastructure required for the connection of the above-mentioned RES projects to the transmission or distribution network.

The following actions are currently underway, which will help to facilitate investors by reducing red tape and permitting time for RES projects:

- Technical assistance from the European Commission (DG Reform) to simplify permitting procedures for RES projects, which is in the process of mapping/mapping existing procedures.

- Development of an online platform 'Digital One Stop Shop' as part of the National Recovery and Resilience Plan, through which all applications for authorisation of RES projects, as well as applications for building renovation, will be submitted and processed electronically.

It is expected that by the end of July 2023, the first phase of the online platform43, which will deal with the electronic submission of applications, will be delivered and operational.

As regards the conclusion of RES power purchase agreements, the Electricity Market Rules should be amended to allow such contracts to be concluded. At this stage, special provisions have been included in the KAH regarding the participation in the competitive electricity market of a cumulative RES representative and a demand response representative. Until the above is completed, the Ministry of Energy and Industry will proceed with specific support plans so that the various RES producers can also conclude agreements with EAC Supply.

<u>RES self-consumers</u>

In accordance with Article 38 of the Promotion and Encouragement of the Use of Renewable Energy Sources Law of 2022 (Law 107 (I)/2022), all consumers have the right to act as RES self-consumers. Furthermore, in accordance with Article 38 (2) of the same law, CERA will issue regulatory decisions on the application of the provisions relating to RES self-consumers under Article 21 of Directive (EU) 2018/2001. As part of this obligation, CERA has launched a tender for the purchase of services to define the regulatory framework to facilitate the development of RES self-consumption. According to the tender schedule, the regulatory framework is expected to enter into force in the first half of 2024.

At the same time, as mentioned in point 3.1.2i, the 'Plan for electricity generation from RES for own consumption' has been in place since 2013, under which all consumers may install a photovoltaic system or another RES system to meet their electricity needs. Consumers' interest in this scheme is particularly heightened, as the installation of photovoltaic net-metering or net-billing systems under the Plan leads to a huge reduction in the electricity bill of the household or their business.

The Plan is revised annually with the aim of making it more attractive for consumers. In 2021 and 2023, the new categories of virtual net-metering and virtual net-billing were introduced respectively. Within these categories, it is possible to install a PV system on a different site from the premises served and to offset its production against the electricity consumption of the premises served. They are aimed at consumers who due to lack of space (e.g. apartments) or other urban/environmental constraints cannot install photovoltaic systems on the roofs of their premises.

<u>Renewable energy communities</u>

In accordance with Article 37 of the Promotion and Encouragement of the Use of Renewable Energy Sources Law of 2022 (Law 107 (I)/2022), CERA lays down the regulatory framework for the development of renewable energy communities. CERA has launched a tender for the purchase of services to define the regulatory framework for RES Communities. According to the timetable of the ongoing tender, the regulatory framework is expected to enter into force in the first half of 2024. Subsequently, it may be necessary to amend the Electricity Market Rules, the Transmission Rules and the Distribution Rules for the operation of RES Communities. It is estimated that the first RES communities will be implemented by the end of 2024 on the basis of the interest expressed by municipal authorities, mainly private owners of multi-apartment buildings and by commercial consumers in participating in RES communities. In addition to the above framework, the Ministry of Energy and Industry will prepare an interim support plan through the Private Consumption Plan.

vi. Assessment of the necessity to build new infrastructure for district heating and cooling produced from renewable sources

43https://res.bfu.meci.gov.cy/login

In the context of technical assistance from the SRSS, a study was carried out by Ricardo Energy Efficiency Environment (SRSS/C2017/004) to identify the potential for applying high-efficiency techniques for heating and cooling in Cyprus. The study also examined the possibility of developing district heating and cooling infrastructure. The main results of this study are the following:

- District heating and cooling systems based on CHP technologies using RDF or oil are the only cost-effective options.
- Such developments are economically effective (with a discount rate of 6 %) in only two tourist areas (Poseidonos Avenue, Paphos Avenue and Kryos Avenue area) which are entirely made up of hotels. These developments are also not cost-effective (e.g. with a higher discount rate of 12 %) without financial support. In order to promote private investment in district heating networks, returns are needed with a discount rate of more than 20 %.
- The cost-effectiveness of RDF based solutions is largely due to the relatively low cost considered for this fuel in the study. Further consideration should be given to the possibility of procuring RDF at that price in order to confirm this finding.

vii. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account: biomass availability, including sustainable biomass: both domestic potential and imports from third countries and other uses of biomass from other sectors (agriculture and forest sectors), as well as measures for the sustainability of biomass production and use

See point 2.1.2 (iv). Application of additional measures under examination

3.1.3. Other elements of the dimension

i. Where applicable, national policies and measures affecting the EU ETS sector and assessment of the complementarity and impacts on the EU ETS

There are no explicit national policies for the ETS sector. However, there are national policies and measures included in the NECP that will also affect the EU ETS sector and in particular electricity generation:

(a) Promoting natural gas as an intermediate fuel to decarbonise the energy system

(b) Promoting renewable energy in all sectors with a further emphasis on synergies between different sectors and in particular with the transmission of RES energy through electricity interconnection (increasing RES penetration rate in the energy mix)

(c) Improving energy efficiency in all sectors

(D) Research and innovation and new technologies.

The impact of the implementation of these policies on emissions of the ETS sectors is presented in Chapters 4 and 5.

ii. Policies and measures to achieve other national targets, where applicable

See 2.1.1.ii.

iii. Policies and measures to achieve low-emission mobility (including electrification of transport)

Policies and measures in relation to biofuels in road transport are described in section 2.1.2.i. and the current legislative framework also allows for the use of biofuels in aviation fuels.

In addition, the Ministry of Transport, Communications and Works is considering a measure to incentivise the use of alternative fuels in specific vehicle groups such as buses, agricultural vehicles and light trucks and refresher training of involved staff and entities. To this end, the Ministry of Transport, Communications and Works on 30 June 2023 authorised the application of conversion equipment developed by a private company to convert existing petrol and diesel vehicles of categories M2 – M3 and N2 – N3 to biomethane vehicles.

As regards hydrogenation, a company under a European programme will produce hydrogen from wastewater and supply light trucks for the distribution of food from a private company. The project is in the process of being authorised.

Measures to promote electro-mobility also fall within the decarbonisation and RES dimension. As these measures also fall under the energy efficiency dimension, a detailed description is given in paragraph 3.2.iv.

iv. Where applicable, national policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

Direct and indirect subsidies to fossil fuels (mineral oils, natural gas, coal) are defined as policies and measures in both energy production and consumption, by granting tax exemptions and subsidies to energy-intensive industries such as fuel extraction, subsidies to energy production, etc.

Cyprus does not provide subsidies to fossil fuels. More specifically, energy products and electricity are subject to excise duty in accordance with the Excise Duty Act No 91 (I) of 2004. The national legislation is in line with European Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity, and the excise duties imposed are not below the minimum levels laid down in that Directive.

In addition, as regards the various exemptions provided for in the Excise Duty Law, they are granted on the basis of the provisions of Directive 2003/96/EC.

3.2. Dimension energy efficiency

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of financial nature) to promote the energy performance of buildings, in particular as regards to the following:

i. Energy efficiency obligation schemes and alternative policy measures under Articles 7a and 7b and Article 20(6) of Directive 2012/27/EU and to be prepared in accordance with Annex III to this Regulation

As mentioned above, the cumulative end-use energy savings target for the period 2021-2030 is 349,04 ktoe of which 67,36 ktoe should be achieved by implementing measures among people affected by energy poverty, vulnerable customers, people in low-income households and people living in social housing. These savings will be achieved through a combination of the Energy Efficiency Obligation Enforcement Scheme and alternative measures.

The Energy Efficiency Obligation Enforcement Scheme is a legislative mechanism that sets requirements on obligated parties to achieve energy savings targets and entered into force in Cyprus for the first time in 2023. In accordance with the provisions of the legislation, as liable parties for each energy product, energy distributors or retail energy sales companies are selected, which at the same time hold cumulatively at least ninety percent (90 %) of the energy sold per energy product (electricity or petroleum products) with minimum energy sales of 15 ktoe. The obligated parties shall be determined on an annual basis by means of a Ministerial Decree on the basis of which the annual cumulative target is allocated. The first such decree imposes a cumulative energy savings obligation of 22,2 ktoe on seven

(7) obligated parties, including an electricity distribution company and six (6) petroleum product distributors, for the year 2023. The overall cumulative target to be achieved by obligated parties over the period 2023 – 2030 is 100 ktoe.

Table 3.7 shows the measures expected to be implemented to achieve the cumulative mandatory target based on the preliminary national planning. For the time being, no decision has been taken on the measures to reach the share of the energy poverty target. Since, at the time of preparation of this NECP, the national plan for meeting all obligations (Articles 4, 5 and 6) relating to energy efficiency and arising from the revision of Directive 2012/27/EU had not been completed, the data in Table 3.7 may vary or even add new measures to the final NECP to be submitted to the European Commission in June 2024. At first sight, it appears that if these measures are implemented on the basis of existing planning, the mandatory cumulative target of the period will be marginally achievable, but is not sufficient to reach the share of the energy poverty target. Given that the national planning to achieve all the objectives and obligations arising from the recast of Directive 2012/27/EU has not been completed, the quantification and contribution of the measures in Table 3.7 to the achievement of the mandatory cumulative target, the measures to achieve the share of the energy poverty target and the additional measures to be taken to meet the other obligations will be included in the final NECP to be submitted to the European Commission in June 2024. Finally, Table 3.8 shows the measures by area of coverage.

Table 3.7. Energy efficiency obligation scheme and alternative measures under Articles 9 and 10 of recast Directive 2012/27/EU

A/A	Policy Measure Title	Brief description of the policy measure	Start/End
1	Energy Efficiency Obligation Enforcement Scheme (EEOS).	As part of the implementation of the EEOS, energy distributors (electricity and petroleum products) are required to implement end-use energy saving measures to final customers. The Energy Efficiency Obligation Enforcement Scheme is a legislative mechanism that sets requirements on obligated parties to achieve energy savings targets and entered into force in Cyprus for the first time in 2023.	2023 – 2030
2	Additional building factor for new buildings and buildings being renovated.	In the case of new buildings and buildings being renovated, the building factor may be increased by 5 % if the primary energy consumption of a building does not exceed 50 (kWh/m² year). The aim is to incentivise the construction or renovation of buildings that go beyond the NEET requirements. The incentive was revised on 1 July 2020 and expires on 31 March 2024. The incentive shall be applied following an order issued by the Minister for the Interior and shall be implemented by the spatial planning authorities in cooperation with the Ministry of Energy, Commerce and Industry. Discussions with the Department of Spatial Planning and Town Planning on the revision of the Mandate are scheduled to take place in the second half of 2023.	2014 – 2024
3	Individual energy efficiency interventions and energy upgrades in selected state buildings.	Article 5 of Directive 2012/27/EU requires Member States to renovate annually 3 % of the total surface area of buildings owned and occupied by central government authorities or to choose an alternative approach, including other cost-effective energy saving measures in selected privately owned public buildings (including but not limited to major renovations and measures to change user behaviour) in order to achieve equivalent energy savings by 2030. With the revision of the Directive, this obligation (Article 6 of the revised Directive) has been differentiated since 2026 and should now be renovated to 3 % of the total surface area of buildings owned by public bodies and should be converted into buildings with a relative zero energy consumption.	2021 – 2030
4	Implementation of soft measures (information campaigns, trainings, workshops, etc.).	The Energy Service places particular emphasis on disseminating information on energy issues, with a view to raising awareness among citizens and among different professionals. To this end, the Energy Service in cooperation with other bodies will continue to organise workshops related to energy savings, training sessions, awareness-raising campaigns on energy efficiency, development of energy saving tools for citizens, lectures in schools, distribution of energy efficiency brochures, awareness raising for behavioural change measures in the public sector, etc. In addition, the Energy Service participates in the annual "Save Energy" exhibition organised by the Federation of Employers and Industrialists. Various instruments, such as Facebook, Twitter and YouTube, will be used to promote, among others, energy savings and RES.	2021 – 2030
5	European Regional Cooperation Programme INTERREG V-A Greece – Cyprus 2014-2020.	The Ministry of Energy, Commerce and Industry participates in the co-financed project with the acronym 'STRATENERGY' implemented under the European Regional Cooperation Programme INTERREG V-A Greece – Cyprus 2014-2020. The objective of the Cyprus project is the energy upgrading of five buildings in the wider public sector. Some of the key energy efficiency measures to be implemented in buildings are thermal insulation of roofs and walls, replacement of windows, replacement of lighting, replacement of heating and cooling systems, and installation of photovoltaic systems. Interventions in Cyprus' buildings are expected to be completed in 2023. The Energy Performance Certificate of all buildings after energy upgrading should be at least B.	2018-2023
6	Grant scheme "Save – Stepping up in homes"	The Plan aims at the extensive energy upgrading of existing dwellings. The 1th notice of the project took place in March 2021. Under the plan, there are 3 types of investment that can be implemented: A. Energy upgrading of a dwelling in a building with zero energy consumption (NZEB) and compliance with the criteria laid down in the relevant national legislation. A maximum grant of up to EUR 32.000. B. Energy upgrading of a dwelling that will simultaneously install a photovoltaic system operated by the net-billing method, in order to achieve the following mandatory criteria: Primary energy savings of at least 60 % based on the final EPC of the dwelling	2021 – 2027

A/A	Policy Measure Title	Brief description of the policy measure	Start/End
		compared with the initial upgrading of the dwelling to Energy Class A, the dwelling after the Energy Upgrading must achieve at least two of the three average thermal transmittance factors of the elements of the envelope and the installation of a net-billing photovoltaic system in the dwelling. A maximum grant of up to EUR 27.000. C. Energy upgrading of a dwelling in order to achieve the following mandatory criteria: Primary energy savings of at least 60 % based on the final EPC of the dwelling compared to the original one, the dwelling after Energy Upgrading must achieve at least two of the three average thermal transmittance factors of the envelope elements. A maximum grant of up to EUR 22.000. The grant rate for all types of investments shall be 80 % of the total eligible amount for homes of vulnerable consumers and 60 % of the total eligible amount for the rest of the dwellings. The 2th Project Notice took place in May 2023.	
7	Grant scheme "Save – step up to businesses and other bodies"	The Plan aims to promote energy saving investments in buildings and facilities, owned and/or used by small and medium-sized enterprises and non-profit organisations. Support is provided for the renovation and energy upgrading of buildings/infrastructure as well as for improving the efficiency of production processes. The project was launched in June 2022. Under the plan, there are 4 types of investment that can be implemented: A. Investments in buildings and investments related to the production and operation processes of SMEs or a combination of both may be implemented without the installation of a system PV. For buildings, a primary energy saving of at least 35 % should be achieved and at least one investment in the building envelope should be implemented. For the production and operating processes of SMEs, primary energy savings of at least 30 % should be achieved. A maximum grant of up to EUR 100.000 and a grant rate of 40 % of the cost of each eligible category of expenditure. B. Investments in buildings and investments related to the production and operation processes of SMEs or a combination of both and the possibility of installing a PV system may be implemented. For buildings, a primary energy saving of at least 50 % should be achieved and at least one investment in the building envelope should be implemented. For the production and operating processes of SMEs, primary energy savings of at least 50 % should be achieved. A maximum grant of up to EUR 150.000 and a grant rate of 40 % of the cost of each eligible category of expenditure. C. Investments in buildings are mandatory. Energy upgrading of a building to a zero-energy building (NZEB), primary energy savings of at least 30 % and compliance with the criteria laid down in the relevant national legislation of NZEBs. For the production and operating processes of SMEs, primary energy savings of at least 30 % should be achieved. A maximum grant of up to EUR 300.000 and a grant rate of 40 % of the cost of each eligible category of expenditure. For Non-Profit Organisations, the rate of sponsorship is 60 %. D. Only investments in buildings occupied by non-profit organisations. Primary energy savings of at least 30 % should be achieved. A maximum grant of up to EUR 150.000. A maximum grant of up to EUR 100.000 and a grant rate of 60 % of the cost of each eligible category of expenditure.	2023 – 2026
8	Energy upgrading of hospitals and/or hospital units and construction of new energy-efficient hospitals and/or hospital units	The measure concerns the energy upgrading of hospital departments and/or hospital units with at least 30 % reduction in primary energy demand and construction of new energy-efficient hospital departments and/or hospital units with primary energy demand at least 20 % lower than the requirement laid down in the national legislation for the NZEB. The energy upgrading of 8 hospital departments and/or hospital units and the construction of 3 new energy-efficient hospital departments and/or hospital units has been approved for implementation through the 2021-2026 Recovery and Resilience Plan. In addition, 4 hospital departments and/or hospital units will be upgraded using national resources and applying the above requirements.	2021 – 2026

A/A	Policy Measure Title	Brief description of the policy measure	Start/End
9	Grant scheme 'Encouraging greenhouse gas emission reductions in enterprises'	The Plan is expected to be operational before the end of 2023 and aims to provide financial incentives in the form of public sponsorship to encourage the reduction of greenhouse gas emissions from existing small and medium-sized enterprises and existing large enterprises. The amount of financial support to be provided will depend on the type of enterprise (small, medium, large) and the type of investment. In the context of the operation of the Plan, it is expected that some of the eligible expenditure categories will be environmental studies, replacement of an existing vehicle fleet or part thereof with electric vehicles, installation of charging points for electric vehicles, electric bicycles, management of organic waste, food waste monitoring devices, replacement of old mobile or fixed air-conditioning systems with new environmentally friendly air conditioning systems, replacement of old equipment (e.g. refrigerators, freezers, fire-extinguishing systems) containing fluorinated gases with own-use equipment containing environmentally friendly gases; installation of carbon footprint recorders, replacement of lamps with LED lamps, installation of light, motion and timers, building/energy management system (BMS/EMS), smart meters, thermal insulation of the building envelope, energy efficiency windows and double glazing, energy efficient electrical appliances, installation of photovoltaic systems for self-generation, installation of solar thermal systems, etc.	2023 – 2030
10	Individual energy efficiency interventions and energy upgrades in buildings in the wider public sector.	The measure concerns the implementation of individual energy efficiency interventions and energy upgrades in public and wider public sector buildings. The investments in the public sector will be different from those they will carry out under Measure 3 described above. Some of the investments to be implemented concern integrated energy upgrading of existing school buildings, energy upgrading of fire brigade facilities, etc.	2021 – 2026
11	Grant plans of the RES and E Fund for the promotion of energy efficiency investments in the residential, tertiary and public sectors.	The measure concerns the various grant plans that will be operated in the coming years by the RES and E & E Fund. Since 2021, the following end-use energy saving grant schemes are operational on an annual basis and are expected to be operational until at least 2025: Plan for thermal insulation of roof in dwellings, Household thermal insulation plan combined with installation of PV in dwellings, Support Plan for installing/replacing solar systems for the production of hot water for use in dwellings. In addition, Law 2021/2022 operated a subsidy plan for the replacement of electric appliances (air conditioners, refrigerators, refrigerator-freezers and washing machines) in homes of vulnerable electricity consumers, which is expected to reopen at the end of 2023 or early 2024. Finally, in February 2023, the 1th notice of the Grants Plan for Encouragement of Energy Rating by Local Authorities and the Broader Public Sector Bodies took place. As part of the operation of this project, beneficiaries may submit a proposal which includes investments in one or more buildings and/or other infrastructure. In all buildings where investments are to be made, they must be converted into zero-energy buildings and comply with the criteria laid down in the relevant national legislation. For each individual investment implemented in another infrastructure, primary energy savings of at least 30 % shall be achieved compared to the previous consumption of the specific equipment on which the operation is carried out. The funding rate is set at 100 % of the actual eligible costs (VAT excluded), while the total maximum grant amount is EUR 700.000 per application/beneficiary. The main eligible categories of investment are: carrying out energy audits, thermal insulation of horizontal building elements, thermal insulation of walls and components of the structure, replacement of frames, installation or replacement of autonomous air-conditioning units, installation of a building automation and control system, installation of high-efficiency cogeneration of electricity and heat, installation or replacement of solar hot water system, installation or replacement of solar hot water system, installation of PV system and batteries, replacement of public lighting and building lighting with led lamps, replacement of sporting phases/installations, replacement of water pumps in water supply, irrigation and/or sewerage networks, replacement of irrigation pumps or pumps in sports pitches.	2021 – 2026

A/A	Policy Measure Title	Brief description of the policy measure	Start/End
12	Energy efficient road lighting.	The measure concerns the replacement of existing road lighting lamps with more efficient ones on national motorways as well as on local roads in municipalities and municipalities**.** The**municipalities of: The**measure concerns the gradual replacement of street lighting (approximately 100.000 lamps) in all communities in Cyprus. Replacement in all Communities has been completed in 2022. **Municipalities of: A financial tool for municipalities and communities was created in**2018 to apply for a loan to the Ministry of Interior to replace street lighting. Until the end of 2022, funding was approved and granted to 11 municipalities. The financial tool remains open for use by municipalities.	2018-2024
13	Advanced measurement infrastructure project.	The measure concerns the gradual installation of 400.000 smart electricity meters in the country's building stock in the period 2023 – 2026. Smart meters will be deployed through the Recovery and Resilience Plan. Smart meters facilitate the optimisation and control of the distribution system, increase the penetration of distributed renewable energy sources into the system, and enable the aggregation of RES and increase the direct participation of the final customer at all market stages. In addition, the use of smart meters will allow creating the necessary conditions to empower citizens as consumers. According to the timetable of the project, 200.000 smart meters should be installed by 30/09/2024 and all 400.000 meters have to be procured and installed by 30/06/2026.	2021 – 2030
14	Energy saving measures in the road transport sector.	Some of the measures for the period 2021-2030 are the implementation of the measures of the Sustainable Urban Mobility Plans (SUMPs) in all cities in Cyprus (e.g. the creation of bicycle paths and bus lanes, the implementation of measures to enhance the accessibility and movement of cyclists, pedestrians and people with mobility difficulties in urban centres), the promotion of electro-mobility through the installation of electric vehicle charging stations in publicly accessible spaces and the provision of sponsorship for the purchase of electric vehicles, replacement of the government vehicle fleet with the purchase of electric vehicles, etc.	2021-2030
15	Energy efficiency in the water sector.	The Water Department of the Ministry of Agriculture, Rural Development and Environment aims to implement the following energy efficiency measures by 2030: Energy efficient planning of water supply networks. Procurement based on energy efficiency. Preventive maintenance of pumping equipment. Leak detection. Energy efficient water management. Introduction of energy management. Planning is at an early stage and limited information is available. In addition, investments relating to the supply and installation of smart water meters in specific municipalities in Cyprus have been approved for implementation through the Recovery and Resilience Plan.	2021-2030
16	Energy consumption fee applicable to electricity.	Compared to the minimum level of electricity tax of EUR 0,1/kilowatt-hour laid down in Directive 2003/96/EC, the consumption charge leads to higher retail electricity prices. Energy savings due to such taxation exceeding EU minimum levels are taken into account, as the consumption charge is levied for energy efficiency. On 20/12/2019, the Regulations on the Promotion and Encouragement of the Use of Renewable Energy Sources (Determination of Consumption Duty Amounts) of 2019 (Regulatory Administrative Act 417/2019) were published in the Government Gazette of the Republic of Cyprus, which entered into force on 1 January 2020. As of 01/01/2020, the consumption charge levied on all electricity consumers amounts to EUR 0,5 cents per kilowatt-hour excluding vulnerable consumers where half of the charge is applied. The current amount of the excise duty is provided for in a methodology (Article 11 (2) of Law 108 (I)/2022) according to which the amount of the consumption charge, levied from 1 January of each year, is calculated in euros per kilowatt-hour, rounded to four decimal places, as the ratio of the Fund's annual financial needs to the expected total annual electricity consumption. It is further provided that the level of the consumption charge may not be less than 0,12 per kWh.	2021-2030

A/A	Policy Measure Title	Brief description of the policy measure	Start/End
17	Excise duty on road transport fuels exceeding the minimum levels required by Directive 2003/96/EC.	Account shall be taken of energy savings resulting from taxation measures that go beyond the minimum levels of taxation applicable to motor fuels as laid down in Directive 2003/96/EC, as energy taxes are levied on energy efficiency. Until 2012, excise duties on motor fuels in Cyprus were at the minimum level set by Directive 2003/96/EC. Taxes on diesel fuel were then increased in two stages (2013 and 2014) to EUR 0,479/litre, while petrol was EUR 0,450/litre. These levels of taxation changed in December 2018, when the Cypriot Parliament decided to reduce excise duty levels by EUR 0,05/litre on all liquid fuels taxed above the EU minimum level. They have been lowered to the EU minimum levels of Directive 2003/96/EC on 8 March 2022 and remain there for the time being.	2014 – 2030

Table 3.8. Policies and measures and sectoral coverage

A/A	Policy Measure Title	Coverage Sector	Category
1	Energy Efficiency Obligation Enforcement Scheme (EEOS).	All sectors	All
2	Additional building factor for new buildings and buildings being renovated.	All sectors except Transport	Buildings
3	Individual energy efficiency interventions and energy upgrades in selected state buildings.	Tertiary sector	Public and wider public sector buildings
4	Implementation of soft measures (information campaigns, trainings, workshops, etc.).	All sectors	All
5	European Regional Cooperation Programme INTERREG V-A Greece – Cyprus 2014-2020.	Tertiary sector	Buildings in the wider public sector
6	Grant scheme “Save – Stepping up in homes”	Domestic sector	Buildings
7	Grant scheme “Save – step up to businesses and other bodies”	Tertiary and Industrial sector	Buildings, processes
8	Energy upgrading of hospitals and/or hospital units and construction of new energy-efficient hospitals and/or hospital units	Tertiary sector	Hospital buildings
9	Grant scheme ‘Encouraging greenhouse gas emission reductions in enterprises’	Tertiary sector, industrial sector and transport sector	Buildings, appliances, transport, processes
10	Individual energy efficiency interventions and energy upgrades in buildings in the wider public sector.	Tertiary sector	Public and wider public sector buildings
11	Grant plans of the RES and E Fund for the promotion of energy efficiency investments in the residential, tertiary and public sectors.	Domestic Sector, Third Sector	Buildings, appliances, processes
12	Energy efficient road lighting.	Tertiary sector	Road Lighting in the Public Sector and the Greater Public Sector
13	Advanced measurement infrastructure project.	All except transport	Buildings, processes
14	Energy saving measures in the road transport sector.	All sectors	Transport
15	Energy efficiency in the water sector.	Tertiary Sector, Domestic Sector	Buildings, processes
16	Energy consumption fee applicable to electricity.	All sectors	Appliances, buildings, processes
17	Excise duty on road transport fuels exceeding the minimum levels required by Directive 2003/96/EC.	All sectors	Transport

ii. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU

A preliminary draft of the Long-term Building Renovation Strategy is attached in **Annex 3**. The final document of the Long-term Building Renovation Strategy will be submitted together with the final NECP in 2024.

iii. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers to energy performance contracting and other energy efficiency service models

The Cypriot energy services market is characterised by a lack of customer confidence as well as a lack of technical expertise, in particular in the preparation and management of appropriate public tenders. There is interest on the supply side (at this stage, 10 legal persons are registered in the register of the EIS, which is kept on the basis of legislation by the Ministry of Health. Action) and the legal framework, including supporting documents, has been created. Awareness raising is ongoing and a number of projects are expected to start soon.

To further develop the energy services market in Cyprus, the Energy Service, with technical assistance from the SRSS, completed two studies, one of which was carried out by the JRC entitled 'Long-term strategy for mobilising investments for the renovation of Cyprus' national buildings'58 and one by GIZ entitled 'Energy Efficiency Strategy for Cyprus by 2020, 2030 and 2050'59, which examined the obstacles to the development of a market for energy efficiency services in Cyprus. These studies provide a list of solutions, measures and actions that can be taken by the Energy Service to overcome these obstacles. Among the findings are the lack of appropriate forms of financing, lack of standardisation, inexperience of actors, distrust of (potential) customers, perceived business and technical risk, small project size and high transaction costs, as well as the need to remove barriers to procurement for energy efficiency services in the public sector. Some of these solutions will be taken forward in the period 2023-2030. Specific actions will include, inter alia, targeted trainings and capacity building of stakeholders, dissemination of information on the benefits of energy service contracts and opportunities for WEIs to implement the results of mandatory energy audits carried out by non-SMEs. There will also be an opportunity for EIS to participate in the energy efficiency obligation scheme through an electronic platform offering a trading system for energy savings.

The Energy Service is currently preparing the relevant documents for tendering for the purchase of services of an external expert who will support the competent authority (Energy Service) in preparing/setting out standard procedures and tender documents for carrying out energy audits in the public and wider public sector and subsequently for implementing the recommendations of the energy audits through the licensed energy service providers (EPY). It will also include the creation of a model energy efficiency contract (EEC) to be concluded between the RIS and the competent authorities in the public and wider public sector. The availability of these documents will be a positive step towards promoting energy services and energy performance contracting in the public sector. These documents will be accompanied by a guide and communicated to the public authorities in order to facilitate them.

iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2 (for example measures to promote the exemplary role of public buildings and energy-efficient public procurement, measures to promote energy audits and energy management systems, consumer information and training measures, and other measures to promote energy efficiency)

With regard to the exemplary role of public buildings, please refer to Chapter 6 of the Long-term Building Renovation Strategy, which describes in detail policies and actions relating to all public buildings, such as energy-saving workers, energy upgrades of public schools, nurses and buildings owned and used by the central government, and the energy upgrading sponsorship scheme by local authorities and bodies in the wider public sector.

As regards energy efficiency in public procurement, the Energy Service will strengthen monitoring on the purchase of energy-efficient products and public buildings. Monitoring will be carried out by asking all central government authorities to inform the Energy Service of contracts signed in each calendar year that include provisions for energy-efficient products, services or buildings.

The main identified obstacles preventing the wider uptake of energy efficiency measures (such as

58"Long-term strategy for mobilising investments for the renovation of Cyprus' national buildings"
59 Study on the "Energy Efficiency Strategy for Cyprus to 2020, 2030 and 2050"

limited funding, limited interest of final consumers in energy efficiency investments, lack of incentives between tenants and building owners, a non-fully functioning market for energy services) will be adequately addressed in the post-2023 period. Measures will include, inter alia, changes to the current legislative framework, development of guidance documents, targeted actions to raise public awareness of the benefits of energy efficiency interventions, such as information campaigns and training for selected groups, etc. Emphasis has been placed on standardising procurement procedures for energy services in the public sector.

As regards undertakings required to carry out energy audits, the Energy Service has strengthened compliance checks.

The Energy Service will also consider additional measures to implement the recommendations of the energy audit reports. To this end, the Ministry In cooperation with Ernst VeterYoung and the European Commission, they are considering the creation of a National Development Agency in Cyprus to facilitate access to finance for businesses. This study is expected to produce an On Bill Scheme that can act as a financing mechanism for Energy Service Providers. The implementation of the practice is expected to take place with the establishment of the National Development Agency in 2026. Although the structure of the small domestic energy market does not currently leave much room for competition between energy suppliers, the introduction of the energy efficiency obligation scheme should promote and accelerate the creation of a functioning national energy services market.

Existing regulations on building codes, energy performance certificates will be further strengthened in terms of increased monitoring and enforcement.

Capacity building for different stakeholder groups (e.g. installers, energy managers, lawyers, bankers) will be designed to support the development and strengthening of the capacities of individuals and institutions for the wider uptake of energy efficiency measures. In addition, the introduction of standardised tools and procedures, as well as electronic databases, electronic registers and communication platforms for energy efficiency professionals, as well as the establishment of a methodology and electronic management of the quality assessment of energy audits, are considered important. These instruments will become operational in the post-2023 period and contribute to better monitoring of the quality of services provided by energy efficiency professionals.

However, the most important obstacle to achieving the projected savings is the limited budget available. The private sector is used to respond only when there is a significant public grant, while the public sector tends to request full capital coverage in advance. For this reason, the transition to a more market-oriented system of financial support will certainly be a challenge and this will require careful planning together with the mobilisation of appropriate financial and market instruments. The aim on the part of the State is not to reduce its overall share of support for energy efficiency interventions, but rather to push public financial resources towards more cost-effective support instruments and more leveraged types of energy efficiency interventions.

All financial instruments should be designed to be cost attractive as well as market implementable. Priority will be given to projects with rapid market uptake (e.g. overall energy upgrades, roof thermal insulation, heat pumps, solar thermal, photovoltaics) allowing both integrated and autonomous interventions. The energy efficiency obligation scheme will bridge regulatory and financial gaps to allow for an increase of potential beneficiaries.

Increasing investment after 2023 will require more private financing and more market-based solutions.

Issues of financing for facilitating and removing barriers to energy efficiency investments in private buildings and businesses will also be discussed during the organisation of the Sustainable Energy Investment Forum in Cyprus in 2023.

More information on concrete measures will be included in the final revision of the NECP in 2024.

The focus is also on consumer information and training through information campaigns. In 2022, the Energy Service proceeded with the implementation of a public information campaign on energy efficiency, which took place between September and December 2022 with national resources. The aim of the campaign was to strengthen the energy saving effort by encouraging citizens to implement simple energy saving measures but also to invest in energy efficiency measures in combination with RES in homes and businesses through the MEPB's grant plans. As part of the campaign, 4 separate information packages were carried out, concerning the creation of a culture and the encouragement of citizens to implement energy saving measures at zero cost, low cost and high cost, and to encourage the use of the Ministry's grant plans.

The main actions of the campaign focused on the promotion of information and information material via the website of the Energy Service and the Ministry of the Interior, the creation and transmission of radio spots, the creation and transmission of TV spots, the promotion of information and information material via social media (Facebook and Twitter) of the Energy Service and the Ministry of the Interior, online advertising via Google Ads, and finally advertisements on online information platforms.

In addition, advice on a range of simple energy saving measures at home and in the workplace was published and promoted to all the media in 2022. The campaign will be repeated for the year 2023.

Transport

According to the National Land Transport Strategy Cyprus (National Land Transport Strategy), the achievement of transport objectives to increase energy efficiency is mainly based on the policies and measures planned since the previous version of the NECP. In addition, some additional measures and policies are proposed that strengthen the existing ones and focus on achieving an increase in the distribution of public transport, active travel and micro-mobility and a reduction in private vehicle travel.

<u>Existing Policies and Measures (WEM scenario)</u>

(1) Design and implementation of Sustainable Urban Mobility Plans (SUMPs) in all cities. SUMPs include costed policies and measures that scientifically demonstrate that a concrete shift from car travel to sustainable modes of transport can be achieved. The total investment for the implementation of sustainable mobility measures amounts to EUR 882 million, for the implementation of the AFM, most of which concerns the implementation of measures included in the cities' SUMPs. It should be noted that this amount has been calculated during the impact study at strategic level, concerns the financing by all four implementing bodies (Ministry of Transport, Communications and Works, Department of Public Works, Department of Town Planning and Housing and Local Authorities), while this amount will be estimated gradually during the implementation of SUMP projects. This package includes significantly improved bus services (routes, frequencies, opening hours), upgrading the infrastructure for pedestrians/cyclists/public transport, development, implementation of a holistic parking policy, implementation of high-quality public transport corridors and effectively a group of targeted measures promoting the use of sustainable modes of transport and discouraging the use of car travel.

    For the time being, SUMPs for Limassol and Larnaca have been completed, a revision of the SUMP for the city of Nicosia is under preparation and the development of SUMPs for Famagusta and Paphos. Within the Nicosia SUMP there are transformation actions, which include the implementation of the tram, which will be implemented gradually after 2030. At this stage, bus lanes are in operation, which will later, after 2030, be converted into axles for a Bus rapid transit (BRT) or tramway system.

(2) A telematics system has been in place since 2014 to improve the quality of public transport services: management and recording of data to further optimise the public transport system, operation of a website, mobile app, detailed real-time timetable and timetable. The project, which has been

completed in 2018 at a cost of approximately EUR 7 million, is expected to be extended until 2023, offering additional services to improve the services provided and connect them to multimodal transport (Park DubRide) and shared bicycle and scooter systems. The budget for the extension of this measure is estimated at EUR 6.5 million.

(3) The new bus contracts, which have already entered into force for the period 2020 – 2030, with a budget of EUR 740 million, foresee the development of priority public transport corridors in the cities of Nicosia, Limassol and Larnaca and the renewal of the fleet of around 700 public passenger buses with low-/zero-pollutant engine vehicles such as EURO 6, hybrid or electric. It is also envisaged that old EURO 5 and EURO 6 vehicles will be converted into vehicles using compressed natural gas (CNG) when this technology is available and the average age of the public fleet is set to decrease from 17 years to 10 years. In addition, provision is made for the creation of infrastructure for charging electric vehicles across Cyprus, as well as for upgrading the quality of public transport services, by improving routes in terms of frequency, timetables and routes. Additional investments in public transport of the order of EUR 60 million will be made by 2028 to develop and improve existing and create new smart stops and public transport hangars across Cyprus.

(4) As regards the promotion of electrification in public transport, it is estimated that 7 % of the public bus fleet will be electric by 2030, with the purchase of 60 electric vehicles, which will operate in priority corridors and city centres, where low-pollutant zones are planned to be established. EMEL has already purchased 40 electric buses (zero pollutants), which joined the fleet in February 2023, while a further 5 electric buses in Nicosia and 5 in Larnaca will be integrated. At the same time, the Ministry of Transport, Communications and Works is considering purchasing through European programmes a number of electric buses to be given to the concessionaires for use. The total budget for this project is EUR 14 million

(5) Amendment of the Motor Vehicles and Traffic Act (N129 (I)/2020) on the revision of vehicle taxes and annual circulation taxes, a measure concerning the tax levied on vehicles with a view to reducing CO2 emissions,**which**has been in force since 2014. The last amendment was decided on 29 March 2019 and revised the method of calculating car registration (Law 47 (I)/2019).

In addition, the promotion of the 'Determination of Special Measures for the Reduction of Air Pollutants and Greenhouse Gas from Road Transport Act of 2023' of the Ministry of Transport, Communications and Works is a reform aimed at creating the necessary legal basis so that measures related to the road network and vehicle traffic can be determined on the basis of reducing the environmental impact of road transport. This is a reform undertaken by the Ministry of Transport, Communications and Works (Road Transport Department), as part of the Recovery and Resilience Plan, "Cyprus a tomorrow", in which the two grant schemes to promote electromobility have also been approved for 100 % funding from the Fund. The draft law is also a reform provided for in the General Policy Framework for Promoting the Use of Electric Vehicles of the Ministry of Transport, Communications and Works, which has been approved by the Council of Ministers.

When the draft law is adopted, the Minister for Transport, Communications and Works, after consulting the relevant local authority, may lay down measures, such as the following:
- The designation of low or zero emission areas or pathways.
- The prohibition on the movement of polluting vehicles on specific areas or roads or on specific days and hours.
- The setting of a date beyond which the registration of polluting vehicles, such as old diesel specifications, shall not be permitted.
- The establishment of bus lanes.
- The definition of transport activities, to be carried out exclusively by electric vehicles, e.g. the delivery service.
- Laying down requirements for the inclusion, in advertisements or other ways of promoting the

purchase or use of conventionally fuelled vehicles, of messages promoting alternative modes of transport, such as walking, cycling and the use of public passenger transport.

In addition, on the basis of the law, regulations will be issued specifying the infringements to be recorded by means of photo-labelling devices and the procedure to be followed for the purposes of out-of-court regulation of such infringements.

(6) In order to promote electromobility, in accordance with the General Policy Framework for the Promotion of the Use of Electric Vehicles, as well as the European Directives on clean vehicles, two projects are being implemented, namely the Plan for the Mobilisation of the Purchase and Use of Low/Zero Emissions Vehicles, including the Plan for the Withdrawal of Machine Vehicles and the Economic Incentive Plan for the Market for Electric Vehicles. The Plans are financed by the European Union Recovery and Resilience Facility, as part of Cyprus' Recovery and Resilience Plan (RRP). Projects have started in 2022 and will run until mid-2026, with a total budget of EUR 45 million

In addition, it is proposed to implement a grant plan for the purchase of low/zero emission vehicles on an annual basis with a budget of EUR 3 million per year, which is expected to be more effective after 2025, when market conditions are expected to be more favourable for the purchase and use of electric vehicles.

(7) In order to promote electromobility, there is also a 'Electric mobility with 1000' incentive plan for the installation of electric vehicle charging stations. The Department of Electrical and Mechanical Services of the Ministry of Transport has published the above grant plan, which is included in the National Recovery and Resilience Plan and is financed by the European Union's Recovery and Resilience Facility (RRF). The main objective of the plan is to promote electromobility through the development of a comprehensive network of recharging points for electric vehicles. Specifically, the sponsorship plan, which is aimed at individuals (natural and legal persons), non-governmental organisations (NGOs), local authorities and legal persons governed by public law (it does not cover public authorities (Ministries, Departments, Services, Directorates, Independent Authorities, etc. of the Public Service), has set the objective of subsidising the installation of 1.000 recharging points for electric vehicles, with a total budget of EUR 4 million, while the final completion of the Plan, which started in 2023, has been set for mid-2026.

Charging stations for electric vehicles have also been installed by the Public Works Department in October 2021, through the European EnernetMob Programme: one in the Public Works Department, one in Alampra and one at the Nicosia General Hospital.

Other measures include the financing plan for the promotion of energy audits in SMEs, which promotes energy audits in the transport sector, the obligation scheme to impose energy efficiency obligations on fuel distributors, the continuation of current levels of fuel taxation, and extensive afforestation along urban and interurban roads.

Additional Policies and Measures (Scenario with Additional Measures – WAM)

In addition to the SUMP implementation measure and supporting the achievement of the national target of a 82 % share of travel by private vehicle, 13 % with public transport, 5 % micro-mobility and 3 % on foot, the following are proposed:

- The promotion of the 17 actions to promote micromobility of the Train Use Promotion Board, through information campaigns and incentive schemes. These actions are expected to contribute to the 5 % modal share of micro-mobility and have a budget of around EUR 450 million per year.
- Techno-economic study for the construction of light trains. With a budget of EUR 100.000,00, it is proposed to carry out feasibility studies for the implementation of routes between the capital and the cities of Limassol and Larnaca. The measure will be implemented after 2030.
- Central pricing policy for parking management, whereby high parking prices will be set for urban and historical centres, and revenues will be given to municipalities for the implementation of environmental and social projects of general interest.
- Information campaigns and training of large groups (e.g. workers, students) on sustainable and alternative means of transport. This project with a budget of around EUR 15 million aims to actively engage citizens in efforts to shift towards sustainable transport.
- Establishment of urban planning obligations for sustainable development when issuing planning permits, which will instruct applicants for planning permission to upgrade the surrounding area of the building in such a way as to promote the sustainable development of urban areas (e.g. cycling stations, electric vehicle charging stations, tree plantations, etc.).
- Upgrading urban environmental, cycling and urban network design standards in a way that is consistent with the principles of sustainable urban development. The project is foreseen to have a cost of approximately EUR 0.5 million for consultancy payments.

v. Where applicable, a description of policies and measures to promote the role of local renewable energy communities in contributing to the implementation of policies and measures in points i, ii, iii and iv

There are currently no policies and measures to promote the role of local energy communities. This will be further considered in the preparation of the final revision of the NECP in 2024. Several workshops60 and various ideas and best practices have been shared with other Member States in Cyprus. During the workshops it was pointed out that the new obligations arising from the new Directives should review the legislation, develop new tools and introduce new disruptive technologies and new concepts to inform the final consumer to actively participate in the energy community.

vi. Description of measures to utilise energy efficiency potentials of gas and electricity infrastructure

As regards the installation of smart meters, Regulatory Decision (RW) 02/2018 of the CERA – Regulatory Administrative Act 259/2018 on the implementation of a binding timetable for the mass installation and operation by the Distribution System Operator (DSO) of the smart metering infrastructure (Advanced

FOSS60 workshop, 8 May 2019 Energy communities and operational needs

Metering) was issued. Based on point 5 of this Regulatory Decision (RR), the DSO has provided a timetable for the implementation of the project, in which, based on its latest update by the DSO/TSO, it is in the process of recruiting a consultant to assist it in carrying out relevant tasks.

Please note that on the basis of point 4 of the above-mentioned Regulatory Decision (RW) and the fact that the Directive providing for the provisions of Directive (EU) 2019/944 concerning common rules for the internal market in electricity and amending Directive 2012/27/EU, CERA requested the DSO to take appropriate measures "so that by 14 September 2025 at least 80 % of final customers are equipped with smart metering systems, as provided for in the new Directive, in order to avoid the subsequent requirement for corrective measures, which may increase the overall cost of purchasing and installing smart metering systems". In relation to the progress of this project, bi-annual progress reports will be submitted to CERA.

As regards any other measures and policies to be implemented in the period 20212030 that could contribute to the upgrading of the electricity energy infrastructure of electricity infrastructure, a study was carried out by an external consultant (RSE Italy SpA) with the participation of the Ministry of Energy, the DSO and the TSO, which assessed the potential 'energy efficiency of existing electricity infrastructure, in particular in terms of transport, distribution, load management and interoperability, as well as connection to power plants, including the possibility of access to very small power plants'. The results and conclusions of this study state inter alia that "the level of efficiency of the electricity system in Cyprus lies well within the international benchmark".

Based on the above, it emerged that there is no need for loss reduction measures and some of the measures recommended by the consultant are already being implemented by the DSO. One of the measures taken by the consultant was an increase in the level of the grid voltage, which has already been adopted for many years by the DSO through the practice of using 22 kV for new connections and for existing connections, when and where the TSO deems it necessary to upgrade from 11 kV to 22 kV. Therefore, on the basis of the above, no timetable has been established for the upgrading of predefined areas from 11 kV to 22 kV. However, CERA has taken a number of actions that may not directly target the energy upgrading of electricity infrastructure, but will allow for more efficient use of the grid by consumers and better management by DSO and TSO. These actions are set out below:

- Adoption of Regulatory Decision 02/2019 – Regulatory Administrative Act 204/2019 on the preparation of a detailed technical and economic study on the redesign of the transmission and distribution system 2021-2030, on the basis of which a study will be submitted for the redesign of the system by the DSO and the DSO, with a view, inter alia, to it is possible to install more RES/H and eliminate the problems of lack of power absorption of new RES/H.

- The adoption of Regulatory Decision 03/2019 – Regulatory Administrative Act 224/2019 laying down the basic principles of a regulatory framework for the operation of electricity storage facilities upstream of the meter on the wholesale electricity market, on the basis of which the necessary amendments were made to the CDM61 and the SMRs in62order to allow for the non-discriminatory participation of electricity storage facilities upstream of the meter in the electricity market.

Issuing of an offer and SCADA implementation by the DSO at the distribution level which will increase the observability of the distribution system and provide the basis for smart and efficient distribution system management (load and RES – DSC-connected to the distribution system).

VII. Regional cooperation in this area, where applicable

The EU Cross-Border Operational Programme "Greece-Cyprus" strengthens regional cooperation as it aims at economic and social development along the maritime border between Greece and Cyprus. The vision for the cooperation region is to highlight the region as a pole of sustainable development in the wider South-Eastern Mediterranean region towards enhancing competitiveness. Under the European Regional Cooperation Programme Interreg V-A GREECE CYPRUS 2013-2020, projects aimed at increasing energy efficiency have been adopted and are being implemented. The projects are financed 85 % by the European Regional Development Fund and 15 % by the National Resources of Greece and Cyprus. Please note that no new projects have been approved for the time being under the Interreg vi-Cyprus cooperation programme 'Greece-Cyprus 2021-2027'.

STRATENERGY project

The project aims to develop and implement a modern common strategy in the cross-border region to integrate public and wider public sector buildings by 2030 and actions and measures related to energy efficiency improvement. The implementation of mature energy efficiency projects in representative public buildings in the cross-border region and the completion of the Common Strategic and Operational Planning Framework to highlight the 'exemplary role' of the public sector in promoting energy efficiency is the overall objective of the project.

To this end, energy upgrades will be implemented in Cyprus in four buildings owned by wider public sector organisations, dramatically improving their energy efficiency. Some of the key energy efficiency measures to be implemented in buildings are thermal insulation of roofs and walls, replacement of windows, replacement of lighting, replacement of heating and cooling systems, and installation of photovoltaic systems. Interventions in Cyprus' buildings are expected to be completed in 2023. The total budget of the project is EUR 4,32 million for all beneficiaries, while for Cyprus it is EUR 2,48 million beneficiaries of Cyprus are the Ministry of Energy, Commerce and Industry and the Nicosia Development Company.

More information on the project is available on the project website63.

61https://tsoc.org.cy/files/transmission_distribution_rules/5.3.0-rules/% CE% 95 % CE% B3 % CE% BA% CE% B5 % CE% BA% CF% 81 % CE% B9 % CE% CE% AD% CE%% CE% B7 % CE% 88 % CE% CE% B4 % CE% B20 % CE% CF% 83 % CE% B7 % CE% 9C% CE% 9C% CE% 94 % 205.3.0.pdf? v1.5

62 https://www.cera.org.cy/el-gr/apofasis/details/apofasi-4-2022

63STRATENERGY

C-IZEBs project

The objective of the project is to create Intelligent School Buildings for Zero Consumption, combined with charging of electric vehicles, and to train building users to use new RES technologies, with the main added value of the project resulting from the integration of intelligent life. As part of the project, one high school in Crete and a secondary school in Cyprus will be upgraded and transformed into smart, nearly zero-energy school buildings. The energy upgrading of the two buildings aims at creating public buildings with zero energy consumption as a springboard for the construction/operation/maintenance of more energy-efficient public buildings in the eligible area and in the EU in general.

In addition, the installation of technological equipment for measuring/monitoring the energy condition of buildings will meet the need for remote control and enhance the smartness of buildings. Thus, the two public buildings will act as energy/technology models for the remaining public buildings in the eligible area, highlighting savings and smart energy management, ecological sensitivity and technological intelligence as fundamental features for the buildings of the future. The interventions are expected to be completed in 2023. The total budget of the project is EUR 1.76 million for all beneficiaries. The beneficiaries of Cyprus are the Ministry of Education, Culture, Sport and Youth and the University of Cyprus.

More information on the project is available on the website of the Greece – Cyprus Programme[64].

'Upgrading' project

The objective of the project is to develop best energy upgrading techniques which, by applying them, transform existing historic buildings into energy efficient building standards. The project also includes the energy upgrading of two emblematic buildings of the target area, the Presidential Palace of the Republic of Cyprus and the City Hall of Heraklion of Crete. This way the project serves European and national objectives for the transition to a low carbon footprint green economy.

The energy efficiency measures to be implemented in the Presidential Palace of the Republic of Cyprus are the replacement of windows, the replacement of heating and cooling systems, the replacement and upgrading of the ventilation system and the installation of BMS automation systems. The interventions are expected to be completed in 2023. The total budget of the project is EUR 2.2 million for all beneficiaries. The beneficiaries of Cyprus are the University of Cyprus, the Department of Electrical and Mechanical Services, the Department of Public Works and the Presidency and the Presidential Palace.

More information on the project is available on the project website[65].

64C-IZEBs
65UPGRADING

Table 3.9. Preliminary estimated total investment costs (including EU funds, national finance and private finance)

A/A	Policy Measure Title	Public Expenditure (EC) EUR)	Funding	Estimated total investment cost taking into account the private contribution (EUR. EUR)
1	Energy Efficiency Obligation Enforcement Scheme (EEOS).	0	Private Finance	150
2	Additional building factor for new buildings and buildings being renovated.	0	Private Finance	No estimate can be made at that time.
3	Individual energy efficiency interventions and energy upgrades in selected state buildings.	50	From the European Recovery and Resilience Facility and national resources.	50
4	Implementation of information measures (information campaigns, training, workshops, etc.).	1,67	National Resources (EUR 0.167 million per year for energy efficiency campaigns)	1,67
5	European Regional Cooperation Programme INTERREG V-A Greece – Cyprus 2014-2020.	2,19	Co-financed by the European Regional Development Fund	2,19
6	Grant scheme “Save – Stepping up in homes”	85 (+ 30 million in the revised Recovery and Resilience Plan (REPowerEU chapter)	Co-financed by the European Structural and Investment Funds.	200
7	Grant scheme “Save – step up to businesses and other bodies”	40 (+ 5-10 million in the revised Recovery and Resilience Plan (REPowerEU chapter)	From the European Recovery and Resilience Facility and national resources.	105
8	Energy upgrading of hospitals and/or hospital units and construction of new energy-efficient hospitals and/or hospital units	50	From the European Recovery and Resilience Facility and national resources.	50
9	Grant scheme ‘Encouraging greenhouse gas emission reductions in enterprises’	30	From the Recovery and Resilience Facility and national resources.	55
10	Individual energy efficiency interventions and energy upgrades in buildings in the wider public sector.	30	From the European Recovery and Resilience Facility, the European Regional Development Fund and national resources	30

A/A	Policy Measure Title	Public Expenditure (EC) EUR)	Funding	Estimated total investment cost taking into account the private contribution (EUR. EUR)
11	Grant plans of the RES and E Fund for the promotion of energy efficiency investments in the residential, tertiary and public sectors.	38	From the Recovery and Resilience Facility and national resources.	56
12	Energy efficient road lighting.	38	National Resources	38
13	Advanced measurement infrastructure project.	70	The European Recovery and Resilience Facility and the Primary Estimate of the Initial Electricity of Cyprus.	70
14	Energy saving measures in the road transport sector.	837	From the European Recovery and Resilience Facility and National Resources	12300
15	Energy efficiency in the water sector.	No estimate can be made at that time.	From the European Recovery and Resilience Facility and National Resources	No estimate can be made at that time.
16	Energy consumption fee applicable to electricity.	Not applicable	Not applicable	Not applicable
17	Excise duty on road transport fuels exceeding the minimum levels required by Directive 2003/96/EC.	Not applicable	Not applicable	Not applicable
18	Additional measures to achieve (a) the mandatory new targets for reducing final energy consumption in the public sector, (b) mandatory implementation of efficiency measures to combat poverty and (c) new more ambitious national indicative targets for PEC, FEC, FEC for 2030, in line with the new requirements of the revision of the Energy Efficiency Directive			No estimate can be made at that time
TOTAL				Euro 20000 million

VIII. Financing measures, including Union support and the use of Union funds, in the area at national level

Paragraph 3.2.i. presents the measures and policies needed to achieve the objective set out in Article 8 of the recast Directive 2012/27/EU, which will also contribute to the achievement of the new more ambitious national indicative PEC, FEC contributions contributing to the new EU 2030 target. Table 3.9 summarises its financing needs stemming from Community and national financial resources and the total cost of the investments required, also taking into account the need to mobilise private financing.

3.3. Dimension energy security

i. Policies and measures related to the elements set out in point 2.3

Import of liquefied natural gas (LNG)

Following the completion of a feasibility study in 2016, the Government of the Republic of Cyprus decided to proceed with the import of liquefied natural gas (LNG) into the Cypriot market. The import of LNG will act as the original way of supplying natural gas until domestic gas sources are available on the Cyprus market and serve as an alternative form of supply to secure natural gas.

On the basis of the above, ETLNG (Natural Gas Infrastructure Company) announced in October 2018 a tender for LNG import infrastructure in the Gulf of Vassilikos. On 23.8.2019 ETLNG completed the evaluation process of the bids submitted for the project and on 13.12.2019 the contract was signed between ETLNG and the consortium of Chinese, Greek and Norwegian interests, China Petroleum Pipeline Engineering CO Ltd – CPP, METRON S.A with Hudong-Zhonghua Shipbuilding Co. Ltd and Wilhelmsen Ship Management Limited. Under the terms of the tender, the Consortium has 24 months from the date the project was launched to complete the infrastructure works.

Work on the Liquefied Natural Gas Transmission Infrastructure project in Cyprus started on 28.9.2020. The implementation of the project was affected by the impact of the pandemic and the various measures to deal with it, resulting in delays in the project. The works are ongoing and all necessary steps are being taken by ETLNG and the Ministry of Energy, Commerce and Industry to implement the project within the revised timetables set by the contractor, with a view to completing the project by the beginning of 2024. This infrastructure aims at ending Cyprus' energy isolation and has many cross-border benefits for Cyprus and the Eastern Mediterranean region.

The natural gas migration infrastructure project includes the supply of a floating liquefied natural gas import, storage and regasification facility (FSRU), a jetty to which the floating plant will be permanently attached, as well as related infrastructure.

<u>Explore the possibility of importing natural gas/hydrogen via a pipeline</u>

Cyprus and Israel have recently agreed to establish a Technical Commission to examine the construction of a gas/hydrogen pipeline from Israel to Cyprus.

Action plan to restore the electrical system after power failure

In case of limited or interruption of electricity supply, the TSOC shall implement the action plan to restore the electrical system after a power failure. The TMCC shall submit to CERA, whenever necessary, an updated action plan for the restoration of the electrical system after a power failure. The action plan includes, inter alia, the measures/actions to be taken by the TSOC and the power plants themselves, critical support staff, alert mechanisms, means of communication and any other possible action to implement the plan. The Action Plan has been in force since 2014 and several revisions have been carried out since then. The final NECP will assess the effectiveness and any additional costs of the above Plan and its revisions to electricity prices.

Addressing limited or interruptible electricity supply

The ability to cope with limited or interrupted electricity supply is determined by the value of two stochastic reliability indicators, i.e. LOLE (Loss Of Load Expectation) and EENS (Expected Energy Not Served). The maximum values should be set on the basis of economic criteria and taking into account the depopulated nature of the electricity system in Cyprus.

The maximum values for these indicators should be determined on the basis of in-depth studies of the Cypriot system in the final NECP to be submitted in 2024, taking into account economic criteria. .

Emergency procedures in the event of disruption of the supply of petroleum products

In accordance with Directive 2009/119/EU of the European Parliament and of the Council of 14September 2009 imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products, the Republic of Cyprus fulfils its obligations to maintain stocks of petroleum products corresponding to 90 days of its average daily net imports. In addition, contingency plans to address a serious disturbance are in force, including the release of retained oil stocks.

ii. Regional cooperation in this field

Not applicable because natural gas is not introduced into the country's energy mix. Nevertheless, Cyprus participates in and monitors the work of the EU Energy Platform and other relevant working groups at European, regional and international level.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

i. The capital cost of the natural gas migration infrastructure includes the supply of a floating LNG import, storage and regasification plant (FSRU), a jetty to which the floating plant will be permanently attached, as well as associated infrastructure, is EUR 315 million. Cost is financed through a combination of EU CEF (Connecting Europe) sponsorship of up to EUR 101 million (project approved by CEF in January 2018), debt financing (e.g. EIB, etc.) and investment by the Electricity Authority of Cyprus (EAC) worth EUR 43 million. Operating and maintenance costs are estimated at around EUR 200 million over a period of 20 years.

3.4. Dimension internal energy market

3.4.1. Electricity infrastructure

i. Policies and measures to achieve the targeted level of interconnectivity as set out in Article 4(d)

At this stage Cyprus' level of interconnectivity is 0 %. The 'EuroAsia Interconnector' electricity interconnection aims to end the island's energy isolation, with an electricity interconnection rate of 35.1 %, calculated as the nominal interconnection capacity divided by the installed generation and RES generation, 1000/2851 = 35,1.

Implementation of the electricity interconnection between Cyprus and Crete is expected to start in the coming months, which is expected to be completed and operational by 2029. Furthermore, Cyprus and Israel decided to convene the Technical Committee set up in the framework of the implementation of the Memorandum of Understanding signed by Cyprus, Greece and Israel in 2021 to promote the electricity interconnection between Cyprus and Israel, which is part of the EuroAsia Interconnector.

ii. Regional cooperation in this area

See 3.4.2 ii

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

See 3.4.2 iii

3.4.2. Energy transmission infrastructure

i. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Common Interest (PCIs) and other key infrastructure projects

Specific measures for the implementation of Projects of Common Interest (PCIs)

Cyprus supports the inclusion of three Projects of Common Interest in the EU lists drawn up every two years (2021, 2023, etc.), on the basis of Regulation (EU) No 859/2022 on trans-European energy networks. Specifically, the electricity project "EuroAsia Interconnector" and the gas projects "BalkusGas2EU" and "EastMed Pipeline". These projects aim to end the island's energy isolation, complete the internal energy market, increase the flexibility of the national energy system, enhance security of energy supply by diversifying energy corridors and sources and reduce carbon emissions by increasing the penetration rate of RES. In particular, surplus renewable energy produced in one country could be used in another country where electricity demand is high.

Specific measures for other key electricity infrastructure projects

The 2023-2032 Ten-Year Transmission System Development Plan (TDISM)52 is drawn up in accordance with Article 73 of the Electricity Market Regulation Laws of 2021 and 2022.

The main objective of this measure is the development and secure operation of the transmission network in the years 2023-2032. The 'n-2' rule for the transmission system backbone and the n-1 rule for other circuits and power transformers apply.

The TDSO shall take into account the total annual demand forecast for the period 2023-2032 as well as the maximum projected demand for each transmission substation. Account shall also be taken of the average long-term expected increase in production capacity of the new photovoltaic systems. In addition, it analyses the investments to be made in the 2023s to 2032s for the development and safe operation of the electricity transmission system, as well as other requirements set by CERA in its Decision No 03/2022 laying down basic principles for the elaboration of the Ten Year Transmission System Development Plan. The DISM is implemented by the Transmission System Owner, which is part of the Electricity Authority of Cyprus, but belongs to the Transmission BW, which is functionally separate from the NW of production and supply.

The total budget for the projects included in the 2023-2032 CEAM is EUR 231 693 867. Details of this policy and measure can be found in the impact assessment study.

Specific measures for other key gas infrastructure projects

DEFA is in the process of planning and developing the internal gas network within a radius of five (5) kilometres from the termination point of the LNG regasification plants located in the Vasilikos region, to the power plants wishing to be supplied with natural gas.

ii. Regional cooperation in this area

Cyprus, Greece and Israel signed a Memorandum of Understanding on the promotion and timely implementation of the EuroAsia Interconnector in 2021. In this context, the three countries agreed to promote cooperation among themselves to consider the design and possible development and implementation of the EuroAsia Interconnector project. This cooperation includes facilitating the timely granting of the necessary permits and authorisations, but also the discussions and coordination between regulatory authorities and electricity transmission system operators, the harmonisation of their respective technical standards and the consideration of ways and means to ensure the safety, sustainability, resilience and reliability of the electricity interconnection cable.

Cyprus, Greece and Israel also signed an Interstate Agreement on the EastMed Pipeline CSR, which was ratified by all three countries in 2020. The agreement sets out a number of issues between the countries involved, establishes a joint working group between them to monitor and carry out the work needed to implement the project and sets out the legal basis for further advancing CSR.

A bilateral Memorandum of Understanding between Cyprus and Egypt as well as a Tripartite Memorandum of Understanding between Cyprus, Greece and Egypt on the electrical interconnection of the electricity systems of the reporting countries were signed in 2021. Cyprus and Egypt continue to communicate in this regard through meetings of the Technical Committees established in the framework of the implementation of the Memorandum of Cooperation between them.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

In addition to CEF funding of EUR 3.1 million for technical studies, the EuroAsia Interconnector signed in

52 https://tsoc.org.cy/electrical-system/cyprus-transmission-system/tydplan/

2022 a EUR 657 million CEF financing agreement for construction projects. It was also included in the Cyprus Recovery and Resilience Plan to finance construction projects in Cyprus amounting to EUR 100 million.

The EastMed Pipeline PCI, in addition to receiving CEF funding of EUR 36.5 million for technical studies, aims to request the same facility to finance construction projects in the near future. The main condition for submitting this request is to submit an investment request to the regulators involved for the purposes of signing a cost-sharing agreement (CBCA).

Details of the financing of the infrastructure project for the arrival of natural gas “BalkusGas2EU” are given in point 3.3.iii.

3.4.3. Market integration

i. Policies and measures related to the elements set out in point 2.4.3

The policies and measures detailed below.

ii. Measures to increase the flexibility of the energy system with regard to renewable energy production such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

Development of the Transmission System

Name of policy or measure	Regulatory Decision No 03/2022, referred to as the ‘Establishment of Basic Principles for the elaboration of the Ten-Year Transmission System Development Plan’.
Principal objective	The summary in the TSCM of the following elements: • The most important transport infrastructure to be built; or upgrade over the next ten (10) years, including the necessary infrastructure for the penetration of renewable energy and electricity (AP-H) and storage systems electricity. • Techno-economic feasibility analysis for each new transport project that to be included in the TPSCM • Corresponding total estimated financial flows of all projects document. Please note that the allocation of project cost recovery does not fall under the objective of preparing the Ten Year Transmission System Development Plan

	• Detailed timetables implementation of the of Projects transport, taking into account, inter alia, 'reasonable' time period for issuing the required permits and completing expropriations/approvals. • Any environmental and/or other limitations during simulation
Quantitative target	D/E
Planned budget	D/E
Policy type	Regulatory Decision
Status of implementation	Adopted
Period of application	2023-2032

Development of the distribution system

Name of policy or measure	Regulatory Decision No 04/2022, referred to as the 'Establishment of Basic Principles for the elaboration of the Ten-Year Distribution System Development Plan'.
Principal objective	The summary in the TSCM of the following elements: • The most important distribution infrastructure to be built; or to upgraded where the subsequentten (10) years, including the infrastructure necessary for the penetration of renewable energy and electricity (RES-E), electro-mobility and electricity storage systems. • Inclusion of projects to modernise the distribution system including the following non-exhaustive topics: - Development of telemetry systems (Intelligent Measurement Systems and Measurement and Measurement Management System) - Development of a charging management system for electric vehicles - Development of a system for the supervision and control of the distribution network - Development/upgrade Management system of the Network Distributors - Development/upgrade of a Cargo Remote Control System - Automation of a distribution network through the installation of remote controlled transferor equipment, of equipment monitoring the functioning of the system as well as equipment to automatically restore the network in the event of a failure • Projects aimed at improving energy quality and reducing energy losses in the distribution system. • Projects aimed at better serving the users of the distribution system. • Corresponding total estimated cash flows of all distribution projects
Quantitative target	D/E
Planned budget	D/E
Policy type	Regulatory Decision
Status of implementation	Adopted

Period of application	2023-2032

Modernisation systems – AMI and Smart Meters

Name of policy or measure	Regulatory Decision No 02/2018 on the implementation of a binding timetable for the massive deployment and operation by the DSO of the infrastructure for intelligent metering systems (AMI).
Principal objective	AMI shall provide the necessary observability, monitoring and retrieval of electricity and power data and measurements at the customer's connection point. It increases the accuracy of load and demand forecasting, improves system analysis, allows load and demand management and optimisation of distribution system operation. It helps manage charging of electric vehicles, manage photovoltaic systems and monitor production, optimise RES generation forecast, maximise RES penetration, enable remote DSO functions (connections/disconnections, meter reading). In addition, it helps to reduce non-technical losses.
Quantitative target	Installation of 400 000 smart meters by the end of Q2 2026.
Planned budget	EUR 5000 000, including indirect costs and labour costs.
Policy type	Regulatory decisions.
Status of implementation	Adopted
Period of application	04/2023 – 06/2026

iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

Products for ancillary services provided by Storage Systems

(See report on Storage Plan)

Name of policy or measure	Amendment of the SMR and the Member States/CoDs, as approved by RAEK Decision No 03/2019 and No 386/2021 respectively, to implement Regulatory Decision No 03/2019 laying down basic principles for the regulatory framework for the operation of electricity storage systems installed upstream of the meter on the wholesale electricity market.
Principal objective	Amendment of the KAH and the Member States/KAD, as approved by RAEK Decision No 03/2019 and No 386/2021 respectively, to implement Regulatory Decision No 03/2019 with a view to defining specific products for the provision of high-efficiency ancillary services (e.g. rapid primary regulation, synthetic inertia) from electricity storage facilities.
Quantitative target	(Pending)
Expected Benefit	(Pending)
Policy type	Regulatory decisions.

iv. Policies and measures to protect consumers, especially vulnerable and, where applicable, energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

Competitiveness of the retail energy market

Name of policy or measure	Regulatory Decision 01/2017 on the implementation of a binding timetable for the full commercial operation of the new electricity market model.
Principal objective	Introduction of the forward, pre-day and intraday markets, as well as the balancing market, including the possibility of operating a 'strategic reserve' capacity mechanism in order to make the competitive electricity market in Cyprus work and increase the share of RES in the electricity balance.
Quantitative target	% Reduction in electricity costs
Benefit	D/E
Policy type	Regulatory decisions.
Status of implementation	Adopted

Active customers

Name of policy or measure	Regulatory Decision laying down the framework necessary for final customers to be entitled to operate as active customers and/or self-consumers.
Principal objective	Ensure that final customers are entitled to carry out their activity, directly or through aggregation, to sell self-generated electricity, including through energy purchase agreements, to participate in flexibility and energy efficiency schemes, to entrust third parties with the management of facilities needed for their activities, including installation, operation, data management and maintenance without those parties being considered active customers, to pay network charges, to be financially responsible for imbalances in the electricity system and to that extent they are balance responsible parties or transfer their balancing obligation and have systems accounting separately for electricity fed into the grid and electricity consumed from the grid.
Quantitative target	D/E
Planned budget	D/E
Policy type	Regulatory Decision
Status of implementation	Planned policies and measures
Period of application	Q2 2024

Energy Communities[46]

Name of policy or measure	Regulatory Decision establishing a favourable regulatory framework for citizen energy communities.
Principal objective	https://www.cera.org.cy/Templates/00001/data/raek/prosfores/tender_2023-03/tender_2023-03.pdf Defining guidelines on the promotion of active customers and self-consumers from renewable sources, facilitating the establishment of Citizens' Energy Communities and Renewable Energy Communities, demand response through Cumulative Representation, and recommendations for the establishment of the respective regulatory frameworks.
Quantitative target	D/E
Planned budget	90,000
Policy type	Regulatory Decision
Status of implementation	Planned policies and measures
Period of application	Q2 2024

Mass change of supplier

Name of policy or measure	Regulatory Decision on the 'Statement of Regulatory Practice and Methodology of Mass Change Supplier'
Principal objective	The establishment of a framework according to which suppliers may offer the possibility of collective switching, ensuring the elimination of any regulatory or administrative barriers to mass switching, and specifying: - How mass switching schemes operate; - The roles and responsibilities of the actors involved; a supply undertaking and final customers; - Important rules governing the negotiation between entities taking part in these schemes, as well as - Issues of ensuring the highest possible protection in the consumers vs. abusive practices.
Quantitative target	D/E
Planned budget	D/E
Policy type	Regulatory Decision
Status of implementation	Planned policies and measures
Period of application	Q2 2024

[46] https://www.cera.org.cy/Templates/00001/data/raek/prosfores/tender_2023-03/tender_2023-03.pdf

v, Description of measures to facilitate and develop demand response, including those affecting prices to support dynamic pricing

Demand response through aggregation

Name of policy or measure	Regulatory Decision setting out the framework allowing and promoting the participation of demand response through aggregation.
Principal objective	CERA's regulatory decision ensures the implementation of Article 2 (20) of Directive (EU) 2019/944. In addition, the following shall be ensured: • the obligation for market participants that engage in aggregation to be financially responsible for the imbalances they cause in the electricity system and to that extent are balance responsible parties or delegate their balancing obligation; • that final customers who have concluded a contract with independent actors cumulative representation not are subject to payments, penalties or other unjustified contractual restrictions by their suppliers; • the existence mechanism resolution differences between of the market participants that active in the aggregation of other market participants including responsibility for imbalances; • the payment of compensation in accordance with the provisions of Article 22 (11) (b) and (c) of the Electricity Market Regulation Laws of 2021 and 2022; • that the TSO and DSO in close cooperation with the participants the market and final customers shall set out the technical requirements, covering the participation of aggregation loads, for the participation of demand response in all electricity markets based on the technical characteristics of those markets and the technical capabilities of demand response.
Quantitative target	Calculate the benefit of the above application to electricity prices
Planned budget	D/E
Policy type	Regulatory Decision
Status of implementation	Planned policies and measures
Period of application	Q2 2024

Dynamic Invoicing

Name of policy or measure	Regulatory Decision on the 'Statement of Regulatory Practice and Dynamic Pricing Methodology'

Principal objective	Adjustment of the details of the supply dynamic price contracts by the supplier with the highest number of final customers on the electricity market and any supplier with more than two hundred thousand (200.000) final customers. The Regulatory Decision shall determine: • the Dynamic Pricing Forms; • tariff design variations; • relations between operators in the context of dynamic pricing, and • the requirements for the implementation of relevant ICT infrastructure.
Quantitative target	
Benefit	Calculate the benefit in reducing electricity prices, improving system efficiency, any (indirect) contribution to reserves, etc.
Policy type	Regulatory Decision
Status of implementation	Planned policies and measures
Period of application	Q2 2024

3.4.4. Energy poverty

I. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

The policies and measures referred to in paragraph 2.4.4 shall continue to be in force until the completion of the study on the definition of energy poverty and the definition of indicators to measure it. On the basis of the target set to reduce energy poverty, a review of the measures to address it will be carried out.

3.5. Dimension research, innovation and competitiveness

i. Policies and measures related to the elements set out in point 2.5

Existing policies and measures

- National funds promoting among other themes energy and climate research and the development of innovative products and services by enterprises, such as the research and innovation funding programmes for 2021-2027 the Support Plan to Strengthen Business Innovation.
- EU funding for research, innovation and competitiveness, such as Horizon Europe and Life.
- Business4Climate was developed by the Cyprus Federation of Employers and Industrialists (OEB) in cooperation with TEPAS, the Department of Environment and was funded by Climate-KIC. The aim of this initiative is to commit more than 250 companies from all sectors of economic activity in Cyprus to reduce their emissions by at least 8 % by 2030. In this context, companies are expected to implement energy saving and renewable energy measures that will reduce their operating costs and make them more competitive.

- Amend the legal framework on the functioning of public universities to enable them to transform scientific knowledge into commercial products and services. The amendment of the legal plan is under preparation and is expected to proceed to a public consultation soon.

Additional policies and measures

- A new industrial policy that seeks to achieve sustainable development and production through the upgrading of energy efficiency and the integration of RES into productive and industrial infrastructure.

- Skills policy – “Modern professional development for the green and digital transition” National Action Plan of the Republic of Cyprus for the European Year of Skills 2023.

Policies and measures to be considered with a view to achieving the 2030 carbon target

As a result of the stakeholder consultation process (section 2.5), there was a clear need for funding for research and innovation in energy and climate.

ii. Where applicable, cooperation with other Member States in this area, including, where appropriate, information on how the SET Plan objectives and policies are being translated to a national context

SET-PLAN is the research and innovation pillar of EU energy and climate policy, contributing to the structure of European and national research programmes and encouraging significant investments in low-carbon technologies.

The European Technology Priorities, grouped according to the main objective of the Energy Union under the SET, are the following:

(a) World leader in renewable energy
(b) Delivering a consumer-centred smart energy system
(c) Development and strengthening of energy efficiency systems
(D) Diversifying and enhancing energy options for sustainable transport
(e) Promoting the ambition of carbon capture, utilisation and storage
increasing safety in the use of nuclear energy

Cypriot universities and research institutes participate in the informal SETPLAN working group, which has ten areas of application, including:

(a) Photovoltaic Systems
(b) Aggregated solar thermal
(c) Ocean energy
(D) Smart solutions for energy consumers – Promoting energy communities for sustainable urbanisation
(e) Energy systems
energy efficiency in industry
(g) Fuels from renewable energy sources and bioenergy
(h) Geothermal
(I) Energy performance of buildings

Work is ongoing to further align the national research funds for the period 2021-2030 with the SET Plan. Cooperation with other Member States is mainly implemented through programmes funded by Horizon 2020, Interreg MED.

iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

The 2021-2027 national funding programmes for research and innovation have a vision to promote research, technological development and innovation as a key factor for Cyprus’ economic development, contributing to addressing key economic and societal challenges and developing the conditions for sustainable growth, in line with the principles outlined in the Europe 2020 strategic framework for smart, sustainable and inclusive growth. National funding programmes identify energy and climate as priority areas based on the results of the Smart Specialisation Strategy and the SECURITY Programme. National funding programmes are designed and managed by the Foundation for Research and Innovation.

As regards the entire innovation chain, and in particular research on market uptake, the Foundation for

Research and Innovation launched in 2019 innovation funding programmes called 'PRE SEED', 'SEED' and 'INNOVATE'. This aims to assimilate research from higher TRLs into mature ideas, prototypes and products to the market.

The IEK Programmes for Entrepreneurial Innovation are:

(a) the PRESEED programme "Creation and Initial Development of International Guiding startups";
the programme 'Development of internationally competitive innovative products and services from startups' – SEED, and
the Programme 'Development and Promotion of International Competitive Innovative Products and Services by Existing Enterprises' – INNOVATE;

The innovation programmes have funded businesses with EUR 30 million over the past 3 years in 104 small and medium-sized enterprises, including 64 start-ups with a contribution of 15 million private funding and 250 new jobs.

Horizon Europe has the general objective to contribute to building a society and an economy based on knowledge and innovation across the Union, leveraging additional funds for research, development and innovation and contributing to research and development objectives. Cyprus secured EUR 320 million from Horizon 2020.

The LIFE programme is the EU's funding instrument for the environment and climate action. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental and climate policy and legislation by co-financing projects with European added value. For the period 2014-2020 the total budget of the LIFE programme was EUR 3,46 billion.

SECTION B: ANALYTICAL BASIS

4. CURRENT SITUATION AND PROJECTIONS WITH EXISTING POLICIES AND MEASURES

4.1. Projected evolution of the main exogenous factors affecting the energy system and GHG emissions developments

In order to revise the national targets and targets up to 2030, based on the new European Union's 'Fit for 55' policy with a central target of at least a 55 % net greenhouse gas emission reduction by 2030, the following scenarios have been developed:

i. Business-as-usual (BaU) – this scenario assumes that historical trends continue to be they exist until the end of the modelling horizon.
ii. With existing measures (RMS) – this scenario takes into account already adopted policies and measures and assesses their impact on the energy system.
iii. Additional measures (FPS) – this scenario takes into account planned and additional policies and measures, which should indicate an effort to comply with the new national energy and climate targets.

The above scenarios use oil and gas price assumptions provided by the national authorities. These price forecasts are significantly lower than the recommended parameters of the European Commission (EC), as Cyprus is not expected to use it. Therefore, a fourth scenario was developed as a sensitivity analysis, investigating the impact of higher fossil fuel prices, in line with EC recommendations. The general assumptions for fuel prices for both low and high price scenarios as well as projections for ETS prices are given in the following table.

Table 4.1. Projections for fossil fuel prices, ETS prices

	Unit	2022	2023	2024	2025	2026	2027	2030	2035	2040
Oil	\$2020/boe	101	70	70	70	70	70	70	70	70
Gas	\$2020/GJ	N/A	N/A	15	13	8,8	4,7	4,7	4,7	4,7

Existing ETS	EUR 2020/tCO_2	75	77	78	80	80	80	80	82	85
New ETS	EUR 2020/tCO_2	N/A	N/A	N/A	N/A	N/A	25	50	82	85

i. Macroeconomic forecasts (GDP and population growth)

The economy is expected to grow at around 2.5 % on average over the period 2023-2040. More specifically, in the years 2023-2030 the economy will grow at an average rate of 2.8 % and in the years 2031-2040 an average growth rate of 2.1 %. Inflation is forecast at 3.2 % in 2023 and 2.5 % in 2024 and then is expected to be 2 % by 2040. GDP in current prices is expected to increase from EUR 27.006,4 in 2022 to EUR 40.581,7 in 2030 and to EUR 61.132,9 in 2040. The population of Cyprus from 926 thousand in 2023 is expected to increase to 958 thousand in 2030 and 974 thousand in 2040. The population will grow by an average of 0.3 % over the period 2023-2040.

ii. Sectoral changes expected to impact the energy system and GHG emissions

Major investments are expected in large infrastructure, which will directly affect the energy mix and help reduce greenhouse gas emissions. Initially, the import of natural gas for electricity production is expected to start in mid-2024 through a floating terminal for the reception and regasification of Liquefied Natural Gas in the Vassilikos region. This will allow electricity generation to be increased by the combined cycle plants, which are the most efficient units of EAC and now produce electricity from higher diesel costs. At the same time, by replacing electricity production by fuel oil and diesel with natural gas, a significant reduction in greenhouse gas emissions is automatically achieved in the power generation sector.

The advent of natural gas and its use in electricity generation combined with the further penetration of RES in the electricity sector will lead to a significant reduction in GHG emissions in this sector. In the transport sector, a significant reduction in GHG emissions is expected from the increase in the number of electric vehicles replacing conventional vehicles, while the contribution of other renewable fuels to transport such as biomethane and hydrogen is expected after 2030.

The exploitation of indigenous hydrocarbon deposits discovered in the EEZ has not been assessed to what extent it affects GHG emissions, while the installation and operation of a natural gas liquefaction terminal is estimated to increase GHG emissions.

In addition, the installation of the EuroAsia Interconnector electricity cable, which is expected to be operational by the end of 2029, will allow an increase in the penetration of renewable energy technologies for power generation purposes, reducing the frequent electricity cut-outs of these technologies. At the same time, support schemes to promote storage technologies are expected to play a similar supporting role in the coming years.

In the transport sector, investments in the bus fleet as well as in supporting infrastructure (e.g. bus lanes, bus stops, pedestrian routes, cycling routes, etc.) aim to achieve a partial shift towards sustainable mobility instruments. Finally, in the buildings sector, significant energy upgrades are expected in both residential and commercial units, which will help to save energy while reducing greenhouse gas emissions.

iii. Global energy trends, international fossil fuel prices, EU ETS carbon price

Rising costs in fossil fuel prices and the gradual improvement in the cost and efficiency of renewable energy technologies, as well as alternative technologies and measures in different sectors of the economy (e.g. electrification of transport and heating and cooling, energy saving measures, RES in industry, etc.), lead to a global transformation of the energy system. However, the pace of investment in decarbonisation technologies and measures needs to be significantly increased to meet the climate objectives of the Paris Agreement.

Investments in the energy sector are influenced by the prices of technologies and fuels. According to the European Commission's proposed assumptions53, the price of crude oil is forecast to be around EUR 88/βαρέλι (EUR 2020) for the remainder of the decade, while the price of natural gas will be between EUR 11-15/GJ (EUR 2020) for the period 2024-2030. These projections were made public a few months after the beginning of the conflict in Ukraine, which led to a significant increase in energy prices in Europe, but a partial decrease in these prices has already taken place. Despite higher projections in international fossil fuel prices in the assumptions of the European Commission, Cyprus' NECP adopts lower fossil fuel prices. In particular, based on information from the Cyprus Hydrocarbons Company, the international crude oil price is expected to be close to EUR 62/βαρέλι (EUR 2020), which is closest to the prices observed in recent months. Also, on the basis of the purchase price of natural gas in the Eastern Mediterranean and the Middle East, it is assumed that from 2026 Cyprus will be able to source gas at a cost close to EUR 5/GJ (EUR 2020).

The carbon price in the Emissions Trading System (ETS) adopted in the NECP is in line with the European Commission's proposed assumptions. This is assumed to be EUR 77/τόνο CO_2 (EUR 2020) in 2023 and EUR 80/τόνο CO_2 for the period 2025-2030.

53DG Clima, EC Recommended parameters for reporting on GHG projections in 2023

iv. Technology cost developments

Despite the increase in raw material costs following the COVID-19 pandemic as well as the beginning of the conflict in Ukraine, it is expected that there will be a long-term decrease in the cost of investing in technologies that are crucial for decarbonising the economy. In particular, there is a reduction in the cost of investing in renewable energy technologies for generation purposes, such as photovoltaics and wind generators, as well as in storage technologies such as batteries. The cost projections in these technologies have been adapted to the local situation, taking into account recent and future projects as well as offers received from interested investors.

In the road transport sector, the revised NECP largely adopts investment cost projections from the EU Reference Scenario 2020[54] for different vehicle categories and technologies as well as charging stations for electric vehicles. These projections consider that the costs of purchasing hybrid, electric and hydrogen vehicles will decrease significantly in the future, making these technologies more competitive.

4.2. Decarbonisation dimension

4.2.1. It GHG emissions and removals

Current situation

According to the last GHG inventory report submitted to the UNFCCC Secretariat in May 2023[55], total greenhouse gas emissions in 2021 were 8 675 Gg CO_2 eq. (without LULUCF, with indirect emissions), which shows a decrease of 6.1 % between 2005 and 2021. Compared to 1990, total emissions increased by 55.6 % (Figure 4.1).

The high dependence of the energy sector in fossil fuels, transport by private cars and the management of solid waste from landfilling is evident in

trends and linked to high GHG intensity index values compared to other Member States of the European Union. The partial reduction and stabilisation of emissions in recent years is mainly due to increased RES penetration in final consumption, energy efficiency improvement measures and the pandemic. Emissions from the agricultural sector increase significantly due to an increase in the animal population, in particular cows.

The contribution of the energy sector to overall greenhouse gas emissions is the highest compared to emissions produced by other sectors of the economy. In particular, the combustion of fossil fuels for electricity generation and heat is the most important factor contributing to the development of the status quo.

54 European Commission. Directorate General for Energy., European Commission. Directorate General for Climate Action., and European Commission. Directorate General for Mobility and Transport., *EU Reference Scenario 2020: Energy, Transport and GHG Emissions: TRENDS to 2050.* (LU: Publications Office, 2021), https://data.europa.eu/doi/10.2833/35750.
55 https://unfccc.int/documents/627714

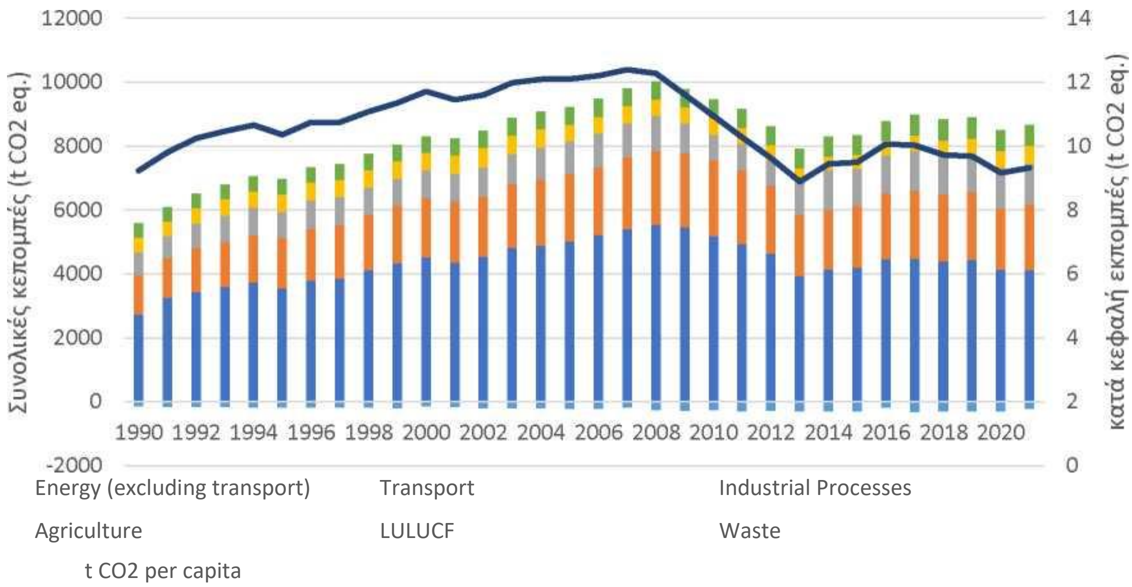


Figure 4.1. Greenhouse gas emissions by sector for the period 1990-2021

Figure 4.2 shows the emissions from growth relative to 2005 in total greenhouse gas emissions as well as sectoral trends. The reduction in emissions in the energy sector was significant (a decrease of 18 % for 2021 compared to 2005 [after a 10 % increase observed in 2008]). Emissions from transport decreased only by 3 %, while the rest of the sectors saw an increase: industrial processes by 27 % mainly due to the use of F-gases, waste by 19 % due to the increase in solid waste generation and agriculture by 6 % due to an increase in the animal population. For the land use, land use change and forestry (LULUCF) sector, there is an increase in removals with significant decreases in the years when major fires are observed (Saita 2007, Solea Valley 2016, Larnaca Mountain 2021).

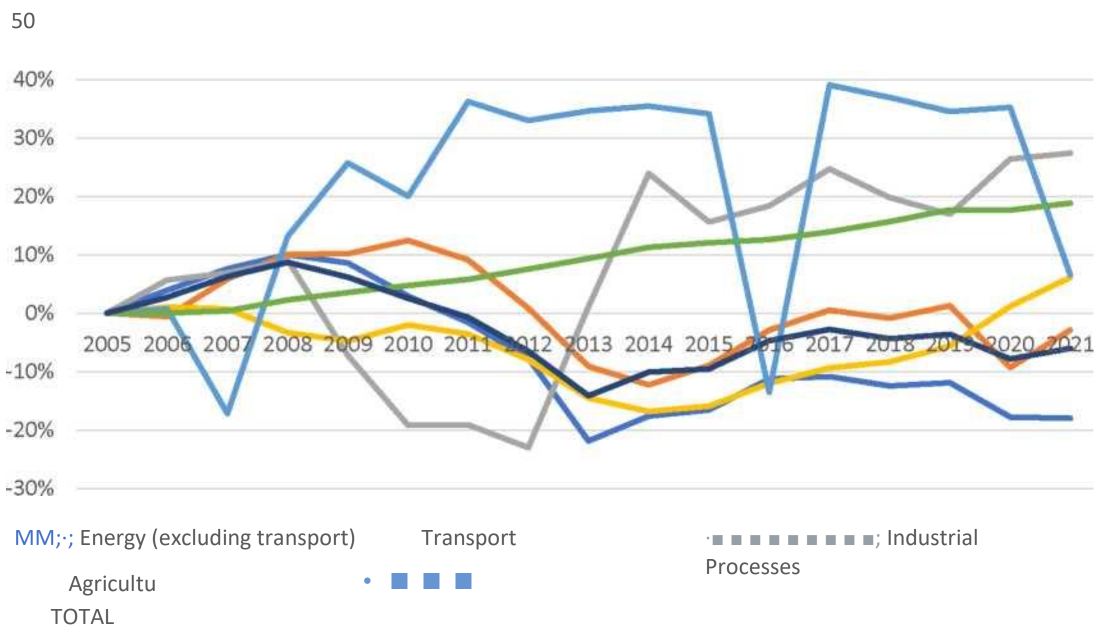


Figure 4.2. Change in sectoral greenhouse gas emissions compared to 2005

1. Trends in current GHG emissions and removals in the EU ETS, effort sharing and LULUCF sectors and different energy sectors

ETS emissions

The ETS in Cyprus comprises 3 installations for the production of electricity, 1 installations for the production of cement and 6 installations for the production of ceramics. These installations contributed 51 % to total national emissions in 2021. As shown in the graph below, emissions from ETS sectors have stabilised since 2014 at around 4,5 million tonnes of CO_2 eq with a slight downward trend since 2017.

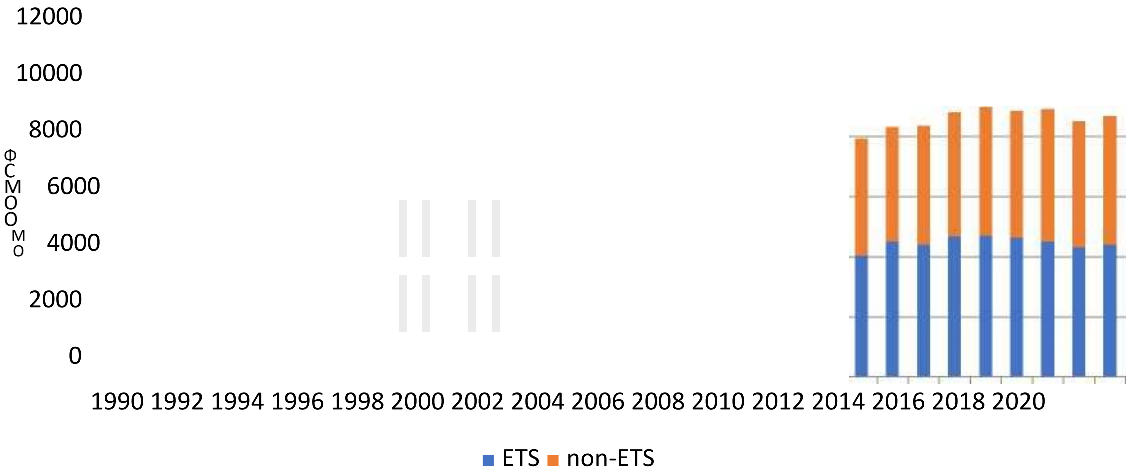


Figure 4.3. Contribution of ETS and non-ETS emissions to total (excluding LULUCF emissions)

Most ETS emissions in Cyprus come from electricity production, followed by cement and ceramics production (71 %, 28 % and 1 % respectively in 2021) (Figure 4.4). It is worth noting the increasing trend in the use of biomass in thermal energy production by the cement industry, which has increased significantly over the last decade (Figure 4.5).

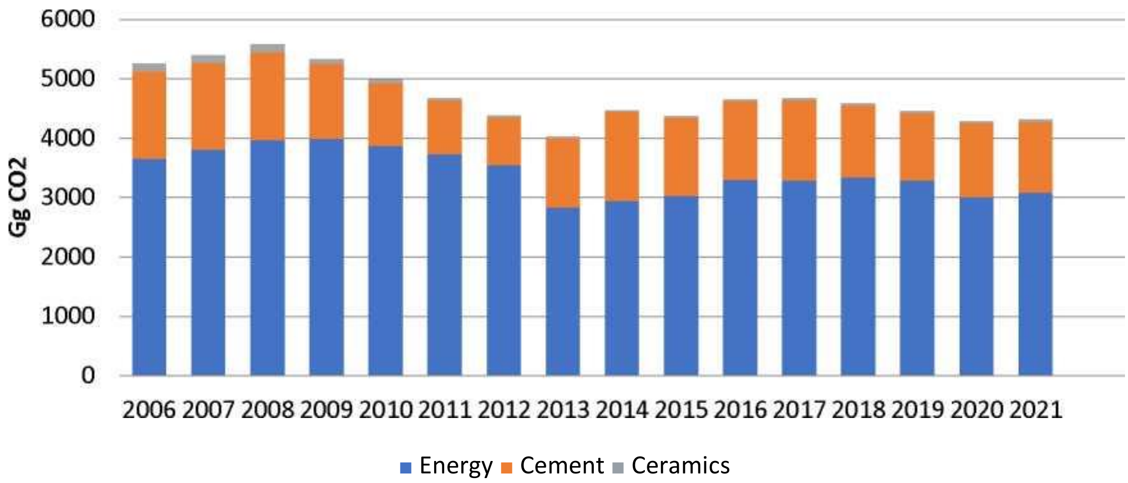


Figure 4.4. Contribution of ETS sectors to ETS emissions

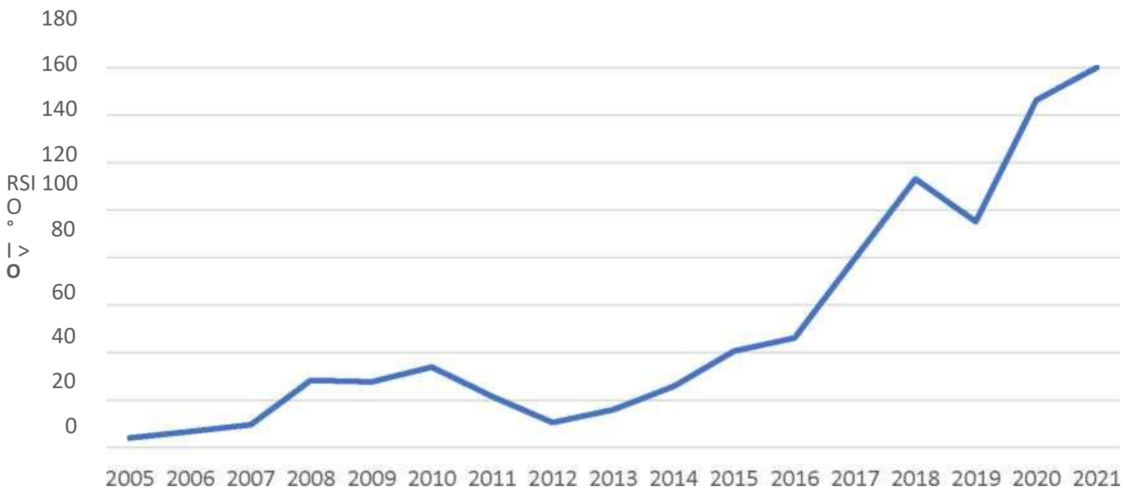


Figure 4.5.
Emissions from biomass in cement industry (ETS)

Non-ETS emissions

According to the latest GHG inventory, the bulk of non-ETS emissions still originate from road transport with 47 %, followed by solid waste management (14 %) and energy production for residential, tertiary and agricultural use (11 %). Followed by the use of F-gases (9 %) and an intestinal decrease (8 %), while the energy sectors for non-ETS industry (4 %), livestock waste (3 %), non-ETS industrial processes (1 %) and agricultural soils (1 %) contribute less.

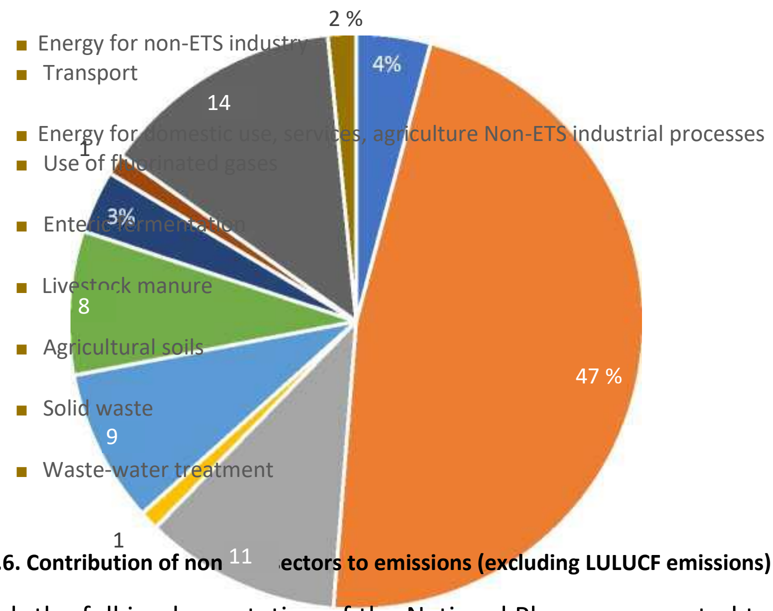


Figure 4.6. Contribution of non ectors to emissions (excluding LULUCF emissions)

Although the full implementation of the National Plan was expected to bring about the achievement of the national targets, a significant divergence appeared to exist on the basis of the recent emission inventory. In particular, for the year 2021, actual emissions were found to exceed by 202 Gg the relative distribution for 2021 (4 275 Gg CO_2 eq while the target is 4 073 Gg CO_2 eq.). The above exceedance from a preliminary analysis appears to be due to the following:

- Transfers: there is an increase in energy consumption than expected.
- Solid waste management: it was assumed in the forecasts that much smaller quantities of waste would go to the HYTY due to the implementation of the measures for sorting at source. It was also considered that biogas will be collected from the old landfill sites from 2020, which has not been implemented to date.
- Use of cooling gases: emissions from cooling gases were calculated on the basis of a constant (a) emissions per capita of 2017 (0.28 Gg CO_2 eq./person), which according to the inventories increased significantly (0.42 Gg CO_2 eq./person), (b) the population grew more than expected (forecast for 881 thousand, 905 thousand in inventories), (c) it was considered a 5.5 % cooling gas recovery through the implementation of the emission reduction sponsorship plan, which has not yet been implemented.
- Enteric fermentation and livestock waste management: the cow population increased much more than expected (88 thousand instead of 72 thousand). The same applies to goats, but to a lesser extent (264 thousand instead of 257 thousand).

This deviation from the targets is estimated to continue for the coming years. This demonstrates, inter alia, the need for the immediate implementation of all the policies and measures of the National Plan in order for the Republic to successfully meet its institutional obligations, without any compliance costs.

Land Use, Land Use Change, Forestry (LULUCF)

For the land use, land use change and forestry (LULUCF) sector, there is an increasing trend in removals with significant reductions in removals in the years where there are major fires (Lefkara 2001, Saita 2007, Larnaca Mountain 2021). Solea Valley 2016,

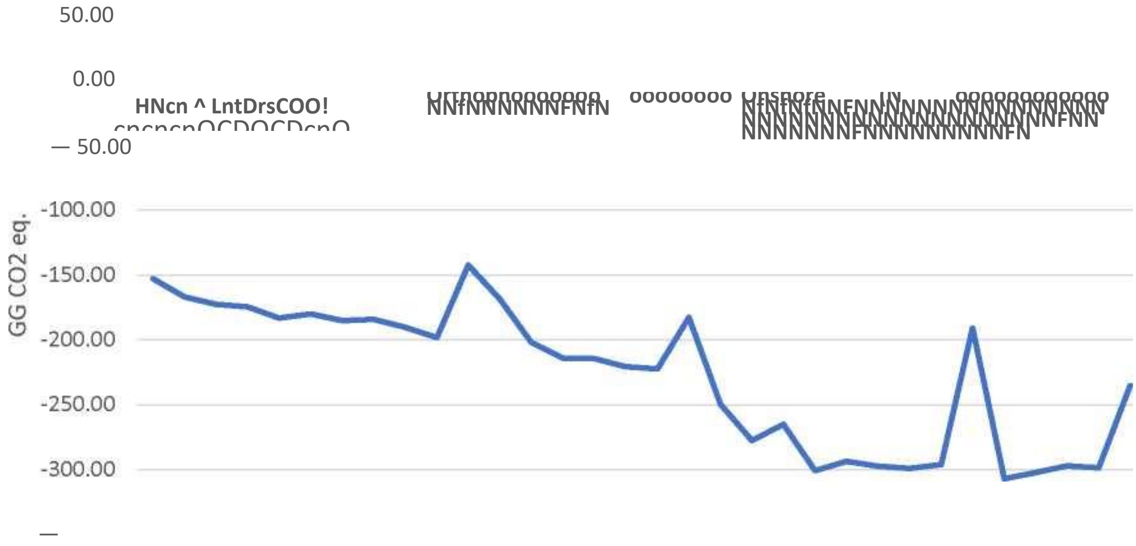


Figure 4.7. Total LULUCF emissions

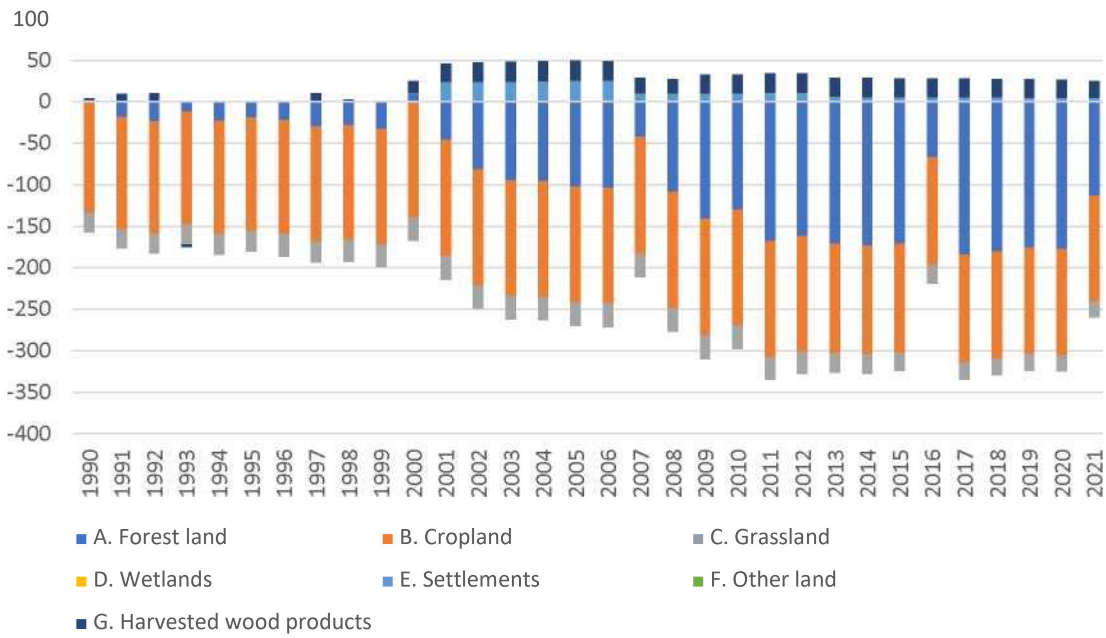


Figure 4.8. Contribution of LULUCF related activities to total LULUCF emissions

II. Projections of sectorial developments with existing national and Union policies and measures at least until 2040 (including for the year 2030)

Based on existing policies and measures, it is estimated that national GHG emissions outside the ETS will decrease to 3 794 Gg CO_2 eq in 2030, as shown in Figure 4.9, corresponding to a decrease of 11 % compared to 2005.

For the ETS sectors, emissions are expected to decrease to 2 985 Gg CO_2 eq in 2030, which corresponds to a 41 % reduction compared to 2005 emissions due to the introduction and use of natural gas in electricity generation.

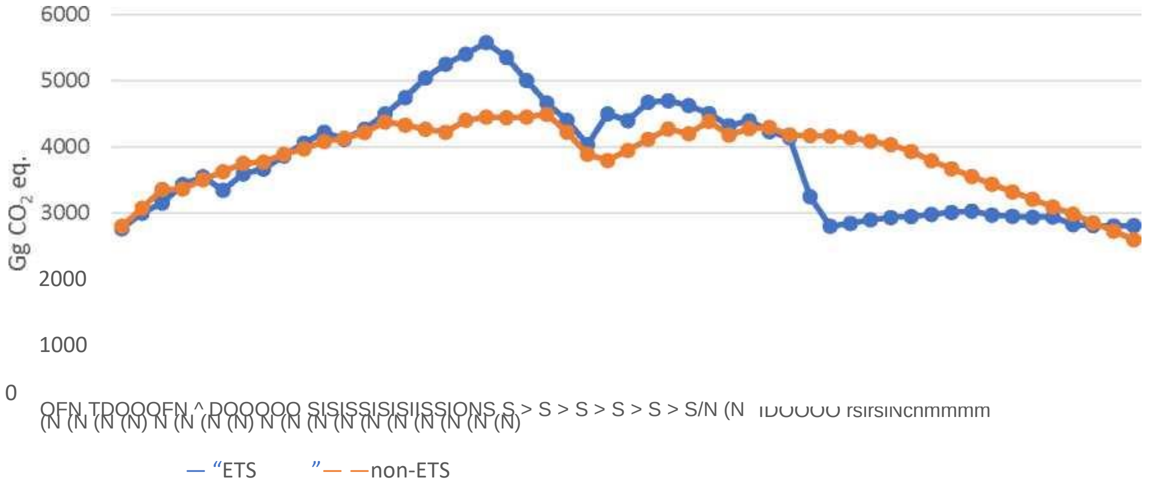


Figure 4.9. Projected greenhouse gas emissions with existing policies and measures

Figure 4.10 shows the expected emissions by 2040 relative to 2005 in terms of total greenhouse gas emissions as well as sectoral trends. In the future, a significant reduction in emissions from the energy sector is expected due to the implementation of the new EU obligations and the import of gas (39 % by 2030 compared to 2005). The waste sector also shows a notable decrease of 28 % by 2030 compared to 2005, due to the implementation of the new EU obligations on waste and the circular economy. The agricultural and industrial process sectors are expected to stabilise their emissions due to their emission reduction constraints, while LULUCF is expected to significantly increase its removals after 2030, due to the implementation of policies and measures in the period 2021-2030.

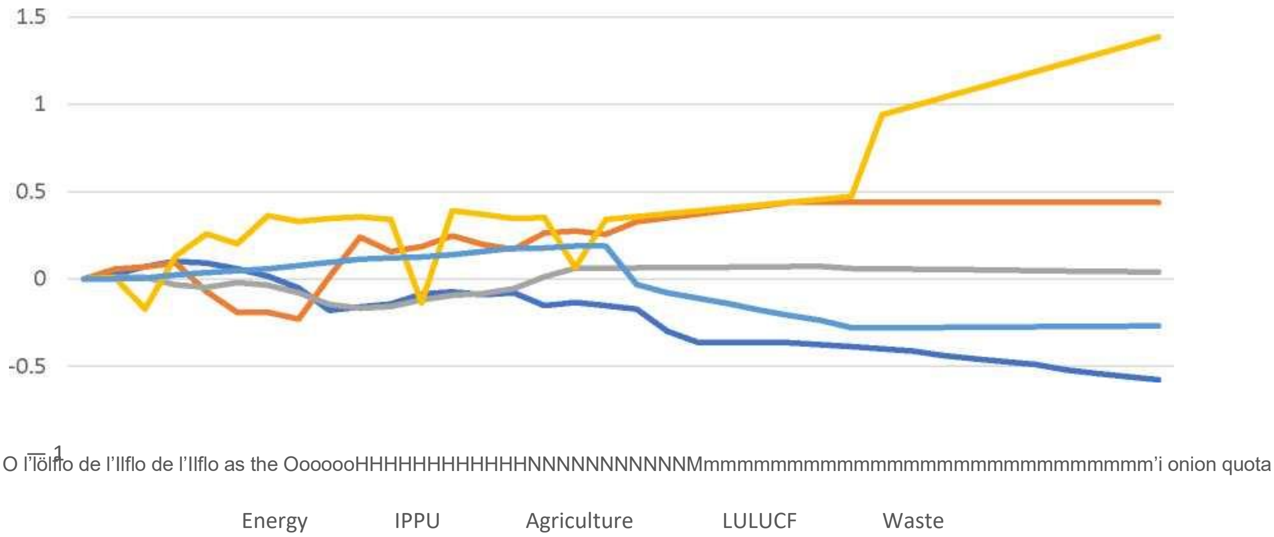


Figure 4.10. Change in sectoral GHG emissions compared to 2005 (2005 = 0)

Forecasts

Full implementation of the MIM can achieve 10 % reductions in non-ETS GHG emissions in 2030 (see Table 4.2 and Figure 4.11). According to GHG emission projections, it appears that over the period 2021-2030 Cyprus will have a small surplus in some years and a small deficit in some years compared to the annual allocations expected to be allocated. Table 4.3 shows the relative annual and total deficits.

Table 4.2. Expected non-ETS GHG emissions from 2021 to 2030 for STBs

Emissions	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
COC. (kt CO_2 eq.)	4312	4295	4184	4170	4167	4147	4090	4036	3963	3851

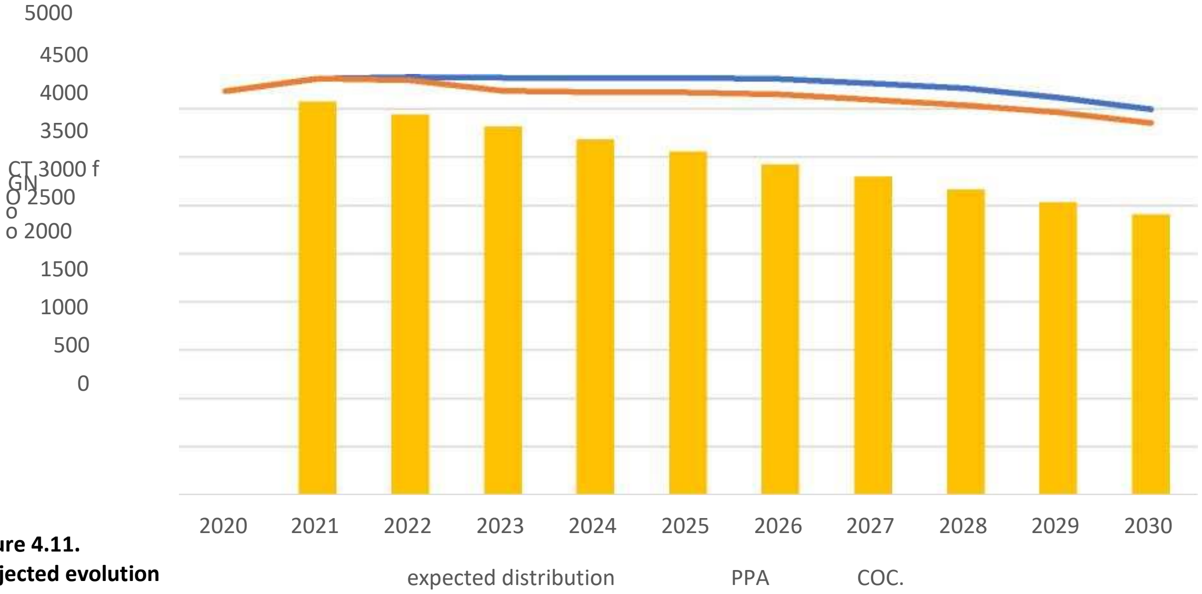


Figure 4.11. Projected evolution of greenhouse gas emissions of the non-ETS sectors according to the MIB

Table 4.3. GHG BEM Forecasts compared to expected allocation

kt CO_2 eq.	Expected distribution	CCM provisions	Surplus/deficit of allowances with MIB
2021	4073	4312	— 239
2022	3943	4295	— 352
2023	3813	4184	— 371
2024	3682	4170	— 488
2025	3552	4167	— 615
TOTAL 2021-2025	**19063**	**21128**	**— 2065**
2026	3422	4147	— 725
2027	3292	4090	— 798
2028	3162	4036	— 874
2029	3032	3963	— 931
2030	2901	3851	— 950
Total 2026-2030	**15809**	**20087**	**— 4278**

4.2.2. Renewable energy

i. Current share of renewable energy in total gross final energy consumption and in different sectors (heating and cooling, electricity and transport) as well as per technology in each of these sectors

In 2021, the share of energy from renewable energy sources (RES) in the gross final consumption of energy in the Republic of Cyprus was 18.42 %. In addition, the share of RES in 2021 in the power sector stood at 14.84 %, in the heating and cooling sector at 41.34 % and in transport at 7.19 %. More information on the current situation in the RES sector can be found in paragraph 2.1.2 (i).

Figure 4.12 shows the contribution of each renewable energy technology to the overall rate of RES use in the Republic of Cyprus in 2021. The dominance of solar energy, which accounts for 36.92 % of the total RES use rate, is due to the widespread use of solar thermal and photovoltaic systems. The contribution of heat pumps for both heating and cooling purposes as well as the use of biomass for heating purposes is also important.

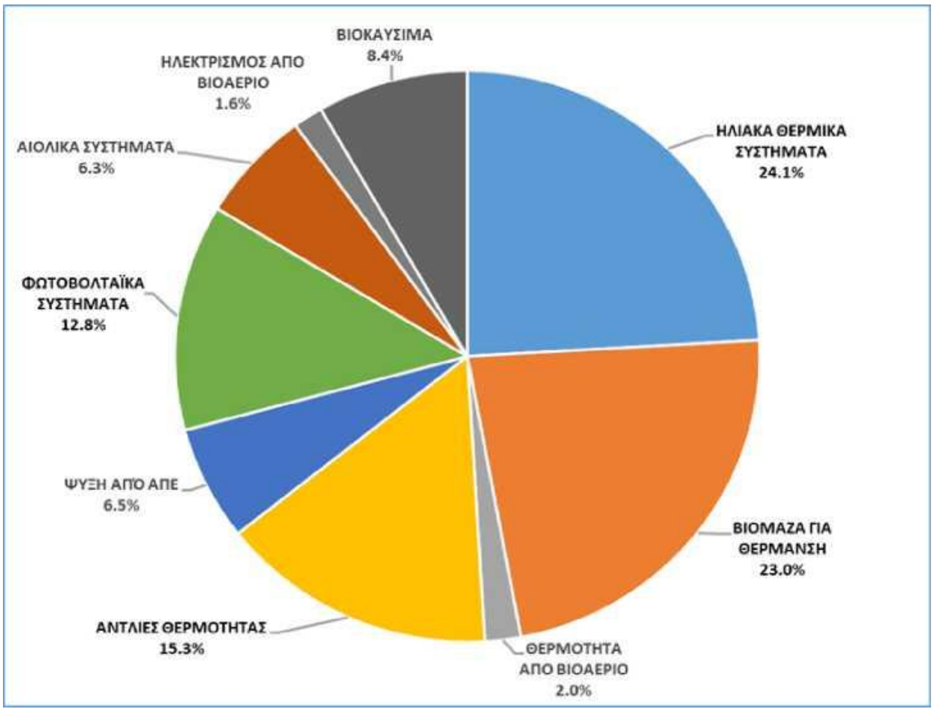


Figure 4.12. Contribution per RES technology to the total rate of RES use in the Republic of Cyprus in 2021.

ii. Indicative projections of development with existing policies for the year 2030 (with an outlook to the year 2040)

Figure 4.13 shows the indicative trajectory of the share of RES in total energy consumption in the scenario with existing measures (SMM) and Figure 4.14 shows the indicative trajectory of the RES share in the heating/cooling, electricity and transport sectors up to 2040.

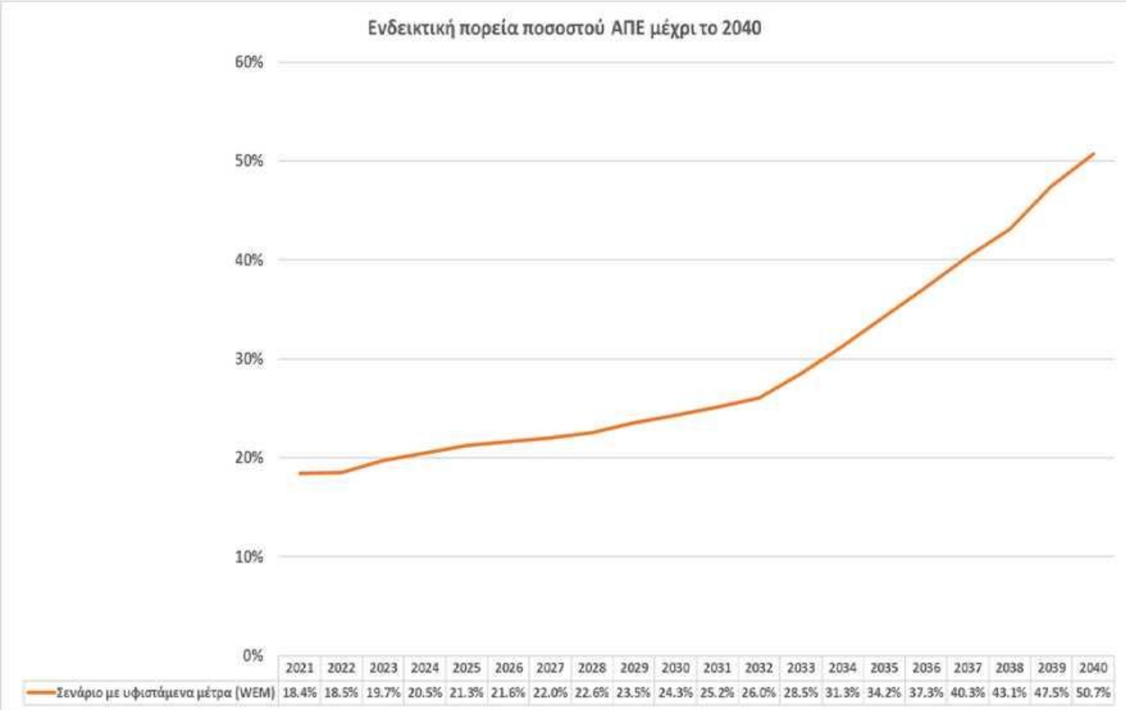
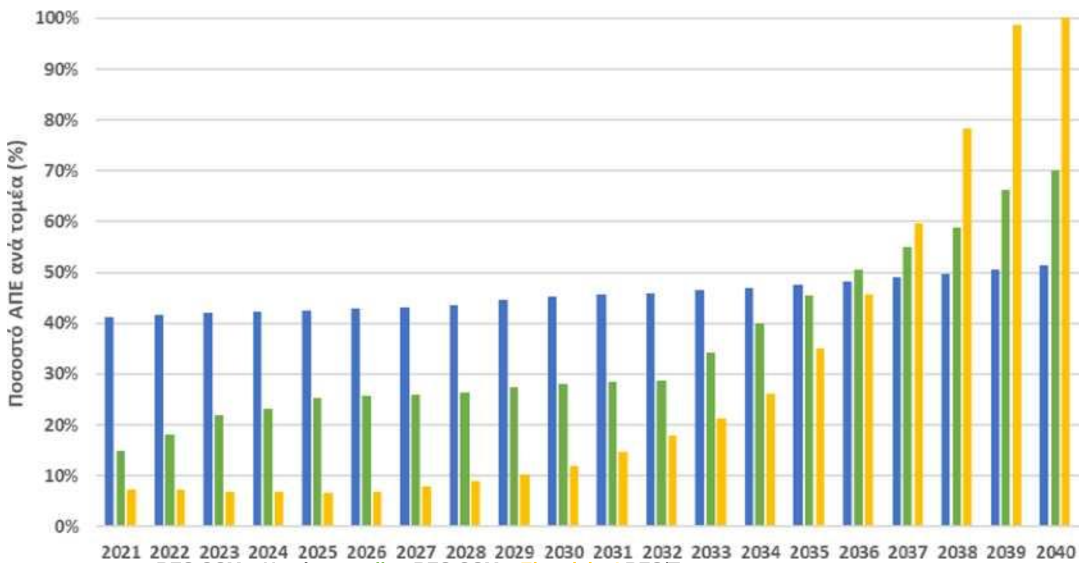


Figure 4.13. Indicative RES trajectory until 2040 in the STM.



■ RES GSM – Heating, cooling,RES GSM – Electricity I RES/Transport

Figure 4.14. Indicative growth trajectory for RES share in the heating and cooling of electricity and transport sectors in the STM until 2040

In the above scenarios, no dynamic analysis of the network has been carried out in order to examine the various technical issues arising from the increase in RES generation in relation to the stability of the network. The assumptions have also not been agreed with all relevant bodies.

4.3. Dimension energy efficiency

i. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Table 4.4. Current primary and final energy consumption in the economy and by sector (official Eurostat data available for current year - 2)

Cyprus Energy data for the year 2021 (Eurostat)	**ktoe**
Primary energy consumption (Europe 2020-2030)	2.311,7
Final energy consumption (Europe 2020-2030)	1.688,7
Final consumption – industry sector – energy use	243,4
Final consumption – transport sector – energy use	661,6
Final consumption – other sectors – commercial and public services – energy use	259,8
Final consumption – other sectors – households – energy use	355,1
Final consumption – other sectors – agriculture and forestry – energy use	45,8
International aviation	157,7

Additional information is also given in point 2.2. i (status quo)

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

From carrying out the comprehensive study to assess78 the energy saving potential in the HE sector, high-efficiency and efficient district heating and cooling cogeneration plants (under consideration and hot cloud production with solar thermal and/or Hydrogen) have a low potential for energy savings. In particular, economic potential in the use of combined heat and power plants (36.3 MWe) is present in the industrial sector and in particular in industrial processes where temperatures beyond 400 °C are[needed], with an estimated primary consumption savings of 26,1 ktoe.

iii. Projections considering existing energy efficiency policies, measures and programmes as described in point 1.2. (ii) for primary and final energy consumption for each sector at least until 2040 (including for the year 2030)

Table 4.5. Sectoral energy projections for 2021-2040 with existing measures

Sectoral Forecasts (Mtoe)	**Primary energy consumption**	**Total final energy consumption**	**Final energy consumption – industry**	**Final energy consumption – households**	**Final energy consumption – agriculture**	**Final energy consumption – transport**	**Final energy consumption – services**
2022	2,4	1,9	0,2	0,3	0,05	1,0	0,2
2023	2,4	1,9	0,2	0,4	0,05	1,0	0,2
2024	2,4	1,9	0,2	0,4	0,05	1,0	0,3
2025	2,3	2,0	0,2	0,4	0,05	1,0	0,3
2026	2,3	2,0	0,2	0,4	0,05	1,0	0,3
2027	2,4	2,0	0,2	0,4	0,05	1,0	0,3

78Comprehensive assessment of the applicability of high-efficiency cogeneration and efficient district heating and cooling

2028	2,4	2,0	0,2	0,4	0,05	1,0	0,3
2029	2,4	2,0	0,2	0,4	0,05	1,0	0,3
2030	2,4	2,0	0,2	0,4	0,05	1,0	0,3
2031	2,4	2,0	0,2	0,4	0,05	1,0	0,3
2032	2,4	2,0	0,3	0,4	0,05	1,0	0,3
2033	2,4	2,0	0,3	0,4	0,05	0,9	0,3
2034	2,4	1,9	0,3	0,4	0,05	0,9	0,3
2035	2,4	1,9	0,3	0,4	0,05	0,9	0,3
2036	2,3	1,9	0,3	0,4	0,05	0,8	0,3
2037	2,3	1,9	0,3	0,4	0,05	0,8	0,3
2038	2,3	1,9	0,3	0,4	0,05	0,8	0,3
2039	2,3	1,9	0,3	0,4	0,05	0,8	0,3
2040	2,3	1,9	0,3	0,4	0,05	0,8	0,3

The breakdown between road and air transport is shown in the table below.

Table 4.6. Sectoral energy projections in the transport sector for 2021-2040 with existing measures

Final energy consumption (Mtoe)	Road Transport	Air Transport
2022	0,6	0,3
2023	0,6	0,3
2024	0,6	0,3
2025	0,6	0,3
2026	0,6	0,4
2027	0,6	0,4
2028	0,6	0,4
2029	0,6	0,4
2030	0,6	0,4
2031	0,6	0,4
2032	0,6	0,4
2033	0,5	0,4
2034	0,5	0,4
2035	0,4	0,4
2036	0,4	0,4
2037	0,4	0,4
2038	0,4	0,4
2039	0,4	0,4
2040	0,4	0,3

iv. Cost-optimal levels of minimum energy performance requirements resulting from national calculations, according to Article 5 of Directive 2010/31/EU

The first minimum energy performance requirements for buildings were adopted on 21 December 2007 and have since been revised four times. From 2013 onwards, any revision of the requirements shall be based on the results of the calculation of cost-optimal levels of minimum energy performance requirements as provided for in Article 5 of Directive 2010/31/EU.

The current minimum energy performance requirements became applicable from 1July 2020 and are based on the results of the second calculation completed in 2018.

Table 4.7. Minimum energy performance requirements for new buildings

Minimum Energy Efficiency Requirements in accordance with:	RAA 568/2007	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT 432/2013	RAA 119/2016 and RAA 379/2016	REGULATORY ADMINISTRATIVE ACT 121/2020
In force since	21/12/2007	1/1/2010	11/12/2013	1/1/2017	1/7/2020
Maximum thermal transmittance of walls and load-bearing elements that are part of the building envelope	0,85 W/m² K	0,85 W/m² K	0,72 W/m² K	0,4 W/m² K Walls may be up to 0,6 W/m²K if windows are up to 2,5 W/m²K	0,457 W/m² K
Maximum U-transmittance of horizontal building elements and roofs forming part of the building envelope	0,75 W/m² K	0,75 W/m² K	0,63 W/m² K	0,4 W/m² K	0,4 W/m² K
Maximum U-transmittance for floors of enclosed non-heated space	2,0 W/m² K	2,0 W/m² K	2,0 W/m² K	— —	— —
Maximum coefficient thermopermeability frames forming part of the building envelope	3,8 W/m² K	3,8 W/m² K	3,23 W/m² K	2,9 W/m² K	2,25 W/m² K
Maximum average thermal transmittance coefficient of its shell building excluding horizontal buildings structural elements	— —	1,3 W/m² K for residential buildings 1,8 W/m² K for non-residential buildings	1,3 W/m² K for residential buildings 1,8 W/m² K for non-residential buildings	— —	— —
Maximum average shading factor on frames that are part of the building envelope	— —	— —	0,63	0,63	0,63
Maximum average installed lighting capacity for office buildings	— —	— —	— —	10 W/m²	10 W/m² May be overcovered if the building equipped with system automation and audit in the lighting
Renewable energy	— —	Installation of a solar system to meet hot water needs in residential buildings Welfare of the installation of a RES system.	Installation of a solar system to meet hot water needs in residential buildings At least 3 % of primary energy consumption must come from RES for non-residential buildings	For single-family houses at least 25 %, for residential multi-dwelling buildings at least 3 % and for non-residential buildings at least 7 % of the primary energy consumption must come from RES.	For hotels, at least 9 % and for all other types of buildings at least 25 % of primary energy consumption must come from RES
Maximum heating energy demand for dwellings	— —	— —	— —	— —	15 kWh/m² year
Maximum primary energy consumption	— —	— —	— —	— —	For buildings and building units which: • Used as dwellings 100 kWh/m² year • Not used as dwellings 125 kWh/m² year • 220 kWh/m² year used as hotels

In57 order to be able to exceed the maximum thermal transmittance factors of walls and elements of the structure, horizontal building elements and roofs and roofs, the maximum average coefficient of the total elements of the building envelope shall not be greater than 0,65 W/m² K

Table 4.8. Minimum energy performance requirements for existing buildings

Minimum Energy Efficiency Requirements in accordance with:		REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT 121/2020
In force since		21/12/2007	1/1/2010	11/12/2013	1/1/2017	1/7/2020
Major renovation	**Maximum thermal transmittance of walls and load-bearing elements that are part of the building envelope**	0,85 W/² K only in buildings over 1 000 m²	0,85 W/m² K only in buildings above 1 000 m²	0,72 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum U-transmittance of horizontal building elements and roofs forming part of the building envelope	0,75 W/m² K only in buildings above 1 000 m²	0,75 W/m² K only in buildings above 1 000 m²	0,63 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum U-transmittance for floors of enclosed non-heated space	2,0 W/m² K only in buildings above 1 000 m²	2,0 W/m² K only in buildings above 1 000 m²	2,0 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum thermal transmittance coefficient of frames forming part of the building envelope	3,8 W/m² K	3,8 W/m² K only in buildings above 1 000 m²	3,23 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum average shading factor on frames that are part of the building envelope	— —	— —	0,63 in buildings above 1 000 m² only	— —	— —
	Minimum energy class in EPC	— —	B only in buildings above 1 000 m²	B only in buildings above 1 000 m²	B All buildings	A for residential buildings B + for non-residential buildings
Building elements that are replaced or installed subsequently	**Maximum thermal transmittance of walls and load-bearing elements that are part of the building envelope**	— —	— —	0,72 W/m² K all buildings	0,4 W/m² K all buildings	0,4 W/m² K all buildings
	Maximum U-transmittance of horizontal building elements and roofs forming part of the building envelope	— —	— —	0,63 W/m² K all buildings	0,4 W/m² K all buildings	0,4 W/m² K all buildings
	Maximum U-transmittance for floors of enclosed non-heated space	— —	— —	2,0 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum thermal transmittance coefficient of frames forming part of the building envelope	— —	— —	3,23 W/m² K all buildings	2,9 W/m² K all buildings	2,25 W/m² K all buildings

Minimum Energy Efficiency Requirements in accordance with:		REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT 121/2020
In force since		21/12/2007	1/1/2010	11/12/2013	1/1/2017	1/7/2020
	Maximum average thermal transmittance coefficient of the building envelope excluding horizontal building elements	— —	— —	0,63 all buildings	— —	— —

This calculation had clearly shown that new buildings should be buildings with a relative zero energy consumption (NZEB), as they fall within the best value for money range, with the exception of hotels. For existing buildings undergoing major renovation, the results of the calculation have shown that higher energy performance should be required than category B, applicable until 2020, but lower energy performance than the NZEB level. It should be noted that the definition of NZEB is the same for new and existing buildings. Furthermore, according to the calculation, the individual measures in existing buildings that provide a high economic benefit over their life cycle are:

1) Roof insulation
2) Heat pumps for heating
3) Photovoltaic
4) High-efficiency air-conditioning units
5) Lighting with LED
6) Solar water heaters for hot water production
7) High efficiency biomass boilers

It should be noted that the above results describe the optimal economic levels from the investor's point of view and not from the macroeconomic point of view.

The tables below show the evolution of minimum energy performance requirements since their first introduction in 2007, for new and existing buildings.

The recalculation of cost-optimal levels of minimum energy performance requirements is ongoing under a contract awarded by the Energy Service and is expected to be completed in June 2023.

4.4. Dimension energy security

i. Current energy mix, domestic energy resources, import dependency, including relevant risks

The following table shows Cyprus' energy mix for 2021.

Table 4.9. Energy mix of Cyprus for 2021 by sector in ktoe

	RES ktoe	Petroleum products ktoe	Other (industrial waste) ktoe	Coal ktoe
Domestic sources	251,7	0	9,8	0
Imports	62,3	1989,8	28,6	41,2
Energy comsuption	314	1989,8	40	41,2

Almost all indigenous energy sources come from renewable energy sources and an amount of 4 % comes from industrial waste. The share of petroleum products amounts to 83 % of the country's energy mix. It is noted that due to the COVID-21 pandemic, aviation fuel consumption has decreased by 50 %. Retail petroleum products are imported from neighbouring countries, Greece and Israel. For 2021, petroleum products for electricity production originated from Member States.

The oil companies conclude and sign an annual contract with refineries for the supply of petroleum products. EAC procures heavy fuel oil and gas oil following a tender and the relevant contract includes strict conditions on delays in procurement. In the case of oil companies, the associated supply risk is considered high, as it depends on one import source, but in the case of EAC, the risk is low as the contract obliges the trader to deliver the product, irrespective of the importing country.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

For projections of the evolution of the energy mix with existing policies and measures at least until 2040, see Impact Assessment, Evolution of the supply of primary energy by 2050 (ktoe) – CoM.

4.5. Dimension internal energy market

4.5.1. Electricity interconnectivity

i. Current interconnection level and main interconnectors

No level of interconnection, no electrical interconnection.

ii. Projections of interconnector expansion requirements (including for the year 2030)

There are no provisions concerning interconnector extension requirements as there is no electricity interconnection. The electrical interconnection is expected to be operational by 2029.

4.5.2. Energy transmission infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

The main characteristics of the existing electricity transmission infrastructure include:

- Transmission substations
- Primary substations
- 220 kV transmission lines (operating at 132 kV)
- 132 kV lines and underground cables
- 66 kV lines and underground cables
- Divorce Transformers 132/66kV
- 132/11kV transformers
- Transformers 132/6.6 kV
- Transformers 132/3.3 kV
- Transformers 66/11kV
- Transformers 66/3.3 kV
- Transformers 15.75/132 kV
- Transformers 11/132kV
- Transformers 11/66kV
- Inductors 75 μVar

Currently, there is no transmission infrastructure for gas.

ii. Projections of network expansion requirements at least until 2040 (including for the year 2030)

The extension and upgrading of the existing electricity grid foreseen for the period 2023-2032 is described in the Ten-Year Transmission Network Development Plan for the period 2019-2028 (Annex 5). No forecasts from the TBU are available after 2032.

With regard to the natural gas network, as already mentioned, DEFA is in the process of planning and developing the internal gas network within a radius of five (5) kilometres from the termination point of the liquefied natural gas regasification facilities located in the Vassilikos region, to power plants wishing to obtain natural gas. At this stage, no forecasts are available to extend it.

4.5.3. Electricity and gas markets, energy prices

i. Current situation of electricity and gas markets, including energy prices

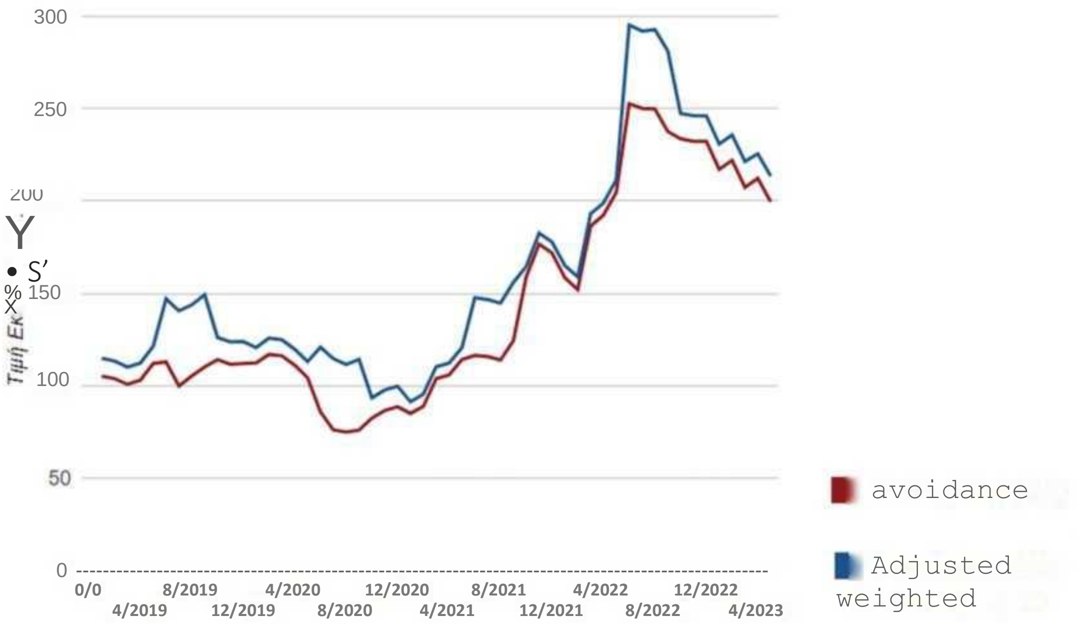


Figure 4.15. Imbalance Clearing Prices in the Transitional Electricity Market Regulation (*source* https://tsoc.org.cy/)

The table below shows the cost of avoiding thermal production of EAC.
Production following CERA's decision to impose a price cap

https://www.eac.com.cy/EL/RegulatedActivities/Supply/renewableenergy/resenergypurchase/Page S/default.aspx

Details on fuel costs for other categories of customers can be found in section 4.6 iii.

There is currently no gas market.

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

Growth projections with existing policies and measures at least until 2040, see Impact Assessment.

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)

Renewable Energy Sources

The renewable energy sector (RES) has the potential to make a significant contribution to the growth of Cyprus' economy and job creation. Cyprus has a strong natural advantage in solar energy, given its climate, sunshine days and its position as an island. However, it has one of the lowest shares of RES in gross final energy consumption, for various, mainly technical reasons. The country's R & D ecosystem will contribute to the goal of further penetration of RES, through participation in research projects to develop new or optimised RES technologies with a focus on solar energy, innovative solutions to energy saving and energy efficiency of buildings and to improve energy management systems. R &Iis largely based on advanced digital technologies such as Artificial Intelligence and the Internet of Things, with the aim of better monitoring the efficiency of energy generation from different technologies, energy consumption and the use of RES in smart grids.

<u>Focus areas for R &I:</u>

- Renewable energy technologies
- Digital management and monitoring systems for energy production and distribution – Energy efficiency in urban areas
- Green technologies

Environment

The link between environment and economic activity is direct and decisive. Investments in environmental R &Ito tackle climate change and reduce air, water and soil pollution will save costs for healthcare, cover damage to the food chain, etc. At the same time, opportunities are created in the R & D ecosystem (research organisations, centres of excellence and businesses) to develop innovative products and services for the monitoring and management of the environment and natural resources and to prevent and mitigate risks such as desertification. The accumulated research capacity of the ecosystem in blue growth, climate and atmosphere combined with the technological potential existing in Cyprus such as earth observation, big data analysis and simulations are expected to contribute significantly to environmental monitoring and decision-making. In particular, the CMMI, CARE-C and ERATOSTHENES Centres of Excellence contribute directly and indirectly to the areas of monitoring, environmental and low-carbon management technologies with a description of their activities in 4.6.2.ii

Focus areas for R &I:

- Adaptation to climate change
- Monitoring and protection of the environment from economic and human activities
- Greening industry and economic activities
- Managing natural resources and protecting biodiversity

Agri-food

The agri-food sector (Agriculture, Livestock, Aquaculture, Food, etc.) contributes to the development of the Cypriot economy and to the creation of jobs, through the development of digital and innovative solutions (e.g. smart irrigation equipment, earth observation) and products for domestic and international markets and the supply of local products to the tourism sector. Research activities aim to improve the competitiveness and resilience of the ecosystem, reduce its environmental footprint, create healthy and environmentally-friendly food systems and protect the country's natural resources. In the sectors closest to the market, such as water resource management, digitalisation of the sector and food quality, there is great interest from Cypriot companies. In contrast, in areas related to system transformation and industry interaction with the environment, there is greater interest from research organisations.

Focus areas for R &I:

- Diversifying and improving the competitiveness of the agri-food ecosystem
- Support activities that follow agroecology principles to improve the resilience and sustainability of the farming system and reduce its environmental footprint
- Mitigating the effects of climate change on the agri-food ecosystem

Shipping

Shipping**is** one of the important pillars of the Cypriot economy and contributes around 7 % to the country's GDP. The maritime ecosystem comprises more than 250 companies, employing around 9000 professionals, offering maritime services: ownership, ship management, insurance, financing, bunkering, maritime training, spatilal observation, etc. The growing demand for decarbonisation technologies, the growing need for better monitoring and optimisation of the operation of ships and proximity to the large market of the Cypriot maritime industry offer significant opportunities for Cypriot entrepreneurs to develop innovative products and services.

Focus areas for R &I:

- Digital technologies and Earth Observation for monitoring and decision-making
- Decarbonising ships
- Equipment and tools for maritime applications

ii. Current level of public and, where available, private research and innovation spending on low-carbon-technologies, current number of patents, and current number of researchers

The total budget of the RESTART 2016-2020 programmes is EUR 215.505.000.

Under the national funding programmes, in addition to the programmes dealing with relevant technologies falling under open themes (Bottom up), a further EUR 6 million has been allocated to programmes dealing with green transition themes under the "Co-Develop" programme. Programmes with open thematic areas make up the bulk of RESTART programmes.

In addition, the Deputy Ministry provides institutional funding of EUR 105 million for the creation and operation of Centres of Excellence which are either directly or indirectly active in related areas:

Centres of Excellence:

CARE-C

The CARE-C Centre of Excellence was established at the Cyprus Institute in 2019 and aims to become a world-class research centre in the fields of climate and atmosphere. The Centre is implementing a comprehensive programme to address the climate challenges faced by Cyprus and the wider Eastern Mediterranean and Middle East (amma) region, which has been recognised as a global climate change hotspot.

CARE-C activities are applicable to different sectors and provide high quality, continuous atmospheric and environmental observations, which feed into climate and atmospheric modelling to predict the impacts of climate change. These findings feed into national and regional policy making to mitigate the effects of climate change, as well as to address related challenges in areas such as public health and the economy.

CMMI – Cyprus Marine and Maritime Institute

The CMMI – Cyprus Marine and Maritime Institute, aims to become an international marine and maritime science and research centre of excellence supporting sustainable blue growth active in the traditional and emerging sectors of the blue economy and driven by the needs of industry and society. The Centre is active in the fields of maritime engineering, marine robotics, digital transformation and optimisation of ship and fleet behaviour, decarbonisation and alternative fuels, marine monitoring, marine and coastal ecosystems, with a focus on the impacts of climate change, biodiversity conservation and the creation of artificial reefs, marine cultural heritage and maritime policies, with a focus on regional cooperation.

Intelligent, Efficient and Sustainable Energy Systems

The FEATHON Centre of Excellence is expected to be operational in September 2023 and will be the upgrade of the existing Energy Sustainability Research Unit of the University of Cyprus, in the field of green and sustainable energy. The Centre's main pillars of activity are green growth, energy sustainability, storage systems, green hydrogen technologies and the promotion of smart energy systems, fully in line with the objectives of the European Green Deal for a climate-neutral Europe by 2050. Research will focus on smart, efficient and sustainable energy solutions, with a focus on developing solutions and applications to address a wide range of modern global energy challenges linking technological, socio-economic, political and environmental aspects.

Koios

The Coio Centre of Excellence focuses on leading research and innovation in the area of Information and

Communication Technology (ICT), with a focus on monitoring, management, control and security of large-scale critical infrastructures such as electricity, transport, water, telecommunications and emergency management and response systems. The ultimate goal of the Centre is to turn these systems into smarter, more efficient, greener and safer to face modern challenges.

The Centre shall use the results of its research and innovation to achieve maximum penetration of renewable energy sources, reduce fuel consumption and pollutant emissions, early detection and resolution of water problems and use smart systems for emergency response and management.

ERATOTHENIS

The ERATOTHENIS Centre of Excellence focuses on basic and applied research and innovation in remote sensing, space monitoring of the environment and geoinformatics and focuses its research activity on areas such as climate change monitoring, water resource management, disaster risk reduction, energy access and analysis of large land observation data.

The CYENS Centre of Excellence (formerly RISE), coordinated by the Municipality of Nicosia and partners at the 3 Cypriot Public Universities, Max Planck and UCL, aims to create a state-of-the-art Research and Innovation Centre, which will provide a multidisciplinary basis for the development and application of new technologies in the field of Information and Communication Technologies (ICT).

CYENS

The CYENS Centre of Excellence is active in ICT specialising in interactive media, smart systems and emerging technologies. CYENS research activities include topics such as interactive media and applications and simulators, virtual environments, 3D digital reconstructions (in various sectors e.g. health, education, tourism, construction, environment, smart cities) and smart systems.

These topics have a wide range of applications in different areas such as Digital Transformation, Sustainable Urban Planning, Agriculture, Environment and Climate Change, Transport, Energy, Cultural Heritage, Education, etc.

iii. Analysis of current price data, which are the three main components of prices (energy, grid, taxes/levies)

Taking into account the electricity prices for EAC's commercial consumers, which is the supplier with a 92.34 % share in April 2023, the following prices apply from 1 June 2022 (EAC Supply, Regulated):

1) Bi-monthly valuation of the commercial use of the Low Voltage Registration Unit (Code 10)

The charges, with a basic fuel price of EUR 300/M.T., for each two-month period are:

- Energy cost for each 10,66 cent unit provided
- Network cost for each 3,02 cent unit provided
- Cost of ancillary services for each 0,65 cent unit provided
- Measurement cost EUR 0,98
- Cost of procurement EUR 6,08

2) Bi-monthly valuation of the industrial use of the Low Voltage Registration Unit (Code 20)

The charges, with a basic fuel price of EUR 300/M.T., for each two-month period are:

- Energy cost for each 10,72 cent unit provided
- Network cost for each 3,02 cent unit provided
- Cost of ancillary services for each 0,65 cent unit provided
- Measurement cost EUR 0,98
- Cost of procurement EUR 6,08

3) Monthly valuation of commercial and industrial use of seasonal double registration of low volume (Code 30)

The charges, with a basic fuel price of EUR 300/M.T., for each month are shown in the table below (not including VAT).

Table 4.10. Charges for the monthly pricing of commercial and industrial use of seasonal double registration Low Voltage (Code 30)

Charge for each unit supplied cent/kWh						Charge per month EUR
		October – May		June – September		
Valuation charges	Periods]	Weekday	SAB/Kyriakia	Weekday	SAB/Kyriakia	
Energy costs	Peak	9,96 cent	9,57 cent	15,63 cent	9,77 cent	— —
	Except Archi	8,75 cent	8,30 cent	9,55 cent	9,34 cent	— —
Network costs	Peak	3,02 cent	3,02 cent	3,02 cent	3,02 cent	— —
	Except Archi	3,02 cent	3,02 cent	3,02 cent	3,02 cent	— —
Cost of ancillary services	Peak	0,65 cent	0,65 cent	0,65 cent	0,65 cent	— —
	Except Archi	0,65 cent	0,65 cent	0,65 cent	0,65 cent	— —
Measurement costs		— —				EUR 0,49
Cost of procurement		— —				EUR 3,04

4) Monthly valuation of commercial and industrial use of seasonal double-entry medium voltage registration (Code 40)

The charges, with a basic fuel price of EUR 300/M.T., for each month are shown in the table below (not including VAT).

Table 4.11. Charges for the monthly pricing of commercial and industrial use of seasonal double-entry medium voltage registration (Code 40)

Charge for each unit supplied cent/kWh						Charge per Month EUR
		October – May		June – September		
Valuation charges	Periods]	Weekday	SAB/Kyriakia	Weekday	SAB/Kyriakia	
Energy costs	Peak	9,76 cent	9,38 cent	15,31 cent	9,57 cent	— —
	Except Archi	8,57 cent	8,13 cent	9,36 cent	9,15 cent	— —
Network costs	Peak	1,83 cent	1,83 cent	1,83 cent	1,83 cent	— —
	Except Archi	1,83 cent	1,83 cent	1,83 cent	1,83 cent	— —
Cost of Auxiliaries Services	Peak	0,64 cent	0,64 cent	0,64 cent	0,64 cent	— —
	Except Archi	0,64 cent	0,64 cent	0,64 cent	0,64 cent	— —
Measurement costs		— —				EUR 0,49
Cost of procurement		— —				EUR 3,04

5) Monthly valuation of commercial and industrial use of seasonal Double Voltage Registration (Code 50)

The charges, with a basic fuel price of EUR 300/M.T., for each month are shown in the table below (not including VAT).

Table 4.12. Charges for the monthly pricing of commercial and industrial use of seasonal double registration High voltage (Code 50)

Charge for each unit supplied cent/kWh				Charge per month EUR
Valuation charges	Periods]	October – May	June – September	

		Weekday	SAB/Kyriakia	Weekday	SAB/Kyriakia	
Energy costs	Peak	9,56 cent	9,19 cent	15,00 cent	9,37 cent	— —
	Except Archi	8,40 cent	7,97 cent	9,17 cent	8,96 cent	— —
Network costs	Peak	0,54 cent	0,54 cent	0,54 cent	0,54 cent	— —
	Except Archi	0,54 cent	0,54 cent	0,54 cent	0,54 cent	— —
Cost of ancillary services	Peak	0,64 cent	0,64 cent	0,64 cent	0,64 cent	— —
	Except Archi	0,64 cent	0,64 cent	0,64 cent	0,64 cent	— —
Cost of procurement		— —				EUR 3,04

For all the above price quotations, EAC shall levy the following additional fees:

- Energy consumption fee: EUR 0.005/kWh. This levy is used to support the National Fund for RES and Energy Saving and is not subject to VAT;
- Public service obligations58: EUR 0,00058/kWh;
- 19 % VAT.

In addition, the charge for fuel repurposing shall be equal to the product of the electricity consumed, multiplied by the fuel repurposing.

The readjustment of fuels59 depends on (a) the average monthly weighted fuel price and (b) the fuel clause factor.

The average monthly weighted fuel price is the sum of the purchase costs of EAC fuels consumed in the previous month, the cost of purchasing greenhouse gas emission allowances and the charges of the Cyprus Petroleum Stock Management Organisation (KODAP).

The Fuel Clause Rate reflects the increase/decrease in the price of one kWh in euro when the average monthly weighted fuel price increases/decreases by one euro and is adjusted every six months.

The total adjustment cost is calculated on a monthly basis as follows:

Fuel adjustment (cents/kWh) = (Medium monthly weighted fuel price – Basic fuel price) x (Fuel clause coefficient) x 100

The fuel price adjustment calculated in the above way shall be revised if the cost of avoiding thermal production of EAC production exceeds 11 cent/kWh in the Lower Voltage, in accordance with the methodology approved by the Regulatory Authority for Energy of Cyprus in its Decision No 148/2023.

The retail price of petroleum products shall consist of the following elements:

- Cost of purchasing the product. This includes the addition of biofuel.
- Operating costs and other costs of companies and service stations.
- Profit of petroleum companies and service stations
- Excise duties and fees
- Value Added Tax (VAT)

Excise duties

The national legislation is in line with European Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity, and the excise duties imposed are not below the minimum levels laid down in that Directive. In addition, as regards the various exemptions provided for in the Excise Duty Law, they are granted on the basis of the provisions of Directive 2003/96/EC.

58 https://www.cera.org.cy/el-gr/apofasis/d5ce4070-e805-4/apofasi-150-2023
59 https://www.cera.org.cy/el-gr/apofasis/details/apofasi-148-2023

Details of the taxation of petroleum products are set out in the table below.

Table 4.13. Taxation of petroleum products

Petroleum product	Duties	Excise duties in EUR	CADAP fee in EUR	VAT
Petrol RON 95	4.7 %	0,429/Λίτρα	0,0107/Λίτρα	19 %
Petrol RON 98	4.7 %	0,429/Λίτρα	0,0107/Λίτρα	19 %
Diesel 10 ppm Gas oil used as motor fuel	0 %	0,400/Λίτρα	0,0107/Λίτρα	19 %
Gas oil used for heating purposes	0 %	0,07473/Λίτρα	0,0107/Λίτρα	19 %
Kerosene used for heating purposes	4.7 %	0,07473/Λίτρα	0,0107/Λίτρα	19 %
Kerosene jet fuel Passenger Private	4.7 % 4.7 %	0,40/Λίτρα	0.0107/Λίτρα 0,0107/Λίτρα	19 % 19 %
Propane butane LPG	8 % 0 %	0 0	0 0	5 % 5 % (only LPG in cylinders is subject to the reduced rate of 5 %)
LPG for cars	8 %	0,125/κιλό	0	19 %

Petroleum product	Duties	Excise duties in EUR	CADAP fee in EUR	VAT
Gas oil for agriculture	0 %	0,021/Λίτρα	0,0107/Λίτρα	19 %
Heavy oil used as heating fuel	3.5 %	0,015/κιλό	0,0027/κιλό	19 %
Electrical energy	N/A	EUR 0/MWh (Instead of the minimum rate of excise duty for electricity set out in Table C of Directive 2003/96/EC, which is EUR 0,5 per MWh for business use and EUR 1,0 per MWh for non-business use, Cyprus is currently subject to excise duty for the purposes of the RES and E Fund)	D.E.	19 %

IV. Description of energy subsidies, including for fossil fuels

Energy subsidies in Cyprus are divided into two main categories: Subsidies to support renewable energy technologies and oil price subsidies.

Long-term subsidies to RES technologies arise for the various feed-in-tariffs agreements signed by the RES and Energy Saving Fund in the period 2004-2015 under old support schemes.

Table 4.14 shows the distributed costs, per technology and the actual subsidy paid to renewable energy producers under a grant agreement (FiT) and a tender procedure, in the period 2008-2022.

Table 4.14. Subsidy to RES producers in EUR million per year

	Photovoltaic Systems	Wind Parks	Biomass plants/Biogas[60 61 62]
2008	0,03	0	
2009	0,135	0	
2010	0,055	0	0,122
2011	1,365	3,607	0,696
2012	2,369	2,223	0
2013	4,402	5,725	0
2014	9,624	10,433	0,266

60* In 2013-2014 the cost of avoiding electricity, the so-called market price for electricity energy from RES was higher than the FiT value for biomass projects. Excess amount reimbursed the RES and Energy Saving Fund.

2015	11,349	19,637	1,565
2016	14,005	24,815	1,783
2017	11,957	18,299	1,222
2018	9,887	14,722	0,718
2019	8,582	14,142	0,461
2020	9,832	16,351	0,903
2021	8,621	11,324	0,409
2022	3,022	0,432	0

For wind farms, there is provision for compensation with a lower subsidy if the projects exceed a certain production threshold (i.e. 2 wind farms will not receive a subsidy after the first 7000 hours of their operation, for all production exceeding this threshold). In this respect, it is expected that the average subsidy will be reduced by 20 % for all energy produced by wind farms.

According to the support plans in force from 2016 onwards, the new commercial RES electricity projects (to be contracted with ADEC-Supply) receive the purchase price of electricity from RES (avoidance costs) to the operation of the competitive electricity market, in which case these projects will be integrated into the competitive market. The purchase price of RES electricity (avoidance costs) is calculated in accordance with a methodology established by CERA. The current and historical sale price of electricity produced from renewable sources (avoidance costs) is available on the EAC website63.

With a view to ensuring that the purchase price of electricity from RES is not affected by the increased prices of conventional fuels for the purchase of greenhouse gas allowances, which do not affect the cost of producing electricity from RES, and so that consumers who have a contract with RES are protected from disproportionate charges, Decision Ap.112/2023 of 11/04/2023 set a maximum of EUR 11/kWh (at low voltage) at the RES purchase price by the EAC Supply for projects included in subsidy plans and support schemes.

Taking into account the evolution and cost of technologies, it is estimated that electricity prices will decrease when natural gas is available in 2024 in the range of EUR 135/MWh and gradually decrease to EUR 93/MWh in 2030 (Figure 4.16). A corresponding trajectory is expected to follow the price of avoidance costs.

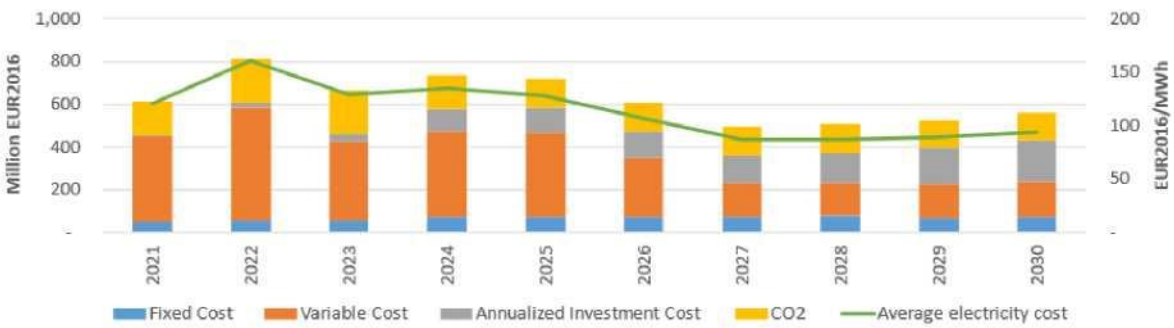


Figure 4.16. Electricity prices in the AFM, assuming ideal market conditions

As there are currently no real competitive electricity market conditions in Cyprus, it is difficult to estimate the actual price of the subsidy as, under real market conditions, it is expected that RES technologies will compete with each other (i.e. solar, wind and biomass plants). The energy model used was not able to provide detailed billing every half an hour throughout the 2030 horizon. As the competitive market is expected to function in 2024, future subsidy prices will be reassessed in the preparation of the Final NECP.

As mentioned in point 3.1.3. iv above, Cyprus does not provide subsidies to fossil fuels. More specifically, energy products and electricity are subject to excise duty in accordance with the Excise Duty Act No 91 (I)

63https://www.eac.com.cy/EL/EAC/RenewableEnergySources/Pages/resenergypurcheac.aspx.

of 2004. The national legislation is in line with European Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity, and the excise duties imposed are not below the minimum levels laid down in that Directive. In addition, as regards the various exemptions provided for in the Excise Duty Law, they are granted on the basis of the provisions of Directive 2003/96/EC.

As regards energy products used by the Electricity Authority of Cyprus (EAC) to produce electricity, they are exempt from excise duty pursuant to Article 44 (1) (c) of the Excise Duty Law, which transposes Article 14 (1) (a) of Directive 2003/96/EC, which exempts from excise duty energy products and electricity used to produce electricity and electricity used to maintain electricity generation capacity. Please note that, according to Annex I to the Excise Duty Law, the standard rate of excise duty on gas oil used as motor fuel is EUR 400,00 per 1.000 litres.

Furthermore, Article 4 (2) of Directive 2003/96/EC states that “... the level of taxation means all charges levied in respect of all indirect taxes (excluding VAT) calculated directly or indirectly on the quantity of energy products and electricity at the time of release for consumption.” Consequently, the minimum rate of excise duty for electricity set out in Table C of Directive 2003/96/EC, which is EUR 0,5 per MWh for business use and EUR 1,0 per MWh for non-business use, is currently subject to a consumption charge in Cyprus for the purposes of the RES and EXES Fund, Table 4.12 presents an estimate of the amount of subsidy from the RES and E & E Fund for existing RES projects (with FiT subsidy agreement) for the period 2023-2025.

Table 4.15. Estimated subsidy to RES producers in EUR million per year 2023-2025

	Photovoltaic Systems	**Wind Parks**	**Biomass/Biogas Units**
2023	6,0	8,9	0,3
2024	8,2	13,0	0,26
2025	8,0	13,0	0,26

The table below presents overall financial data for the various subsidy measures from 2015 with estimates up to and including 2025.

Table 4.16. **Grant per policy measure in EUR million for the period 2015 – 2025**

A/A	Policy title	Description	Economic Sector	Purpose	Article Grant	Start	Expired	Total actual grant in EUR	Total estimated grant in EUR
1	Feed in Tariff – Photovoltaic	Total subsidy amounts received by RES producers. Long-term subsidies to RES technologies arise for the various RES Power Purchase Agreements signed by the RES and Energy Saving Fund in the period 2004-2015 due to old support schemes.	Electricity production	Production support	Feedin tariffs-based system	2004	2035	77.255.709 (2015 – 2022)	22.260.000 (2023-2025)
2	Feed in Tariff – Wind		Electricity production	Production support	Feedin tariffs-based system	2004	2032	119.722.933 (2015 – 2022)	34.885.327 (2023-2025)
3	RES Production Subsidy (Feed in Tariff) — Biomass		Electricity production	Production support	Feedin tariffs-based system	2004	2032	7.061.044 (2015 – 2022)	815.349 (2023-2025)
4	Aid scheme for solar systems for the production of hot water in dwellings	Installation or replacement of solar hot water systems.	Households	Support for RES and energy Efficiency	Donations	2004	On-going	3.678.775 (2015 – 2023)	(2024-2025) no data available
5	Construction of LNG Terrestrial Terminal	The Cypriot Government provides State guaranteed loans for the construction of a LNG terminal for energy security purposes.	LNG	Infrastructure support	Concessional loans	2019	2023	— —	230.000.000 (2019 – 2023)
6	Grant scheme to encourage the use of renewable energy sources and energy savings in dwellings	Grant for installation of PV and/or heat-insulation of trout in dwellings.	Households	Supporting RES and Energy Efficiency	Donations	2019	On-going	— —	84.810.000 (2020 – 2023)

A/A	Policy title	Description	Economic Sector	Purpose	Article Grant	Start	Expired	Total actual grant in EUR	Total estimated grant in EUR
7	Individual energy efficiency and energy efficiency interventions in selected government and municipal buildings	Individual energy efficiency interventions and energy efficiency renovations in selected government buildings. In addition, implementation of the “STRATENERGY” project[64].	Public	Supporting RES and Energy Efficiency	Other type of subsidy	2019	2025	152.967 (2019-2022)	20.714.286 (2021 – 2025)
8	Save – I step up businesses and other bodies	A grant scheme to promote energy saving investments in buildings and facilities, owned and/or used by undertakings and non-profit organisations.	Enterprises and non-profit organisations	Supporting Energy Efficiency	Donations	2016	On-going	7.351.000 (2016 2022)	40.000.000 (2023-2025)[65]
9	Save – I step up the dwellings	The project aims to support the implementation of energy efficiency measures in homes of natural persons with increased sponsorship for housing of social vulnerable groups.	Households	Supporting Energy Efficiency	Donations	2016	On-going	22.653.861 (2016-2022)	60.000.000 (2023-2025)[66]
10	Aid scheme for the replacement of electrical appliances in homes of vulnerable consumers	Supporting socially vulnerable groups by increasing energy efficiency.	Households	Supporting Energy Efficiency	Donations	2021	On-going	1.381.699 (2022)	3.618.301 (2023)

The64 project is implemented under the European Regional Cooperation Programme “GREECE CYPRUS” and concerns the renovation of buildings in the wider public sector.
Payments65 will also be made after 2025.
Payments66 will also be made after 2025.

A/A	Policy title	Description	Economic Sector	Purpose	Article Grant	Start	Expired	Total actual grant in EUR	Total estimated grant in EUR
	electricity								
11	Energy efficient road lighting	The municipalities of: The measure concerns the gradual replacement of street lighting lamps in all the Communities of Cyprus. The replacement was completed in 2022. Municipalities of: A financial instrument for municipalities was introduced in 2018 through which they can apply for a loan to the Ministry of Interior for the replacement of street lighting lamps.[67]	Public	Supporting Energy Efficiency	Favourable loans and other subsidies	2019	2023	20.844.000 (2019 – 2022)[68]	17.198.406 (2019 – 2022)[69]
12	Grant scheme to encourage energy upgrading by local authorities and bodies in the wider public sector	The project provides sponsorship to encourage the implementation of energy upgrading investments by local authorities and semi-public organisations.	Public	Support for RES and energy Efficiency	Donations	2022	On-going	— —	9.000.000 (2023 – 2025)

By67 the end of 2022 loans have been approved for fourteen municipalities. The financial tool remains open for use by municipalities.
The68 amount relates only to the Communities and the replacement has been completed.
The69 amount concerns only the municipalities and the replacement is ongoing.

5. IMPACT ASSESSMENT OF PLANNED POLICIES AND MEASURES

In accordance with Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, the impact analysis presented in this chapter assesses the impact of the measures provided for in the Scenario with Additional Measures (AFM) of the draft revised NECP compared to the Scenario with Existing Measures (Scenario). The two scenarios were described in detail in the previous chapters of the NECP.

5.1. Impact of planned policies and measures on the energy system and GHG emissions and removals

described in section 3 on the energy system and GHG emissions and removals, including a comparison of projections against existing policies and measures (as described in section 4).

The estimated impact of the BM and AFM scenarios on the energy mix and emissions of greenhouse gases and air pollutants by 2030 are presented in the following sub-chapters. The results of the OSeMOSYS cost optimisation energy model used in this analysis are directly linked to the technical and economic assumptions, development plans and policy and measures choices agreed by the competent national bodies and described in the previous chapters of this Plan.

5.1.1 . Scenario with Existing Measures (WEM) – With Existing Measures (WEM)

The results of this section have been broken down by sector (electricity, transport, heating and cooling). In addition, it presents results on primary and final energy consumption, as well as projections of greenhouse gas emissions in the sectors inside and outside the Emissions Trading System (ETS).

5.1.1.1. Electricity Supply Sector

Installed Capacity

The projections provided by the model for the electricity sector are quite interesting and can be described as conservative. Due to the adoption of low gas and oil price assumptions, as well as higher cost assumptions for renewable energy technologies compared to the European Commission's suggestions, the installation of new photovoltaic systems by 2025-2026 is limited to planned investments (Table 5.1). At the same time, new thermal power plants in the Vasiliko region will be available in the middle of the decade (317 MW combined cycle and 17 MW MEK in 2025), while in 2029-2030 combined cycle units are increasing by 129 MW. By 2030, photovoltaic capacity has risen to 812 MW, driven by increasing electricity demand. This development has been supported by the development of batteries since 2026, reaching 25 MW (100 MWh) in 2030, while two pumped storage projects of 80 MW (640 MWh) are being developed in 2028 and 2029. Part of the investments in storage technologies (65 out of 105 MW) are considered to be financially supported by a relevant support scheme financed by the Just Transition Fund, with a total budget of EUR 40 million.

Table 5.1. Capacity forecasts in the electricity sector (MW) – STBs.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Basil	836	836	836	836	836	836	836	836	836	836
Dhekelia	450	450	450	450	450	450	450	450	102	102
Single	128	128	128	128	128	128	128	128	128	128

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
New CCGT	0	0	0	260	317	317	317	317	345	446
New ICE	0	0	0	17	17	17	17	17	17	17
Solar photovoltaics (PV)	290	376	516	600	700	732	752	772	792	812
Wind	158	158	158	170	170	170	170	170	170	170
Biomass	12	12	12	12	12	12	12	12	17	22
Pumped storage	0	0	0	0	0	0	0	40	80	80
Lithium-ion batteries	0	0	0	0	0	10	20	25	25	25

Electricity generation

The projected installed capacity leads to a corresponding electricity mix (Figure 5.1). The import of natural gas in the second half of 2024 leads to a transitional period as shown below. Since 2025, electricity generation is mainly based on plants using natural gas as a fuel. The RES share in electricity generation (RES – H) reached 28 % in 2030, as the contribution from photovoltaic systems increases. It should be noted that electricity generation from thermal plants remains relatively stable until 2030, while the increase in electricity demand is mainly met by increased RES penetration. The partial electrification of transport also leads to an increase in final electricity demand. In 2030, electricity consumption in transport reached 270 GWh.

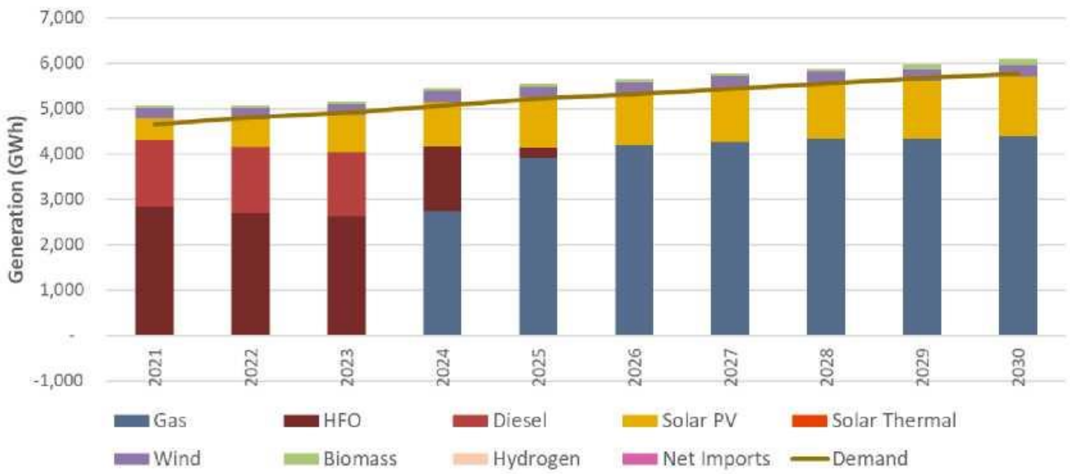


Figure 5.1. Planned generation composition until 2030 – STM

5.1.1.2. Transport sector

The forecast in the transport sector shows a gradual uptake of alternative fuels and technologies (Table 5.3). In the passenger car fleet, the number of diesel-fuelled vehicles is decreasing, while these are replaced by petrol, hybrid and electric vehicles. It is important to note that some electrification of the vehicle fleet is expected at the end of the decade. Investments made in the period 2028-2030 increase the electric vehicle fleet to 42,550 by 2030. The number of hybrid vehicles is also increasing significantly, reaching 170,000 in 2030. The technology cost assumptions are in line with those made by the European Commission and adopted in this analysis, but it was considered to be a more conservative degree of adoption of the technologies than the forecasts of the Commission itself70 and the International Energy Agency71, which predict that more than 50 % of sales of passenger cars and light trucks in Europe at the end of the decade will be electric.

Changes in the vehicle fleet lead to corresponding changes in transport fuel consumption (Table 5.4). Petrol remains the main motor fuel until 2030, with a slight increase in demand for part of the horizon. However, demand for diesel fuel falls from 13.1 PJ (363 million litres) in 2021 to 9.5 PJ (265 million litres)

70 European Commission (2021), EU Reference Scenario 2020 – Energy, transport and GHG emissions – Trends to 2050. doi: 10.2833/35750
71 International Energy Agency (2023), Global Electric Vehicles Outlook 2023. Paris, France. https://www.iea.org/reports/global-ev-outlook-2023

in 2030. Similarly, biofuel consumption is on a downward trend due to the assumption of stable blending exclusively with diesel fuel.

Electrification of transport is seen as key to decarbonising this sector. This is achieved to a certain extent in the present scenario with the penetration of pure electric vehicles, which leads to an increase in electricity consumption in the sector to 270 GWh in 2030. This consumption accounts for 4.7 % of total final electricity demand.

Further growth in electricity demand in transport can lead to challenges for the grid, but can also provide opportunities. The increase in electricity is not expected to follow a uniform profile, as charging of electric vehicles will mainly take place at specific times of the day. This will lead to variations in the overall electricity demand profile. However, smart vehicle charging and the possible use of vehicle-to-grid systems, which would allow electric vehicles to be used as additional electricity storage units, can provide support to the grid.

5.1.1.3. Heating and cooling sector

Continued investments in renewable energy technologies in buildings as well as investments in heat pumps lead to an increase in the share of renewable energy in the heating and cooling sector. The significant increase in RES rates projected until 2030 is mainly due to solar thermal technologies and heat pumps in buildings. The projected final energy demand of the heating and cooling sector per fuel is shown in Table 5.2. The RES share projected in the heating and cooling sector increases to 45 % in 2030.

Table 5.2. Final energy demand in the heating and cooling sector (PJ) – MB.

PJ	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Other petroleum products	6,88	7,01	7,15	7,46	7,72	7,79	7,83	7,83	7,77	7,67
PET Coke	2,09	2,12	2,17	2,33	2,46	2,55	2,72	2,85	2,98	3,08
LPG	2,56	2,64	2,76	2,95	3,14	3,21	3,26	3,30	3,33	3,33
Biomass	3,24	3,22	3,18	3,20	3,21	3,19	3,21	3,23	3,26	3,27
Of which	0,00	0,00	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,03
Solar thermal	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,26	0,26
Other petroleum products	3,17	3,34	3,60	3,89	4,18	4,31	4,41	4,55	4,69	4,79
Ambient energy	2,87	2,93	2,99	3,05	3,11	3,17	3,23	3,29	3,35	3,41
Non-renewable waste	1,69	1,57	1,40	1,15	0,89	0,67	0,49	0,35	0,26	0,20
RES – CHP share	**41.3 %**	**41.6 %**	**42.0 %**	**42.2 %**	**42.5 %**	**42.9 %**	**43.2 %**	**43.6 %**	**44.7 %**	**45.2 %**

Table 5.3. Intended vehicle fleet (total number of vehicles) – STM.

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Passenger cars	Diesel	127.894	123.490	118.285	112.439	106.193	99.466	92.580	85.373	78.006	70.558
	Hybrid diesel	—	—	—	—	—	—	—	—	—	—
	PHEV diesel	4	10	15	21	26	32	38	43	49	54
	Petrol	459.853	468.822	463.902	459.612	456.388	453.526	429.311	403.807	377.663	350.798
	Hybrid petrol	13.533	17.601	36.889	56.234	74.941	93.768	112.626	131.675	150.763	169.963
	PHEV petrol	64	280	496	713	929	1.145	22.806	45.799	69.427	78.055
	Electrically	364	866	1.477	2.204	3.085	4.135	5.404	6.920	8.747	26.462
	LPG	115	225	336	447	558	668	779	898	1.017	1.137
	Natural gas;	—	—	—	—	—	—	—	—	—	—
	Hydrogen	—	—	—	—	—	—	—	—	—	—
Buses	Diesel	3.486	3.057	2.800	3.084	3.134	2.877	2.677	2.448	2.191	1.962
	Hydrogen	—	—	—	—	—	—	—	—	—	—
	Electrically	1	1	1	2	3	5	6	7	222	505
	Natural gas;	—	—	—	—	—	310	561	842	942	942
Motorcycles	Petrol	42.413	42.298	42.863	43.368	44.582	45.429	46.068	47.350	48.158	48.809
	Electrical	733	851	1.008	1.164	1.320	1.476	1.631	1.787	1.943	2.478
Lorries	Diesel	17.128	16.715	16.999	17.285	17.571	17.860	18.158	18.470	18.767	19.083
	Electrically	—	—	—	—	—	—	—	—	—	—
	Hydrogen	—	—	—	—	—	—	—	—	—	—
	Natural gas;	—	—	—	—	—	—	—	—	—	—
Lightweight carriers	Diesel	102.495	95.106	95.301	88.688	82.075	75.525	68.850	62.238	60.303	53.753
	Electrically	12	47	82	117	152	187	221	256	4.420	13.105
	Hybrid diesel	46	113	2.005	10.604	19.296	27.957	36.768	45.486	45.553	45.619
	Petrol	5.802	5.552	5.115	4.803	4.429	4.055	3.681	3.369	2.932	2.620
	Grand total	**773.943**	**775.035**	**787.574**	**800.784**	**814.682**	**828.421**	**842.165**	**856.768**	**871.102**	**885.904**

Table 5.4. Projected evolution of fuel consumption (PJ) in the transport sector until 2030 – MB.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Biofuels	1,02	0,98	0,93	0,91	0,89	0,85	0,83	0,80	0,76	0,72
Diesel	13,06	12,54	12,36	12,06	11,76	11,36	10,98	10,61	10,14	9,54
Petrol	13,53	13,73	13,85	13,98	14,12	14,26	14,00	13,73	13,44	13,03
LPG	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,03	0,03
Natural gas;	—	—	—	— —	— —	0,17	0,31	0,46	0,51	0,51
Hydrogen	—	—	—	—	— —	— —	— —	— —	— —	— —
Electrical energy	0,004	0,009	0,016	0,023	0,031	0,040	0,216	0,403	0,666	0,973

5.1.1.4. Primary energy supply and final energy demand

Primary energy supply slightly decreases between 2023-2025 and then increases until 2030 (Table 5.5). The main driver is the integration of larger shares of renewable energy, which meets the growing demand for electricity. Moreover, compared to 2023 where fuel oil is still used to a significant extent, the import of natural gas in electricity production in the second half of 2024 reduces primary energy needs due to higher efficiency than fuel oil and oil.

Table 5.2. Evolution of supply of primary energy up to 2030 (ktoe) – STM.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Diesel	607	577	561	288	281	271	262	253	242	228
Petrol	323	328	331	334	337	341	334	328	321	311
Heavy fuel oils	597	567	559	323	— —	— —	— —	— —	— —	— —
Heavy fuel oil (Low-S)	65	58	51	—	49	1	— —	— —	— —	— —
LPG	61	63	66	71	75	77	78	79	80	80
Other petroleum products in buildings	164	167	171	178	184	186	187	187	186	183
PET coke	50	51	52	56	59	61	65	68	71	73
Natural gas;	—	—	—	460	655	720	740	751	747	760
Hydrogen	—	—	—	—	— —	— —	— —	— —	— —	— —
Electricity	—	—	—	—	— —	— —	— —	— —	— —	— 2
Biomass/biofuels	118	116	114	114	114	115	117	119	139	147
Of which geothermal	2	—	—	—	0	0	0	0	0	0
Solar thermal	76	80	86	93	100	103	105	109	112	114
Solar photovoltaics (PV)	40	52	71	83	95	100	103	106	109	113
Wind	20	21	21	21	21	21	21	22	22	23
Non-renewable waste	40	37	33	27	21	16	12	8	6	5
Aviation Spirit	159	319	326	338	351	360	367	371	373	374
Total	**2321**	**2438**	**2443**	**2385**	**2343**	**2371**	**2392**	**2402**	**2409**	**2411**

Despite some stabilisation in primary energy supply, final energy demand is projected to increase somewhat until the last years of the decade (Table 5.6). The main factor in this case is the increased final demand for electricity, due to the widespread trend towards electrification in the economy, but which will be produced by more efficient gas plants and renewable energy technologies and thus reduces primary energy needs. The continued electrification of the heating and cooling sector as well as the increasing amount of electricity consumed in the transport sector play an important role in increasing electricity demand. The contribution of fossil fuels is decreasing over time. In addition, the overall contribution of solar thermal energy to the heating and cooling sector is expected to increase by 50 % from 2021 to 2030.

Useful information can be extracted by comparing final energy demand with primary energy supply. As mentioned above, although final energy demand is moderately increasing between 2021 and 2030, primary energy supply remains stable. This is a sign of improved energy efficiency. In particular, as a share of primary energy, final energy demand stands at 73 % in 2021 and increases to 83 % in 2030.

Table 5.3. Final evolution of energy demand up to 2030 (ktoe) – STB.

ktoe	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Diesel	312	300	295	288	281	271	262	253	242	228
Petrol	323	328	331	334	337	341	335	328	321	311
LPG	61	63	66	71	75	77	78	79	80	80
Other petroleum products in buildings	164	167	171	178	184	186	187	187	186	183
Natural gas;	—	—	—	—	— —	4	7	11	12	12
PET Coke	50	51	52	56	59	61	65	68	71	73
Hydrogen	—	—	—	—	— —	— —	— —	— —	— —	— —
Electricity	400	414	422	435	449	457	468	478	487	497
Biomass/biofuels	102	100	98	98	98	99	101	103	106	107
Of which geothermal	—	0	0	0	0	0	0	0	1	1
District heating and cooling	— —	— —	— —	— —	— —	— —	— —	— —	6	6
Solar thermal	76	80	86	93	100	103	105	109	112	114
Non-renewable waste	40	37	33	27	21	16	12	8	6	5
Air transport	159	319	326	338	351	363	371	378	382	386
Total	**1688**	**1860**	**1880**	**1918**	**1956**	**1976**	**1988**	**1996**	**2002**	**1992**

As shown in Table 5.7, the share of RES in final energy demand is projected to increase gradually. The main sector leading this transition is the electricity supply sector. The RES share is expected to increase to 24.3 % by 2030. It should be noted that the above takes into account the fuel consumption in aviation and the specific treatment of this sector in the case of Cyprus, in accordance with Directive (EU) 2018/2001.

Table 5.4. Share of RES in final energy demand across the energy system – STM

	All sectors	Electricity	Heating and cooling	Transfers (based on the current RED calculation methodology)
2021	18.4 %	14.8 %	41.3 %	7.3 %
2022	18.5 %	18.0 %	41.6 %	7.3 %
2023	19.7 %	21.9 %	42.0 %	6.9 %
2024	20.5 %	23.3 %	42.2 %	6.8 %
2025	21.3 %	25.4 %	42.5 %	6.7 %
2026	21.6 %	25.8 %	42.9 %	7.0 %
2027	22.0 %	25.9 %	43.2 %	7.9 %
2028	22.6 %	26.3 %	43.6 %	8.9 %
2029	23.5 %	27.4 %	44.7 %	10.2 %
2030	24.3 %	28.2 %	45.2 %	11.9 %

5.1.1.5. Greenhouse gas emissions from the energy system

Drawing directly from the results of the model, the trajectory for greenhouse gas emissions from the energy system is derived (Figure 5.2 and Table 5.8). Carbon emissions are being reduced to some extent, first by introducing natural gas into electricity production and later by producing electricity from solar photovoltaics in the ETS sectors. In this scenario, CO_2 emissions in the ETS sectors decrease from 3.271 kt in 2021 to 1.773 kt in 2030. The reduction in CO_2 emissions in the non-ETS sectors is relatively modest. Emissions in the non-ETS energy sector decrease from 2.642 kt in 2021 to 2.533 kt in 2030. The main factor behind this very small decrease is the continued dependence of the transport sector on petroleum products.

Table 5.5. Greenhouse gas emissions trajectory in the ETS and non-ETS sectors from the energy system

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ETS CO_2	**MT**	3,26	3,09	3,02	2,35	1,94	1,93	1,99	2,02	2,02	1,77
Non-ETS CO_2	**MT**	2,58	2,57	2,58	2,60	2,62	2,62	2,59	2,55	2,50	2,41
ETS CH_4	**kt**	0,13	0,12	0,12	0,07	0,04	0,04	0,04	0,04	0,04	0,04
Non-ETS CH_4	**kt**	1,99	2,01	2,24	2,46	2,68	2,88	3,28	3,68	4,04	4,19
ETS N_2O	**kt**	0,03	0,02	0,02	0,01	0,01	0,00	0,00	0,00	0,00	0,00
Non-ETS N_2O	**kt**	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05

Figure 5.2. Trajectory for the evolution of greenhouse gas emissions in the ETS sectors and outside the energy system – BEM

5.1.1.6. Emissions of air pollutants

The above mentioned options in energy technologies and fuel mix result in the air pollutant emission projections presented in Table 5.9. Although the increase in the share of renewable energy across the economy leads to a reduction in NO_x and SO_2emissions, $PM_{2.5}$ and PM_{10} emissions are initially decreasing until 2025, as a result of stricter regulations in road transport and a relative decrease in the rate of growth of passenger cars, while emissions remain relatively stable during 2025-2030. This is due to the increased use of biomass in the heating and cooling sector. It should be mentioned that the national emission ceiling set for SO_2 limits the use of high sulphur fuel oil from 2020 onwards.

Table 5.6. Projections of air pollutant emissions by 2030 – STM.

Pollutant	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
No_x	**kt**	7,52	6,88	6,48	6,38	5,57	5,04	4,67	4,33	4,10	3,65
PM_{10}	**kt**	3,31	3,23	3,17	3,09	2,99	2,95	2,96	2,96	2,96	2,94
$PM_{2,5}$	**kt**	3,07	2,99	2,93	2,85	2,77	2,73	2,74	2,73	2,74	2,72
SO_2	**kt**	3,52	3,52	3,52	3,52	0,78	0,61	0,61	0,61	0,60	0,59

The following forecasts from the Department of Labour Inspection for all sectors of the economy provide a more comprehensive picture of the expected evolution of pollutant emissions (Table 5.10).

Table 5.7. Total economy-wide projections of air pollutant emissions by 2030 – MB.

Pollutant	Unit	2021	2025	2030
No_x	kt	11,88	9,80	7,88
$PM_{2,5}$	kt	3,35	3,05	2,97
SO_2	kt	3,76	0,90	0,70

5.1.2 Scenario with Additional Measures (WAM) Scenario

5.1.2.1. Electricity Supply Sector

Installed Capacity

Due to the decrease in electricity demand, the AFM leads to changes in the investment prospects of the power generation sector (Table 5.11). New investments in conventional thermal plants are 45 MW lower, while photovoltaic capacity is increased by 75 MW in 2030 compared to the CoM. In addition, investment in storage technologies is increased. In particular, the storage capacity of batteries is doubled compared to the BMB in 2030. This increase is related to the implementation of a second phase of the State Support Plan for the promotion of storage technologies, which is estimated to have an additional budget of EUR 40 million in addition to the one included in the MIB.

Table 5.8. Capacity forecasts in the electricity sector (MW) – AFM.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Basil	836	836	836	836	836	836	836	836	836	836
Dhekelia	450	450	450	450	450	450	450	450	102	102
Single	128	128	128	128	128	128	128	128	128	128
New CCGT	0	0	0	260	260	260	260	260	260	399
New ICE	0	0	0	20	20	20	20	20	20	20
Solar photovoltaics (PV)	290	376	516	600	700	732	752	772	869	889
Wind	158	158	158	170	170	170	170	170	170	170
Biomass	12	12	12	12	12	12	12	17	22	27
Pumped storage	0	0	0	0	0	0	0	40	80	80
Lithium-ion batteries	0	0	0	0	0	20	40	50	50	50

Electricity generation

The above technological development provides the electricity generation mix shown in Figure 5.3. Although the electricity interconnection is assumed to be fully operational by the end of 2029 in both scenarios, electricity trade is limited by the end of the decade. In particular, net exports of electricity amount to 20 GWh in the CPM and 71 GWh in the AFM – these are projected to increase gradually after 2030.

Taking into account the lower electricity demand, the RES-E share in the SPP rose to 31.5 % in 2030, as opposed to 28 % in the CPM. It is also interesting to mention that the demand for electricity in transport is rising to 290 GWh, corresponding to 5 % of total electricity demand in 2030.

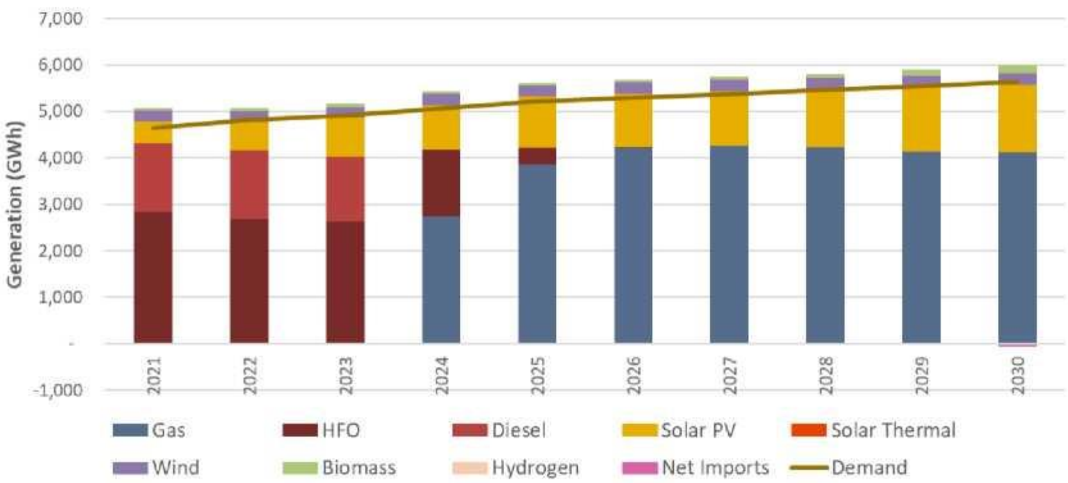


Figure 5.3. Projected generation composition by 2030 – AFM.

5.1.2.2. Transport sector

Due to the perceived significant shift of passenger traffic from passenger cars to sustainable modes of transport and the introduction of the new ETS from 2027, according to the assumptions of this scenario, there are significant changes in the vehicle fleet of the VMS scenario (Table 5.13). The most notable change is the lower forecast for the passenger car population compared to the CoM. In particular, the passenger car fleet is projected to grow at a lower pace in this scenario and is almost 60 thousand lower in 2030 than in the MIM. Much of this decrease can be seen in petrol cars – these are about 25 thousand fewer in 2030. The circulation of hybrid petrol cars is comparable to the MB, although it is reduced by 15 thousand while electric power increases by 25 thousand vehicles in 2030. There is also a decrease in the number of hybrid vehicles (PHEV) of petrol by 40 thousand. On the contrary, the shift to public transport creates the need for additional buses, which are 600 points higher in 2030. As a result of the wider electrification and the evolution of the cost of electric buses considered to be in line with the European Commission's assumptions, a large number of these additional buses are powered by electricity, reaching 22 % of the fleet by 2030.

The prospects for fuel consumption in the transport sector change as a result of the vehicle fleet projections mentioned above (Table 5.14). The largest variation can be observed in petrol consumption. This decreases by 13 % in 2030 compared to the CoM. This is due to the reduced use of passenger cars and the higher use of sustainable means of transport, as well as the increased uptake of electric vehicles, as the new ETS incurs the cost of using vehicles based purely on petroleum products. A slight decrease of 3 % is also observed in diesel fuel sales.

For biofuels, it is assumed that blending with petrol starts in 2026, which increases biofuel consumption by 51 % in the VMS in 2030. Despite the penetration of natural gas in electricity production and the assumptions that at least one CNG refuelling station will be built in each region of Cyprus, the use of natural gas in motor vehicles is considered to be cost-effective only for the bus fleet – the SYM estimates 942 CNG buses while the SPM raises the figure to 1013 buses. For the consumption of electricity in the transport sector, total consumption increases by 20 GWh in 2030 compared to the CoM.

It is important to highlight the 6 % decrease in the overall energy demand of the transport sector due to the promotion of sustainable modes of transport. This is due to the additional public investment in sustainable transport foreseen in the AFM, as will be described in section 5.4. It should be noted that the implementation of these projections will require both investment in infrastructure and public acceptance and uptake of these means of transport for the success of these investments. According to the SHARES methodology, the RES-M share in this case is estimated at 14.6 % in 2030. In the case of the BMP scenario, the corresponding value was 12.1 % in 2030.

5.1.2.3. Heating and cooling sector

The additional energy efficiency measures adopted in the AFM lead to a reduction in the overall final energy demand of the heating and cooling sector. Specifically, a 8 % reduction in energy consumption (excluding electricity) is estimated by 2030 compared to the CoM. As shown in Table 5.12, the consumption of all fuels is reduced in relation to the CoM, while the share of RES in the heating and cooling sector rises to 48 % compared to 45 % in the CoM scenario.

Table 5.9. Final energy demand in the heating and cooling (PJ) sector – CHP.

PJ	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Other petroleum products	6,88	7,00	7,12	7,39	7,61	7,65	7,61	7,48	7,30	7,10
PET Coke	2,09	2,12	2,17	2,33	2,46	2,55	2,45	2,22	2,06	1,90
LPG	2,56	2,65	2,78	2,99	3,18	3,25	3,26	3,26	3,24	3,21
Biomass	3,24	3,22	3,18	3,20	3,21	3,18	3,26	3,30	3,33	3,28
Of which geothermal	0,00	0,00	0,00	0,01	0,01	0,01	0,01	0,02	0,02	0,02
Solar thermal	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,26	0,26
Other petroleum products	3,17	3,34	3,60	3,89	4,16	4,27	4,32	4,40	4,48	4,56

Ambient energy	2,87	2,93	2,99	3,05	3,11	3,17	3,23	3,29	3,35	3,41
Non-renewable waste	1,69	1,57	1,40	1,15	0,89	0,67	0,47	0,32	0,23	0,17
RES – CHP share	**41.3 %**	**41.6 %**	**42.1 %**	**42.3 %**	**42.6 %**	**43.0 %**	**44.0 %**	**45.3 %**	**47.1 %**	**48.2 %**

Table 5.10. Intended vehicle fleet (total number of vehicles) – VMS.

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Passenger cars	**Diesel**	127.894	123.490	118.285	112.439	106.193	99.466	92.580	85.373	78.006	70.558
	Hybrid diesel	—	—	—	—	—	—	—	—	—	—
	PHEV diesel	4	10	15	21	26	32	38	43	49	54
	Petrol	459.853	468.822	457.519	446.679	436.720	426.956	402.741	377.237	351.093	324.228
	Hybrid petrol	13.533	17.601	36.889	56.234	74.941	93.768	112.626	131.675	150.763	155.071
	PHEV petrol	64	280	496	713	929	1.145	15.719	31.449	36.831	37.047
	Electrically	364	866	1.477	2.204	3.085	4.135	5.404	6.920	19.554	52.925
	LPG	115	225	336	447	558	668	779	898	1.017	1.137
	Natural gas;	—	—	—	—	—	—	—	—	—	—
	Hydrogen	—	—	—	—	—	—	—	—	—	—
Buses	**Diesel**	3.128	2.744	2.853	3.026	3.202	2.971	2.792	2.587	2.356	2.151
	Hydrogen	—	—	—	—	—	—	—	—	—	10
	Electrically	1	1	1	2	3	4	5	129	534	906
	Natural gas;	—	—	—	—	—	404	757	1.013	1.013	1.013
Motorcycles	**Petrol**	42.413	42.298	42.570	42.883	43.278	43.592	44.029	44.385	44.820	42.297
	Electrical	733	851	1.008	1.164	1.320	1.476	1.631	1.787	1.943	4.958
Lorries	**Diesel**	17.128	16.715	16.999	17.285	17.571	17.860	18.158	18.470	18.767	19.035
	Electrically	—	—	—	—	—	—	—	—	—	—
	Hydrogen	—	—	—	—	—	—	—	—	—	48
	Natural gas;	—	—	—	—	—	—	—	—	—	—
Lightweight carriers	**Diesel**	102.495	95.106	95.301	88.688	82.075	75.525	68.850	62.238	55.625	49.075
	Electrically	12	47	82	117	152	187	221	8.684	17.526	26.211
	Hybrid diesel	46	113	2.005	10.604	19.296	27.957	36.768	37.058	37.125	37.191
	Petrol	5.802	5.552	5.115	4.803	4.429	4.055	3.681	3.369	2.932	2.620
	Grand total	**773.585**	**774.721**	**780.951**	**787.308**	**793.780**	**800.202**	**806.779**	**813.314**	**819.953**	**826.536**

Table 5.11. Evolution of fuel consumption (PJ) in the transport sector up to 2030 – VMS.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Biofuels	1,02	0,98	0,93	0,92	0,90	1,32	1,28	1,22	1,16	1,09
Diesel	13,06	12,54	12,42	12,17	11,92	11,52	11,14	10,51	9,88	9,27
Petrol	13,53	13,73	13,67	13,62	13,59	13,09	12,80	12,48	12,07	11,34
LPG	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,03	0,03
Natural gas;	—	—	— —	— —	— —	0,25	0,46	0,62	0,61	0,61
Hydrogen	—	—	— —	— —	— —	— —	— —	— —	— —	0,01
Electrical energy	0,004	0,009	0,016	0,023	0,031	0,04	0,16	0,39	0,67	1,04

5.1.2.4. Primary energy supply and final energy demand

Primary energy supply is significantly reduced in this scenario, due to changes in the energy mix and demand indicated in all sectors (e.g. electricity, transport, heating and cooling). In particular, a reduction of 5.3 % compared to the CoM will be achieved by 2030. This corresponds to a difference of 127 ktoe (Table 5.15). A significant reduction in petrol use is achieved due to measures in the transport sector (by 40 ktoe in 2030). Similarly, lower energy demand in the cement industry reduces the demand for pet coke by 28 ktoe in 2030. There are smaller differences in energy demand from other petroleum products, solar thermal systems, biomass and LPG.

Table 5.12. Evolution of supply of primary energy up to 2030 (ktoe) – AFM

ktoe	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Diesel	607	577	563	291	285	275	266	251	236	222
Petrol	323	328	327	325	324	313	306	298	288	271
Heavy fuel oils	597	567	559	322	— —	— —	— —	— —	— —	— —
Heavy fuel oil (Low-S)	65	58	51	— —	78	2	— —	— —	— —	— —
LPG	61	63	67	72	76	78	78	78	78	77
Other petroleum products in buildings	164	167	170	176	182	183	182	179	174	170
PET coke	50	51	52	56	59	61	58	53	49	45
Natural gas;	—	—	—	460	646	734	745	743	724	724
Hydrogen	—	—	—	— —	— —	— —	— —	— —	— —	— —
Electricity	—	—	—	— —	— —	— —	— —	— —	— —	— —
Biomass/biofuels	118	116	114	114	114	126	129	138	157	163
Of which geothermal	2	—	—	— —	0	0	0	0	0	0
Solar thermal	76	80	86	93	99	102	103	105	107	109
Solar photovoltaics (PV)	40	52	71	83	95	100	103	106	118	124
Wind	20	21	21	21	21	21	21	22	21	23
Non-renewable waste	40	37	33	27	21	16	11	8	5	4
Aviation Spirit	159	319	326	338	351	359	361	361	360	358
Total	**2321**	**2438**	**2441**	**2378**	**2353**	**2369**	**2364**	**2341**	**2318**	**2283**

While the final energy demand in the BM shows a moderate increase over the period 2022-2030, the LAP shows a decrease after an initial increase (Table 5.16). This results in an overall difference of 104 ktoe in 2030.

As regards the overall efficiency of the system, by comparing primary energy supply and final energy demand, slightly improved data can be observed compared to the current ones. The final to primary energy ratio is estimated at 83 % in 2030, as in the MB.

Table 5.13 – Final evolution of energy demand up to 2030 (ktoe) – SWP

ktoe	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Diesel	312	300	297	291	285	275	266	251	236	222
Petrol	323	328	327	325	324	313	306	298	288	271
LPG	61	63	67	72	76	78	78	78	78	77
Other petroleum products in buildings	164	167	170	176	182	183	182	179	174	170
Natural gas;	—	—	—	—	— —	6	11	15	15	15
PET Coke	50	51	52	56	59	61	58	53	49	45
Hydrogen	—	—	—	—	— —	— —	— —	— —	— —	0

Electricity	400	414	422	436	449	458	466	476	484	495
Biomass/biofuels	102	100	98	98	98	110	113	115	117	116
Of which geothermal	—	0	0	0	0	0	0	0	0	1
District heating and cooling —	—	— —	— —	— —	— —	— —	— —	— —	6	6
Solar thermal	76	80	86	93	99	102	103	105	107	109
Non-renewable waste	40	37	33	27	21	16	11	8	5	4
Air transport	159	319	326	338	351	362	366	368	369	370
Total	**1688**	**1860**	**1877**	**1912**	**1946**	**1961**	**1957**	**1938**	**1920**	**1888**

As shown in Table 5.17, reduced primary and final energy needs lead to an increase in the overall share of renewable energy. In this scenario, this is estimated at 26.5 % compared to 24.3 % in the STM by 2030.

Table 5.14. Share of RES in final energy demand across the energy system – CHP.

	All sectors	Electricity	Heating and cooling	Transfers (based on the current RED calculation methodology)
2021	18.4 %	14.8 %	41.3 %	7.3 %
2022	18.5 %	18.1 %	41.6 %	7.3 %
2023	19.8 %	21.9 %	42.1 %	7.3 %
2024	20.6 %	23.3 %	42.3 %	7.3 %
2025	21.4 %	25.1 %	42.6 %	7.3 %
2026	22.4 %	25.6 %	43.0 %	8.9 %
2027	22.9 %	26.0 %	44.0 %	9.6 %
2028	23.7 %	27.0 %	45.3 %	10.7 %
2029	25.4 %	29.7 %	47.1 %	12.2 %
2030	26.5 %	31.5 %	48.2 %	14.6 %

5.1.2.5. Greenhouse gas emissions from the energy system

Unlike the MIB, a higher reduction in carbon emissions is achieved in both the energy-related ETS and non-ETS energy sectors (Figure 5.4). In the AFM, investments in saving measures reduce energy consumption and RES penetration increases – thus CO2 emissionsare reduced by 280 kt in 2030 in the ETS sectors compared to the GMP. Similarly, compared to the MIB, non-ETSco2 emissions decrease further by 200 kt in 2030. In this case, the reduction is largely due to energy saving measures in buildings, the shift of the transport sector from passenger cars to sustainable modes of transport, as well as the increased uptake of low- or zero-emission vehicles due to the new ETS, which is due to be operational in 2027.

Table 5.15. Greenhouse gas emissions trajectory in the ETS and non-ETS sectors from the energy system

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
ETS CO_2	**MT**	3,26	3,09	3,02	2,35	2,01	1,96	1,96	1,93	1,87	1,49
Non-ETS CO_2	**MT**	2,58	2,57	2,57	2,58	2,59	2,55	2,51	2,44	2,35	2,23
ETS CH_4	**kt**	0,13	0,12	0,12	0,07	0,04	0,04	0,04	0,04	0,04	0,03
Non-ETS CH_4	**kt**	1,99	2,01	2,24	2,46	2,67	2,87	3,20	3,43	3,56	3,48
ETS N_2O	**kt**	0,03	0,02	0,02	0,01	0,01	0,00	0,00	0,00	0,00	0,00
Non-ETS N_2O	**kt**	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,04

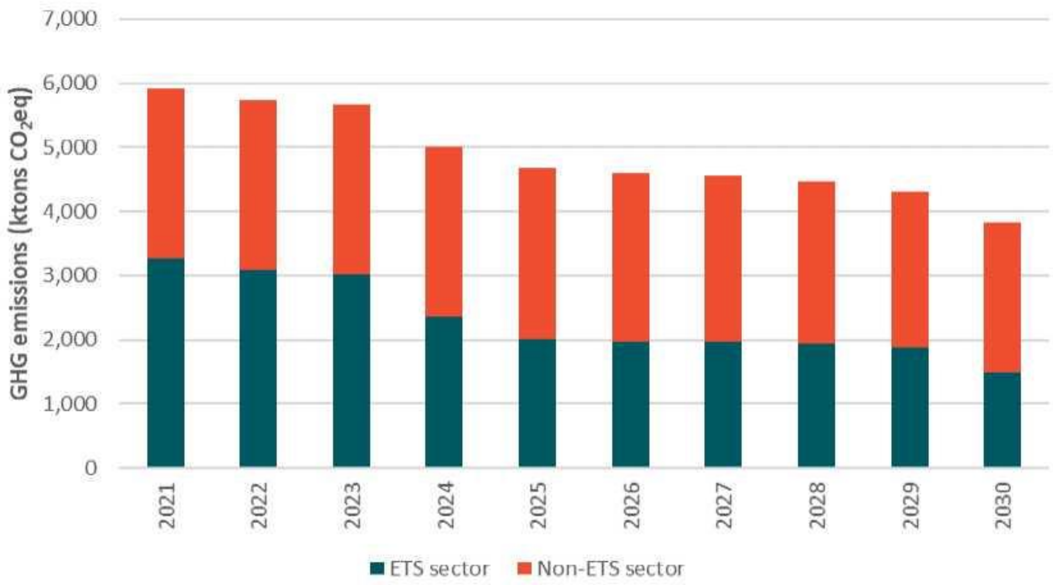


Figure 5.4. Evolution of GHG emissions in ETS and non-ETS – ETS from the energy system

5.1.2.6. Emissions of air pollutants

Compared to the MIB, there is a reduced projection of air pollutant emissions, as shown in Table 5.19. A decrease is observed for most air pollutants, but $PM_{2,5}$ and PM_{10} show the highest reduction in the long term. This is due to lower biomass use in the heating and cooling sector, as well as a decrease in fossil fuel consumption in road transport. There is also a decrease in SO_2 emissions by 2030. This is due to a decrease in the consumption of petroleum products in the heating and cooling sector and in electricity generation. Finally, NO_x emissions are lower in the VMS due to lower gas consumption for electricity generation as well as lower reliance on fossil passenger cars in the road transport sector.

Table 5.16. Projections of air pollutant emissions by 2030 in the AFM.

Pollutan	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
No_x	kt	7,53	6,88	6,44	6,38	5,65	5,09	4,71	4,35	4,01	3,48
PM_{10}	kt	3,31	3,23	3,17	3,08	2,99	2,95	2,99	2,99	2,98	2,88
$PM_{2,5}$	kt	3,07	2,99	2,93	2,85	2,77	2,73	2,77	2,78	2,77	2,68
SO_2	kt	3,52	3,52	3,52	3,52	0,76	0,61	0,59	0,58	0,57	0,55

The picture of emissions forecast is more complete given the forecasts of the Department of Labour Inspection (TEE) for the other sectors of the economy that are not reflected in this study (Table 5.20).

Table 5.17. Total economy-wide projections of air pollutant emissions in the AFM by 2030.

Pollutant	Unit	2021	2025	2030
No_x	kt	11,89	9,88	7,71
PM2.5	kt	3,35	3,06	2,93
SO_2	kt	3,76	0,88	0,66

5.1.3 . Energy saving and its impact on energy supply

As explained in the previous sections, the scenario with additional measures (ADM) requires the implementation of different energy efficiency policies for buildings and equipment in the heating and cooling sector, as well as important measures allowing for a shift from passenger cars to public and non-motorised modes of transport. As a result of these measures, and in combination with the changes in the power generation sector, Cyprus' energy system is expected to become significantly more efficient by 2030 compared to the scenario with the existing measures (CPM). This is illustrated in Table 5.21, which shows the basic energy consumption data and calculated energy savings between the two scenarios. It is evident that most of the energy savings come from the road transport, industry and buildings sectors.

Despite reduced energy supply needs due to energy efficiency improvements, there seems to be a limited risk of investments that will be devalued before their useful life (stranded assets) in the AFM. Increased RES penetration and projected investments in new thermal plants lead to low use of available heat capacity in both scenarios. In particular, the average load factor of thermal power plants in 2030 is estimated to reach 32 % in the CPM and 31 % in the AFM.

However, the projected low load factors do not lead to much differentiation from the current situation, since in 2021 the average load factor of the units of the Electricity Authority of Cyprus (EAC) is estimated at around 34 %. This low rate is observed in Cyprus due to large fluctuations in final electricity demand. According to data from the Cyprus Transmission System Operator (TSO), while the total installed capacity of thermal units in 2021 was 1.478 MW, the maximum load was 1.236 MW and the average load was around 580 MW. Due to its isolated nature, the electricity system of Cyprus is designed to provide stability even at times when large infrastructure is not available. The operation of the interconnection cable, EuroAsia interconnector, may help to make greater use of the planned electricity generation investments for the purposes of electricity exports. The prospect of electricity trade will depend to a large extent on the electricity prices observed in neighbouring systems when the interconnection is operational.

5.1.4 Comparison with EU climate and energy targets

Table 5.22 shows the projected total GHG emissions for the period 2021-2030, broken down by ETS and non-ETS emissions. These total forecasts are derived from the calculations of MARDE reported in previous chapters of the NRCP.

While the achievement of climate targets is not fully dependent on the energy system (GHG emissions also depend on non-energy activities such as waste management, land use and the use of fluorinated gases), the results of energy system modelling play a crucial role in assessing the overall achievement of the energy and climate targets. The SMP package included in the corresponding scenario does not seem to be sufficient to meet the final energy consumption target set for Cyprus in the revised Energy Efficiency Directive, and the national authorities will assess in the near future the extent to which the overall and sectoral renewable energy use targets as set out in the revised Renewable Energy Directive, which was adopted very recently (June 2023), have been achieved.

Meeting the emission reduction target for the non-ETS sectors seems to be quite difficult for the Cypriot economy. Even in the VMS, emissions are expected to decrease by 23.1 % by 2030 compared to 2005 levels, leaving a gap of 380 kt CO_2 eq for Greece to comply with the Effort Sharing Regulation, which aims to reduce emissions by 32 % in 2030 compared to 2005. Taking into account the European Climate Law which sets the objective of reaching net zero emissions by 2050, the above figures show how much additional effort is needed to bring Cyprus into line with the EU's long-term objective. Part of the 23 % reduction in the FPS is due to the adoption of the new ETS for heating, motor and light industrial fuels, which will apply from 2027 onwards. Due to the new ETS, the retail price of fossil fuels is expected to increase, resulting in little savings in the end-use of energy, as well as a greater shift towards electrification, helping to reduce emissions in the ESR.

With this in mind, it must nevertheless be stressed that it may not be possible to accelerate the green transformation of the energy system by 2030 because it takes time to implement measures that promote the penetration of renewable energy sources, such as energy storage and grid modernisation projects, while accelerating building renovation rates and enabling a rapid transition to sustainable mobility are hampered by financial, administrative, labour and behavioural barriers. It is therefore reasonable to consider that, in order for Cyprus to achieve the objectives of the 'Fit for 55' package, it needs to move faster towards reducing carbon emissions in non-energy sectors where untapped potential appears to exist, such as agriculture, livestock farming and waste management, which has been described in previous chapters of this NECP.

Table 5.18. Projected evolution of savings in final and primary energy consumption in Cyprus until 2030. All prices are expressed in thousands of tonnes of oil equivalent (ktoe)

Scenario with existing measures	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Final energy consumption by sector:								
Road transport	649	644	640	638	629	621	610	592
Air Transport	326	338	351	363	371	378	382	386
Residential sector	366	384	401	407	413	416	418	418
Services	253	263	275	282	288	293	303	305
Cement industry	140	139	137	134	135	136	139	141
Rest of Industry	99	101	103	104	103	103	103	103
Agriculture	47	48	49	49	48	48	48	48
Total excluding air transport	**1554**	**1580**	**1604**	**1613**	**1616**	**1618**	**1620**	**1606**
Total with air transport	**1880**	**1918**	**1956**	**1976**	**1988**	**1996**	**2002**	**1991**
Buildings	*619*	*647*	*675*	*689*	*700*	*709*	*720*	*722*
Industry	*239*	*240*	*240*	*238*	*238*	*239*	*241*	*243*
Primary energy input for electricity production	985	903	836	853	872	884	911	935
Primary energy consumption	**2443**	**2385**	**2343**	**2371**	**2392**	**2402**	**2409**	**2411**

Scenario with additional measures	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Final energy consumption by sector:								
Road transport	646	639	632	627	618	603	583	559
Air Transport	326	338	351	362	366	368	369	370
Residential sector	366	384	399	404	407	407	405	403
Services	253	263	275	282	286	289	296	298
Cement industry	140	139	137	134	130	123	119	112
Rest of Industry	99	101	103	104	102	101	100	99
Agriculture	47	48	49	49	48	48	47	47
Total excluding air transport	**1551**	**1574**	**1594**	**1599**	**1591**	**1571**	**1551**	**1518**
Total with air transport	**1877**	**1912**	**1946**	**1961**	**1957**	**1938**	**1920**	**1888**
Buildings	*619*	*647*	*674*	*686*	*693*	*696*	*702*	*701*

Industry	*239*	*240*	*240*	*238*	*232*	*224*	*219*	*212*
Primary energy input for electricity production	985	902	857	866	874	879	900	914
Primary energy consumption	**2441**	**2378**	**2353**	**2369**	**2364**	**2341**	**2318**	**2283**

Saving energy	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Savings in final energy consumption by sector:								
Road transport	3	6	9	11	12	18	27	33
Air Transport	0	0	0	1	6	10	14	16
Residential sector	0	0	1	3	6	9	13	14
Services	0	0	0	0	2	4	6	7
Cement industry	0	0	0	0	5	13	20	28
Rest of Industry	0	0	0	0	1	2	2	3
Agriculture	0	0	0	0	0	1	1	1
Savings in total energy consumption without aviation	**3**	**6**	**10**	**14**	**25**	**47**	**69**	**88**
Savings in total energy consumption by air transport	**3**	**6**	**10**	**15**	**31**	**58**	**83**	**104**
Savings in final energy consumption in buildings	*0*	*0*	*1*	*3*	*8*	*13*	*19*	*21*
Savings in final energy consumption in Industry	*0*	*0*	*0*	*0*	*6*	*15*	*23*	*32*
Primary energy savings for electricity production	— 1	1	— 20	— 13	— 1	5	11	21
Savings in consumption primary energy	**3**	**7**	**— 10**	**3**	**28**	**61**	**91**	**127**

Table 5.19. Projected evolution of greenhouse gas emissions according to MBs and AFM.

(kt CO_2 eq.)	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
COC.										
ETS	4395	4161	4070	3315	2891	2895	2953	2992	2983	3013
non-ETS	4312	4295	4184	4170	4167	4147	4090	4036	3963	3851
TOTAL	8707	8455	8254	7485	7057	7042	7043	7027	6946	6864
AFM										
ETS	4395	4157	4068	3312	2966	2927	2957	2965	2922	2923
non-ETS	4312	4189	4018	3999	3814	3741	3663	3559	3434	3281
TOTAL	8707	8346	8087	7311	6781	6668	6620	6524	6356	6204

5.1.5 . Application of the ‘Energy Efficiency First’ principle to planned policies and measures

In line with the guidance provided by the European Commission, when designing their energy and climate policies, Member States should apply the Energy Efficiency Principle as a matter of priority, meaning that priority should be given to policies and measures that reduce primary or final energy consumption and improve energy security, and other measures should only be taken into account once energy efficiency actions are deemed impracticable or very costly. The package of planned policies and measures provided for in the SPM of the Cypriot National Energy and Climate Plan appears to be in line with the principle of energy efficiency as a matter of priority, for the following reasons:

As a result of the energy efficiency measures, Cyprus’ energy supply will be lower compared to the CPM, as explained in section 5.1.3 above. This means that energy efficiency is indeed prioritised compared to e.g. stronger use of renewables.

As shown in section 5.1.4, cost-effective policies and measures related to energy efficiency have been included in the AFM. These include additional projects to renovate residential and tertiary buildings and industrial equipment at a much faster pace than has been done so far, strong promotion of public and non-motorised transport and transition to electric cars. Cogeneration of electricity and heat in industry is also foreseen, which significantly increases energy efficiency. These measures have a negative or close to zero total cost of living and are therefore cost-effective. Further energy efficiency measures are not recommended as they do not seem realistic (e.g. the renovation of many more buildings by 2030 requires prohibitively high financial and human resources). This finding is based on two studies funded by the European Commission's Structural Reform Support Service in the recent past, the results of which have been used in Cyprus' NECP and this[62,63]Impact Assessment, as well as on recent analyses carried out by the Ministry of Energy, Commerce and Industry in cooperation with the Cyprus Institute's external consultants to determine the energy saving measures included in the AFM.

It is particularly important to note that the AFM provides for energy efficiency measures in transport (modal shift towards public and non-motorised transport and electromobility), which include very significant investments reaching unprecedented levels for the data of the Cypriot transport system. This underlines how strongly the principle of energy efficiency has been taken into account as a matter of priority.

If even more measures to curb energy demand, such as energy efficiency improvements, were envisaged, this would put Cyprus at risk of failing to meet two other main objectives related to energy supply: the renewable energy target and the reduction of emissions of the ETS sectors – which in the case of Cyprus is mainly electricity generation.

As a result of the above, energy efficiency measures in all end-uses of the Cypriot economy, as provided for in the AFM and to the extent that they will be fully implemented, can significantly improve the security of the country's energy supply.

The only further policy worth considering is the implementation of a green tax reform that includes carbon pricing in non-ETS sectors of the Cypriot economy, which could be phased in as early as 2024 at levels covering the levels of taxation foreseen by the new ETS that will enter into force across Europe as of 2027. Such a reform can indeed give further impetus to energy efficiency and the substitution of liquids.

5.1.6 Vougiouklakis Y., Struss B., Zachariadis T. and Michopoulos A. (2017), An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050. Study financed by the European Commission Structural Reform Support Service under grant agreement SRSS/S2016/002 and from the German Federal Ministry of Economy and Energy.

5.1.7 Zachariadis T., Michopoulos A. and Sotiriou C. (2018), Evaluation of the Effectiveness of Possible Climate Change Mitigation Policies and Measures. Final Report submitted to the European Commission's Structural Reform Support Service under Service Contract No. SRSS/C2017/024.

low or zero-carbon fossil fuels. This reform is included in Cyprus's Recovery and Resilience Plan.

5.2. Impact of planned policies and measures on macroeconomic, health, environment, employment and education

Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as 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 to projections with existing policies and measures

5.2.1 Macro-economic impacts

5.2.1.1. Methodology

To assess the macroeconomic impact of the AFM scenario compared to the MIB, an input output analysis (IO) was applied. IO is a quantitative technique to study the interdependence of productive sectors in an economy over a given period of time, which has been extensively applied to policy impact assessment, technology change analysis and foresight72.

To this end, the national IO table for Cyprus made available by the European Statistical Office (Eurostat) for 2019 was transformed into a linear equation system that accounts for how the output of each economic sector is allocated through sales to other sectors (intermediate demand) and final demand (consumers). The IO framework was gradually extended to use physical units to analyse energy use and related environmental activities73.

Thus, a dynamic input-output model was developed and implemented to assess the economy-wide impact of the two different scenarios considered for Cyprus's economy over time (until 2030). The rationale for this approach is that the AFM will include additional and/or different types of investments in the period 2023-2030 compared to the MIB. These changes in investment needs were used as an input to the IO model of Cyprus in order to simulate their impact on the economic output and employment of each main sector of the Cypriot economy.

5.2.1.2. Input data

As a result of the energy system simulations with the OSeMOSYS model, for each of the two scenarios (with existing measures and additional policies and measures) there is provision for annual investments in each productive sector of the economy, as well as a forecast of households' annual expenditure on energy goods. For this analysis, investments were grouped into seven categories: (a) industry, (b) electricity generation technologies, (c) electricity storage technologies, (d) gas infrastructure, (e) electricity interconnection, (f) public transport, (g) private transport and (h) buildings (energy efficiency measures).

The results of the OSeMOSYS energy projections described in Chapter 5.1 were introduced into the IO model through changes in its exogenous variables, i.e. investment expenditure by sector of economic activity. A crucial aspect of the impact assessment is the extent to which the production of the necessary equipment to implement the investments of the two scenarios, and thus the related costs, takes place within Cyprus' economy or abroad. The assessment of the relevant macroeconomic impact is based on the investment costs incurred within the national economy and are not directly imported from abroad. This analysis also takes into account the induced effects of energy savings, i.e. reduced household costs for energy consumption.

Table 5.23 presents the total estimated expenditure under the national economy linked to the development and operation of all interventions under the BMP scenario, and Table 5.24 presents the corresponding data for the AFM. The allocation of costs to the different economic sectors was done on the basis of the information obtained from a literature [review] 66,67 as well as on the experience with the previous implementation of such studies for Cyprus747576. It should be noted that the investment costs consist of the cost of capital and operation and maintenance. As mentioned above, in order to measure more accurately the impact of investment on the economy for each sector, investments are divided into local investments and imports.

Table 5.20. Annual investment and private consumption expenditure under the MIB by sector of economic activity for the period2023-2030 (in EUR 2019 million).

72Miller, R.E., Blair, P.D. (2009). *Input-Output analysis: Foundations and extensions* (2nd EDN). Cambridge University Press, New York.

73Giannakis, E., Kushta, J., Giannadaki, D., Georgiou, G.K., Bruggeman, A., Lelieveld, J. (2019). Exploring the economy-wide effects of agriculture on air quality and health: Experience from Europe. *Science of the Total Environment*, 663, 889-900.

74Tourkolias, C., Mirasgedis, S., Damigos, D. and Diakoulaki, D. (2009), Employment benefits of electricity generation: A comparative assessment of lignite and natural gas power plants in Greece. *Energy Policy* 37 (10), 4155-4166.

75Markaki, M., Belegri-Roboli, A., Michaelides, P., Mirasgedis, S. and Lalas, D.P. (2013), The impact of clean energy investments on the Greek economy: An input-output analysis (2010 – 2020). *Energy Policy* 57, 263-275.

76Taliotis, C., Giannakis, E., Karmellos, M., Fylaktos, N. and Zachariadis, T., 2020. Stimulating the economy-wide impacts of energy policies in Cyprus. *Energy Strategy Reviews*, 29, 100495.

	2023	2024	2025	2026	2027	2028	2029	2030
Agriculture	3,1	3,3	3,1	3,0	3,3	3,3	3,4	3,5
Forestry	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Mining mines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Production of food beverages	10,2	11,1	10,3	10,1	10,9	10,9	11,4	11,8
Textiles	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Wood and paper	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Chemical and plastic products	29,0	33,6	37,8	38,5	42,1	46,6	50,6	54,0
Fabricated metal products	14,5	16,8	18,9	19,3	21,0	23,3	25,3	27,0
Machinery and equipment	21,1	37,7	26,7	29,7	32,1	38,3	35,6	37,0
Energy	303,2	319,2	334,8	344,0	368,5	385,7	397,6	408,3
Construction	289,0	452,1	364,5	343,6	359,2	411,2	487,2	477,4
Trade	132,9	143,4	141,1	143,4	151,9	153,9	158,5	162,6
Accommodation and food services	0,5	4,1	1,3	1,0	0,9	1,0	1,2	1,9
Transport	7,4	46,3	17,3	17,3	14,6	16,0	19,9	21,8
Bank financing	35,6	45,5	39,4	39,2	40,9	41,9	43,8	44,8
Property	8,1	39,9	14,7	11,6	10,7	13,6	19,6	19,8
Public administration	5,9	15,8	9,3	8,1	8,4	8,8	10,1	11,3
Education	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Health	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Other services	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Table 5.21. Annual investment and private consumption expenditure under the AFM by sector of economic activity for the period 2023-2030 (in EUR million' 2019).

	2023	2024	2025	2026	2027	2028	2029	2030
Agriculture	2,8	3,0	2,7	2,7	2,9	3,1	3,3	3,3
Forestry	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Mining mines	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Production of food beverages	9,2	9,9	9,1	9,0	9,5	10,4	10,9	11,2
Textiles	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Wood and paper	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Chemical and plastic products	29,0	40,7	44,4	48,2	51,1	55,6	59,6	63,5
Fabricated metal products	14,5	20,4	22,2	24,1	25,6	27,8	29,8	31,8
Machinery and equipment	22,2	41,3	30,8	35,1	37,3	41,6	39,6	41,4
Energy	301,5	317,6	331,8	342,0	363,0	376,3	383,2	390,9
Construction	305,5	474,6	379,0	383,3	394,3	457,0	532,1	534,2
Trade	127,6	133,8	133,9	138,2	143,6	152,7	156,0	158,7
Accommodation and food services	0,9	4,0	1,1	1,2	1,1	1,2	1,3	2,4
Transport	17,2	44,2	18,4	21,8	19,2	21,2	24,1	28,9
Bank financing	35,1	42,5	36,7	37,6	38,7	41,5	43,0	44,2
Property	11,0	39,5	12,3	13,4	12,6	16,0	20,8	24,5
Public administration	5,8	15,1	7,7	7,7	7,8	8,8	9,7	11,9
Education	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Health	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Other services	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Table 5.22. Annual total economic output (in million EUR' 2019) and annual total employment (in thousands of people) linked to investments under both scenarios for the period 2021-2030.

	2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Total economic output (EUR 2019)								
With the existing measures	54.885	57.210	58.159	59.167	60.323	61.568	62.800	63.822
With Additional Policies and	54.935	57.262	58.194	59.293	60.424	61.698	62.909	63.963
Difference between	0.09 %	0.09 %	0.06 %	0.21 %	0.17 %	0.21 %	0.17 %	0.22 %
Total employment								
With the existing measures	505.444	526.705	536.226	545.396	555.948	567.253	578.639	588.134
With Additional Policies and	505.684	527.088	536.518	546.433	556.763	568.507	579.684	589.388
Difference between	0.05 %	0.07 %	0.05	0.19 %	0.15	0.22 %	0.18 %	0.21 %

Note: Total economic output includes both intermediate and final demand and is therefore higher than the GDP which only includes final demand.

5.2.1.3. Results

Table 5.25 shows the impact on the economy as a whole in terms of economic output and employment from investment under the two scenarios. Investment in the AFM leads to an increase in the country's economic output in 2030 about 0.2 % higher than the increase due to investment under the BMP scenario. Similarly, investments in the AFM lead to an annual increase in employment at national level of around 0.2 % higher than an annual increase due to investments under the BMP scenario for the same period. These small differences are explained by the fact that the additional investments foreseen in the AFM – compared to the MB – are limited in absolute terms, although differentiated by sector: as will be mentioned in section 5.3.3 below, the AFM foresees more investments in sustainable mobility, energy upgrades of buildings and energy storage, and fewer in private vehicles. However, as Table 5.25 shows, the overall net effect of these diversified investments is low.

Table 5.26 shows the sectoral distribution of economic output in the Cypriot economy in 2030 relative to investments under the two scenarios. The economic sectors that mainly benefit from the AFM are: (a)

Metallic products, (b) Chemical and plastic products, (c) Construction and (d) Mining and quarrying. The highest negative impacts are observed on the economic output of the energy sector due to reduced energy demand due to the implementation of energy efficiency measures in the AFM – this does not imply reduced economic activity in absolute terms, but only a relatively reduced activity compared to the CPM. In the rest of the economy, there is a notable increase in the production of metal products in the SPM scenario due to their use in the energy efficiency measures adopted in the SPM, as well as an increase in investment in construction. The construction sector has a strong local character and is characterised by large-scale investments such as those included in the AFM, in particular in new transport and energy infrastructure. However, the differences between scenarios and sectors are generally quite small, without any sector showing disproportionately large changes compared to others.

It is important to note that the above analysis is limited by the use of IO modelling method as a tool to investigate the distribution of investments across different sectors. The IO model does not allow to simulate the tax impact, which may be important in this case, as the measures in the AFM require large public investment in public transport infrastructure and reductions in private investment in private vehicles. Such measures could have a noticeable impact on the state budget, which, however, is not reflected in this model.

Table 5.23. Change in economic output by main sector of Cyprus' national economy in 2030 due to investments in the AFM, compared to the CPM.

Areas of economic activity	2030
Agriculture	— 0.03 %
Forestry	0.00 %
Mining mines	0.96 %
Production of food beverages	— 0.03 %
Textiles	0.07 %
Wood and paper	0.37 %
Chemical and plastic products	1.24 %
Fabricated metal products	1.25 %
Machinery and equipment	0.67 %
Energy	— 1.25 %
Construction	1.24 %
Trade	— 0.01 %
Accommodation and food services	0.03 %
Transport	0.17 %
Bank financing	0.01 %
Property	0.23 %
Public administration	0.05 %
Education	0.00 %
Health	0.00 %
Other services	0.04 %

5.2.1.4. Competitiveness issues

As will be explained in more detail in the next section, in the absence of other policies (e.g. change in energy taxation) that could affect energy prices, the differences between the BM and AFM scenarios are foreseen for retail prices of electricity and liquid fuels. In the case of electricity, the prices

a consumer in the AFM is expected to be slightly higher (by 2 % in 2030) compared to the CPM. Based on the guidance provided by the European Commission on the expected allowance prices of the new ETS from 2027 onwards, where an allowance price of EUR 50 is expected in 2030, retail prices of transport fuels are expected to increase by 9 % on average and prices of heating oil and industry by 11-13 % in 2030 compared to those in the BEM scenario.

These changes are not very large (especially given the usual fluctuation in energy prices even without specific measures and policies) and represent a relatively low share of production costs in the different sectors of the Cypriot economy. As shown in a previous study on the impact of energy costs on productivity in Cyprus[77], fuel price increases of 7 % for fuels and 12 % for electricity were expected to affect production costs of less than 0.4 %. This means that, in the case of the Cypriot NECP, the above-mentioned changes in energy prices should not raise competitiveness concerns.

5.2.2 Socio-economic impacts

The implementation of strong energy and climate policies usually leads to changes in the relative prices of energy products compared to a normal price path. These price changes in turn affect households' cost of living in different ways. This section focuses on analysing the redistributive impacts stemming from the policies of the additional policies and measures scenario compared to the scenario of existing policies and measures. The analysis is carried out by assessing the extent to which Cypriot households with different income, place of residence (urban and non-urban areas) and demographic characteristics are affected by changes in electricity and fuel prices due to the application of the AFM scenario.

5.2.2.1. Expenditure by Cypriot households on energy goods

A key concern with energy and environmental policies is that they can have a disproportionate impact on the most vulnerable parts of society by raising energy prices. Expenditure on energy goods is generally found to be "regressive", i.e. low-income households spend a larger part of their income on these goods than high-income households. Table 5.27 shows the annual expenditure of Cypriot households on the main energy goods (electricity, heating fuels and motor fuels), both in absolute terms and as a fraction of their annual income. This information comes from the latest Family Budget Survey carried out by the Statistical Service of Cyprus for a representative sample of around 2.700 households in 2015. There are no more recent data, as the next corresponding Survey is launched by the Statistical Office in 2023 with a view to completion in 2024.

According to the information in Table 5.27, Cypriot households used to spend on average around EUR 3.100 per year on fuel and electricity or 10.6 % of their income in 2015. The poorest households spent around EUR 1.300 per year (19 % of their income) and the wealthiest around EUR 5.000 per year (8.3 % of their income). This means that total expenditure on energy goods is indeed regressive. More than half of these costs relate to transport fuels

77Keteni E., Mamuneas T. and Zachariadis T., 2013. The Effect of EU Energy and Climate Policies on the Production Sectors of the Economy of Cyprus – Final Results. Economic Policy Paper 01-13, Economics Research Centre, University of Cyprus.

on average, but the distribution between income groups is quite different: the poorest spend more on electricity and motor fuels, while wealthy people spend more on transport fuels. Overall, the inverse progressive expenditure phenomenon is stronger in the case of electricity, where poor households spend (as a percentage of their income) more than three times more than wealthy households. This means that the change in electricity prices has a greater impact on the distribution of revenues from the change in the prices of other energy products.

Table 5.24. Cypriot households' annual expenditure on energy goods in 2015.

	Expenditure in EUR 2015 for:			
Income Team	**Electricity**	**Heating fuels (oil, LPG, biomass)**	**Motor fuels (petrol, diesel)**	**All energy products**
Poorer 10 %	226	164	710	1.300
10 % -20 %	517	222	1.059	1797
20 % -30 %	607	278	1.325	2210
30 % -40 %	696	312	1.466	2.474
40 % -50 %	815	311	1.677	2.803
50 % -60 %	863	353	2.227	3442
60 % -70 %	940	425	2197	3562
70 % -80 %	1.002	554	2646	4.203
80 % -90 %	1.042	592	2701	4.335
Richest 10 %	1.383	788	2786	4957
All households	**829**	**400**	**1.879**	**3.107**

Expenditure as%of annual income for:

Income Team	**Electricity**	**LPG biomass heating (oil)**	**Motor fuels (diesel)**	**All energy products**
Poorer 10 %	8,3	2,4	10,4	19,1
10 % -20 %	4,7	2,0	9,6	16,2
20 % -30 %	4,3	2,0	9,4	15,7
30 % -40 %	4,0	1,8	8,4	14,2
40 % -50 %	3,8	1,4	7,8	13,0
50 % -60 %	1,3	1,4	8,6	13,3
60 % -70 %	3,0	1,4	7,1	11,4
70 % -80 %	2,7	1,5	7,0	11,1
80 % -90 %	2,2	1,2	5,6	9,0
Richest 10 %	1,8	1,0	1,5	8,3
All households	**2,8**	**1,4**	**6,4**	**10,6**

Source: 2015 family Budget Survey of the Statistical Service of Cyprus. Data analysed by the Centre for Economic Research of the University of Cyprus.

5.2.2.2. Changes in energy prices between CPM and AFM scenarios

Tables 5.28 and 5.29 show the projected evolution of fuel and electricity prices, respectively, in accordance with the NECP and NECP AFMs. In addition to the implementation of the new ETS, which is taken into account in the AFM, and in the absence of additional policies that could further affect energy prices (e.g. further changes in energy taxation), differences between the two scenarios are expected (a) in retail electricity prices due to changes in the electricity mix and the evolution of the prices of fuels used in electricity production, and (b) in fossil fuel prices, largely due to the introduction of the new ETS.

Obviously, as shown in Tables 5.28 and 5.29, the period between 2020 and 2022 was characterised by large fluctuations in energy prices. Initially, a global fall in fossil fuel prices was observed in 2020 as a result of the fall in demand due to the pandemic. This was followed by a strong price increase in 2021 due to the economic recovery and a further increase in 2022 due to the war in Ukraine. Retail prices are projected to be lower by the end of 2023 compared to 2022 and then to evolve in line with the assumptions for fossil fuel prices reported in an earlier chapter of this NECP.

In the case of electricity, changes in electricity generation costs will be the complex result of the differences between the CPM and AFM scenarios as explained in Chapter 5.1.2 – mainly due to the higher penetration of renewables, the use of natural gas in electricity generation, which is considered to be supplied at low prices from mid-2026 onwards, the consequent reduction in the cost of purchasing emission allowances, the operation of new thermal power plants and the existence of an electricity interconnection towards the end of the decade. Overall, in both the CPM and the AFM, generation costs are projected to be lower than in 2021-22 and somewhat higher (by 12-14 %) than the low electricity cost in 2020. Further quantitative documentation is provided in section 5.3 below.

This impact analysis requires an estimation of the difference between the two BM and AFM scenarios. As shown in Table 5.28, electricity costs in the AFM are expected to be 1 % higher in 2030 than in the CPM. The reason for this small increase lies in the slightly higher investment needs and lower projected electricity demand in this scenario, leading to somewhat higher energy production costs per MWh in 2030 – see also Section 5.3.2. Assuming that other fixed costs of electricity generation will not change between the two scenarios, 1 % of the electricity production costs are estimated to increase retail electricity prices by around 1 % by 2030 between the two scenarios.

In the case of transport fuels, the change in prices between the BM and VMS scenarios is mainly due to the introduction of the new ETS and – to a lesser extent – to the new renewable energy obligations for 2030 in the transport sector in line with the possible requirements of the revised new RES Directive amending Directive (EU) 2018/2001. Overall, retail petrol and diesel prices are projected to increase by 8.7 % to 10.4 % by 2030 between the two scenarios, or by 9 % as a weighted average of the increases in total transport fuel expenditure of Cypriot households – also taking into account the gradual increase in electromobility that will reduce the impact of fossil fuel prices on household expenditure.

In the case of heating fuels, and in line with the guidance given by the European Commission on the evolution of the new ETS allowance price that Member States propose to include in their modelling in the context of the revision of the NECP, it is assumed that their price will increase by EUR 50 '2020 per tonne CO_2 by 2030, corresponding to approximately EUR 13,5 cents’ 2020 per litre of oil or an increase of about 11-13 % compared to the price of heating fuel in the Cypriot market prevailing in the first quarter of 2023[78]. For

households using LPG as heating fuel, this corresponds to an increase of EUR 7,8 cents per litre and an increase of less than 8 % compared to the current retail prices of LPG. As most households use oil rather than LPG for heating, we can consider a weighted average increase in heating fuel prices of 10 %.

If households were unable to react to these price changes, it would be possible to calculate the change in the cost of living of each income group by multiplying the percentage change in the prices in Tables 5.28 and 5.29 by the corresponding expenditure in Table 5.27. However, in reality, when prices change, households adjust their consumption and expenditure following a change in prices in line with their preferences. How each household reacts depends on the different socio-demographic characteristics and consumption habits of each household. Therefore, detailed modelling of consumer behaviour is needed and the modelling approach adopted here is briefly explained in the following paragraphs.

5.2.2.4. Simulation method

Household energy demand and the subsequent redistributive effects of energy policies have been studied in several countries. These studies are based, inter alia, on data from household expenditure surveys conducted annually by the national statistical institutes. This allows for empirical assessment of detailed

Heating oil prices[78] ranged between EUR 1.17 and EUR 1.03/litre in the first months of 2023. See the MRO’s Retail Fuel Price Observatory: https://eforms.eservices.cyprus.gov.cy/MCIT/MCIT/PetroleumPrices incomes and substitution patterns between goods. However, in some countries (Cyprus is one of them) household expenditure surveys are carried out less frequently. This poses problems in the empirical analysis of demand. To overcome this problem, an alternative approach was developed and applied with data from Cypriot households from Pashardes et al79. This method is based on the fact that price changes differ between goods consumed by a household, so their effect may differ between households due to heterogeneity of household preferences. For example, vegetarians are not affected by changes in the price of meat. Therefore, when the only species in the food basket that increases its price is meat, only meat-and-goats face an increase in the unit cost of food.

79Pashardes P., Pashourtidou N. and Zachariadis T., Estimating welfare aspects of changes in energy prices from reference heterogeneity. *Energy Economics* 42 (2014), 58 – 66.

Table 5.25. Projected evolution of the cost of electricity generation in the CPM and AFM.

Scenario of existing policies and measures

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average cost of electricity (EUR '2016/MWh)	121	160	129	135	129	107	86	87	89	92
Annual growth rate	48	32	—	5	—	—	—	1 %	2 %	4
Rate of change compared to 2020	48	95	57	65 %	57	30	5	6 %	8 %	12 %
Scenario of additional policies and measures	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average cost of electricity (EUR '2016/MWh)	121	160	129	135	128	107	86	87	89	93
Annual growth rate	48	32	—	5	—	—	—	1 %	2 %	5
Rate of change compared to 2020	48	95	57	65 %	56	30	5	6 %	8 %	14 %
Difference (Additional – Existing Policies and Measures)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Average electricity costs	0	0	0 %	0	0 %	0 %	0	0 %	0 %	1
Retail price of electricity (estimated)										**1 %**

Table 5.26. Projected evolution of car fuel prices in the CPM and AFM. Including consumption taxes and 19 % value added tax.

Scenario of existing policies and measures

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Price of petrol (EUR 2016/1000 litres)	1.242	1.843	1.462	1.462	1.462	1.462	1.462	1.462	1.462	1.462
Annual growth rate	15	48 %	— 21 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Rate of change compared to 2020	15	71 %	35 %	35 %	35 %	35 %	35 %	35 %	35 %	35 %
Price of diesel (EUR 2016/1000 litres)	1.276	1.874	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475
Annual growth rate	15	47 %	— 21 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Rate of change compared to 2020	15	68 %	32 %	32 %	32 %	32 %	32 %	32 %	32 %	32 %

Scenario of additional policies and measures

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Price of petrol (EUR 2016/1000 litres)	1.242	1.843	1.462	1.462	1.462	1.462	1.526	1.564	1.577	1.589
Annual growth rate	15	48 %	— 21 %	0 %	0 %	0 %	4 %	2 %	1 %	1 %
Rate of change compared to 2020	15	71 %	35 %	35 %	35 %	35 %	41 %	45 %	46 %	47 %
Price of diesel (EUR 2016/1000 litres)	1.276	1.874	1.475	1.475	1.475	1.475	1.551	1.597	1.612	1.627
Annual growth rate	15	47 %	— 21 %	0 %	0 %	0 %	5 %	3 %	1 %	1 %
Rate of change compared to 2020	15	68 %	32 %	32 %	32 %	32 %	39 %	43 %	45 %	46 %

Difference (Additional – Existing Policies and Measures)

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Petrol price	0 %	0 %	0 %	0 %	0 %	0 %	4.3 %	6.9 %	7.8 %	8.7 %
Diesel price	0 %	0 %	0 %	0 %	0 %	0 %	5.2 %	8.3 %	9.3 %	10.4 %
Weighted average difference										**9 %**

In the case of energy, the total cost depends on the prices of goods such as electricity, electricity, petrol, LPG, heating oil, solid fuels and renewable sources. To the extent that changes in the prices of these goods are not proportional and their consumption shares vary across households, then the unit energy costs also differ per household. As in the example of vegetarian vegetarian mentioned above, car-free households are not affected by changes in transport fuel prices, while households with many cars may have a significant increase in their living costs if the prices of these fuels rise. Thus, Pashardes et al. developed appropriate commodity cost indices commonly used for empirical demand analysis, and used the variation in these costs across households to estimate an econometric system of demand using data from limited family budget surveys. They applied the method to estimate the price elasticity of household energy demand using data from three Family Budget Surveys carried out in Cyprus in 1996, 2003 and 2009 by the Statistical Service of Cyprus. They then simulated the impact on household welfare of increases in welfare prices that are supposed to result from the adoption of the 2020 EU energy and climate package in households, grouped by income, location and demographics. This impact analysis uses the same model, simulating the effects of the changes in electricity and transport and heating fuel prices mentioned above for the year 2030, in order to investigate the impact of the AFM scenario on consumer welfare compared to the evolution foreseen in the CoM.

5.2.2.5. Simulation of welfare effects

Based on the relative weight of expenditure for the different energy goods (last row of Table 5.27), and on the result of Tables 5.28 and 5.29, the AFM foresees changes in consumer prices of 2 %, 9 % and 10 % for electricity, transport fuels and heating fuels respectively compared to the CoM. The weighted average change in all energy goods is around 7.3 %. This means that the AFM will have a slightly negative impact (i.e. an increase) on the cost of living of Cypriot households by 2030, with some redistribution of costs from motor and heating fuels (which are proportionally more expensive) to electricity (less expensive), but the overall impact is expected to be low, as there will also be substitution, e.g. replacement of oil boilers with heat pumps. Households in the two lowest income categories (deciles) may suffer a decrease in purchasing power of EUR 90-140 '2020 in 2030, or about 1-1.5 % of their income. In the high income categories, the corresponding decrease in purchasing power is expected to be higher in absolute terms but lower in relative terms: approximately EUR 350-400 '2020 or about 0.5 % of their income.

Overall, changes in household welfare are expected to be small. This is evident when taking into account the results of the welfare simulations presented in Tables 4, 5 and 6 by Pashardes et al., taking into account that the effects of that study were simulated with the assumption of a 7.6 % increase in the weighted average cost of all energy products80, similar to the increase in the SPM in this study. In our case, low-income households may experience an increase in their costs of between EUR 50-100’ 2020 per year, or 0,5-1 % of their income, and high-income groups may incur an additional cost of EUR 200-300’ 2020 or 0,3-0.4 % of their income. The impact will be slightly more pronounced for rural households, which spend 10 % more on transport fuels, but will generally not be particularly high.

To sum up, the implementation of the AFM scenario is not expected to generate significant costs or benefits for households nor to affect the distribution of income in Cypriot society. However, to avoid adverse effects on energy-poor households, government authorities will pay attention to providing resources, e.g. from the Social Climate Fund, to alleviate the most vulnerable households.

5.2.3 Effects on employment

In the case of Cyprus, one can express with sufficient certainty the conclusion that the risk of a reduction in employment at national level from the application of the AFM scenario is very low. This is based on:

- The results from the economic modelling mentioned above in Section 5.2.1, which show a slight increase in net employment (around 1000 new jobs in 2030 between the two scenarios, see Table

80SEE Pashardes et al. (*Energy Economics* 42 (2014)), end of page 63.

5.26).

- The fact that the number of employees in the fossil fuel sector (power plants, oil companies, etc.) is relatively limited. On the contrary, it should be expected that a significant number of additional jobs can be created to enable the implementation of energy efficiency and renewable energy measures due to the significant shift in investment in these sectors by 2030.

In any event, the implementation of the AFM scenario in Cyprus is very likely to have positive effects on employment, at least in the short to medium term. The benefit is expected to be greater if the measures taken in the scenario are implemented without reducing the purchasing power of Cypriot households and without absorbing a large part of national public resources. Public investments that can be supported by the EU budget and private investments that can be facilitated through financial instruments of the European Investment Bank or Cypriot banks can be particularly beneficial in this respect.

5.2.4 Environmental and Health Impact

As shown above in Chapter 5.1, the implementation of the AFM leads to reductions in emissions of air pollutants that cause health effects. Table 5.32 uses information from Tables 5.10 and 5.20 and shows the relative change in emissions of the three main air pollutants in 2030, compared to those of the BMP scenario. The 6.8 % reduction in PM emissions is mainly due to the lower use of fossil fuels in road transport. NOx emissions are 2.9 % lower in the VMS due to lower use of natural gas in power generation, as well as lower reliance on petrol and diesel passenger cars. The biggest improvement (reduction) is expected in SO_2 emissions (by 10 %), due to the decrease in the use of oil in transport thanks to electromobility.

The health impacts of the main air pollutants are well documented in the literature, and there is an increasing number of assessments of the actual effects on human health due to the exposure of humans to high levels of concentrations of certain air pollutants in the environment. Impacts are usually expressed in premature deaths and lost life years. Premature deaths are deaths that occur before a person reaches the expected age of death. This expected

age is usually the life expectancy for a country that also depends on gender. Lost life years (YLL) are defined as the years of possible loss of life due to premature death and are estimated by the average number of years a person would have lived if they had not died prematurely81.

According to the European Environment Agency, the exposure of the Cypriot population to high levels of PM, NO_2 and ozone concentrations caused around 560, 180 and 60 premature deaths per year respectively in 202082. The emission reductions presented in Table 5.30 for the AFM will lead to improved air quality, especially in cities, thus reducing premature deaths and lost life years. It should be noted that there is no direct link between pollutant emissions and ambient air concentrations, as part of air pollution is due to the transfer of pollutants from other countries. These two events underline that it is not easy to estimate the change in the health effects of reducing national emissions alone. However, it can reasonably be assumed that, according to the AFM, the number of premature deaths caused by PM and NOx emissions can be reduced by around 30 per year.

Exposure to SO_2 concentrations has decreased in recent decades in Europe. Since 2007, exposure of the urban population to concentrations above the EU daily limit value remains below 0.5 %. Serious adverse effects on human health are therefore expected to be very low. However, SO_2 emissions are still regulated at EU level due to their role in building erosion and soil growth causing biodiversity loss. In accordance with Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants, Cyprus commits to reducing national SO_2 emissions (compared to 2005) by 83 % by 2029 and by 93 % from 2030. The implementation of the AFM scenario will not lead to full compliance with these targets, but will help towards compliance. The implementation of the AFM scenario will also help Cyprus

81 European Environment Agency (2018), Assessing the risks to health from air pollution. https://www.eea.europa.eu/themes/air/health-impacts-of-air-pollution /assessing the-risks-to-health

82 European Environment Agency (2022), Air quality in Europe 2022. EEA Report No. 05/2022, Copenhagen. doi: 10.2800/488115.

to meet its respective obligations regarding NOx and $PM_{2.5}$ emissions. These are side benefits of decarbonisation policies.

The health benefits mentioned above can also be expressed in monetary terms by using assessments of the external costs of each pollutant. This is the sum of economic damage to human health, crops, materials and biodiversity per tonne of pollutants emitted into the atmosphere – although the calculations are dominated by damage related to human health. To estimate the cost of NO_x, PM and SO_2 emissions, the calculations of pan-European studies were used: results of the CASES project83 on power plant emissions and from Ricardo-AEA84 on road transport emissions. All prices have been converted into constant euros per tonne of pollutant. As explained elsewhere85, the cost of damage has increased over the years, which is why variable external costs are used annually. The last column of Table 5.30 contains an estimate of the reduction of damage costs due to emission reductions in the AFM. The overall economic benefit from the reduced air pollution of the TMP scenario is close to EUR 10 million in 2030. Overall over the whole decade 2020-2030, the benefit exceeds EUR 30 million' 2022. The benefits of reducing PM emissions are higher because this pollutant has the most adverse health effects and therefore the highest damage costs per tonne86.

Table 5.27. Reduction of air pollutant emissions in the AFM compared to the CoM, and benefit (avoidance of damage costs) in the year 2030 thanks to these reductions.

Pollutant	Change in total emissions in 2030 (000 tonnes)	Change in emissions in 2030 (%)	Avoidance of loss costs in 2030 (EUR million' 2022)
No_x	— 0,17	— 2.2 %	1,9
PM	— 0,04	— 1.3 %	7,1
SO_2	— 0,04	— 5.7 %	0,9
Total Benefit			**9,9**

5.3. Overview of investment needs

5.3.1 Economic impact of the BMP scenario on the electricity sector

The investments foreseen for electricity generation will have a significant impact on electricity costs as a whole. Thus, due to the significant investments in electricity and the import of natural gas in mid-2024, the average cost of gross electricity production is gradually decreasing from existing levels. Obviously, this is a function of the assumed fuel price and technological costs adopted in the model. Figure 5.5 provides an analysis of the different cost elements of the undiscounted system87. It appears that the cost reduction is achieved when the system is fully moved towards gas production in the period 2024-2025. It can be observed that variable costs (fuel costs) are the main driver of electricity costs until 2030. In terms of actual investment costs, these are shown for each technology in Figure 5.6.

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83 FEEM (2008), CASES (Cost Assessment for Sustainable Energy Systems) – Final Conference Proceedings and External Costs Database. 2008.
84 Ricardo-AEA (2014), Update of the Handbook on External Costs of Transport. Report for the European Commission's Directorate General for Mobility and Transport.
85Sotiriou C. and Zachariadis T., Optimal Timing of Greenhouse Gas Emissions Abatement in Europe. *Energies* 12 (2019), 1872; doi: 10.3390/en12101872.
86As mentioned, environmental costs have risen over the years. For the year 2030, based on the literature values referred to in this text, the marginal damage cost per tonne of NOx, PM and SO2 was estimated at EUR 11.438, EUR 177.800 and EUR 21.745 '2022 respectively.
The87 figure presents the undiscounted costs to avoid the false impression that costs are expected to decrease dramatically over time. Taking into account that the discount rate applied is 8.5 % for most technologies in the electricity sector (the same as the rate used in the European Commission's respective models), if the discounted present value of costs were presented in the Figure, then prices after the first years would be significantly distorted (i.e. they would appear to be reduced).

Figure 5.5. Average electricity costs and analysis of system cost elements – STM.

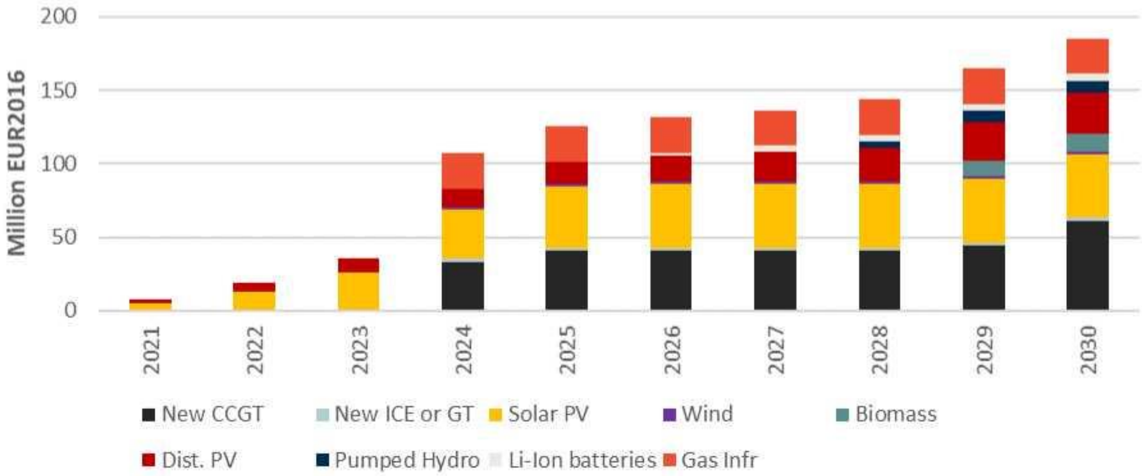


Figure 5.6. Annual investment costs in production and storage technologies in the period 2021-2030 – SMM.

5.3.2 Economic impact of the AFM scenario on the electricity sector

The small differences between the scenarios lead to similar results, as the electricity costs in the AFM follow a similar trajectory as in the CPM (Figure 5.7).

Figure 5.7. Average cost of electricity and breakdown of system cost elements – AFM.

Compared to the MIB, the investment requirements in electricity supply (shown in Figure 5.8) are higher in the AFM. The difference relates to an increase in the penetration of renewable energy technologies, leading to a difference in investment in electricity generation technologies of EUR 39 million over the period 2023-2030. There are also additional investments in storage technologies in the AFM at the same time.

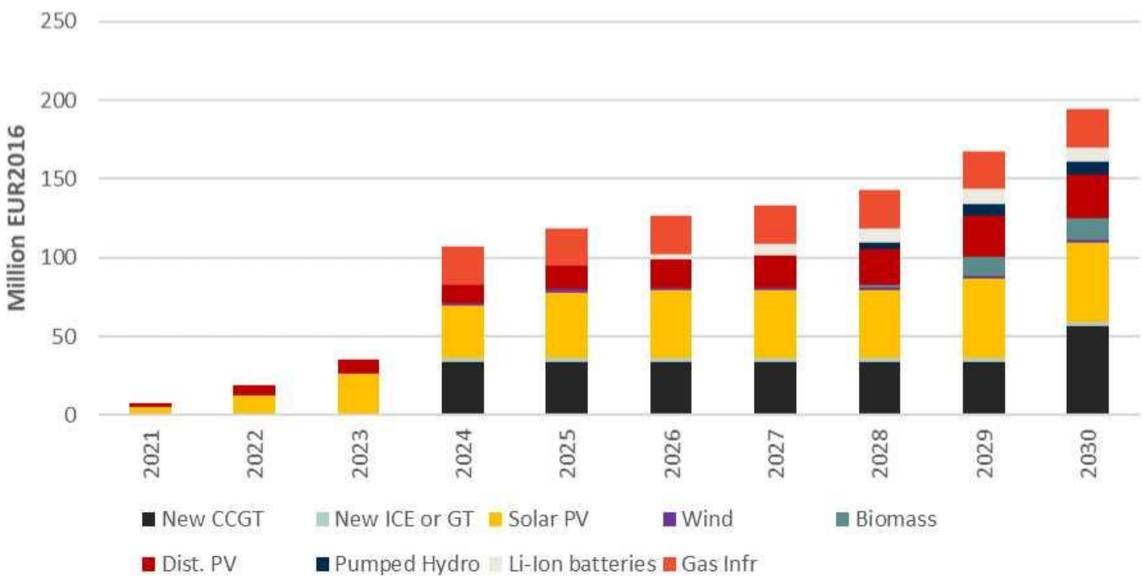


Figure 5.8. Annual investment costs in solar photovoltaic, solar thermal and storage technologies in the period 2020-2050 – SPM.

5.3.3 Additional economy-wide investment needs in the AFM

In order to assess the additional investments envisaged in the AFM vis-à-vis the FMP, both public and private investments in the two scenarios need to be assessed. As policies and measures supported by public funds play a key role in shaping the regulatory landscape and mobilising private investment, this assessment starts by mapping the green public investments already programmed through EU funds and the national budget. These are reported in section 5.3.3.1 and correspond to the investments in the IBM scenario. Below, in section 5.3.3.2, we describe the additional investments planned by the government for the near future, as well as additional investments (e.g. energy upgrades of buildings, waste management, etc.) that are considered critical to achieve the energy savings and emission reductions provided for in the NRM, as described in the previous sections of Chapter 5.

5.3.1.1. Existing public investment

This section provides an overview of planned public investment for Cyprus' green transition, based on the latest information (end of May 2023). As in the impact assessment of the previous NECP, the focus is on energy and transport-related investments and sponsorship schemes, but information on the performance of existing projects that will reduce greenhouse gas emissions in other sectors (e.g. waste, agriculture, livestock, land use) included in the AFM is also added.

For actions related to energy and mobility, projects, investments and sponsorship provided for in the following plans have been included:

- The National Recovery and Resilience Plan (NRRP) in its current version (endorsed by the European Council in 2021, with some budget reductions already foreseen in some investments under the RRP under review to be submitted to the European Commission for approval).
- The approved projects or project categories of the European Structural and Investment Funds (from the regular EU budget, i.e. the Multiannual Financial Framework 2021-27).
- The approved Just Transition Plan, with the budget currently secured for the actions of this Plan.
- The funding provided by the Connecting Europe Facility.
- Additional investments or costs of sustainable mobility foreseen in the national budget of the Ministry of Transport, Communications and Works.

Table 5.31 presents the list of investments planned in Community and national funds. In order to understand the contents of this table, it is important to note the following:

i. The list of RRP projects is more detailed because the RRP investments and reforms are specific and have clear timelines for implementation. The investments foreseen in the Structural Funds are listed in a somewhat more centralised way.
ii. The second column of Table 5.31 shows the public budget of these funding programmes, i.e. the amount coming from public (national and European) funds, while the third column shows the estimated total cost, which includes public and private investments. Some of the projects presented in this table are direct public sector investments, so that the amounts foreseen in the public budget (second column of the table) are equal to the total investment cost (third column). Other projects on this list are private sector support programmes, where the public budget provides between 50 % and 85 % of the total investment. For these projects we calculate their total (public + private) investment costs, so the third column of the table contains amounts that are larger than those shown in the second column. The exact intensity of public grants in each support programme is different and has been calculated per programme on the basis of information from the respective government authorities implementing them.
iii. Many of the investments in energy renovations provide financing both for energy saving interventions (e.g. roof thermal insulation, switching of frames, conversion of buildings to nearly zero energy consumption, etc.) and for the installation of photovoltaics in buildings. Therefore, part of the funds allocated should be allocated to energy efficiency investments and another to renewable energy investments. This is presented in the last two columns of Table 5.31. The allocation of funds is different for each investment because it depends on the type of interventions supported by each project. For example, building renovations supported by the RRP have different requirements than the corresponding renovations supported by the Structural Funds. The distribution of investment amounts between energy saving and renewable energy measures was made on the basis of recent information from the Ministry of Energy, Commerce and Industry.

Theoverall picture from Table 5.31 is that more than EUR 4 billion in current prices is already foreseen (and calculated in the MIS of the present NECP) for Cyprus's green energy transition. More than half of these funds (over EUR 2 billion) will be allocated to the country's electricity interconnection, which is due to be operational by the end of this decade and which will significantly enhance Cyprus' energy security and the penetration of electricity from renewable sources, especially after 2030. Sustainable mobility and electric mobility will account for almost a quarter of the total funds, or around EUR 1,1 billion. Energy efficiency investments in buildings and industry will receive comparatively lower amounts, just over EUR 250 million, by 2030. This is why energy renovations need to receive stronger support in the AFM, as described in the next section.

Table 5.28. List of main investments or investment categories related to energy transition provided for in Community and national funds in Cyprus.

Recovery and Resilience Plan

Measure/Category of Measures	Public Resources (EUR	(EUR	Total Part of budget Budget for savings energy production (EUR million)	Part of the RES budget (EUR million)
Renewable Energy Grants upgrades to SMEs, wider public sector, NGO	40	80	32	48
Grants for RES energy upgrades in residential buildings	30	60	12	48
Additional grants for renewable energies upgrades to residential buildings	40	80	16	64
Grants for RES energy upgrades to local authorities	9	9	4	5
Reducing CO2 emissions in enterprises and organisations	5	8	7	2
Energy upgrades in public buildings and water abstraction stations	11	11	8	3
Smart Grid in Pan/Cyprus	2	2	0	2
Smart meters	35	35	18	18
EuroAsia Interconnector	100	200	0	200
Sustainable Mobility	32	32	32	0
Electric vehicles – Grants for charging stations with PV	2	3	0	3
Electric Vehicles – Grants for Vehicle Purchase	40	232	232	0
Electric vehicles – Installation of points State	5	7	7	0
TOTAL	**350**	**759**	**366**	**393**

European Structural and Investment Funds 2021-27 (NATURAL Programme)

Measure/Category of Measures	Public Resources (EUR	(EUR	Total Part of budget Budget for savings energy production (EUR	Part of the RES budget (EUR
Energy upgrades in schools and public buildings	75	75	60	15
Energy upgrades in schools and private buildings	75	125	100	25
Installation of PV in camps YEI/Cyprus	32	32	0	32
Sustainable mobility	150	150	150	0
TOTAL	**332**	**382**	**310**	**72**

Table 5.31 (continued)

Just Transition Plan [funds included in European funds up to May 2023]

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR	Part of budget for energy savings (EUR million)	Part of the RES budget (EUR million)
Grant Plan for the Installation of Energy Storage Systems 300 MWh – Phase 1	40	150	0	150
Grant scheme for the use of renewable energy sources in undertakings with heavy energy footprint	20	66.7	0	67
SSSC installation (Static Synchronous Series Compensators) number of transmission substations	10	12	0	12
Installation and upgrade of transmission substations	50	60	0	60
Upgrading of transmission lines with method of changing the pipeline (reconductoring)	10	12	0	12
Development of an Optical Fibre Network in Distribution for the needs of the energy network (phase 1)	17	17	0	17
System automation Medium voltage distribution and installation SCADA/ADMS	27	27	0	27
GIS to support the digital transformation of the Networks and the operation of the digital one-stop-shop in the RES connection	5	5	0	5
TOTAL	**179**	**350**	**0**	**350**

Connecting Europe Facility

Measure/Category of Measures	Public Resources (EUR	Total Budget * (EUR	Part of the budget for savings energy production (EUR million)	Part of the RES budget (EUR million)
EuroAsia Interconnector	657	2000	0	2000

* With an estimate of the financial contribution of the other project actors

Resources for Sustainable Mobility from the State Budget

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR	Part of the budget for energy savings (EUR million)	Part of the RES budget (EUR million)
Sustainable mobility projects	700	700	700	0

Total Existing Investment from European and National Resources

Table 5.31 (continued)

Measure/Category of Measures	Public Resources (EUR million)	Total budget (EUR million)	Part of the budget for energy savings (EUR million)	Part of the RES budget (EUR million)
Investments exclusively for Savings				
Energy production				
Investments exclusively for RES	970	2585	0	2585
Investments for the promotion of RES + Energy saving	322	485	256	230
Investing in sustainable mobility	882	882	882	0
Investment in electro-mobility	45	239	239	0
TOTAL	**2218**	**4190**	**1376**	**2814**

5.3.1.2. Additional public investment

In order to assess the investments required in addition to those in the previous section for the implementation of the AFM scenario of the revised NECP, a dual approach was followed:

(A) Initially, information was collected on the additional funds planned by government authorities for green actions. These comprise:

- The additional investment proposed by the Government of Cyprus to the European Commission for the REPowerEU chapter of the revised National Recovery and Resilience Plan. This information was provided by the Ministry of Finance (Directorate-General for Development) at the end of May 2023. We have included investments directly related to the green energy transition as relevant, while we have not included proposed investments with potentially significant but unknown impacts in the short and medium term, e.g. funds for research projects on green technologies. The public funds involved amount to EUR 94 million and are expected to mobilise additional private capital up to a total investment of EUR 191 million.
- Projects included in the country's approved Just Transition Plan (JTM), for which only part of their budget has already been included for funding from the Just Transition Fund (see Table 5.31 above). It is assumed that all investments included in the country's official SRP88 will be made and that those for which only part of the budget has already been foreseen, the remaining funds will be provided either through national envelopes or through other resources until 2030. Such projects include an additional sponsorship plan for electricity storage and several investments to modernise the electricity distribution system. Public funds in this category amount to EUR 96 million and additional private capital is expected to be mobilised up to a total investment of EUR 217 million.
- Projects aimed at alleviating energy poverty with the help of the newly decided Social Climate Fund (SCF)89, which is planned to start one year before the introduction of the new ETS, i.e. in 2026. In accordance with the relevant Regulation, EUR 131 million has been allocated to Cyprus for the period 20262032, which must be supplemented by an additional 25 % of national co-financing. The Member

88 See https://thalia.com.cy/en/strategic-en/territorial-just-transition-plan/
89 See the final decision of the EU colleges on 8 February 2023: https://data.consilium.europa.eu/doc/document/ST-6207-2023-INIT/en/pdf.

members shall be allowed to use up to 37.5 % of these funds for direct income support to vulnerable households and businesses. Therefore, assuming that 35 % will be allocated to income support, we assume here that 65 % of the funds can be provided for programmes supporting vulnerable population for energy efficiency and sustainable mobility investments. As the CCC Regulation allows expenditure to be incurred until the end of 2033, we assumed that most funds (but not all) will be used in Cyprus until 2030 and will be mainly directed towards investments in buildings. This leads to an approximate estimate of EUR 100 million of public funds that can be allocated to additional energy efficiency investments through the CBC. With an average aid intensity of 80 % (which is the normal subsidy provided to vulnerable households/businesses), total public and private investment could reach EUR 125 million from this source of financing.

- Investments in the areas of energy saving in industry, reduction of GHG emissions in the broader business sector and rehabilitation of disposal and landfills, as described in previous chapters of this NECP, with public funds allocated per project category amounting to EUR 18, 25 and 53 million respectively.
- Additional investments reported by the Ministry of Transport, Communications and Works by the end of May 2023, aimed at promoting sustainable mobility and achieving the modal shift foreseen in the AFM scenario. Such measures shall include: actions to promote urban cycling and micro-mobility, pricing policies for the activation of Park MontenegRide and car-pooling systems, as well as urban parking management, the extension of advanced telematics services to public transport, the expansion of smart traffic lights and the upgrading of bus stations and stops, the establishment of low-emission and low-speed zones in city centres and various information campaigns and public education targeting large groups. These measures amount to approximately EUR 53 million (public funds) by 2030, to be complemented by an additional EUR 250 million that bus companies operating in Cypriot cities could invest in the purchase of additional modern buses in addition to the minimum requirements set out in the contracts signed with the Cypriot government.

Table 5.32 lists the additional investments mentioned above, estimated at EUR 150 million of public funds and EUR 434 million of total public and private investment, almost exclusively targeting energy savings90.

It90 should be noted that the projects for the rehabilitation of landfills and landfills aim to reduce GHG emissions and not directly to energy use. Therefore, in Table 5.32, their budget has not been broken down between energy savings and RES.

Table 5.29. List of planned investments related to Cyprus' energy transition from national and European funds, in addition to those included in the AFM.

Recovery and Resilience Plan (proposed REPowerEU chapter under review) LPIS until 28 May 2023)

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR	Part of budget for savings energy (EUR	Part of the RES budget (EUR million)
New "save – upgrade" plan to Residential	30	50	40	10
Grants for RES energy upgrades in residential buildings	35	70	14	56
Grants for RES energy upgrades large enterprises	10	20	4	16
Grants for renewable energy upgrades to local authorities; broader public sector	11	11	4	7
Electric Vehicles – Grants for Purchase checked	8	40	40	0
TOTAL	**94**	**191**	**102**	**89**

Just Transition Plan [funds not included in European funds by May 2023, may be included in other European/national funds until 2030]

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR	Part of budget for savings energy (EUR	Part of the RES budget (EUR million)
Grant Plan for the Installation of Energy Storage Systems 300 MWh – Phase 2	40	150	0	150
Development of an Optical Fires Network in Distribution for the needs of the energy phase)	28	28	0	28
Automation of the medium voltage distribution system and installation of a system SCADA/ADMS	21	21	0	21
GIS to support the digital transformation of the Networks and the running the digital one-stop-shop in RES connection	7	18	0	18
TOTAL	**96**	**217**	**0**	**217**

Social Climate Fund 2026-2030

Measure/Category of Measures	Public Resources (EUR	Total Budget * (EUR	Part of budget for savings energy (EUR million)	Part of the RES budget (EUR million)
Additional grants for energy upgrading of buildings (including vulnerable households)	**100**	**125**	100	25

Additional resources from the State budget

			Part of	Part of the RES

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR million)	budget for savings energy production (EUR million)	budget (EUR million)
Additional sustainable mobility projects	53	303	303	0
Energy saving projects in industry	18	36	36	0
Allocation Plan for Reducing Emissions in Enterprises	25	42	33	8
Rehabilitation of landfill and HYTY	53	53		
TOTAL	**150**	**434**	**373**	**8**

(B) Specific for energy renovations in buildings, the additional funds shown in Table 5.32 are insufficient to achieve the energy savings provided for in this AFM. Therefore, a specific analysis was carried out on the additional building renovations (and the corresponding chapters) necessary to enable energy savings in line with the AFM. To this end, data collected by the Ministry of the Interior on:

- The number of renovation works granted so far.
- The estimated final energy savings per renovation.
- The aid intensity per category of renovation, i.e. the percentage of the total investment covered by the public grant depending on whether the renovation is complete or partial, aid to “normal” or vulnerable households, etc.

An estimate wasthen made of the amount of renovations to be financially supported by 2030. In summary, as shown in Table 5.33, our assessment showed that, in addition to the funds planned in the revised RRP and the funds to be made available by the CBC shown in Table 5.32 above, additional public funds of up to EUR 100 million should be made available by 2030 for renovations of private housing as well as buildings in the public sector and private enterprises. The total investment mobilised can exceed EUR 200 million. Such measures, in the form of both direct public investment and support programmes in the private sector, will also include the installation of photovoltaic panels – but the main part of these funds should be allocated to energy efficiency actions. Together with the investments from the RRP and the CBC, these funds correspond to around 3000 building renovations per year – in private homes, businesses, the public sector and vulnerable households – for each year of the period 2024-2030. This requires a strong acceleration (doubling to tripling) of the current building renovation rates.

Table 5.30. Additional investment required from national and European resources to implement the AFM.

Additional necessary resources for energy upgrading of buildings

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR million)	Part of the budget for energy savings (EUR	Part of the RES budget (EUR million)
Additional grants for energy upgrading of buildings (including vulnerable households)	**100**	**208**	167	42

By combining the information in the previous two tables, Table 5.34 shows the total additional investment needs for the implementation of the AFM scenario. This amounts to more than EUR 500 million of public funds, which are intended to mobilise almost EUR 1,2 billion of total public and private investment (in current prices) by 2030.

Table 5.31. Total investment required from national and European resources to implement the AFM.

Total additional investment needed from European and national resources

Measure/Category of Measures	Public Resources (EUR	Total budget (EUR million)	Part of budget for savings energy production (EUR million)	Part of the RES budget (EUR million)
Investments exclusively for Energy Saving	18.0	36.0	36.0	0.0
Investments exclusively for RES	96	217	0	217
Investments in promotion of RES + energy savings	311	526	362	164
Investing in sustainable mobility	53	303	303	0
Investment in electro-mobility	8	40	40	0
Investments for the rehabilitation of illegal landfills and landfills	53	53		
TOTAL	**540**	**1175**	**742**	**380**

5.3.4. Summary of additional investment needs across the economy

In addition to what has been mentioned in the case of electricity supply in Section 5.3.2, the AFM foresees that the level of economy-wide investment required by 2030 to implement all these measures is somewhat higher than in the BMP scenario, but not very high, as the CoM already includes a very significant number of green investments. Table 5.35 shows these estimated investment needs. Displays investments by category in different columns:

- In columns (1) and (2), it presents the estimated investments for the two BMs and AFM.
- Columns (3) and (4) show the difference in investments between the two scenarios, in absolute and percentage terms respectively.

Columns (5) to (9) then break down the investments needed to implement the AFM (in addition to those provided for in the MB) into:

- Public investment – column (5).

- Total public and private investment – column (6) – to be mobilised due to the public funds shown in the previous column.

These two columns reproduce the figures shown in Table 5.34 above, but with a more detailed breakdown by investment category.

- Column (7) of Table 5.35 shows additional private investment that is projected to materialise independently of public funds, as a result of broader policies and measures in the AFM scenario. In fact, this column shows that there will be lower private investment in private cars of around one billion euro by 2030, thanks to the implementation of sustainable mobility measures and the new ETS, and lower investments of around EUR 120 million in the building sector (e.g. fewer purchases of new solar thermosets or energy-consuming appliances) thanks to the adoption of energy efficiency measures in the AFM, which require fewer purchases of energy-using equipment.
- Column (8) summarises the chapters shown in the three previous columns and is identical to column (3).
- The last column (9) represents the total investment in the previous column as a fraction of the projected cumulative GDP of Cyprus until 2030.

Noting each investment category in Table 5.35, it is worth noting the following:

Electricity: The energy generation and electricity storage sectors need slightly higher investments due to the additional development of energy storage capacity in the FSM. Investments in electricity generation are slightly higher than in the CPM: energy efficiency measures reduce the need for electricity demand from thermal plants in the AFM compared to the CPM, but on the other hand the implementation of the AFM leads to slightly more investments in PV than in the CPM. Investments in energy storage are also higher in the AFM. Finally, there is no additional investment in the electricity interconnection because the assumption that the interconnection will be completed in 2029 is included in both CPM and AFM.

Mobility: The shift towards sustainable modes of transport is an important component of a decarbonisation policy, and this is reflected in the AFM. The FSM's additional investment in public transport, non-motorised mobility and micro-mobility is expected to exceed EUR 300 million. However, these additional investment needs – expected to be covered by both public and private resources – are compensated by a reduction in purchases of new vehicles, which saves (mainly private) expenditure of around one billion euro for the period 2023-2030.

Buildings and Industry: Energy renovations in residential and tertiary sector buildings, if actively implemented, will require by 2030 additional investment of over EUR 400 million. This amount is consistent with the level of energy savings in households and services calculated in the AFM and is expected to come from a combination of public and private investment. These amounts are the result of a recent analysis of the building renovation plans already implemented, as carried out by the Ministry of Energy and Industry and external consultants, as well as a previous collection of data and studies carried out for the Ministry of the Interior as part of previous Technical Assistance studies91. Similarly, investments in industry to achieve energy savings and reduce emissions foreseen in the FSM amount to EUR 118 million for the period 2023-2030. This includes the rehabilitation of waste disposal and landfills to reduce methane emissions.

Overall, as shown in Table 5.35, the implementation of the AFM is projected to lead to very low additional (relative to the MB) investment across the economy for the period up to 2030 of less than EUR 100 million' 2022 (corresponding to less than 0.5 % of GDP in 2022). If one focuses on public capital alone, total additional investment up to 2030 is estimated at EUR 540 million in 2022 (or 1.9 % of GDP in 2022). There are two main reasons for the very low increase in overall investment needs:

For91 a summary, see Zachariadis T., Michopoulos A., Vougiouklakis Y., Piripitsi K., Ellinopoulos C. and Struss B., Determination of Cost-Effective Energy Efficiency Measures in Buildings with the Aid of Multiple Indices. *Energies* 11 (2018), 191; doi: 10.3390/en11010191. The full technical assistance study is available on thewebsite of the Ministry of the Interior.

- The reduction of expenditure on new cars due to the shift towards public and non-motorised transport foreseen in this scenario. It is projected that the growth of the total vehicle fleet will be slower in the VMS compared to the RMS, leading to 7 % fewer motor vehicles in the first scenario by 2030 and around EUR 1 billion lower expenditure on the purchase of these vehicles. This amount goes well beyond the funds needed to promote sustainable transport through various actions currently being prepared by the Government of Cyprus and outlined in the previous section. It should be recalled that most expenditure on motor vehicles is private (apart from some public subsidies for the purchase of electric vehicles), while a large part of sustainable mobility investments come from public funds.
- Comparatively moderate energy savings (and corresponding moderate emission reductions) of the TSG scenario compared to the CoM. While it is easy to consider AFM assumptions as unambitious, it must be borne in mind that the implementation of additional energy renovations and sustainable mobility interventions is hampered not only by economic reasons but also by constraints on administrative capacity and labour shortages. Even the number of building renovations assumed in the AFM, as mentioned in the previous section, is well above the number of renovations carried out in recent years. Assuming additional funds for support schemes for building renovations and additional resources for investments in sustainable mobility projects may lead to unrealistic outcomes in the AFM.

Of the EUR 540 million public investment shown in column (5) of Table 5.35, about half should focus on energy renovations of public and private buildings as well as the replacement of energy-using equipment. Given the significant amount of resources required, an effort should be made to come from additional EU funds and/or loans.

However, to accelerate the deployment of energy renovations of buildings and the shift towards less energy-intensive mobility, which are also key objectives of the RePowerEU initiative and the European Green Deal, financial incentives have proven to be insufficient. They need to be complemented by smart policies and measures that can understand the main behavioural barriers to policy implementation, encourage energy-saving behaviour and induce consumers and businesses to engage in interventions that otherwise neglect or hesitate to adopt, even though their effectiveness is well documented in expert circles.

Table 5.32. Investments in the period 2023-2030 to implement the Scenario with Additional Measures (EC) EUR' 2022).

	Public investment in private				Analysis of additional investments for the implementation of the AFM				
Sector	**Scenario with Existing Measures (FAM)** (1)	**Scenario with Additional Measures (AFM)** (2)	**Additional investments in AFM (public + private)** (3)	**% difference** (4)	**Additional Public Resources** (5)	**Additional investment (public + private) generated by public funds** (6)	**Additional private investment independent of public funds** (7)	**Total additional public + private investment** (8) = (3)	**% of total GDP 2023-2030** (9)
Generation of electricity (new thermal plants, RES, etc.)	1625	1691	67	4 %	56	67		67	0.02 %
Energy storage (pumped storage of batteries)	150	300	150	100 %	40	150		150	0.06 %
Gas infrastructure (LNG regasification plant)	272	272	0	0 %	0	0		0	0.00 %
Electrical Interconnection	2000	2000	0	0 %	0	0		0	0.00 %
Sustainable Mobility (public coaches, micromobility, low-emission zones, etc.)	1427	1731	303	21 %	53	303		303	0.11 %
Private transport (clean vehicles and fuels, charging stations, e-mobility, etc.)	11546	10572	— 974	— 8 %	8	40	— 1014	— 974	— 0.36 %
Residential and commercial buildings (energy upgrades) *	477	897	420	88 %	276	464	— 45	420	0.16 %
Industry * *	75	193	118	157 %	106	118		118	0.04 %
Total Investment	**17572**	**17656**	**84**	**0.5 %**	**540**	**1142**	**— 1058**	**84**	**0.03 %**

* Includes public investment and public sponsorship for private sector projects, as well as private investments in heat pumps and solar water heaters. Other private investments in energy savings made without public support are not included.

* * projects for the rehabilitation of waste sites are also included. It does not include purely private investments made in industry without state support.

Note: Investments that reduce greenhouse gas emissions in sectors related to the circular economy, land use and afforestation are not included in this table, because it is not yet clear how large the planned additional investments are and which part of the investments can deliver significant emission reductions.

To this end, for the implementation of the AFM scenario, it is desirable for the Cypriot government to be supported by a team of behavioural science experts, with sufficient prior experience in supporting policy decisions. The creation of a Group of Good Economics, as is the case with many governments around the world, to implement its know-how, can significantly help the government to accelerate Cyprus' green transition, in line with the priorities of RePowerEU and the European Green Deal.

5.4. Impact of planned policies and measures on other Member States and on regional cooperation

at least until the last year of the period covered by the plan, including a comparison with projections based on existing policies and measures

5.4.1. Regional infrastructure projects

A key issue that emerges indirectly in the analysis is that of regional cooperation. The Cypriot NECP has a regional impact directly connected to two large blocks of infrastructure, which will allow electricity trade through EuroAsia Interconnector on the one hand and gas trade through the EastMed pipeline (or an alternative interconnection) on the other hand. The modelling effort has made an attempt to illustrate the benefits offered by EuroAsia Interconnector to the electricity supply system in Cyprus. However, as the systems of Greece and Israel are represented as simple nodes of electricity demand and supply, the conclusions drawn from these simulations have limitations.

In order to estimate the exchange of electricity between the three countries, separate electricity prices shall be adopted at each node. The volume of imported and exported electricity is then determined by the price difference between each node, limited only by the assumed net transmission capacity of the interconnector sections. The limit value for the Cypriot system is calculated intrinsically from the OSeMOSYS energy model used in this NECP, based on the cost of available technologies and fuels at each point in time. The equivalent import prices are then calculated on the basis of the price difference observed for non-domestic electricity between Cyprus and Greece before the war in Ukraine. Similarly, the export price is calculated on the understanding that there is a 20 % difference between the average import prices and the average export prices. The reason for this is twofold. First, electricity imports will take place in periods of high demand when prices are high compared to exports, which will usually take place in periods of excess production when prices are lower. Second, the transmission losses of the interconnector will also affect the price-export relationship.

An important limitation with the approach taken is that import/export prices of electricity do not change throughout the year. In fact, there are seasonal and daily variations in the electricity limit values depending on the load profile and the availability of technology in each respective system at each point in time. Therefore, although the average annual electricity costs in Cyprus are higher, there are cases where it falls below the assumed annual export prices. For example, production from photovoltaics at very low cost may occur during the stomach, which can then be exported for an economic benefit. Moreover, the approach presupposes that there is an infinite demand for electricity in the external systems whenever excess electricity generation is available in the Cypriot system. For example, when there is excessive solar photovoltaic or wind production that cannot be absorbed by the system, it can be exported rather than curtailed. However, this presupposes that Greece and Israel have an equivalent demand that can cover this exceedance, which may not necessarily be the case.

Table 5.33. Hypothetical import and export prices of electricity and calculated average electricity costs in Cyprus in the WAM scenario (EUR 2016/MWh).

	2030
Introduction	79
Export	63
Cyprus	93

The assumptions made in the BMBs and AFMs lead to projected net electricity exports of 20 and

71 GWh respectively in 2030, which is considered the first year of full operation of the electricity interconnection project. Electricity exports increase significantly in the period after 2030 in all scenarios.

Although the domestic production of natural gas and the possible development of the East Med pipeline are not explicitly taken into account in this analysis, it is expected that the project will not have a direct impact on the island's energy mix. The development of the project is not within the timeframe of this NECP, as it is not expected to be operational before 2030. To the extent that natural gas, whether imported or domestic, will be supplied to the internal market at international market prices, the cost competitiveness of gas-fired technologies will remain unaffected, especially as the CoM and AFM of this study assume low gas prices for national electricity production.

However, revenues stemming from potential exports of domestic gas may be recycled into the Cypriot economy, thus affecting the purchasing power of economic operators. Similarly, the revenues generated by the State could to some extent be used to support clean energy technologies. For example, the existence of financial incentives could further promote investments in technological options that facilitate the decarbonisation of the system. These technologies include, but are not limited to, renewable energy and storage technologies, electric vehicles, heat pumps or energy efficiency measures.

The efforts of the national authorities in the near future should be directed towards reaching an agreement with neighbouring countries on the assumptions to be used for large infrastructure projects. This is crucial in the case of EuroAsia Interconnector, especially as it can have a drastic effect on the Cypriot energy prospects. However, assumptions about the size and timing of development of other more uncertain projects, such as the EastMed pipeline that could link the gas markets of Israel, Cyprus and Greece (and possibly Italy), or alternative gas interconnection options, potentially including Egypt, also need to be agreed as they affect the projected energy balance and trade potential of these countries.

5.4.2. Market integration

A long-term cost optimisation model was used to analyse the scenarios. These types of models assume that there is a perfect, functional and predictable market in that system. This in turn implies that there is perfect competition between market participants, who provide energy at marginal production costs, while perfect foresight allows market participants to be fully aware of all present and future circumstances affecting the costs at which they

they supply or purchase energy. Essentially, as optimisation models require perfect market conditions, the results of the model are presented in terms of potential improvement, in order to recognise the extent to which cost-competitive investments of certain technological options are economically viable. The EU has attached particular importance to the full liberalisation of the internal electricity market.[92] Please note that plans to fully implement a competitive electricity market in Cyprus are progressing gradually. Once fully implemented, the electricity market could create an enabling environment for investors, which could in turn encourage further investments in electricity generation and storage infrastructure.

For example, in the AFM, when taking into account the relevant support schemes, two 40 MW pumped storage projects each are considered cost-competitive, not only for energy arbitrage, but also for providing an operational reserve. This centralised storage option may store electricity from RES variables in high efficiency periods, as a preferred alternative compared to RES cut-outs. In addition, if the flexibility of existing thermal plants in Cyprus does not improve and the production from thermal plants cannot be reduced or even easily closed to accommodate variable RES production, storage may

92 See e.g. European Union, 'Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 Concerning Common Rules for the Internal Market in Electricity and Repealing Directive 2003/54/EC (Text with EEA Relevance)', Pub. L. No. 32009L0072, OJ L 211 (2009),http://data.europa.eu/eli/dir/2009/72/oj.

also be useful for the operation of these plants. For example, the most efficient plants in Cyprus are combined cycle gas turbines, but these cannot be continuously switched on and off as operating costs would increase dramatically. On the contrary, they could potentially operate continuously for long periods of time, even at low loads, using storage infrastructure.

Therefore, it can be argued that central storage can work for the benefit of the whole system. Whether the control of the central storage should be carried out by the Transmission System Operator (TSO) or left to the market is currently the subject of political and technical consultation between the State authorities.

Although the development of lithium-ion batteries is capital-intensive, it is considered economically optimal to develop also this storage option in CPM and AFM, as it allows for additional competitive production from variable renewable energy options. In this case, a lower system cost is achieved through arbitrage time, where cheap electricity from solar photovoltaics can be used to charge storage during the day and then used in peak periods of demand in the evening. The provision of ancillary services, in terms of operational reserves, can further increase the attractiveness of this technology as an option. Lithium-ion batteries can be developed at both central and distributed levels – for example, in residential or commercial buildings. In order for the technological option to provide network support, the deployment of an appropriate electronic infrastructure is a prerequisite, as it requires the operation of a smart grid, which will have a cost. In both BMMs and AFMs of this draft revised NECP, the installation of 400.000 smart meters is planned to be completed by the end of 2026.

This is reinforced by a recent European Commission Recommendation93 (14/3/2023) on energy storage, which states that Member States should accelerate the development of storage facilities and other flexibility tools on islands, remote

93https://energy.ec.europa.eu/news/commission-recommendations-how-exploit-potential-energy-storage-2023-03-14_en regions and outermost regions of the EU with insufficient grid, capacity and unstable or interurban connections to the main grid, for example through support schemes for flexible low-carbon resources, including storage, and a revision of grid connection criteria to promote hybrid energy projects (i.e. renewable energy generation and storage). These recommendations will be addressed by the MEEB and CERA.

Furthermore, the creation of a competitive electricity market at home is important for the functioning of a regional electricity market. The establishment of an electricity interconnection of Cyprus, mentioned above, may allow an increase in the share of renewable energy in the electricity supply sector. This increased RES development presupposes that at times when production exceeds domestic demand, the excess can be exported to Israel or Greece. Similarly, it is considered that in times of low RES efficiency, electricity can be easily sourced from these neighbouring systems. This requires a framework through which the systems involved can trade at cost-efficient prices and volumes. Electricity authorities need to prepare for amending the Electricity Market Rules and related market systems to enable the interconnection of Cyprus’ electricity market with the EU electricity market. Such rules should preferably be adopted by CERA already in 2024.

Other regulatory interventions, such as the creation of a regulatory framework for energy communities, the regulations on charging operation for electric vehicles and the rules on priority dispatch and aggregation, are also important factors for Cyprus’ green energy transition and can contribute to achieving the results of the AFM scenario. More detailed information on Cyprus’ measures on these aspects is provided in the respective chapters of the revised NECP.

Part 2

List of parameters and variables used in section B of the national plans

1. **General parameters and variables**
2. Population [million]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Population	**Million**	0.905	0.905	0.913	0.921	0.929	0.937	0.944	0.951	0.957	0.964	0.992	1.014

3. GDP [euro million]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
GDP	**EUR Millions**	22984	24294	25023	25849	26667	27334	27963	28522	29004	29498	32362	36362

4. Sectoral gross value added (including main industrial, construction, services, and agriculture sectors) [euro million]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Sectorial gross value added	**EUR Millions**	22984	24294	25023	25849	26667	27334	27963	28522	29004	29498	32362	36362

5. Number of households [thousands]
6. Number of passenger-kilometres: all modes, i.e. split between road (cars and buses separated if possible), rail, aviation and domestic navigation (when relevant) [million pkm]

			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	**Number of passenger-kilometers**	**Billion Veh-km**	7.831	7.956	8.089	8.224	8.362	8.501	8.643	8.788	8.934	9.084	9.809	10.5
	Public road transport	**Billion Veh-km**	0.104	0.105	0.106	0.108	0.11	0.112	0.114	0.115	0.117	0.119	0.129	0.138
	Private cars	**Billion Veh-km**	7.517	7.637	7.764	7.894	8.026	8.16	8.296	8.434	8.575	8.718	9.415	10.08
	Motorcycles	**Billion Veh-km**	0.211	0.215	0.219	0.223	0.226	0.23	0.234	0.238	0.242	0.246	0.266	0.284
WEM	**Number of passenger-kilometers**	**Billion Veh-km**	7.831	7.956	8.089	8.224	8.362	8.501	8.643	8.788	8.934	9.084	9.809	10.5
	Public road transport	**Billion Veh-km**	0.104	0.105	0.106	0.108	0.11	0.112	0.114	0.115	0.117	0.119	0.129	0.138
	Private cars	**Billion Veh-km**	7.517	7.637	7.764	7.894	8.026	8.16	8.296	8.434	8.575	8.718	9.415	10.08
	Motorcycles	**Billion Veh-km**	0.211	0.215	0.219	0.223	0.226	0.23	0.234	0.238	0.242	0.246	0.266	0.284
WAM	**Number of passenger-kilometers**	**Billion Veh-km**	7.831	7.956	8.012	8.068	8.124	8.18	8.236	8.292	8.348	8.404	8.668	8.931
	Public road transport	**Billion Veh-km**	0.104	0.105	0.111	0.118	0.125	0.132	0.139	0.145	0.152	0.159	0.178	0.195

	Private cars	Billion Veh-km	7.517	7.637	7.684	7.732	7.78	7.828	7.876	7.923	7.971	8.019	8.258	8.496
	Motorcycles	Billion Veh-km	0.211	0.215	0.217	0.218	0.219	0.221	0.222	0.223	0.225	0.226	0.233	0.24

7. Freight transport tonnes-kilometres: all modes excluding international maritime, i.e. split between road, rail, aviation, domestic navigation (inland waterways and national maritime) [million tkm]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Freight transport tonnes-kilometres	Billion Veh- km	2.128	2.025	2.059	2.093	2.128	2.164	2.2	2.237	2.274	2.312	2.496	2.672
Trucks	Billion Veh- km	2.128	2.025	2.059	2.093	2.128	2.164	2.2	2.237	2.274	2.312	2.496	2.672

8. International oil, gas and coal fuel import prices [EUR/GJ or euro/toe] based on the Commission's recommendations

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
International Fuel Prices	EUR/GJ												
Oil	EUR 2020/GJ	10.5	15.4	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72
Gas (NCV)	EUR 2020/GJ	15.1	33.2	24	14.6	13.2	8.757	4.693	4.693	4.693	4.693	4.693	6.571

9. EU-ETS carbon price [EUR/EUA] based on the Commission's recommendations

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Carbon price ETS sectors	EUR 2020/ton CO2	22984	24294	25023	25849	26667	27334	27963	28522	29004	29498	32362	36362

10. Exchange rates to EUR and to USD (where applicable) assumptions [euro/currency and USD/currency]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Exchange rate to EUR and to US dollar	EUR/currency and/or USD/currency	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13

2. Energy balances and indices

2.1. Energy supply

(a) Domestic production by fuel type (all energy products produced in significant quantities) (ktoe (ktoe) (kilotonnes of oil equivalent))

	Supply type	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BU	Solids	ktoe												
	Oil	ktoe												
	Natural gas	ktoe												
	Nuclear	ktoe												
	RES	ktoe	243,1	264,5	292,1	322,1	347,3	365,3	374,1	395,6	452,2	470,2	584,7	741,8
WEM	Solids	ktoe												

	Oil	ktoe												
	Natural gas	ktoe												
	Nuclear	ktoe												
	RES	ktoe	255,4	269,6	292,4	310,8	329,9	338,5	346,7	356,3	382,8	398	583,5	859,1
WAM	Solids	ktoe												
	Oil	ktoe												
	Natural gas	ktoe												
	Nuclear	ktoe												
	RES	ktoe	255,4	269,6	292,5	311,1	329,6	348,4	355,9	370,8	403,8	418,7	561,1	833,5

(b) Net imports by fuel type (including electricity and allocation to intra-European and extra-European net imports [ktoe]

	Fuel type	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Net Imports	ktoe	2026	2161	2167	2091	2039	2076	2113	2132	2093	2114	2044	1858
	Solids	ktoe												
	Oil	ktoe	2026	2161	2167	1631	1292	1295	1294	1293	1288	1276	1132	945,6
	Natural gas	ktoe	0	0	0	460	746,4	781,2	819,1	838,4	804,4	837,7	912,4	912,4
	Electricity	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
WEM	Net Imports	ktoe	2026	2130	2117	2047	1992	2017	2033	2037	2020	2008	1791	1446
	Solids	ktoe												
	Oil	ktoe	2026	2130	2117	1587	1337	1297	1294	1287	1273	1250	1081	893
	Natural gas	ktoe	0	0	0	460	655,1	719,7	739,8	750,8	747,2	759,9	754,9	640,8
	Electricity	ktoe	0	0	0	0	0	0	0	0	0	— 1,74	— 45,8	— 87,8
WAM	Net Imports	ktoe	2026	2130	2115	2040	2002	2004	1997	1963	1909	1861	1606	1219
	Solids	ktoe												
	Oil	ktoe	2026	2130	2115	1580	1356	1271	1251	1220	1185	1142	905,7	693,2
	Natural gas	ktoe	0	0	0	460	646,4	733,6	745,4	743,1	723,8	724,2	743,6	613,5
	Electricity	ktoe	0	0	0	0	0	0	0	0	0	— 6,14	— 43,4	— 87,2

(c) Exclusion from imports from third countries [%]

	Dependency	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Import Dependency	%	88 %	88 %	87 %	86 %	85 %	84 %	85 %	84 %	82 %	82 %	78 %	71 %
WEM	Import Dependency	%	87 %	87 %	87 %	86 %	85 %	85 %	85 %	85 %	84 %	83 %	75 %	63 %
WAM	Import Dependency	%	87 %	87 %	87 %	86 %	85 %	85 %	84 %	84 %	82 %	81 %	74 %	59 %

(e) Gross internal consumption by fuel type source (including solids, of all energy products: coal, crude oil and petroleum products, natural gas, nuclear energy, electricity, derived heat, renewables, waste) [ktoe]

	Consumption type	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Gross Inland Consumption	ktoe	2309	2463	2493	2440	2407	2457	2499	2536	2551	2589	2631	2601
	Solids	ktoe												
	Oil	ktoe	2026	2161	2167	1631	1292	1295	1294	1293	1288	1276	1132	945,6
	Natural gas	ktoe	0	0	0	460	746,4	781,2	819,1	838,4	804,4	837,7	912,4	912,4
	Nuclear	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Electricity	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Renewable energy forms	ktoe	243,1	264,5	292,1	322,1	347,3	365,3	374,1	395,6	452,2	470,2	584,7	741,8
	Other	ktoe	40,42	37,48	33,31	27,37	21,19	16,05	11,65	8,356	6,202	4,823	1,841	0,859
WEM	Gross Inland Consumption	ktoe	2321	2438	2443	2385	2343	2371	2392	2402	2409	2411	2376	2306
	Solids	ktoe												
	Oil	ktoe	2026	2130	2117	1587	1337	1297	1294	1287	1273	1250	1081	893
	Natural gas	ktoe	0	0	0	460	655,1	719,7	739,8	750,8	747,2	759,9	754,9	640,8
	Nuclear	ktoe	0	0	0	0	0	0	0	0	0	0	0	0

	Electricity	ktoe	0	0	0	0	0	0	0	0	0	— 1,74	— 45,8	— 87,8
	Renewable energy forms	ktoe	255,4	269,6	292,4	310,8	329,9	338,5	346,7	356,3	382,8	398	583,5	859,1
	Other	ktoe	40,42	37,48	33,32	27,4	21,21	16,04	11,64	8,366	6,202	4,792	1,786	0,792
WAM	Gross Inland Consumption	ktoe	2321	2438	2441	2378	2353	2369	2364	2341	2318	2283	2168	2053
	Solids	ktoe												
	Oil	ktoe	2026	2130	2115	1580	1356	1271	1251	1220	1185	1142	905,7	693,2
	Natural gas	ktoe	0	0	0	460	646,4	733,6	745,4	743,1	723,8	724,2	743,6	613,5
	Nuclear	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Electricity	ktoe	0	0	0	0	0	0	0	0	0	— 6,14	— 43,4	— 87,2
	Renewable energy forms	ktoe	255,4	269,6	292,5	311,1	329,6	348,4	355,9	370,8	403,8	418,7	561,1	833,5
	Other	ktoe	40,42	37,48	33,32	27,4	21,21	16,04	11,19	7,534	5,383	4,069	0,944	0,233

2.2. Electricity and heat

(a) Gross electricity generation [GWh]

		Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Gross electricity generation	GWhe	5118	5155	5341	5613	5902	6143	6385	6598	6832	7056	7847	9039
WEM	Gross electricity generation	GWhe	5071	5067	5160	5445	5548	5648	5773	5876	5970	6094	7507	9352
WAM	Gross electricity generation	GWhe	5071	5067	5162	5440	5619	5685	5742	5802	5903	5985	7264	9022

(b) Gross electricity generation per fuel (all energy products) [GWh]

	Fuel type	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Nuclear energy	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Solids	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil (including gas refinery)	GWhe	4351	4358	4317	1645	43,97	0,266	0	0	0	0	0	0
	Gas (including derived gases)	GWhe	0	0	0	2720	4453	4601	4808	4908	4739	4901	5094	4957
	Biomass-waste	GWhe	51,37	51,37	51,37	51,37	51,37	51,37	51,37	72,6	115,8	137,1	233	233
	Hydro (pumping excluded)	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Wind	GWhe	246,5	219,6	219,6	230,2	231,5	231	236,4	231,2	221,9	232,5	210,2	206
	Solar	GWhe	468,3	525,9	752,7	966,7	1123	1259	1289	1387	1755	1785	2310	3643
	Geothermal and other updates	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Other fuels (Hydrogen, Methanol)	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
WEM	Nuclear energy	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Solids	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil (including gas refinery)	GWhe	4310	4153	4027	1437	224,9	4,542	0	0	0	0	0	0
	Gas (including derived gases)	GWhe	0	0	0	2741	3914	4185	4275	4328	4336	4383	4337	3510
	Biomass-waste	GWhe	59,94	59,94	59,94	59,94	59,94	59,94	59,94	59,94	106,7	131,5	268,2	268,2
	Hydro (pumping excluded)	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Wind	GWhe	231,3	245,3	245,3	246,4	239,6	239,7	242,8	254,7	258,7	264,1	264,1	251,9
	Solar	GWhe	469,7	609,3	827,1	960,6	1110	1159	1195	1234	1269	1315	2638	5322
	Geothermal and other updates	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Other fuels (Hydrogen, Methanol)	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
WAM	Nuclear energy	GWhe	0	0	0	0	0	0	0	0	0	0	0	0
	Solids	GWhe	0	0	0	0	0	0	0	0	0	0	0	0

	Oil (including gas refinery)	**GWhe**	4310	4152	4030	1433	354	9,666	0	0	0	0	0	0
	Gas (including derived gases)	**GWhe**	0	0	0	2739	3856	4217	4249	4233	4147	4124	4215	3304
	Biomass-waste	**GWhe**	59,94	59,94	59,94	59,94	59,94	59,94	59,94	84,71	131,5	156,2	268,2	268,2
	Hydro (pumping excluded)	**GWhe**	0	0	0	0	0	0	0	0	0	0	0	0
	Wind	**GWhe**	231,2	245,3	242,6	246,9	238,7	239,2	240,1	252	249,5	264,1	264,1	251,9
	Solar	**GWhe**	469,8	609,3	829,9	960,7	1110	1159	1192	1232	1375	1441	2516	5198
	Geothermal and other updates	**GWhe**	0	0	0	0	0	0	0	0	0	0	0	0
	Other fuels (Hydrogen, Methanol)	**GWhe**	0	0	0	0	0	0	0	0	0	0	0	0

(c) Share of combined heat and power generation of total electricity and heat production [%]

	Fuel type	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	Share of power generation from combined heat and power generation in total electricity generation, including the generation in pumped storage power stations	%	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
	Share of heat generation from combined heat and power generation in total heat generation (CHP heat generation divided by the total heat for district heating)	%									100 %	100 %	100 %	100 %
WEM	Share of power generation from combined heat and power generation in total electricity generation, including the generation in pumped storage power stations	%	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
	Share of heat generation from combined heat and power generation in total heat generation (CHP heat generation divided by the total heat for district heating)	%									100 %	100 %	100 %	100 %
WAM	Share of power generation from combined heat and power generation in total electricity generation, including the generation in pumped storage power stations	%	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
	Share of heat generation from combined heat and power generation in total heat generation (CHP heat generation divided by the total heat for district heating)	%									100 %	100 %	100 %	100 %

(D) Power generation capacity by source including withdrawals and all new investments [MW]

		Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Capacity electricity generation including modifications and new investments	GW	1,868	1,908	2,048	2,555	2,816	2,903	2,923	2,988	2,946	3,058	3,345	3,508
	Nuclear energy	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Solids	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Oil (including gas refinery)	GW	1,414	1,414	1,414	0,61	0,61	0,61	0,61	0,61	0,262	0,262	0,134	0
	Gas (including derived gases)	GW	0	0	0	1,164	1,324	1,324	1,324	1,324	1,375	1,462	1,52	1,195
	Biomasswaste	GW	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,017	0,022	0,027	0,05	0,05
	Hydro (pumping excluded)	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Wind	GW	0,158	0,158	0,158	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,169
	Solar	GW	0,285	0,325	0,465	0,6	0,7	0,788	0,808	0,867	1,117	1,137	1,472	2,094
	Geothermal and other updates	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Other fuels (hydrogen, Methanol)	GW	0	0	0	0	0	0	0	0	0	0	0	0
WEM	Capacity electricity generation including modifications and new investments	GW	1,874	1,96	2,1	2,472	2,63	2,662	2,682	2,702	2,406	2,533	3,024	3,898
	Nuclear energy	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Solids	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Oil (including gas refinery)	GW	1,414	1,414	1,414	0,61	0,61	0,61	0,61	0,61	0,262	0,262	0,134	0
	Gas (including derived gases)	GW	0	0	0	1,081	1,138	1,138	1,138	1,138	1,166	1,267	1,043	0,668
	Biomasswaste	GW	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,017	0,022	0,05	0,05
	Hydro (pumping excluded)	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Wind	GW	0,158	0,158	0,158	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,169
	Solar	GW	0,29	0,376	0,516	0,6	0,7	0,732	0,752	0,772	0,792	0,812	1,628	3,011
	Geothermal and other updates	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Other fuels (hydrogen, Methanol)	GW	0	0	0	0	0	0	0	0	0	0	0	0
WAM	Capacity electricity generation including corrections	GW	1,874	1,96	2,1	2,475	2,576	2,608	2,628	2,653	2,407	2,571	2,912	3,795

	and new investments												
	Nuclear energy	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Solids	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Oil (including gas refinery)	GW	1,414	1,414	1,414	0,61	0,61	0,61	0,61	0,61	0,262	0,262	0,134	0
	Gas (including derived gases)	GW	0	0	0	1,084	1,084	1,084	1,084	1,084	1,084	1,223	1,005	0,617
	Biomasswaste	GW	0,012	0,012	0,012	0,012	0,012	0,012	0,012	0,017	0,022	0,027	0,05	0,05
	Hydro (pumping excluded)	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Wind	GW	0,158	0,158	0,158	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,17	0,17
	Solar	GW	0,29	0,376	0,516	0,6	0,7	0,732	0,752	0,772	0,869	0,889	1,554	2,959
	Geothermal and other updates	GW	0	0	0	0	0	0	0	0	0	0	0	0
	Other fuels (hydrogen, Methanol)	GW	0	0	0	0	0	0	0	0	0	0	0	0

heat generation from combined heat and power plants, including from industrial waste

		Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Heat production	GWhe	0	0	0	0	0	0	0	0	71,11	71,11	71,11	71,11
WEM	Heat production	GWhe	0	0	0	0	0	0	0	0	71,11	71,11	71,11	71,11
WAM	Heat production	GWhe	0	0	0	0	0	0	0	0	71,11	71,11	71,11	71,11

(g) Cross-border interconnection capacities for gas and electricity [Definition of electricity in line with the outcome of ongoing discussions based on the 15 % interconnection target] and their projected utilisation rates

		Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Cross-border interconnection capacities for electricity	GW	0	0	0	0	0	0	0	0	0	0	0	0
WEM	Cross-border interconnection capacities for electricity	GW	0	0	0	0	0	0	0	0	0	1	1	1
WAM	Cross-border interconnection capacities for electricity	GW	0	0	0	0	0	0	0	0	0	1	1	1

2.3. Conversion sector (a) Fuel inputs to thermal power generation (including solid, oil, gas) [ktoe]

	Fuel Inputs to Thermal Power Generation	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Total	ktoe	955,8	942,8	935	833,5	755,6	777,1	811,8	827,4	792,2	825,5	900,3	900,4
	Solids	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	ktoe	955,8	942,8	935	373,5	9,153	0,055	0	0	0	0	0	0
	Gas	ktoe	0	0	0	460	746,4	777,1	811,8	827,4	792,2	825,5	900,3	900,4
WEM	Total	ktoe	955,8	902,8	876,5	782,7	704,2	716,6	732,4	739,8	734,9	747,7	742,8	628,8
	Solids	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	ktoe	955,8	902,8	876,5	322,8	49,12	0,941	0	0	0	0	0	0

	Gas	ktoe	0	0	0	460	655,1	715,7	732,4	739,8	734,9	747,7	742,8	628,8
WAM	**Total**	ktoe	955,8	902,7	877	781,8	724,6	729,7	734,3	728,3	709,1	709,6	729,1	599,2
	Solids	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	ktoe	955,8	902,7	877	321,9	78,23	2,005	0	0	0	0	0	0
	Gas	ktoe	0	0	0	460	646,4	727,7	734,3	728,3	709,1	709,6	729,1	599,2

2.4. Energy comsuption

(a) Primary and final energy consumption [ktoe]

		Unit	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	**Primary energy consumption**	ktoe	2309	2463	2493	2440	2407	2457	2499	2536	2551	2589	2631	2601
	Final energy consumption	ktoe	1688	1871	1903	1955	2010	2046	2072	2099	2126	2138	2111	2075
WEM	**Primary energy consumption**	ktoe	2321	2438	2443	2385	2343	2371	2392	2402	2409	2411	2376	2306
	Final energy consumption	ktoe	1688	1860	1880	1918	1956	1976	1988	1996	2002	1992	1926	1888
WAM	**Primary energy consumption**	ktoe	2321	2438	2441	2378	2353	2369	2364	2341	2318	2283	2168	2053
	Final energy consumption	ktoe	1688	1860	1877	1912	1946	1961	1957	1938	1920	1888	1734	1667

(b) Final energy consumption by sector (including industrial, residential, tertiary, agricultural and transport (including breakdown between passengers and goods, where data is available)) [ktoe]

	Energy consumption by sector	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	**Industry**	ktoe	243,6	243,5	241,2	244,6	247,9	248,5	250,1	258,9	272,2	287,9	362,1	388,6
	Residential	ktoe	341,4	358,2	376,3	400,2	423,2	435,6	448,3	458,5	466	471,7	480,6	491,1
	Tertiary	ktoe	236,9	251,6	263,8	280,9	300	315,5	327,6	337,8	351,2	356,2	356,8	367,7
	Transport	ktoe	659,6	651,3	648,9	644,5	640,5	637,8	629,4	621,4	610,2	592,2	464,4	348
	Other (agriculture and aviation)	ktoe	206,1	366,4	373,1	384,8	398,6	409	416,8	422,6	426,4	429,7	447,1	479,7
	By transport activity													
	Passenger transport	ktoe	455,7	455,8	453,7	451,4	449,2	448	440,9	433,9	424,8	411,8	308,6	219,9
	Freight transport	ktoe	203,9	195,6	195,2	193,1	191,3	189,8	188,5	187,6	185,3	180,4	155,8	128,1
WEM	**Industry**	ktoe	243,6	242,5	239,1	240,3	240	238	238,2	238,9	241,4	243,3	288,5	309,8
	Residential	ktoe	341,4	353,3	366,1	384,2	400,7	406,7	412,6	416,2	417,7	417,9	418,7	435,1
	Tertiary	ktoe	236,9	246,2	252,6	263	274,6	282,3	287,7	293,2	302,7	304,6	304,3	313,2
	Transport	ktoe	659,6	651,3	648,9	644,5	640,5	637,8	629,4	621,4	610,2	592,2	464,4	348
	Other (agriculture and aviation)	ktoe	206,1	366,1	373,5	385,8	400,1	411,3	419,8	426,3	430,3	433,4	449,1	480,2
	By transport activity													
	Passenger transport	ktoe	455,7	455,8	453,7	451,4	449,2	448	440,9	433,9	424,8	411,8	308,6	219,9
	Freight transport	ktoe	203,9	195,6	195,2	193,1	191,3	189,8	188,5	187,6	185,3	180,4	155,8	128,1
WAM	**Industry**	ktoe	243,6	242,5	239,1	240,3	240	237,8	232,4	224,2	218,8	211,7	199	198,3
	Residential	ktoe	341,4	353,3	366,1	384,2	399,3	403,8	406,8	406,8	405,2	403,4	397	412,3
	Tertiary	ktoe	236,9	246,2	252,6	263	274,6	282,3	285,8	289	296,5	297,8	295,2	304,3
	Transport	ktoe	659,6	651,3	646,1	638,8	631,9	626,6	617,7	603	583,2	558,7	422,6	306,7
	Other (agriculture and aviation)	ktoe	206,1	366,1	373,5	385,8	400,1	410,6	413,9	415,3	416	416,3	419,2	443,9

	By transport activity													
	Passenger transport	ktoe	455,7	455,8	450,9	445,7	440,6	436,8	429,2	419,8	405,4	385,8	273,5	184,5
	Freight transport	ktoe	203,9	195,6	195,2	193,1	191,3	189,8	188,5	183,1	177,8	172,9	149,1	122,2

(c) Final energy consumption by fuel (all energy products) [ktoe]

	Energy consumption by fuel	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	**Solids**	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	ktoe	1070	1219	1232	1257	1283	1295	1294	1293	1288	1276	1132	945,6
	Gas	ktoe	0	0	0	0	0	4,087	7,353	11	12,25	12,2	12,07	11,94
	Electricity	ktoe	399,9	421,5	436,8	458,9	482,7	502,5	522,3	539,8	557,7	576,2	642,2	737,9
	Heat	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Renewable energy forms	ktoe	177,5	193,5	200,8	211,5	223	229,2	235,1	243,1	252,1	260,7	303,9	344,8
	Other	ktoe	40,42	37,48	33,31	27,37	21,19	16,05	11,65	8,356	6,202	4,823	1,841	0,859
WEM	**Solids**	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	ktoe	1070	1228	1241	1264	1288	1296	1294	1287	1273	1250	1081	893
	Gas	ktoe	0	0	0	0	0	4,087	7,353	11	12,25	12,2	12,07	11,94
	Electricity	ktoe	399,9	414,4	422	435	448,6	457,4	467,9	477,7	487	496,7	567	672,8
	Heat	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Renewable energy forms	ktoe	177,5	180,1	184,1	191,1	198	202,4	207,2	212,4	218	222,2	257,3	303,3
	Other	ktoe	40,42	37,48	33,32	27,4	21,21	16,04	11,64	8,366	6,202	4,792	1,786	0,792
WAM	**Solids**	ktoe	0	0	0	0	0	0	0	0	0	0	0	0
	Oil	ktoe	1070	1228	1238	1258	1278	1269	1251	1220	1185	1142	907,2	700,8
	Gas	ktoe	0	0	0	0	0	5,932	11,06	14,74	14,68	14,61	14,46	14,31
	Electricity	ktoe	399,9	414,3	422,2	435,5	449,2	458,1	466,1	475,7	484,4	495,3	559,6	656,9
	Heat	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Renewable energy forms	ktoe	177,5	180,1	184,2	191,3	197,7	212,3	216,8	220,6	224	225,4	245,3	288,4
	Other	ktoe	40,42	37,48	33,32	27,4	21,21	16,04	11,19	7,534	5,383	4,069	0,944	0,233

(e) Primary energy intensity of the total economy (primary energy consumption per GDP [toe/EUR]

	Primary energy intensity of the economy	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU		total/million euro '2015	100,5	101,4	99,62	94,4	90,27	89,89	89,37	88,91	87,95	87,76	81,29	71,52
WEM		total/million euro '2015	101	100,3	97,63	92,28	87,88	86,75	85,53	84,22	83,06	81,72	73,41	63,42
WAM		total/million euro '2015	101	100,3	97,53	92	88,24	86,66	84,54	82,08	79,93	77,41	66,99	56,47

final energy intensity by sector (including industrial, residential, tertiary and passenger transport (including breakdown between passengers and freight, where data is available), freight transport)

	Energy by sector	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	**Final energy intensity by sector**	**total/million euro '2015**	73,42	77,02	76,06	75,63	75,38	74,87	74,11	73,6	73,3	72,47	65,23	57,07
	Industry													
	Residential													
	Tertiary													

	Passenger transport	TOE/million veh-km	58,19	57,28	56,09	54,88	53,72	52,7	51,01	49,37	47,55	45,34	31,46	20,95
	Freight transport	TOE/million veh-km	95,83	96,58	94,81	92,26	89,89	87,71	85,69	83,87	81,51	78,01	62,42	47,96
WEM	Final energy intensity by sector	total/million euro '2015	73,42	76,54	75,14	74,19	73,35	72,29	71,08	69,98	69,04	67,52	59,51	51,92
	Industry													
	Residential													
	Tertiary													
	Passenger transport	TOE/million veh-km	58,19	57,28	56,09	54,88	53,72	52,7	51,01	49,37	47,55	45,34	31,46	20,95
	Freight transport	TOE/million veh-km	95,83	96,58	94,81	92,26	89,89	87,71	85,69	83,87	81,51	78,01	62,42	47,96
WAM	Final energy intensity by sector	total/million euro '2015	73,42	76,54	75,03	73,97	72,97	71,75	69,97	67,96	66,19	64,01	53,58	45,85
	Industry													
	Residential													
	Tertiary													
	Passenger transport	TOE/million veh-km	58,19	57,28	56,28	55,24	54,23	53,4	52,1	50,63	48,56	45,9	31,55	20,65
	Freight transport	TOE/million veh-km	95,83	96,58	94,81	92,26	89,89	87,71	85,69	81,89	78,21	74,8	59,74	45,74

2.5. Prices

(a) Electricity prices by type of sector of use (residential, industrial, tertiary)

	Electricity prices by type of using sector	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU	Centralised electricity generation cost, considering only centralised infrastructure	euro 2016/MWh	124,9	171,8	137,7	145,2	138,3	113,3	90,03	89,77	92,1	94,85	106,6	125,7
	The average cost of electricity for each kWh consumed across the economy. Additional to centralised infrastructure, this takes into account electricity generated by distributed technologies as well	euro 2016/MWh	119,9	164	131,9	138,9	132,6	109,3	87,86	87,43	90,39	92,67	102	119
	Residential	euro/MWh												
	industry	euro/MWh												
	Tertiary	euro/ktoe												
WEM	Centralised electricity generation cost, considering only centralised infrastructure	euro 2016/MWh	126,5	168,4	135,3	141,5	134,8	111,2	88,75	89,34	90,79	94,91	90,95	94,28
	The average cost of electricity for each kWh consumed across the economy. Additional to centralised infrastructure, this takes into account electricity generated by distributed technologies as well	euro 2016/MWh	121,1	160,4	129,1	135,1	128,7	106,9	86,24	86,85	88,97	92,32	87,46	90,94
	Residential	euro/MWh												
	industry	euro/MWh												

	Tertiary	euro/ktoe												
	Centralised electricity generation cost, considering only centralised infrastructure	euro 2016/MWh	126,5	168,4	135,3	141,7	134,1	110,8	88,76	90,07	91,13	96,6	92,98	94,66
WAM	The average cost of electricity for each kWh consumed across the economy. Additional to centralised infrastructure, this takes into account electricity generated by distributed technologies as well	euro 2016/MWh	121,1	160,4	129,1	135,2	128,2	106,5	86,23	87,08	88,87	93,37	89,07	91,1
	Residential	euro/MWh												
	industry	euro/MWh												
	Tertiary	euro/ktoe												

(b) National retail fuel prices (including taxes, by source and sector) [EUR/ktoe]

	National retail fuel prices (including taxes, per source and sector)	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
	Diesel oil	euro/ktoe												
	Industry	euro/ktoe												
	Households	euro/ktoe	20,88	37,49	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88
	Transport private	euro 2016/GJ	35,45	52,06	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96
	Transport public	euro 2016/GJ	35,45	52,06	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96
BAU	**Gasoline**	euro/ktoe												
	Transport private	euro 2016/GJ	38,83	57,59	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
	Transport public	euro 2016/GJ	38,83	57,59	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
	Natural gas	euro/ktoe												
	Industry	euro/ktoe												
	Households	euro/ktoe												
	Diesel oil	euro/ktoe												
	Industry	euro/ktoe												
	Households	euro/ktoe	20,88	37,49	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88
	Transport private	euro 2016/GJ	35,45	52,06	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96
	Transport public	euro 2016/GJ	35,45	52,06	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96
	Gasoline	euro/ktoe												
WEM	**Transport private**	euro 2016/GJ	38,83	57,59	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
	Transport public	euro 2016/GJ	38,83	57,59	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
	Natural gas	euro/ktoe												
	Industry	euro/ktoe												
	Households	euro/ktoe												
	Diesel oil	euro/ktoe												
	Industry	euro/ktoe												
	Households	euro/ktoe	20,88	37,49	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88	27,88
WAM	**Transport private**	euro 2016/GJ	35,45	52,06	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96
	Transport public	euro 2016/GJ	35,45	52,06	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96	40,96
	Gasoline	euro/ktoe												

	Transport private	euro 2016/GJ	38,83	57,59	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
	Transport public	euro 2016/GJ	38,83	57,59	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7	45,7
	Natural gas	euro/ktoe												
	Industry	euro/ktoe												
	Households	euro/ktoe												

2.6. Investments

Investment costs in energy transformation, supply, transmission and distribution sectors

	Energy related investments	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	**Energy-related investment costs for overall economy**	Million EUR 2016	1391	1643	1875	2518	1987	1742	1796	1833	2497	2082	2126	2388
	Energy-related investment costs for power sector	Million EUR 2016	69,25	50,54	157,5	857,1	319,9	94,4	28,52	77,68	482,7	192,3	177,3	272,4
	Energy-related investment costs for overall economy	% of GDP												
	Energy related investments costs for Industry	% of value added												
WEM	**Energy-related investment costs for overall economy**	Million EUR 2016	1397	1679	1711	2398	1833	1698	1765	1815	2085	2022	2312	2515
	Energy-related investment costs for power sector	Million EUR 2016	75,32	101,5	157,5	689,6	185	54	45,88	79,12	211,3	213	267,3	400,2
	Energy-related investment costs for overall economy	% of GDP												
	Energy related investments costs for Industry	% of value added												
WAM	**Energy-related investment costs for overall economy**	Million EUR 2016	1397	1679	1681	2250	1657	1617	1642	1796	2071	2016	2257	2242
	Energy-related investment costs for power sector	Million EUR 2016	75,32	101,5	157,5	693,8	109,9	69,17	58,6	99,74	247,6	274,4	259,4	368
	Energy-related investment costs for overall economy	% of GDP												
	Energy related investments costs for Industry	% of value added												

2.7. Renewable energy

(a) Gross final consumption of energy from renewable energy sources and share of energy from renewable sources in gross final energy consumption by sector (electricity, heating and cooling, transport) and by technology

	Gross final consumption of energy from renewable sources and share of renewable energy in gross final energy consumption and by sector	**Unit**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**
BAU	**RES in Gross Final Energy Consumption**	%	0,184	0,185	0,197	0,209	0,217	0,223	0,226	0,233	0,255	0,26	0,315	0,405
	RES-H survival share	%	0,413	0,417	0,423	0,424	0,427	0,43	0,433	0,436	0,444	0,446	0,463	0,497

	RES-E share	%	0,148	0,155	0,192	0,222	0,238	0,251	0,247	0,256	0,306	0,305	0,351	0,452
	RES-T share	%	0,072	0,089	0,087	0,088	0,09	0,091	0,099	0,108	0,12	0,136	0,356	0,955
	(final consumption of renewable energy in transport as contribution to overall target	%												
	Contribution of biofuels and biogas produced from feedstock listed in part A of Annex IX and consumed in transport	%												
	Contribution of biofuels and biogas produced from feedstock listed in part B of Annex IX and consumed in transport	%												
	Contribution from biofuels, bioliquids and biomass fuels consumed in transport, produced from food or feed crops	%												
	Contribution of other biofuels and consumed in transport	%												
	Gross final consumption of RES for heating and cooling	ktoe	221,7	229	238,3	249,6	261,4	268,1	274,6	283,2	299,2	308,8	356,3	397,8
	Gross final consumption of electricity from RES	ktoe	65,88	68,52	88,02	107,3	120,9	132,5	135,6	145,4	180	185,3	236,7	351
	Gross final consumption of energy from RES in transport	ktoe	24,37	23,42	22,3	21,8	21,32	20,66	21,02	21,53	23,1	24,25	41,66	82,53
	Total Gross final consumption of RES	ktoe	311,9	321	348,6	378,8	403,6	421,3	431,2	450,1	502,3	518,3	634,7	831,4
	Gross final consumption of waste heat and cold for heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Waste heat and cold share in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,007	0,007	0,007	0,006
	Gross final consumption of RES from district heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	RES share from district heating and cooling in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,007	0,007	0,007	0,006
	Gross final consumption of waste heat and cold from district heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Waste heat and cold share from district heating and cooling in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,007	0,007	0,007	0,006
	RES in Gross Final Energy Consumption	%	0,184	0,185	0,197	0,205	0,213	0,216	0,22	0,226	0,235	0,243	0,342	0,507
	RES-H survival share	%	0,413	0,416	0,42	0,422	0,425	0,429	0,432	0,436	0,447	0,452	0,475	0,513
	RES-E share	%	0,148	0,18	0,219	0,233	0,254	0,258	0,259	0,263	0,274	0,282	0,455	0,701
	RES-T share	%	0,072	0,072	0,069	0,068	0,067	0,07	0,079	0,089	0,102	0,119	0,35	1,186
WEM	**(final consumption of renewable energy in transport as contribution to overall target**	%												
	Contribution of biofuels and biogas produced from feedstock listed in part A of Annex IX and consumed in transport	%												
	Contribution of biofuels and biogas produced from	%												

	feedstock listed in part B of Annex IX and consumed in transport													
	Contribution from biofuels, bioliquids and biomass fuels consumed in transport, produced from food or feed crops	%												
	Contribution of other biofuels and consumed in transport	%												
	Gross final consumption of RES for heating and cooling	ktoe	221,7	226,7	233,3	242,2	251,1	255,1	259,6	264,7	276,4	280,8	316,9	360,8
	Gross final consumption of electricity from RES	ktoe	65,43	78,64	97,36	108,9	121,2	125,4	128,8	133,1	140,5	147,1	272,6	502,3
	Gross final consumption of energy from RES in transport	ktoe	24,37	23,42	22,31	21,81	21,34	20,66	21,08	21,6	22,58	23,67	47,84	112
	Total Gross final consumption of RES	ktoe	311,5	328,7	353	373	393,6	401,1	409,4	419,4	439,4	451,6	637,3	975,2
	Gross final consumption of waste heat and cold for heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Waste heat and cold share in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,009	0,009	0,008	0,008
	Gross final consumption of RES from district heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	RES share from district heating and cooling in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,009	0,009	0,008	0,008
	Gross final consumption of waste heat and cold from district heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Waste heat and cold share from district heating and cooling in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,009	0,009	0,008	0,008
WAM														
	RES in Gross Final Energy Consumption	%	0,184	0,185	0,198	0,206	0,214	0,224	0,229	0,237	0,254	0,265	0,364	0,553
	RES-H survival share	%	0,413	0,416	0,421	0,423	0,426	0,43	0,44	0,453	0,471	0,482	0,543	0,606
	RES-E share	%	0,148	0,181	0,219	0,233	0,251	0,256	0,26	0,27	0,297	0,315	0,451	0,714
	RES-T share	%	0,072	0,072	0,069	0,069	0,069	0,089	0,096	0,107	0,122	0,146	0,394	1,305
	(final consumption of renewable energy in transport as contribution to overall target	%												
	Contribution of biofuels and biogas produced from feedstock listed in part A of Annex IX and consumed in transport	%												
	Contribution of biofuels and biogas produced from feedstock listed in part B of Annex IX and consumed in transport	%												
	Contribution from biofuels, bioliquids and biomass fuels consumed in transport, produced from food or feed crops	%												
	Contribution of other biofuels and consumed in transport	%												
	Gross final consumption of RES for heating and cooling	ktoe	221,7	226,7	233,3	242,3	250,6	253,9	258,6	263	273,1	275,3	298,5	340,8

	Gross final consumption of electricity from RES	ktoe	65,43	78,64	97,37	109	121,2	125,4	128,3	134,9	151	160	262,1	491,7
	Gross final consumption of energy from RES in transport	ktoe	24,37	23,42	22,41	22	21,62	31,75	31,59	31,74	32,48	33,75	51,79	108,6
	Total Gross final consumption of RES	ktoe	311,5	328,7	353,1	373,3	393,3	411,1	418,5	429,6	456,5	469	612,4	941,1
	Gross final consumption of waste heat and cold for heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Waste heat and cold share in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,008	0,009	0,009	0,009
	Gross final consumption of RES from district heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	RES share from district heating and cooling in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,008	0,009	0,009	0,009
	Gross final consumption of waste heat and cold from district heating and cooling	ktoe	0	0	0	0	0	0	0	0	6,114	6,114	6,114	6,114
	Waste heat and cold share from district heating and cooling in gross final consumption for heating and cooling	%	0	0	0	0	0	0	0	0	0,008	0,009	0,009	0,009

(b) Production of electricity and heat from renewable sources in buildings; this includes, where available, disaggregated data on the energy produced, consumed and injected into the grid through solar photovoltaic systems, solar thermal systems, biomass, heat pumps, geothermal systems, as well as all other decentralised renewable systems)

	Electricity and heat generation from renewable energy in buildings	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
BAU		ktoe	240,5	250,6	262,7	276,8	291,4	300,8	310,1	321,5	334,2	346,5	408	463,4
WAM		ktoe	240,5	248,3	257,7	269,4	281	287,8	295,1	303	311,3	318,5	368,6	426,5
WEM		ktoe	240,5	248,3	257,7	269,5	280,5	286,7	294,1	301,3	308	313	350,2	406,4

3. GHG emissions and removals related indicators

3.1. GHG emissions by policy sector (EU ETS, effort sharing and LULUCF)

		unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	**ETS**	**GG CO2 eq.**	4395	4281	4250	3483	2973	3038	3149	3215	3138	3216	3392	3392
	ESR	**GG CO2 eq.**	4312	4313	4307	4307	4310	4297	4250	4201	4132	4036	3422	2773
	LULUCF	**GG CO2 eq.**	— 235	— 296	— 300	— 303	— 307	— 311	— 314	— 318	— 322	— 325	— 343	— 362
WEM	**ETS**	**GG CO2 eq.**	4395	4161	4070	3315	2891	2895	2953	2992	2983	3013	3001	2734
	ESR	**GG CO2 eq.**	4312	4294	4184	4170	4166	4147	4090	4036	3963	3851	3224	2576
	LULUCF	**GG CO2 eq.**	— 235	— 296	— 300	— 303	— 307	— 311	— 314	— 318	— 322	— 325	— 472	— 516
WAM	**ETS**	**GG CO2 eq.**	4395	4157	4068	3312	2966	2927	2957	2965	2922	2923	2969	2664
	ESR	**GG CO2 eq.**	4212	4189	4018	3999	3814	3741	3663	3559	3434	3281	2730	2107
	LULUCF	**GG CO2 eq.**	— 235	— 296	— 300	— 303	— 307	— 311	— 314	— 318	— 322	— 325	— 635	— 742

3.2. GHG emissions per sector of the Intergovernmental Panel on Climate Change and by gas (where appropriate to distinguish between EU ETS and ESD sectors) [tCO_2eq]

	Gas	unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	Total Including LULUCF	GG CO2 eq.	8469	8298	8257	7486	6975	7024	7084	7098	6948	6926	6470	5803
	Total Excluding LULUCF	GG CO2 eq.	8705	8594	8557	7789	7283	7335	7399	7416	7270	7252	6814	6165
	CO2 emissions including net CO2 from LULUCF	GG CO2 eq.	6786	6601	6582	5835	5344	5409	5486	5516	5383	5379	4927	4266
	CO2 emissions excluding CO2 from LULUCF	GG CO2 eq.	7023	6899	6883	6140	5653	5722	5802	5836	5706	5707	5272	4630
	CH4 emissions including CH4 from LULUCF	GG CO2 eq.	1106	1067	1040	1012	986.7	963.4	940.6	918.6	897	901.3	897.5	894.3
	N2O emissions including N2O from LULUCF	GG CO2 eq.	206.7	254.6	257.8	257.7	259.6	263.6	266.7	269.8	272.5	246.7	235.6	223.2
	HFCs	GG CO2 eq.	353.5	356.9	360.2	363.4	366.5	369.5	372.3	375	377.6	380.1	391.2	399.9
	SF6	GG CO2 eq.	16	16	17	17	17	17	17	17	17	17	18	18
WEM	Total Including LULUCF	GG CO2 eq.	8469	8159	7954	7181	6750	6731	6729	6709	6624	6538	5753	4782
	Total Excluding LULUCF	GG CO2 eq.	8705	8455	8254	7485	7057	7042	7043	7027	6946	6864	6226	5309
	CO2 emissions including net CO2 from LULUCF	GG CO2 eq.	6786	6495	6410	5668	5255	5252	5270	5268	5199	5144	4378	3429
	CO2 emissions excluding CO2 from LULUCF	GG CO2 eq.	7023	6793	6712	5974	5564	5565	5586	5588	5523	5472	4853	3959
	CH4 emissions including CH4 from LULUCF	GG CO2 eq.	1106	1069	942.7	910.8	889.3	869.8	845.4	825	805.7	803.2	794.6	786.5
	N2O emissions including N2O from LULUCF	GG CO2 eq.	206.5	241.1	244.6	245	247.8	251.9	255.4	258.9	262	233.2	222	209.6
	HFCs	GG CO2 eq.	353.5	335.3	338.4	339	339.5	339.7	339.8	339.8	339.6	339.3	340	338.1
	SF6	GG CO2 eq.	16	16	17	17	17	17	17	17	17	17	17	17
WAM	Total Including LULUCF	GG CO2 eq.	8368	8050	7787	7007	6495	6394	6359	6276	6124	5984	5064	4028
	Total Excluding LULUCF	GG CO2 eq.	8603	8346	8087	7311	6803	6704	6673	6594	6446	6309	5699	4771
	CO2 emissions including net CO2 from LULUCF	GG CO2 eq.	6786	6492	6399	5646	5300	5212	5195	5127	4991	4877	3968	2948

	CO2 emissions excluding CO2 from LULUCF	**GG CO2 eq.**	7023	6790	6701	5951	5609	5525	5512	5447	5314	5204	4608	3695
	CH4 emissions including CH4 from LULUCF	**GG CO2 eq.**	1106	1066	889.2	860.3	689.6	670.4	646.5	626.5	607.2	603.9	592.4	580.9
	N2O emissions including N2O from LULUCF	**GG CO2 eq.**	205.3	239	241.7	241.1	243.2	245.9	248.7	251	253	226.9	214.5	201.7
	HFCs	**GG CO2 eq.**	253.5	235.3	238.4	241.4	244.4	247.1	249.8	252.3	254.8	257.2	267.5	275.7
	SF6	**GG CO2 eq.**	16	16	17	17	17	17	17	17	17	17	18	18

3.3. Carbon intensity of total economy [tCO_2eq/GDP]

		unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	**ETS**	**GG CO2 eq./GDP (euro)**	0.191	0.176	0.17	0.135	0.111	0.111	0.113	0.113	0.108	0.109	0.105	0.093
	ESR	**GG CO2 eq./GDP (euro)**	0.188	0.178	0.172	0.167	0.162	0.157	0.152	0.147	0.142	0.137	0.106	0.076
	LULUCF	**GG CO2 eq./GDP (euro)**	— 0.01	— 0.012	— 0.012	— 0.012	— 0.012	— 0.011	— 0.011	— 0.011	— 0.011	— 0.011	— 0.011	— 0.01
WEM	**ETS**	**GG CO2 eq./GDP (euro)**	0.191	0.171	0.163	0.128	0.108	0.106	0.106	0.105	0.103	0.102	0.093	0.075
	ESR	**GG CO2 eq./GDP (euro)**	0.188	0.177	0.167	0.161	0.156	0.152	0.146	0.142	0.137	0.131	0.1	0.071
	LULUCF	**GG CO2 eq./GDP (euro)**	— 0.01	— 0.012	— 0.012	— 0.012	— 0.012	— 0.011	— 0.011	— 0.011	— 0.011	— 0.011	— 0.015	— 0.014
WAM	**ETS**	**GG CO2 eq./GDP (euro)**	0.191	0.171	0.163	0.128	0.111	0.107	0.106	0.104	0.101	0.099	0.092	0.073
	ESR	**GG CO2 eq./GDP (euro)**	0.183	0.172	0.161	0.155	0.143	0.137	0.131	0.125	0.118	0.111	0.084	0.058
	LULUCF	**GG CO2 eq./GDP (euro)**	— 0.01	— 0.012	— 0.012	— 0.012	— 0.012	— 0.011	— 0.011	— 0.011	— 0.011	— 0.011	— 0.02	— 0.02

3.4. Indicators related to CO_2emissions

(a) GHG intensity of domestic heat and power generation [tCO_2eq/MWh]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
GHG intensity of domestic power and heat generation	**tCO2eq/MWh**	0.603	0.591	0.566	0.413	0.302	0.298	0.300	0.298	0.276	0.278	0.272	0.236

3.5. Parameters not related to CO2 emissions

(a) Livestock capital: dairy cattle [1 000 heads], non-dairy cattle [1 000 heads], sheep [1 000 heads], pig [1 000 heads], poultry [1 000 heads]

Livestock		**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2035**	**2040**

dairy cattle	**1000 Heads**	44.51	38.22	37.38	36.53	35.68	34.84	33.99	33.14	32.29	36.89	36.42	35.96
non-dairy cattle	**1000 Heads**	43.47	43.22	43.03	42.83	42.63	42.44	42.24	42.05	41.85	41.71	41.19	40.67
Pigs	**1000 Heads**	360.6	303	295.6	288.2	280.8	273.4	266	258.5	251.1	293.9	291	288
Sheep	**1000 Heads**	311.7	315.2	318.6	322.1	325.6	329	332.5	335.9	339.4	342.9	342.9	342.9
poultry	**1000 Heads**	3625	13966	15004	16042	17080	18118	19156	20194	21232	13966	14664	15362

(b) Nitrogen input from the use of synthetic fertilisers [kt nitrogen]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Nitrogen input from application of synthetic fertilisers	**kt nitrogen**	7	7	7	7	7	7	7	7	7	7	6	6

(c) Nitrogen input from manure application [kt nitrogen]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Nitrogen input from application of manure	**kt nitrogen**	17	21	21	22	22	23	23	24	24	22	22	22

(D) Nitrogen capture from N fixing crops [kt nitrogen]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Nitrogen fixed by N-fixing crops	**kt nitrogen**	1	1	1	1	1	1	1	1	1	1	1	1

area of cultivated organic soils [hectares]

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Area of cultivated organic soils	**hectares**	30076	30076	30076	30076	30076	30076	30076	30076	30076	30076	30076	30076

generation of solid municipal waste (MSW)

		unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	**Municipal solid waste (MSW) generation**	**t**	554584	554584	559717	564688	569532	574087	578478	582702	586766	590671	607803	621326
WEM	**Municipal solid waste (MSW) generation**	**t**	892216	554584	559717	564688	569532	574087	578478	582702	586766	590671	590671	590671
WAM	**Municipal solid waste (MSW) generation**	**t**	892216	554584	559717	564688	569532	574087	578478	582702	586766	590671	590671	590671

(h) Urban solid waste (MSW) landfilled

		unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	**Municipal solid waste (MSW) going to landfills**	**t**	344719	344719	347909	350999	354010	356842	359571	362197	364722	367150	377799	386204
WEM	**Municipal solid waste (MSW) going to landfills**	**t**	554584	332750	315835	298466	256289	252598	248745	244735	240574	236268	236268	236268
WAM	**Municipal solid waste (MSW) going to landfills**	**t**	554584	332750	315835	298466	256289	252598	248745	244735	240574	236268	236268	236268

(l) CH4 recovery share of total CH4 production from landfills [%]

		unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Bau	**Share of CH4 recovery in total CH4 generation from landfills**	**%**	0	0	0	0	0	0	0	0	0	0	0	0
WEM	**Share of CH4 recovery in total CH4 generation from landfills**	**%**	0.00	0.00	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
WAM	**Share of CH4 recovery in total CH4 generation from landfills**	**%**	0.00	0.00	0.27	0.27	0.57	0.59	0.60	0.62	0.63	0.65	0.65	0.65

Annexes;

Annex 1. European Mission: Climate Neutral and Smart Limassol by 2030

2023

The European Mission: 100 climate Neutral and Smart Cities by 2030 is a Horizon Europe innovation that requires the selected cities to prepare and submit to the European Commission the Climate City Convention which will act as a strategy to accelerate the European Commission's Climate Neutrality targets by 2050.

In September 2021, the European Commission launched five Missions to address some of the key challenges facing humanity: (1) adaptation to climate change: support at least 150 European regions and communities to become climate resilient by 2030 (2) Cancer: improving the lives of over 3 million people by 2030 thanks to prevention and treatment, and extending and improving the lives of cancer patients and their families (3) Restoring our oceans and waters by 2030 (4) 100 climate-neutral and smart cities by 2030 (5) A European Soil Deal: 100 living labs and lighthouses to lead the transition towards healthy soils by 2030. In November 2021 up to and including January 2022, cities in Europe were invited to express their interest in participating in the Mission. In April 2022, it was announced that among 377 applications the Municipality of Limassol was selected as sending city together with another 99 European Cities and 12 Cities linked to Horizon programme.

The participation of the Municipality of Limassol in the European Mission: 100 climate Neutral and Smart Cities by 2030 are divided into three phases: (A) 2021-2022. Preparation of an application for expression of interest and selection as sending city (B) 2022-2023. Preparation and registration of the EU Climate City Convention for Mission Label (C) 2024-2030 Implementation of actions – Evaluation and Adaptation.

During the drafting period of the NECP – the Municipality of Limassol is working on the design and preparation of the City of Climate Contract with the extended participation of central government, local authorities, private bodies, NGOs and citizens. The Convention consists of three chapters:

(J) Commitments:

(a) the reasons why the Municipality of Limassol considered it necessary to participate in the mission referred to; (b) the climate neutrality target by 2030 as set by the Mission; (c) the priorities and summary of the first actions for the next 2-3 years; (d) the list of co-creators of the Climate Convention; (e) the signed commitment of the co-creators of the Climate Convention.

Keyboard for Climate Action Projects:

(a) Information on the current situation in the Municipality of Limassol with the various opportunities and obstacles that may lead to or deter the objective, (b) the Chartoguard with actions to be carried out within the municipal boundaries of the Municipality of Limassol and their expected outcome, (c) Proposals to remove any obstacles to the implementation of the actions, (d) a description of the financial investment required for the actions.

Investment Plan:

(a) the indication of existing climate investments, (b) the map of the costs and financial investment needed to achieve the objective, (c) the design, organisation and development of the economic strategy.

The City of Climate Contract is signed by the Mayor and Municipal Council of the Municipality of Limassol, the Central Government of Cyprus and the European Commission, and is registered with the European Commission in September 2023 in order to obtain a certification which unlocks funds for the implementation of the actions.

The Climate Action Project Portfolio consists of five vertical themes: (1) transport (2) Energy (3) Structured Environment (4) Coastal – Marine Area (5) Circular Economy: (6) digital Limassol. The Municipality of Limassol is supported by: (a) the Institute of Cyprus, (b) the University of Cyprus, (c) the TEPAC, (d) the University of Frederick, (e) the University of Nicosia, (f) the University of Naples, (g) the Eratosthenis Centre of Excellence and (h) the Kos Centre of Excellence.

As part of networking and exchange of 'good' practices with other cities, the Municipality of Limassol took part in and set up Cooperation Networks: (1) network of Consignment Cities of Cyprus with the 4 municipalities in Cyprus who applied to be selected as sending cities: (a) Municipality of Limassol, (b) Municipality of Strovolos, (c) Municipality of Paphos, (d) Municipality of Aradippou, (2) Town of Greece and Cyprus – ClimaNet network with the 7 sending municipalities of Greece: (a) Municipality of Ioannina, (b) Municipality of Athens, (c) Municipality of Thessaloniki, (d) Municipality of Kozani, (e) Municipality of Kalamata and (f) Municipality of Trikkaion and Municipality of Limassol, (3) European University of Technology and European Mission Cities.

In the context of creating conditions for interaction and co-design of the City of Climate Convention, the Municipality of Limassol carried out a number of actions including:

(a) 28/11/2022 announcement of participation in the Mission and Communication of first steps, taking positions from stakeholders, (b) 13-15/02/2023 Technical Laboratories per theme with the participation of stakeholders and the public, (c) 13-17/03/2023 Technical Laboratories per theme with the participation of the departmental Municipality of Limassol, stakeholders and the public presence of the City Counsellor for the European Mission, (d) 07 08/04/2023 two-dayconference with discussions on the holistic sustainable development of municipalities and municipalities in Cyprus and preparation of a written report on the results of CFC2023 part of the Climate Convention; (e) presentations at a large number of conferences, seminars, festivals, events.

The projects included in the chapter Mapping of Climate Action Actions are subject to calls for funding opportunities as created for the sending cities and not only.

In securing pledges, the Municipality of Limassol has the support of: (A) central government, (B) local governments, (C) NGOs, (D) private bodies, (E) Municipalities.

To coordinate the progress and implementation of the City of Climate Convention, a private-law company with 100 % shareholder was established in the Municipality of Limassol. The members of the Management Board shall be composed of members of the Transition Group on Climate Neutrality. Alongside the Transition Group, the Enlarged Transition Group on Climate Neutrality is also being activated.

The Climate Convention is deposited in September 2023, evaluated, revised and redeposited in March 2024, evaluated every two years initially until 2030 and then until 2050 inclusive.

Annex 2. Summary of key topics covered in research and innovation stakeholder interviews

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
Agricultural Research Institute	1. Protection of areas in good agricultural condition 2. Green spots/waste management and circular economy 3. Use of fertiliser to improve soil, as it is in poor condition in Cyprus 4. Promotion of rural clusters 5. Extreme weather events 6. Climate change and agriculture 7. Energy Communities 8. Energy efficiency in agriculture	1. There is a need to protect land in good agricultural condition as it is a source of carbon sequestration and to ensure local food supply. The same applies to green zones/areas adjacent to protected areas, which can be vulnerable to changes in the new planning zones in order to satisfy the construction flower. 2. Green Points are not properly designed and structured so that citizens can easily deposit special materials such as wood, timber, sheets and curtailment. 3. Compost has many benefits in agriculture, such as pest management such as nematodes, protection against soil erosion, increase in soil organic matter, which further increases crop yields (citrus + wheat). These have benefits as the use of compost can reduce the use of fertilisers/pesticides. 4. Need to promote the production of compost – at least 30 % of waste in Cyprus is biologically suitable for composting. This will have two advantages: better management of	- Studies identifying and recording all soils in good agricultural condition throughout Cyprus, and then further identify best practices and measures to protect them. Include carbon sequestration issues. - Better/stronger governance measures to protect green areas and protected areas with protected species. - Three green waste streams can be they are used as useful products to generate revenue as follows: wood – heavy branches – for energy, sheets for composting and thin small branches for soil cover – circular economy - Incentives for agro-industries to they shift to the circular economy (anaerobic waste treatment plants to use biomass to produce energy, composting or other useful products that can increase revenues). - Specialised research in the field of compost; with a view to improving its quality for the various crops. Cyprus also has the potential to develop a specialised laboratory to standardise fertiliser quality.

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
	9. Infrastructure and water distribution 10. Cypriot products – provisions on food origin	waste in Cyprus and improvement of agriculture. 5. Research in ARI (Adapt2Clima) found that some agricultural areas are vulnerable to climate change. Moreover, extreme weather events (EWE) can have a negative impact on agriculture. 6. The RES could be applied for GHG. However, the current framework obliges farmers to install PV vehicles on good land next to their greenhouse effect and prevents farmers from forming cooperatives and installing common PV vehicles on a piece of land. As a consequence, farmers do not want to install RES as they consume valuable agricultural land. There is a role for energy communities here. 7. Energy efficiency in greenhouses. The objective of greenhouses is to control the climate, control and regulate temperature, water, soil and pests. There is scope to improve their energy efficiency, both to become smart and to become a small Internet of Things. 8. In recent years, there has been a lack of funding for setting up research laboratories on these issues, and there is an urgent need for funding	- Further specialised studies using climate models that determine the impacts of climate change on agriculture, with a view to developing new agricultural zones/Delimitation of specific agricultural areas to be restructured with new crops/plants suitable for climate change. - Use modelling/spatial analyses for areas with water scarcity or water scarcity for emergency responses. - Research on smart greenhouses, sensors, automation and IoT use. - Research on heating and cooling systems animals, in order to increase their effectiveness. - Research on the use of shallow geothermal in greenhouses and animals. - Financing of specialised laboratories and researchers. - Development of rural clusters that they combine agriculture, processing, agro-tourism, etc. with the necessary infrastructure. - Urgent research to adapt to climate change and extreme weather events, in particular floods, and how this water is used and reused for aquifer replenishment and irrigation (e.g. good management of water)

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
		for specialised laboratories, researchers and equipment. 9. There is a huge problem with water distribution/water supply network – it needs to be upgraded and expanded. Water scarcity is a major problem and in coastal areas salted water incurs groundwater, resulting in a lack of water availability for farmers. 10. Mandatory labelling provisions. For example, meat produced in Cyprus can only be considered a Cypriot product if the animal is fed exclusively with ingredients/products of Cypriot origin 50 %, i.e. *alfalfa* fed on animals – *must* be at least 50 % of Cypriot origin/crop – REGULATION (EU) No 1169/20 11	water/collection to be used for recharging) - Progress in waste water treatment, in order to more water available for irrigation - More technique needed training/diplomas – Post-secondary vocational education and training - Research and innovation in green roofs/green walls – wetlands. Address microclimate change due to heat storms, clean air quality, sinks of coal.
Union of Cyprus Municipalities	1. Powers and duties of local authorities 2. Know-how 3. Extreme weather events	1. Local authorities and tasks related to energy, environment and climate are limited. 2. Currently, local authorities lack the know-how or appropriate resources for energy, environment and climate actions. 3. Moreover, there is no funding for local authorities to enable them to take action in these areas. Central government is recommended to	- Learning and sharing best practices with other local authorities, in particular with regard to transport - Studies for local authorities and appropriate legal and regulatory framework and powers to enable them to take action in the field of energy, environment and climate. - Adaptation to climate change and extreme weather events, in particular floods.

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
		it provides low-interest loans to local authorities to enable them to undertake investments and projects related to energy, environment and climate. 4. The concept of energy communities is at odds with municipal law. 5. A key issue faced by local authorities is flooding and water management. 6. You propose to sign more local authorities and municipalities to the Covenant of Mayors and to develop their own Sustainable Energy (and Climate) Action Plans, which can then be implemented.	
Cyprus Energy Regulatory Authority	1. Sources of RES 2. Save 3. Energy Communities 4. Clean energy package 5. Biomass and energy	1. CERA is interested in renewable gases, including hydrogen and biomethane, as it is part of the RES Directive (EU) 2018/2001 2. Waste in energy – there is significant scope in Cyprus. Consideration could be given to large centralised waste treatment plants to minimise any land use concerns. 3. Storage can contribute to further RES penetration 4. Directive 2019/955 on the internal market for electricity needs to be transposed into national legislation in order to activate energy communities	- Demand response services and services flexibility, in particular for consumers and electric mobility - Electric mobility and storage; and how electric vehicles contribute to grid stability - Technical Study on the Internal Market electricity - Risk assessment study: in case there is no interconnection, how Cyprus can meet its RES targets. - There are not many national research funds available for clean energy packages - Biomass and biomass research energy production

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
			— — Adapted competitions for research related to Cyprus' specific problems
Water Development Department	1. Desalination 2. Investigation 3. Water management	1. The WDD policy is to decouple drinking water and weather conditions (e.g. precipitation). They aim at full supply (100 %) of drinking water demand. To achieve this, they rely on desalination and water recycling. In addition, they aim to have a **surplus** in the water supply network, meaning that the networks of the governmental water supply network have two water reserves: tanks and desalination. As a result, Cyprus will increasingly rely on desalination. 2. Waste water treatment plants (WTTP) currently do not meet water needs, as they do not operate at full capacity (currently only 22 million m³ are generated and the capacity is 65 million m³). Once the WTTP operates at full capacity, it will be able to cover 40 % of the irrigation needs, which are currently never covered by the GWW. 3. Currently, desalination plants operating in Cyprus are very efficient, with no real room for improvement. Moreover, they rely heavily on Israel to develop desalination technology, which is then purchased by the WDD.	1. Water management, including smart monitoring of networks and leakage control. 2. Demand management from all sectors of the economy. 3. Smart metering – optimisation plans 4. Low-cost waste water treatment techniques requiring less land 5. Research on the use of waste water to the fullest extent possible 6. Smart farming – hydroponics 7. Incentives/R &Iand examples for water using industries and wastewater producers – related to the circular economy, so that they can increase their revenues

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
		4. However, EAC, in cooperation with the WDD, announced an innovation challenge by which it invited expressions of interest (EoIs) for new desalination technologies (not based on reverse osmosis). 11 EoIs and 8 proposals were received. The issue with the proposals presented is that the solutions proposed so far have high land requirements. 5. Desalination and RES. RES, such as photovoltaic compounds, are more suitable for autonomous desalination plants and are less suitable for desalination plants in Cyprus. 6. They are looking for new ways of using RES. In Asprocremos they plan to test and handle floating solar panels. The expected benefits include the need for less land use and minimisation of exploration. The project will also monitor any disadvantages related to the ecosystem and water quality of the reservoir. An Energy Purchase Contract is required to be fully implemented. 7. In the Moni dam they are testing a floating membrane with the aim of minimising depopulation. To date, they have been satisfied with this: it has minimised damping and has also reduced the need to use chemicals for treatment	

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
		seaweed. They have also added photovoltaics but these need to be connected. 8. The abstraction of water resources is currently not a feasible option, due to the requirements for a certain level of water in the dams, which cannot be achieved in the weather conditions of Cyprus. They have carried out many studies and currently technology and requirements do not make it possible. The WDD has also explored pumped water sources using wastewater reservoirs, but the required energy makes it impossible. 9. Water leaks are an important issue, some networks may have leaks of up to 40 %. Due to the WDD's commitment to meet all water demand, this means that they have to use desalination plants to supply more water to replenish this lost water. If water leaks and water demand were generally better managed, there would be less water supply and therefore less use for desalination plants, reducing the energy use of the water sector.	

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
Transmission system operator	1. Further RES penetration 2. Save	1. The challenge to achieve the RES targets under the NECP is important. In an internal study carried out by the TSO, they found that without storage, grid interconnection and outage capacity of RES installations, the maximum amount of RES penetration can be 22 % by 2030. 2. Allowing the TSO to shut down the RES installations when their supply is greater than consumption would create unfavourable financial conditions for RES companies and investors. RES investments are a lot of money, and if the TSO has to close them when there is insufficient demand, then investors will not recover their investment. This creates an unfavourable investment environment. The only way for the investor to have a high IRR purchase price is to increase. 3. Storage could be an option, but it is now very expensive. If costs are reduced, storage could help. 4. Energy communities would help consumers, especially with regard to electricity costs, and are a positive development. **However**, they will not play a role in increasing further RES penetration.	- Storage (although it is doubtful whether the Cypriot researchers can have a big impact as large companies in the battery sector have not yet achieved a significant development). - RES forecast (although so far something this has not been achieved)

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
		5. The tonnage factor of the Cyprus grid is 17 %	
Deputy Minister of Tourism	1. Existing hotels and their consumption 2. Forms of tourism 3. Horizontal issues such as transport	1. There is scope for existing hotels to reduce their energy and water consumption, as well as to manage their waste. The Cyprus Hotels Association carried out a study on water saving and the development of a common water treatment plant (however, no further progress has been made). 2. Hotels have expressed an interest in installing photovoltaics, but in many cases they have been reduced by the lack of available space. 3. There is a need to develop new forms of tourism that are even more environmentally friendly. The Deputy Ministry aims to develop alternative forms of tourism (such as sport, walking, cycling and religious tourism) with the aim of increasing the number of visitors to Cyprus and also reducing the seasonality of tourism. If this is successful, then the number of tourists will increase (tourist arrivals for 2019 will be 4 million) with a significant impact on the use of energy and water. 4. There is also a plan to further develop tourism in the Troodos region, which needs to be carefully addressed.	- New forms of tourism - Incentives for agro-tourism and new forms tourism – Also motivation- disincentives – for example, marine sports areas to turn to canoes (incentives) and reduce the use of jet skis (disincentives) - Attracting tourists out of season - Hotel energy management; including smart energy management - Retrofit/energy management/ resources in existing tourism infrastructure - For future tourism infrastructures – Research for softer developments that are more environmentally friendly.

Organisation	Main Discussion Issues	Issues identified	Identified R & D areas
		There is a need to develop new forms of radical and innovative agro-tourism that Cyprus can export to other countries. 5. We need to look at transport and the fact that most tourists use vehicles, including motorcycles (2000) and cars to drive, adding to the emissions of the local transport sector.	

<u>Results from the interactive and facilitated workshop</u>

The workshop used the Climate KIC Challenge- Led approach, a participatory approach bringing together "analysts" and "actors" together to develop a common "map" of a specific challenge, in this case the challenge of achieving the objectives of the NECP. The interactive workshop allowed to collect participants' knowledge and identify research and innovation-related gaps and opportunities across all dimensions of the NECP.

Principal	**Themes**	**Challenges**		
		Social	**Technical**	**Resource gaps**
Energy	1. Energy transition 2. Clean Power Generation 3. Penetration of renewable energy	• Lack of public awareness, need to educate the general public about energy generation and the related benefits of distributed energy sources • Lack of public acceptance • Energy poverty • Opportunities for green jobs labour • Cooperation at local level and building energy communities	• Network stability for energy injected by distributed energy • Sufficient capacity network to meet demand in case of failure or peak load • Microgrid check • Energy losses from transport of energy • Lack of space storage and storage solutions currently used are very expensive • Lack of smart grids • Rigid grid • Lack of space available for urban technologies	• High initial costs investment of Renewable Energy Sources (RES) • Lack of available framework • Lack of policies for promotion and incentives for the development of distributed production • Researchers with local know-how • Critical mass of researchers • Available funding with revenue • The regulatory framework is not helps
Transport	1. Goods transport	• There is an increase in the fleet conventional logistics	• Structure of roads	• Negligible share of renewable

Principal	Themes	Challenges		
		Social	Technical	Resource gaps
	2. Sustainable mobility 3. Green public transport 4. Renewable energy in transport	(transporters/distributors/delivery) and at the same time increasing fuel use • Big traffic • Societies dependent on the car leading to congestion, accidents, pollution, low exercise • Society used to drive for meet all mobility needs • Social behaviour and low willingness to use public transport. Although public transport options exist, people still choose to use their own cars, causing traffic, high emissions, higher costs, etc. • The car as a symbol social situation • Bad perception of buses • Raising awareness of use of renewable fuels	• Biomethane production with cost effective way • Biomethane distribution to the end-user • Efficient use biomethane in existing vehicles • Lack of infrastructure	energy in the local transport sector • Policy context • Funding pillars for sustainable mobility • No local production alternative transport • Lack of space – small country
Buildings	1. Thermal comfort 2. Use of hotel energy	• Old buildings • Lack of information on the benefits of new materials	• Hotels are energy-intensive with high energy consumption	• Regulations • Lack of a suitable trained workforce for renovation

Principal	Themes	Challenges		
		Social	Technical	Resource gaps
		• Lack of awareness of available technology • Hotel users do not interested in energy use • Culture and priorities of hotel owners • Shutdown of hotels to renovate hotels and increase their energy efficiency • Seasonality of hotel industry	• Technical restrictions due to hotel age • Few field studies assessing models related to energy efficiency upgrades • Impact of old building materials • Limited availability of low absorption and emission building materials	• Financial costs for the building renovation • Outdated guidelines building lines and codes • Lack of experience and expertise of engineers in energy efficiency and renovations with low absorption and emission materials

Annex 3. Draft Long-term Building Renovation Strategy

Energy Service, Ministry of Energy, Commerce and Industry

Long-term Building Renovation Strategy

May 2023

Contents

Contents

1. Introduction

The Energy Union and the 2030 energy and climate policy framework set ambitious commitments to further reduce greenhouse gas emissions, increase the share of energy consumption from renewable sources and save energy to enhance its energy security, competitiveness and sustainability.

In addition, the European Green Deal (EGD) and the ‘Fit for 55’ policy measures to implement it, envisage even more ambitious commitments to reduce greenhouse gas emissions by at least 55 % by 2030 compared to 1990 and to zero net emissions by 2050.

Buildings are at the heart of energy efficiency policy, accounting for almost 40 % of final energy consumption at Union level and 4045 % at national level. With a view to facilitating the cost-effective transformation of existing buildings into highly energy-efficient buildings in order to achieve the above objectives, each Member State shall draw up a long-term renovation strategy and be submitted to the European Commission as part of the final integrated national energy and climate plan referred to in Article 3 of Regulation (EU) 2018/1999 of the European Parliament and of the Council.

In accordance with Article 2a of the Energy Performance of Buildings Directive – EPBD (Directive 2010/31/EU and Directive (EU) 2018/844), each Member State shall adopt a long-term strategy for the renovation of national stock of residential and non-residential buildings, both public and private, into a highly energy efficient and decarbonised building stock by 2050, facilitating the cost-effective transformation of existing buildings into nearly zero-energy buildings. Each Long-Term Renovation Strategy shall include:

1. An overview of the national building stock based, where appropriate, on statistical sampling and the expected rate of renovated buildings in 2020.
2. The identification of cost-effective approaches to renovations depending on the building type and climatic zone, taking into account possible appropriate triggers in the lifecycle of the building, where applicable.
3. Policies and actions to stimulate cost-effective deep renovation of buildings, including staged deep renovation, as well as to support targeted cost-effective measures and renovations, for example by introducing an optional system of building renovation passports.
4. An overview of policies and actions relating to the worst performing segments of the national building stock, split incentives and market failures, and a description of

national actions contributing to alleviating energy poverty.

5. Policies and actions concerning all public buildings.
6. Overview of national initiatives to promote smart technologies and well-connected buildings and communities, as well as to improve skills and education in the construction and energy efficiency sectors.
7. Evidence-based estimate of expected energy savings and wider benefits, such as those related to health, safety and air quality.

In Cyprus housing is estimated to account for 23 % of final energy consumption, while another 17 % is due to trade, hotels and services, mainly office buildings[94]. The various political, economic and social conditions that have prevailed for many years have not favoured the implementation of energy-saving measures in the construction of buildings, resulting in a highly energy-intensive building stock. The first organised effort to implement energy saving measures in buildings was made in 2004 through the grant plans of the Renewable Energy Sources (RES) and Energy Saving Fund (EPE), while the implementation of mandatory measures for new buildings and buildings over 1 000 m² undergoing major renovation was made for the first time in 2007 with the adoption of the 'Regulation of the Energy Performance of Buildings (Minimum Energy Efficiency Requirements) Decree of 2007'. The absence of thermal insulation, as well as adequate sun protection during the summer months, have negative effects on the economy and the environment, harm the health of citizens, reduce the productivity of workers in workplaces buildings and generally impair the quality of life. Deep building renovations provide an opportunity to solve many of these problems, as the potential for energy savings is enormous, with 90 % of all buildings built before minimum energy performance requirements were introduced.

The Long-Term Building Renovation Strategy (NSAP) highlights, with quantitative and qualitative indicators, the problems caused by the current energy situation of the building stock and the opportunities offered by greater mobilisation of investment in deep renovations. It recognises the parties involved, the obstacles that exist and how they can be overcome. On the basis of the above data, the roadmap with measurable progress indicators up to 2050 is presented.

The DSAK, which was first prepared in 2020, is a development of the Strategy for the Mobilisation of Investments in Building Renovation, which was adopted in 2014 and

94Final energy consumption by sector 2021 – Eurostat revised in 2017. As in the previous cases, it will be developed after consultation with stakeholders. The consultation takes place through the legislative Advisory Committee for the Promotion of Energy Saving in Buildings and Promotion of Buildings with Zero Energy Consumption (Advisory Committee), which consists of 16 organisations and bodies involved in the building sector.

The public consultation was launched in May 2023 with a presentation of the preliminary report of technical assistance received by the Ministry for the revision of the DCI to the Advisory Committee. Details of the public consultation will be recorded as an Annex to the final submission of the DCI.

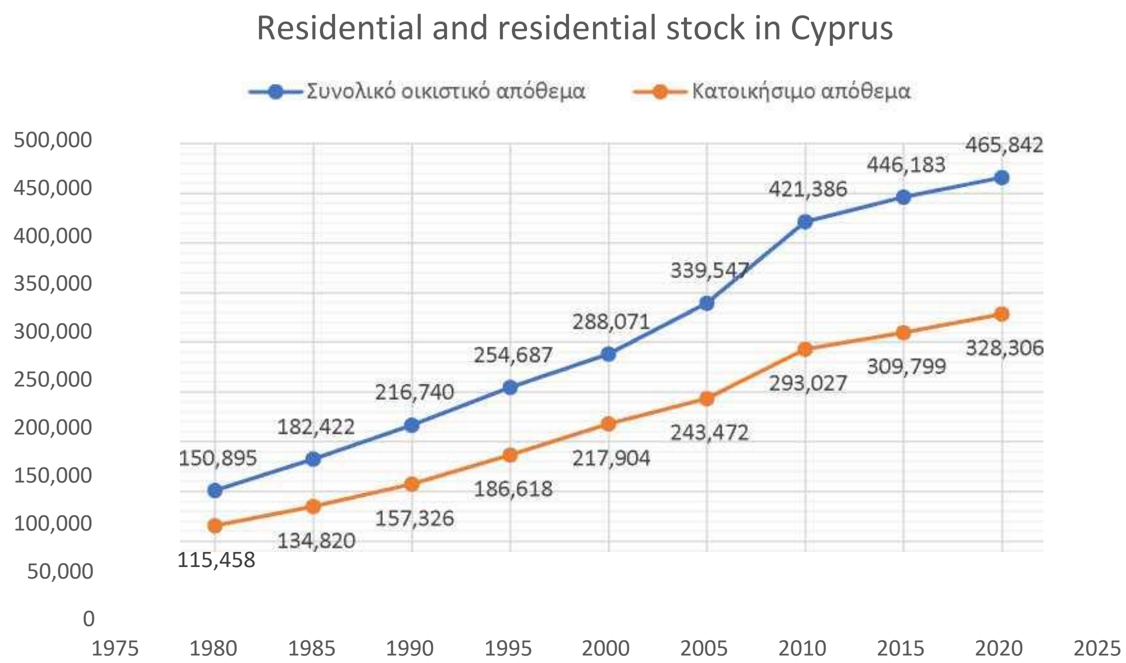
Accelerating the pace at which renovations are carried out is imperative in order to achieve Cyprus' energy and environmental objectives. This rhythm needs to be stepped up to match the ambitions of the 'Fit for 55' policy measures, which among other things calls for a further increase in the rate and depth of renovation in Europe. The aim is to upgrade the building stock in the most cost-effective way for the owner, while maximising the economic, environmental and social benefits for the country.

2. Overview of the national building stock

There are around 466.000 residential buildings and more than 34.000 non-residential buildings in Cyprus. Nearly half of the residential buildings are single-family houses. Cyprus' building stock is relatively new, with most buildings built between 1980 and 2000. However, the absence of any policy measures at the time of building these buildings has led to the majority of existing buildings being underperforming. This is reflected in the final energy consumption of the buildings sector, where it has increased dramatically since the late 90s, with a slight decline in 2013 as a consequence of the economic crisis. The review of the existing building stock is divided into dwellings, non-residential buildings and public buildings, and is based on available statistical data and technical reports "Building Stock in Cyprus and Trends to 2030" by the Joint Research Centre (JRC), "An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050" (GIZ) and "Revision of Cyprus Energy and Climate Plan – Task 5-11: Report on publications and policy elements to update the Cypriot National Long-Term Renovation Strategy' by Trinomics consultant in cooperation with the Cyprus Institute. These reports were carried out in the context of technical assistance provided by the European Commission to the Ministry of the Interior.

2.1 Residential

An important parameter for assessing the energy performance of a building is the year of its completion. Figure 03 shows the time distribution of the housing units built in Cyprus until 2020. Dwellings completed since 2010, which accounts for 9.5 % of all dwellings, are considered to have thermal insulation of the shell. In other words, it is the dwellings that applied for planning permission after 21 December 2007 and the first minimum energy performance requirements were set, assuming that they were completed over a period of three years. However, the minimum energy performance requirements for new buildings have been revised four times in the period 2007 to 2020. As a result, the most recent dwellings have significantly higher levels of thermal insulation and overall energy efficiency than houses completed on the basis of the first minimum energy performance requirements of 2007.



DFIELD **2.1: THE**ICONIC AND RESIDENTIAL RESERVE IN KYPROU 95

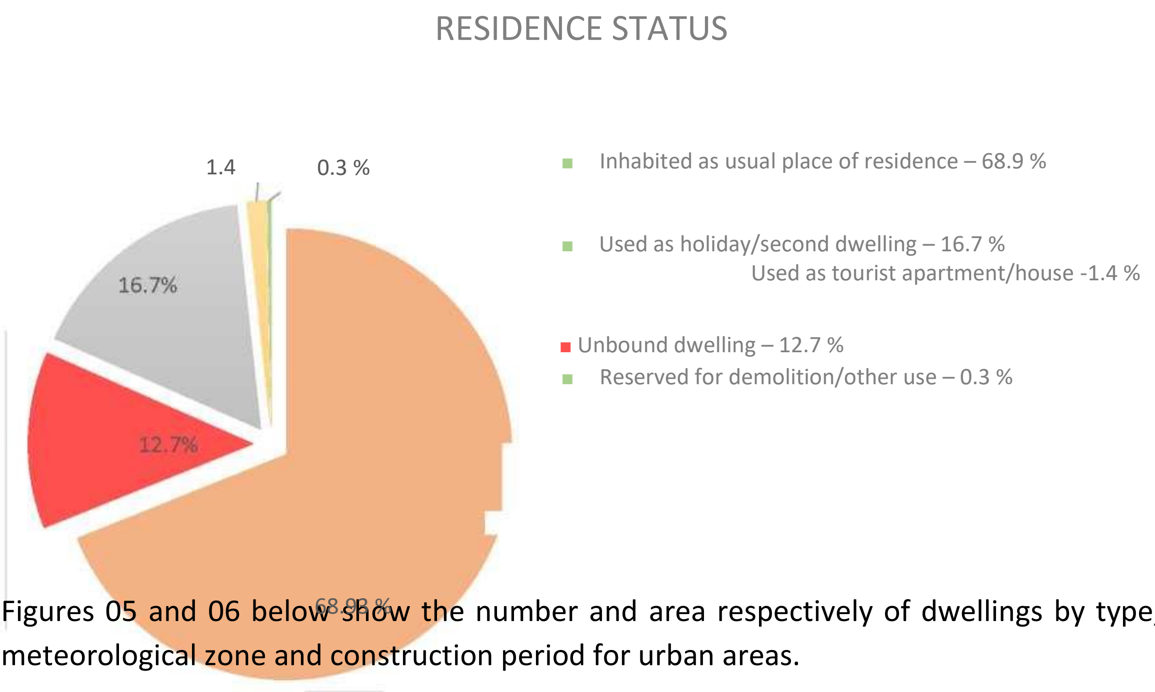
Using the latest aggregate data, which showed that the total housing stock was around 466.000 in 2020, it can be estimated, as a analogy with the 2011 population and dwelling census data, that the dwellings used as a permanent residence are around 328.000. In the same way, it can be estimated that some 81.000 other dwellings are used as holiday or tourist dwellings, which generally means that they have seasonal use and lower annual energy consumption than permanent dwellings. In addition, a further 56.000 are empty, implying that these houses are for sale or rent and that some have been abandoned.

Almost half of the dwellings used for permanent residence are single-family houses, while apartments make up almost a quarter. The remainder relates to various other types of dwellings, such as dwellings in continuous construction, dual dwellings and dwellings in a mixed-use building.

95Statistical Service of Cyprus – Construction and Housing Statistics.

Chart 04 gives a snapshot of dwellings in terms of type and status of dwellings as recorded by a survey by the Statistical Office carried out as part of a population census in 2011.

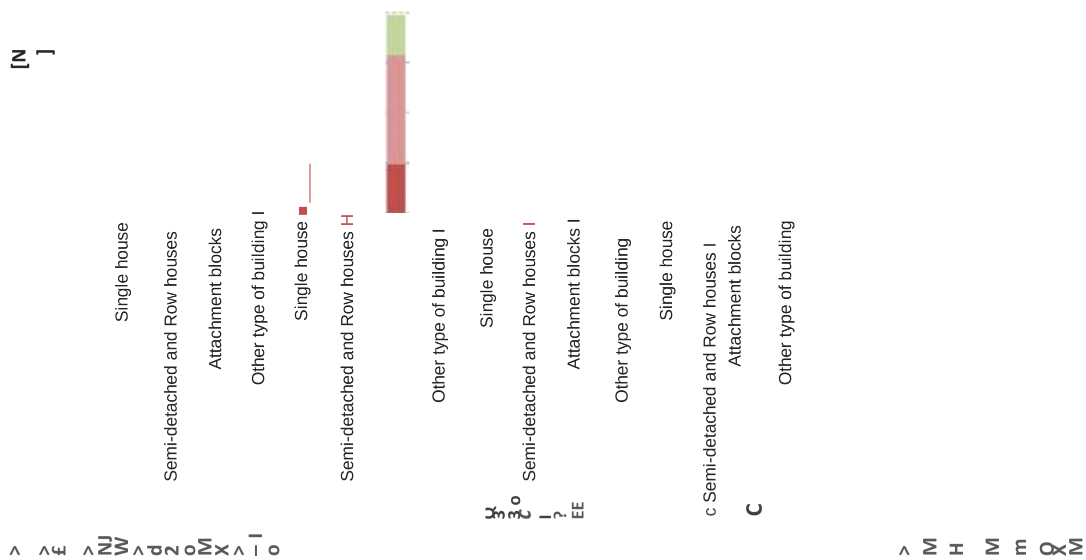
In terms of geographical distribution, 78 % are located in the coastal and lower lowland areas where larger urban centres are also located. In urban areas, 90 % of multi-apartment buildings and 62 % of dwellings in continuous construction are located.

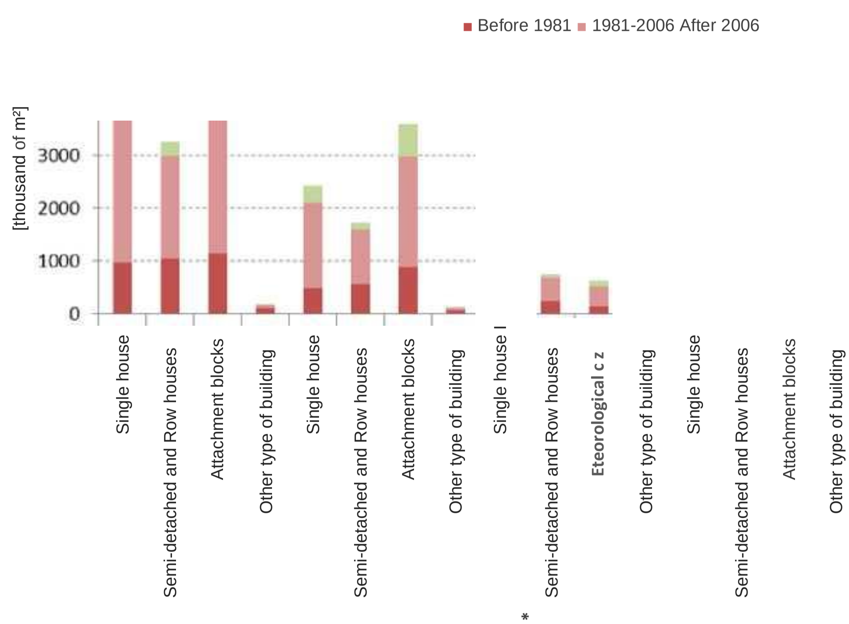


Figures 05 and 06 below show the number and area respectively of dwellings by type, meteorological zone and construction period for urban areas.

DFIELD 2.2: DWELLINGACCIDENT [3]

[3] statistical Service of Cyprus – Population and Housing Inventory 2011

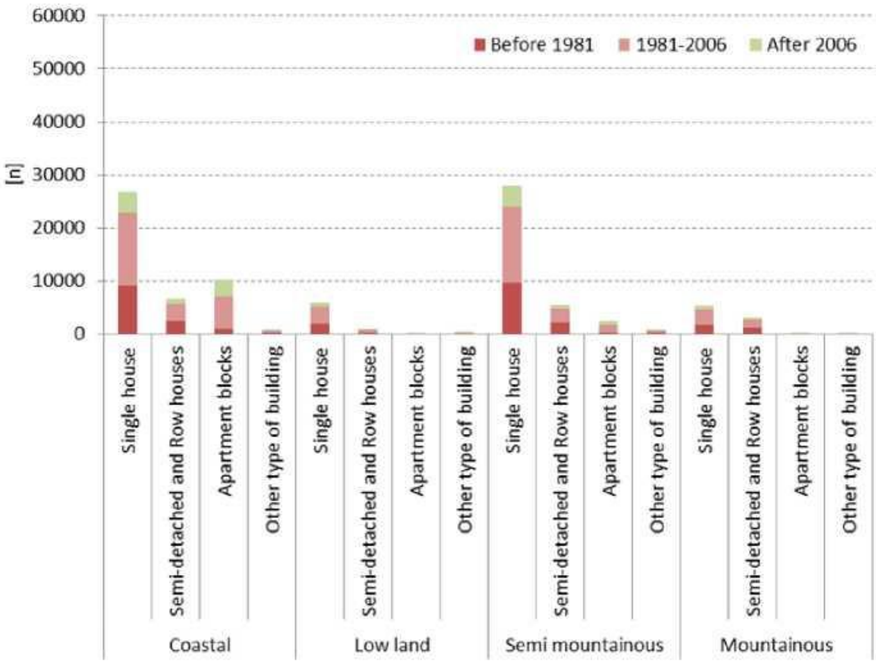




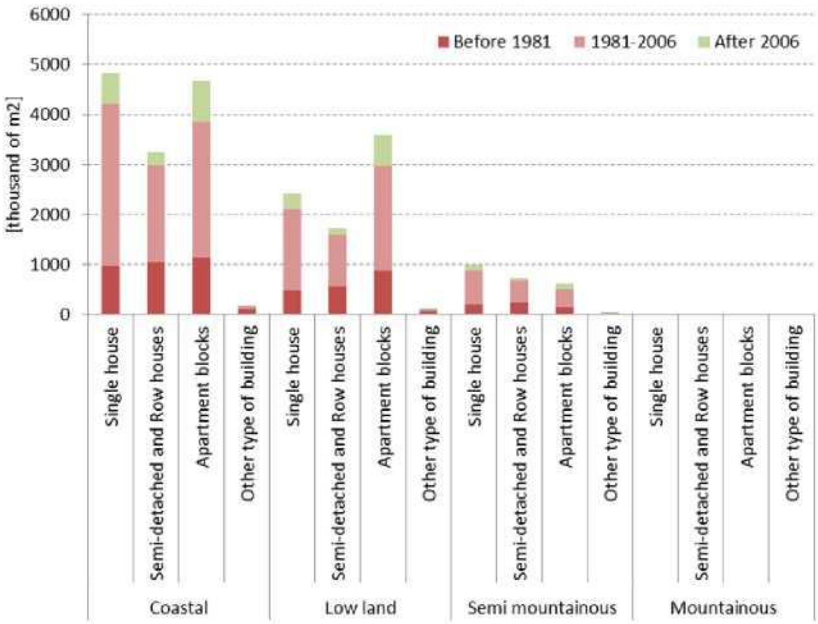
ΜΑ 2.4: ΕΜΒΑΔΟ ΚΑΤΟΙΚΙΩΝ ΑΝΑ ΤΥΠΟ, ΜΕΤΕΩΡΟΛΟΓΙΚΗ

Τα Διαγράμματα 07 ₇ₛ – 0 0 0
ανά τύπο, μετεωρολογική ζώνη και περίοδο κατασκευής για τις αγροτικές περιοχές.

Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*



DFIELD 2.5: APEDALS BY TYPE, METEOROLOGICAL ZONE AND CONSTRUCTION PERIOD – **A AGRONOMICS** [5]



DFIELD 2.6: EINVERT DOMESTIC BY TYPE, METEOROLOGICAL ZONE AN D CONSTRUCTION PERIOD – **A AGRONOMICS** [5]

The meteorological zones referred to shall be those defined in the methodology for calculating the energy performance of buildings as follows:

1. Coastline (Zone 1)
2. Lower lowland (Zone 2)
3. Semi-mountains (Zone 3)

[9] Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*

4. Mountains (Zone 4)

Trends in the size of houses built appear to change over time. Table 03 shows the surface area of single-family and multi-dwelling buildings to be larger in younger buildings. However, for apartments, the tendency is to decrease in area.

Type of home	**Construction period**	**Area (m²)**	**Volume (m³)**	**Number of floors**	**Area of frames (m²)**	**Exterior masonry area (m²)**	**Number of households**
Single-family house	Before 1970	132,1	396,3	1	10	188,4	1
	1971-1990	151,2	453,6	1	17,9	148,8	1
	1991-2007	141,4	424,0	1	22,1	155,6	1
	After 2008	202,2	606,6	2	43,3	276,6	1
Double residence	Before 1970	265,4	796,2	1	20	342	2
	1971-1990	300,2	900,7	1	30,9	231,6	2
	1991-2007	302,4	900,7	2	38,8	297,6	2
	After 2008	302,8	908,4	2	35,7	319,2	2
Dwellings continuously built (more than two)	Before 1970	718,5	2155,5	1	92,1	801	3
	1971-1990	842,7	2528,2	1	89,2	802,5	3
	1991-2007	1001,6	3004,8	1	127,1	921,6	3
	After 2008	1335,5	4006,4	1	169,5	1228,8	4
Multi-dwelling buildings	Before 1970	345,4	1022,6	3	62,3	380,3	3
	1971-1990	690,8	2072,4	3	133	916,8	6
	1991-2007	690,8	2072,4	3	133	916,8	6
	After 2008	861,4	2181,7	4	164	1064	8

IBID. 2.1: XTYPICAL HOME-TYPE ARTERIES BY TYPE AND CONSTRUCTION PERIOD[6]

The share of the residential sector in final energy consumption increased rapidly between 1994 and 2011, from 9.8 % in 1994 to 22 % in 2011. Electricity consumption increased mainly due to the installation of air conditioners and the increasing number of household electric appliances. However, the annual energy consumption per dwelling has decreased since the beginning of 2000 from 1,16 tonnes of Petroleum Equivalent (toe) to 0,85 toe in 2013. At the same time, the share of the residential sector in the

energy consumption has remained roughly stable since 2011. This can partly be attributed to the improvement of the energy performance of buildings through the implementation of the EPBD from the end of 2007.

Forty per cent (32 %) of homes in Cyprus were erected before 1980 and 58 % of them were erected between 1981 and 2010. That is, the vast majority of homes were constructed when

[6] GIZ (2017), An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050

there were no minimum energy performance requirements in force. In the absence of legislative measures, as a rule, no energy saving measures were taken during construction, with the result that the energy situation of the vast majority of homes could be characterised by a very poor to moderate energy situation. Some homeowners have taken individual ex post saving measures, benefiting from the grant schemes of the RES and ES Fund and subsequently the 'Save Upgrade' project, which concerns deep renovation. Given that the buildings renovated in the period 2015 – 2022 were mainly implemented through the "Save Upgrade", the renovation rate in the residential sector for this period is not expected to exceed 0.5 % per year (more details on the "Save Upgrade" project are given in paragraph 4.2.2). As a result, these interventions, although important, did not change the overall energy profile of the residential sector.

The main energy product used by the residential sector is grid electricity, which accounts for almost half of the final energy consumption, with heating oil and LPG being the most important energy products after electricity (see Table 04).

As regards renewable energy systems (RES) in residential buildings, solar energy for hot water production is the most widely used, accounting for 19 % of final energy consumption. This is mainly due to the fact that solar heat is installed to produce hot water in 91 % of dwellings. However, there is no data on the age of these schemes or on their performance. Heat pumps and less use of biomass and geothermal heat pumps are used for heating purposes. For 2020, 22.7 % of energy consumption for heating and cooling was covered by RES. From 2004 onwards, photovoltaic systems started to be installed in dwellings, initially with a subsidised price for the electricity they generate and then using the method of offsetting consumption against electricity generation. There are currently residential buildings in excess of 28.000 [96][97] photovoltaic systems.

Fuel	**Final energy consumption – households (TJ)**
Oil and petroleum products	**4.205,631**
Liquefied gas	1.582,800
Other kerosene	501,729
Gas oil and diesel oil	2.121,103
Fuel oil	0
Renewable energy and biofuels	**4.120,815**
Solar thermal energy	2.678,344
Ambient heat (heat pumps)	575,026
Primary solid biofuels	609,969
Biochar	257,476
Biogas	0

Cyprus96 Distribution System Operator
97Final energy consumption 2021 – Eurostat

Electricity	**6.542,669**
Heat	**0**
Total	**14.869,115**

IBID. **2.2: ELECTRICITY** CONSUMPTION IN THE RESIDENTIAL SECTOR BY BURNING IN **2021**.

In a typical dwelling, provided that the conditions of thermal comfort are met in the dwelling, the greatest energy consumption is due to air conditioning and heating. The most widespread heating system in single-family houses is a central heating system with an oil boiler, as opposed to apartments, in which independent air conditioners are used for heating. Independent air conditioners are the most common air conditioning system used in summer months in all types of homes. However, half of the dwellings do not have any central heating installed, while 18 % of dwellings do not have an air-conditioning system installed, which combined with the absence of thermal insulation in most of the dwellings leads to the conclusion that a large part of the households are compatible with moderate to poor thermal comfort conditions. Tables 05 and 06 give details of the types of heating and air-conditioning systems respectively by type of dwelling. It is noted that there has been a clear trend in recent years to install heat pumps in new homes and therefore the share of heat pumps is increasing.

Heating system	Fuel	Single-family house	Two-family houses and terraced houses	Departments	Other types of houses
Central heating system with an oil boiler	Oil	41 % (27 %)	35 % (25 %)	17 % (5 %)	23 % (9 %)
Central heating system with a condensing boiler	Oil or liquefied gas	0 % (0 %)	0 % (0 %)	0 % (0 %)	0 % (0 %)
Oil stove	Oil	2 % (2 %)	2 % (2 %)	2 % (1 %)	1 % (2 %)
Central heating system with a liquefied gas boiler	Liquid gas	3 % (3 %)	1 % (2 %)	0 % (1 %)	0 % (1 %)
Liquefied gas heater	Liquid gas	11 % (17 %)	11 % (19 %)	9 % (13 %)	28 % (21 %)
Heat pump	Electricity	4 % (3 %)	4 % (2 %)	5 % (2 %)	0 % (2 %)
Heat pump with a ground source heat exchanger	Electricity	0 % (0 %)	0 % (0 %)	0 % (0 %)	0 % (0 %)
Independent air conditioners	Electricity	17 % (17 %)	23 % (19 %)	35 % (42 %)	14 % (19 %)
Independent high efficiency air conditioners	Electricity	4 % (4 %)	6 % (5 %)	9 % (11 %)	4 % (5 %)
Shob electric	Electricity	8 % (10 %)	9 % (12 %)	11 % (15 %)	20 % (29 %)
EAC thermo-accumulators	Electricity	2 % (1 %)	3 % (1 %)	6 % (1 %)	0 % (0 %)
Fireplace	Biomass	4 % (13 %)	3 % (12 %)	1 % (2 %)	1 % (3 %)
No or other means of heating	D/E	3 % (2 %)	2 % (2 %)	5 % (8 %)	7 % (9 %)

IBID. 2.3: THEHEATING SYSTEM BY TYPE OF DWELLING IN URBAN AREAS AND IN BRACKETS IN RURAL AREAS[9]

Air-conditioning system	Fuel	Single-family house	Two-family houses and terraced houses	Departments	Other types of houses
Central system with heat pump	Electricity	4 % (4 %)	4 % (4 %)	5 % (5 %)	0 % (0 %)
Central system with a ground source heat exchanger	Electricity	0 % (0 %)	0 % (0 %)	0 % (0 %)	0 % (0 %)
Independent air conditioners	Electricity	62 % (62 %)	62 % (62 %)	61 % (61 %)	65 % (65 %)
Independent high efficiency air conditioners	Electricity	16 % (16 %)	16 % (16 %)	15 % (15 %)	16 % (16 %)
No or other air conditioning equipment	D/E	18 % (18 %)	18 % (18 %)	18 % (18 %)	18 % (18 %)

IBID. 2.4: THEAIR CONDITIONING SYSTEM BY TYPE OF DWELLING IN URBAN AREAS AND IN BRACKETS IN RURAL AREAS[9]

Table 07 shows the estimated energy demand according to the type of dwelling and its construction period. As the energy demand does not take into account the technical system used, this table illustrates the effectiveness of the shell in terms of thermal insulation per period of manufacture.

	Year of manufacture	Space heating (kWh/m^2/time)	Space cooling (kWh/m^2/year)	Hot water (kWh/m^2/time)
Single-family house	Before 1981	54	72	23
	1981 – 2006	40	54	18
	After 2006	36	50	15
Two-family houses and terraced houses	Before 1981	59	58	23
	1981 – 2006	43	44	18

[9] Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*

	After 2006	39	40	15
Departments	Before 1981	45	105	23
	1981 – 2006	33	84	18
	After 2006	30	76	15
Other types of houses	Before 1981	56	53	23
	1981 – 2006	41	41	28
	After 2006	37	38	15

IBID. 2.5: REQUEST FOR ACTION BY TYPE OF RESIDENCE [10]

2.2 non-residential buildings

In2020, there were 115.746 non-residential accommodation, of which 43.900 in Nicosia (38 %), 34.169 (30 %) in Limassol, 17.845 (15 %) in Larnaca, 12.681 (11 %) in Paphos and 7151 (6 %) in Famagusta [98] [99]. It should be borne in mind that, especially in the tertiary sector, a building may include several individual premises (e.g. a multi-office building or a shopping centre), therefore these statistics do not reflect the actual number of non-residential individual buildings. There are around 34.000 non-residential buildings in Cyprus, including the public sector, with a total surface area of 9 million m². As regards the use of these buildings, the most populous in number of accommodation are offices, retail premises and catering areas. However, by surface area the largest category of buildings is the hotel and accommodation sector, with a total surface area of 2 million m². Table 08 shows the total number and surface area for non-residential building types.

98Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*
99Review of Cyprus Energy and Climate Plan – Task 5-11: Report on publications and policy elements to update the Cypriot National Long-Term Renovation Strategy by Trinomics consultant in cooperation with the Cyprus Institute.

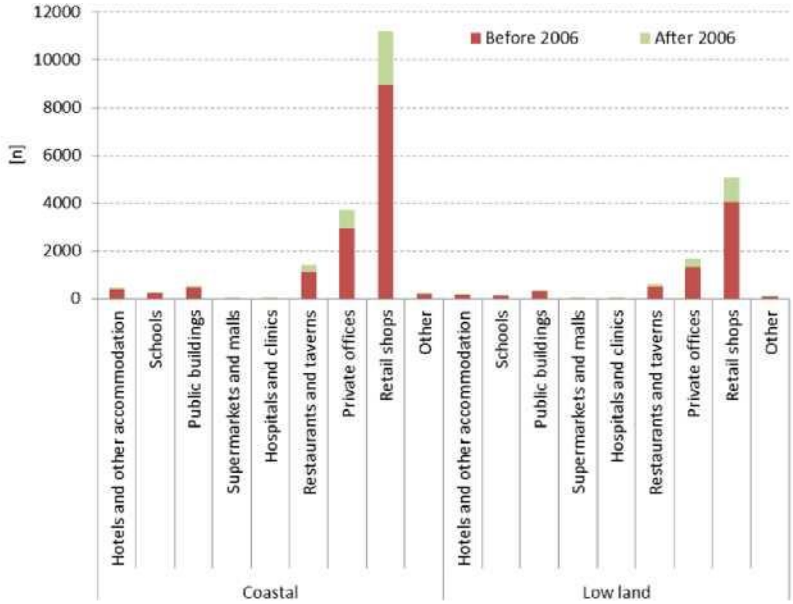
	Total area (m²)	Number of accommodation	Average floor area (m²)
Hotels	2.094.134	766	2.734
Junior and senior high schools and technical schools	613.546	144	4.261
Primary schools	453.755	325	1.396
Kindergartens	96.376	419	230
Public buildings	1.886.370	1.087	1.735
Airports	119.600	2	59.800
Hypermarkets and compartment stores	280.396	67	4.185
Hospitals and clinics	485.898	83	17.354
Restaurants	179.360	2242	80
Private offices	1.665.000	11.100	150
Retail sales facilities (stores)	1.080.000	18.000	60

IBID. 2.6: ECANDELAS AND NUMBER OF CATALYSTS PER TYPE OF BUILDING IN BUILDINGS NOT USED AS DWELLING[12]

Just like in the residential sector, 83 % of the buildings used for the provision of services or other business purposes were constructed before adopting any minimum energy performance requirements. The vast majority of non-residential buildings are located in the coastal and lower lowlands (meteorological zones 1 and 2).

Figure 09 shows the number of buildings by type, dividing them into buildings constructed before and after 2006.

[12] Economidou, M. (2016). *Table 33, Summary of non-residential building stock in Cyprus, Long-term strategy for Mobilisation investments for renovating Cyprus national building stock – JRC Technical Reports.*



DFIELD 2.7: ABLADE OF BUILDINGS NOT USED AS DWELLING IN COASTAL AND LOWLAND AREAS[13]

The non-residential sector meets its energy needs, mainly through the use of electricity, as it covers around 67 % of consumption. Table 09 gives the sector's energy consumption per energy product.

Fuel	Final energy consumption – other sectors – commercial and public services (TJ)
Oil and petroleum products	**1.262,745**
Liquefied gas	459,567
Other kerosene	88,564
Gas oil and diesel oil	610,426
Fuel oil	104,189
Renewable energy and biofuels	**2.309,134**
Solar thermal energy	472,649
Ambient heat (heat pumps)	1.508,592
Primary solid biofuels	126,389
Biochar	171,631
Biogas	23,620
Electricity	**7.306,924**
Heat	**0**
Total	**10.878,803**

IBID. 2.7: THEELASTIC CONSUMPTION OF ENERGY IN THE FIELD OF TRADE AND PUBLIC SERVICES FOR THE YEAR 2021 [14]

[13] Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*
[14] final energy consumption 2021 – Eurostat

Grid electricity The technical systems installed in tertiary sector buildings are different depending on the type of building. Central heating with boiler is the main heating system found in hotels, while central heat pump heating is the main system in offices, shops and supermarkets. The majority of tertiary sector buildings have a centralised air-conditioning system. Relevant data are presented in Tables 10 and 11.

	Fuel	**Hotels**	**Private offices**	**Retail sales facilities (stores)**	**Hospitals and clinics**	**Hypermarkets and compartment stores**	**Restaurants**
Central heating system with an oil boiler	Oil	43 %	41 %	12 %	31 %	11 %	28 %
Central heating system with a condensing boiler	Oil or liquefied gas	2 %	1 %	0 %	1 %	1 %	0 %
Central heating system with a liquefied gas boiler	Liquid gas	10 %	4 %	2 %	4 %	1 %	3 %
Heat pump	Electricity	40 %	44 %	75 %	61 %	81 %	36 %
Heat pump with a ground source heat exchanger	Electricity	0 %	1 %	0 %	1 %	2 %	0 %
Independent air conditioners	Electricity	3 %	6 %	8 %	0 %	8 %	18 %
Independent high efficiency air conditioners	Electricity	1 %	1 %	1 %	0 %	1 %	5 %
No or other means of heating	D/E	1 %	0 %	0 %	0 %	0 %	0 %

IBID. 2.8: HEATING SYSTEM PER TYPE OF BUILDING IN BUILDINGS NOT USED AS DWELLING[15]

	Fuel	**Hotels**	**Private offices**	**Retail sales facilities (stores)**	**Hospitals and clinics**	**Hypermarkets and compartment stores**	**Restaurants**
Central system with heat pump	Electricity	62 %	54 %	75 %	68 %	88 %	42 %
Central system with a ground source heat	Electricity	0 %	1 %	0 %	1 %	2 %	0 %
Independent air conditioners	Electricity	24 %	22 %	8 %	9 %	0 %	28 %
Independent high efficiency air conditioners	Electricity	4 %	3 %	1 %	2 %	0 %	5 %
No or other air conditioning equipment	D/E	10 %	20 %	16 %	20 %	10 %	25 %

IBID. 2.9: THE AIR-CONDITIONING SYSTEM PER TYPE OF BUILDING IN BUILDINGS NOT USED AS DWELLING[15]

Table 012 shows the estimated energy demand per building type.

	Year of manufacture	**Space heating (kWh/m²/time)**	**Space cooling (kWh/m²/year)**	**Hot water (kWh/m²/time)**	**Lighting (kWh/m²/time)**
Hotels	Before 2006	65	268	40	55
	After 2006	45	183	28	50
Private offices	Before 2006	87	203	5	45

[16] Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*

	After 2006	59	138	4	40
Retail sales facilities (stores)	Before 2006	41	194	5	105
	After 2006	28	132	4	95
Hypermarkets and compartment stores	Before 2006	33	470	1	105
	After 2006	23	321	1	95
Restaurants	Before 2006	142	285	214	85
	After 2006	97	194	146	80

IBID. 2.10: ENERGY INPUT PER TYPE OF BUILDING IN BUILDINGS NOT USED AS DWELLING[16]

2.3 buildings owned and/or occupied by the public sector

For buildings owned and/or occupied by the public sector, although they are part of tertiary sector buildings, a specific review of the building stock for this sector is a compelling reason for their exemplary role in the energy performance of buildings. It should be noted that 'public building' is not defined in the EPBD, nor is it defined in the Energy Efficiency Regulation Law and the Energy Efficiency Law.

For the purposes of this text, the reference to public buildings refers to buildings occupied by central government authorities and sub-central contracting authorities as defined in Annex I to the Regulation of Public Procurement Procedures and Related Matters Act of 2016. The public comments and educational establishments are presented separately in the tables below due to the fact that they differ in use from public buildings.

Public buildings are typically used as offices and follow a similar age distribution as private sector offices, leading to low energy efficiency. This is also confirmed by the Energy Performance Certificates (EPCs) issued for these buildings.

The local government in the area controlled by the Republic of Cyprus consists of 30 municipalities and 349 municipalities. Most of the municipalities and larger communities only have one building used for administrative purposes and events. However, large municipalities own more buildings to serve the public, as well as other types of buildings such as libraries and sports centres. During the school years 2022-2023, a total of 272 public and 75 community kindergartens, 328 primary schools, 9 special schools and 114 secondary schools, of which 5 were Ecperian High Schools and 13 Schools of Technical and Vocational Education and Training. The responsibility for the implementation of projects relating to the construction of new schools and the maintenance and extension of existing ones lies with the Technical Services of the Ministry of Education, Sport and Youth (YPAN). Most have been erected before 2006 and almost

[16] Zangheri, P. (2016). *Building Stock in Cyprus and Trends to 2030, JRC Technical Reports.*

all use central heating with a boiler to meet heating needs in winter, and there is generally no air-conditioning in classrooms. It should be noted that there are air-conditioning systems installed in classrooms with special operational conditions, special needs and specific user cases such as the offices of directors, secretarial offices, teachers' rooms, surgeries, amphitheatres, event rooms, summer school workshops, special training units, special classrooms, etc.

As regards public universities, the University of Cyprus, which is the largest public university, owns the highest number of buildings, most of which were erected in the campus in recent years. The Cyprus University of Technology is housed mainly in historic buildings and rented ones in downtown Limassol, whereas the Open University of Cyprus is housed in a building in Nicosia. Public universities operate technical departments that are responsible for the maintenance and smooth functioning of their building facilities.

Relevant data on energy consumption in public buildings are presented in Table 013.

	Year of manufacture	Space heating	Space cooling	Domestic hot water	Lighting
		(kWh/m²/year)			
Public buildings	Before 2006	49	44	5	42
	After 2006	34	30	4	37
Schools	Before 2006	35	55	7	35
	After 2006	24	37	5	30

IBID. 2.11: GENERATION OF ENERGY BY TYPE OF BUILDING UNDER FINANCIAL HEADING[17]

[17] Croci, L., Realini, A (2019). *Termination of the actual energy demand of different types of buildings and processes,* RSE, Report to the European Commission's Structural Reform Support Service, Deliverable 3.2, Contract no. SRSS/S2017/048, Milan.

3. Cost-effective approaches to building renovations

The calculation of cost-optimal levels of minimum energy performance requirements, carried out for the first time in 2013 and repeated every five years on the basis of Article 5 of the EPBD, provides an opportunity to consider the most cost-effective ways of renovating buildings by taking into account initial capital expenditure and operating costs in the lifecycle of the building. In addition, cost-optimal approaches have been examined through technical studies carried out on behalf of the Ministry of Energy, Commerce and Industry. This chapter sets out good economic and technical practices for implementing measures to improve the energy performance of buildings.

3.1 Results of calculation of cost-optimal levels of minimum energy performance requirements

The results of the second calculation of cost-optimal levels, carried out in 2018, showed that for buildings undergoing major renovation, higher minimum energy performance requirements should be set than the currently applicable category B, but lower than the requirements for buildings with a high zero energy consumption (NZEB). It should be noted that the definition of NZEB is the same for new and existing buildings. In particular, in residential buildings that are being renovated, it is economically optimal to upgrade them to energy class A, while for non-residential buildings upgrading to energy class B +. The recalculation of cost-optimal levels of energy efficiency requirements is ongoing in the framework of a contract awarded by the Ministry of Energy, Commerce and Industry and is expected to be completed in June 2023.

Furthermore, according to the 2018 calculation, the individual measures that provide a high economic benefit to the lifecycle of the building are:

1. Roof thermal insulation
2. Heat pumps for heating
3. Biomass boiler

4. High-efficiency air-conditioning units
5. Led lighting
6. Photovoltaic

The results mentioned above relate to the economically-optimal solution from the point of view of investors rather than the broader macroeconomic perspective, and are based on a number of assumptions, the most important ones being:

1. The lifecycle of the building was set at 30 years for residential and public buildings and 20 years for the remaining buildings;
2. The discount rate was set at 5 % for dwellings and 11 % for tertiary sector buildings;
3. The average annual rate of increase in electricity prices is 1.5 % and for petroleum products 1.2 %.

Annex I presents examples of economically optimal combinations of energy-saving measures that can be made in a deep renovation, as demonstrated by the results of these 2018 calculations. It should be stressed that these examples reflect the cost of energy and materials for the given time when the calculations were made, while energy consumption represents the average likely use. Therefore, the examples give a general picture, as the energy-saving interventions and the installation of RES systems in buildings must be looked into in relation to the data of each case.

The costs mentioned in the examples below relate to the additional costs of a planned major renovation, as only then are minimum energy efficiency requirements triggered. In addition, the use of the combinations listed below during renovation and energy savings also offer other benefits such as opening the facades, improving thermal comfort and increasing the value of the building when selling or renting. These benefits have not been quantified as financial income for the investor and have not been taken into account when calculating the economic best levels.

3.2 points in the lifecycle of the building increasing the chances of renovating the building

During the lifecycle of a building, there are points that trigger major renovation. The most common of these are:

1. When transferred to a new owner
2. When rented to a new tenant
3. When static and/or aesthetic upgrade takes place
4. When a change of use and/or additions is made

The change of use and/or additions seems to be the point most likely to lead to a major renovation. Depending on the type of building, the same point may have different chances of triggering a major renovation. For example, a new owner in a dwelling is highly likely to carry out renovation, but this is not the case with a change of ownership in a hotel, where renovations are mainly driven by competition in the tourism sector. While in some categories of buildings the above points may have no chance of triggering renovation. For example, when the building is rented to a new tenant but the rent cannot be increased, there is also no interest from the owner to improve the energy performance of the building.

Minimum energy performance requirements apply to major renovations, as well as to elements of the envelope replaced or retrofitted (more details on minimum energy performance requirements are provided in paragraph 4.1.1). However, the application of the requirements alone does not ensure that the cost-optimal energy saving potential is fully exploited. For this reason, synergies with energy-saving measures leading to economies of scale should be considered when there is a planned renovation or renovation triggered by the reasons set out above.

In addition to the points in a building's lifecycle, energy renovations are also triggered by legislative measures and policies such as those detailed in paragraphs 4.1, 4.2, 6.1 and 6.3. The most important ones are:

1. Availability of financial incentives and funding mechanisms;
2. Mandatory renovation rates for buildings owned and occupied by central government;
3. Purchase and renting of buildings by central government only energy-efficient buildings;

The proposal for a revision of the EPBD as well as the proposal for a revision of the Energy Efficiency Directive are expected to set new legislative measures to trigger renovations. The new measures proposed are as follows:

1. Setting minimum energy performance standards for all existing buildings. These standards should be achieved within a specific timeframe and will effectively trigger energy upgrading in buildings with low energy performance.
2. Extending the current obligation to renovate buildings owned and occupied by central government to all public administration. Renovations of public buildings need to upgrade the building to NZEB or zero-emission building.
3. When public authorities purchase or lease a building, the building must be at least NZEB.

4. Policies and actions for cost-effective deep renovation of buildings

Policies and measures to boost the renovation of existing buildings can be categorised into legislative measures, incentives, training and information measures. An analysis of the current state of play is provided below, and the relevant obstacles along how to overcome them are identified**.**

Some of the measures listed below concern actions targeting individual elements of the building such as inspections of heating and air-conditioning systems and requirements for technical systems. However, they can trigger a deep renovation or form part of a staged renovation.

4.1 Legislative measures

4.1.1 Minimum energy performance requirements for existing buildings

Minimum energy performance requirements for existing buildings shall apply when they undergo major renovation and when elements of their envelope are replaced or retrofitted. The first Minimum Energy Performance Requirements Decree, issued in 2007, required the energy upgrading of buildings of more than 1 000 m² undergoing major renovation. In 2009, the minimum requirements were revised and the issuing of an EPC with a minimum class B for buildings over 1 000 m² undergoing major renovation was added. A new decree was adopted in December 2013, reducing the thermal transmittance rates by 15 %, while for the first time requirements were set for elements of the envelope that are retrofitted or replaced regardless of the size of the building. As of 1 January 2017, the obligation for buildings undergoing major renovation to be of minimum energy class B was extended to all buildings regardless of their size.

The existing minimum energy performance requirements became applicable from 1 July 2020. These require all residential buildings undergoing major renovation to be energy class A, and energy class B + all other buildings. In addition, minimum energy efficiency requirements apply to elements of the envelope that are replaced or retrofitted. The current requirements have been developed on the basis of the results of the calculation of cost-optimal levels of minimum energy performance requirements carried out in 2018, as well as the views of all parties involved in the prior consultation through the competent Advisory Committees.

Table 05 presents chronologically the changes in minimum energy efficiency requirements since 2007.

Minimum Energy Efficiency Requirements in accordance with:		REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT	REGULATORY ADMINISTRATIVE ACT 121/2020
In force since		21/12/2007	1/1/2010	11/12/2013	1/1/2017	1/7/2020
Major renovation	**Maximum thermal transmittance of walls and load-bearing elements that are part of the building envelope**	0,85 W/² K only in buildings over 1 000 m²	0,85 W/m² K only in buildings above 1 000 m²	0,72 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum U-transmittance of horizontal building elements and roofs forming part of the building envelope	0,75 W/m² K only in buildings above 1 000 m²	0,75 W/m² K only in buildings above 1 000 m²	0,63 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum U-transmittance for floors of enclosed non-heated space	2,0 W/m² K only in buildings above 1 000 m²	2,0 W/m² K only in buildings above 1 000 m²	2,0 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum thermal transmittance coefficient of frames forming part of the building envelope	3,8 W/m² K	3,8 W/m² K only in buildings above 1 000 m²	3,23 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum average shading factor on frames that are part of the building envelope	— —	— —	0,63 in buildings above 1 000 m² only	— —	— —
	Minimum energy class in EPC	— —	B only in buildings above 1 000 m²	B only in buildings above 1 000 m²	B All buildings	A for residential buildings B + for non-residential buildings
Building elements that are replaced or installed subsequently	**Maximum thermal transmittance of walls and load-bearing elements that are part of the building envelope**	— —	— —	0,72 W/m² K all buildings	0,4 W/m² K all buildings	0,4 W/m² K all buildings
	Maximum U-transmittance of horizontal building elements and roofs forming part of the building envelope	— —	— —	0,63 W/m² K all buildings	0,4 W/m² K all buildings	0,4 W/m² K all buildings
	Maximum U-transmittance for floors of enclosed non-heated space	— —	— —	2,0 W/m² K only in buildings above 1 000 m²	— —	— —
	Maximum thermal transmittance coefficient of frames forming part of the building envelope	— —	— —	3,23 W/m² K all buildings	2,9 W/m² K all buildings	2,25 W/m² K all buildings
	Maximum average thermal transmittance coefficient of the building envelope excluding horizontal building elements	— —	— —	0,63 all buildings	— —	— —

IBID. 4.1: ALEAD ENERGY EFFICIENCY REQUIREMENTS FOR EXISTING BUILDINGS

4.1.2 Energy Performance Certificates

The Energy Performance Certificate (EPC) is a reliable way to illustrate the energy status of an existing building and to record recommendations for upgrading it. It is required to be presented to the prospective buyer or tenant and a copy must be given to the new tenant or buyer. In addition, commercial advertisements for buildings rented or sold should indicate the energy class. Therefore, the EPC with the information it provides, is a tool to trigger renovation at the point in the life cycle of a building where it is sold or rented out to a new tenant. To date, 84.276 EPCs have been issued. However, only 14 % of the total issued relates to existing buildings, which can lead to the conclusion that the issuance of EPCs for sale and rental purposes remains low. This can be attributed to the following reasons:

1. No legislation linking the EPC to the market-selling document and the rental contract.
2. No information on the energy performance certificate provided to would-be buyers or tenants of buildings;
3. Would-be buyers or tenants of buildings, owners and real estate professionals find it difficult to 'translate' the data shown on the energy performance certificate into building operating costs;
4. Relatively little added value to the sale or rental price that the building owner can obtain due to the high energy performance.

The above obstacles have not allowed the energy performance certificate to gain full momentum as an indicator that affects the value of properties and, ultimately, fostering the energy upgrading of existing buildings. In order to increase the visibility of the EPC to the general public from 2015 onwards, financial incentives were linked to the issuing of EPCs, as in the case of the 'Save – Upgrade' project, and has been included in information campaigns organised by the Ministry of Education.

Further measures to strengthen the EPC in the real estate market are listed in the National Energy and Climate Plan (NECP) as one of the means for Cyprus to achieve its 2030 climate targets and the vision for a decarbonised building stock by 2050. These measures are the revision of the existing legislative framework for the sale and rental of buildings and the further linking of the EPC to financial and fiscal incentives.

It is also important to ensure the quality of the EPC in order to be considered by the building owners as a tool to define the energy saving and RES measures to be implemented in a renovation. To this end, the Energy Service carries out sample checks and targeted checks on EPCs issued. In 475, it is noted that in 2022, buildings and building units were inspected by the Energy Service's authorised inspectors, for the purpose of verifying EPC data and for compliance with minimum energy performance requirements.

It is also important to modernise the way in which EPCs are issued in order to keep up with new measures and policies and technological developments. The Ministry of Energy and Industry proceeded with the revision of the Energy Performance of Buildings Methodology used for issuing EPCs. The project started in December 2018 with the signature of a contract with the University of Cyprus and was completed in 2020. The revised methodology was developed on the basis of the new standards prepared by the European Committee for Standardisation (CEN) under mandate M/480 of the European Commission and Directive 2010/31/EE and amending Directive (EU) 2018/844. The aim was to fill problems and gaps observed in the application of the previous methodology, to include new technologies and to improve the way the building's energy status is recorded in the EPC and its accompanying recommendations. This improvement is expected to lead to higher energy savings, as the EPC is used as an indicator of compliance with minimum energy efficiency requirements in major renovations, but also to achieve savings in financial and other incentives.

The completion of the new DRDI in 2020 enabled the MEAM to conclude, in December 2022, a contract for the creation of software simulating it. Among the objectives of the new software is to be functional, pleasant and user-friendly and provide automated functionalities to reduce computing time. It will also be compatible with all widespread operating systems.

4.1.3 Inspection of heating and air-conditioning systems

The mandatory periodic inspection of air conditioning and heating systems is yet another measure that can contribute towards the energy upgrading of existing buildings. The inspection of air-conditioning and heating systems aims to improve the energy efficiency of the systems through the proposals made by the inspector.

The inspection of air-conditioning systems shall be carried out by air conditioning system inspectors and the inspection of heating systems shall be carried out by inspectors of heating systems. In any case, the inspector shall deliver an inspection report to the building owner, recording the inspector's proposals to improve the performance of the system and/or part of it.

To date, the examination centres approved by the Energy Service have certified 73 heating system inspectors and 71 air conditioning system inspectors and 344 inspections of boiler heating systems and 329 inspections of air-conditioning systems have been carried out.

The Energy Performance of Buildings Act lays down the obligation to regularly inspect systems with a rated output of more than 70 kW. However, on a voluntary basis, smaller power systems may also be inspected, specific heating systems with a boiler capacity of more than 20 kW for heating and air conditioning of more than 12 kW. Inspections may not be carried out in the case of systems covered by an energy performance contract or an agreed energy performance criterion or operated by an operator or network operator and therefore subject to measures to monitor their performance, but also in the case of systems which, irrespective of the effective rated output, are equipped with automation and control systems that enable:

1. Continuous monitoring, recording, analysis and adaptability of energy consumption;
2. Benchmarking the building's energy efficiency, detecting losses in efficiency of technical building systems, and informing the person responsible for the facilities or technical building management about opportunities for energy efficiency improvement; and
3. Communication with interconnected technical building systems and other in-building devices and interoperability with technical building systems of different patented technologies, mechanisms or manufacturers.

The above alternatives essentially recognise that they can be replaced by electronic monitoring of the operation of the system and under certain conditions by energy audits and energy providers. It should be noted that the Law since 2020 extends the scope of inspections to all heating systems (and not only boiler heating systems as they were before), as well as ventilation systems provided that they are combined with heating and air-conditioning systems. Alternative inspection measures will give more flexibility to building owners to implement the best case by case measure.

With a view to modernising and improving inspections, the method of inspecting heating and air-conditioning systems was revised in 2020 on the basis of the new standards adopted by the European Committee for Standardisation (CEN). A new heating and air-conditioning inspection guide has been developed, including inter alia the following:

1. The measured quantities,
2. Instruments used during the inspection of the heating/air-conditioning/ventilation system (exhaust gas analyser, thermometers – thermometers – thermometers, electric energy analysers, water supply meters, liquid meters, pressure measuring instruments, air velocity measuring instruments, flow meters, air quality measuring instrument, coolant leakage controls) and reference to their calibration requirements;
3. A description of the technical details for calculating the Seasonal Energy Efficiency Ratio (SEER, SCOP) for each system to be inspected;
4. A revised inspection report of the cooling/heater/air-conditioning system with or without

ventilation/ventilation (cooling/heat generator, terminals, distribution network, central air-conditioning units (MS), mechanical ventilation systems) recording the energy saving measures proposed by the air conditioning/heating system inspector by quantifying the energy savings that can be achieved by implementing these measures;

5. An assessment of the efficiency and size of the heating/air-conditioning/cooling production unit in relation to the cooling/heating needs of the building and an estimation of the size and
6. The potential to optimise the efficiency of the cooling/heating/air conditioning system or to combine the cooling/heating/air conditioning and ventilation/ventilation system under typical or average operating conditions.

The Energy Service instructed the University of Frederick to train the registered inspectors of heating systems and air conditioning system inspectors. Attendance of the training programme was made compulsory for those who wished to remain registered in the respective registers, so that they could continue to carry out inspections.

4.1.4 requirements for technical systems in existing buildings

In order to further improve the energy efficiency of heating and air-conditioning systems in existing buildings, periodic inspection, regulation and operation of these systems were legislated in 2015 and 2013 respectively. Two guides issued for each system describe the tasks and checks to be carried out by the installers of technical systems. The aim is to ensure that appropriate maintenance measures for heating and air-conditioning systems are taken to ensure that they operate with the best possible energy efficiency.

In addition, for new systems installed in existing buildings and for the existing system upgraded, energy performance requirements have been set in 2016 and the two technical system requirements guides have been revised. Requirements in addition to air conditioning and heating systems also cover hot water and large ventilation systems. The application of the requirements is mandatory to the extent that this is technically, functionally and economically feasible.

In 2022, the Ministry of Energy, Commerce and Industry, in a contract with the University of Frederick, revised the two Guidelines and included the above requirements in a new Guide on ‘Total Performance Requirements for Technical Systems Installated or Upgrade in Buildings and Buildings Used as Residents, and in Buildings and Buildings not used as dwellings’.

The systems covered by the Guide are:

1. Heating systems

2. Cooling systems
3. Ventilation systems
4. Built-in lighting systems
5. Renewable energy systems
6. Automatic building control systems

4.1.5 energy Audit and Energy Efficiency Contracts

The energy audit of buildings, carried out by licensed energy auditors, offers a more holistic approach than that provided by the three other independent experts in the field of energy performance of buildings (Specialised Experts, Air Conditioning Systems Inspectors and Heating Systems Inspectors), as it must be based on up-to-date and measurable operational data on energy consumption in the building and include a detailed overview of the characteristics of this consumption. The training and authorisation of energy auditors started in the second half of 2013.

A periodic energy audit is mandatory for non-small and medium-sized enterprises (non-SMEs) every four years. At the same time, energy audits are promoted through grant plans that operate to implement energy upgrading investments in local authorities, legal persons governed by public law and small and medium-sized enterprises.

In April 2014, the Energy Service Companies (ESCOs) Regulations were adopted to increase confidence among stakeholders in energy audits and to offer an alternative way of financing energy saving measures resulting from the energy audit through Energy Efficiency Contracts (EPCs).

To date, there are 76 energy auditors and 10 energy utilities who can be active in the building sector. However, the activity of the RWPs is at very low levels. This may be due to a lack of confidence on the part of end users in the process and to a lack of know-how and experience on the part of ESPs. Given the relatively small market and lack of access to finance, the development of the energy services market remains blocked. The JRC report, 'Report on the current status of the energy services market and proposals for measures to promote EPC in the public and private sector', lists the obstacles to the development of energy services. These are broken down into the following themes: information and awareness raising, institutional and legislative, financial, external, technical and administrative factors, and behaviour. Table 06 presents the obstacles identified in the GIZ study “An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050” as the most essential to be resolved as a matter of priority.

Information and awareness raising	Institutional and legislative	Finances	Exogenous factors	Technical and administrative	Behaviour
1. Lack of successful applications. 2. Limited customer information on EIS and IGS model. 3. Limited information on funding opportunities. 4. Underestimating the benefits of improving energy efficiency.	1. Public procurement rules. 2. Legislation creating unfavourable conditions for energy efficiency. 3. Absence of certification mechanisms for the RIS.	1. Difficult access to finance. 2. Restriction on the provision of funds or their allocation at high interest rates by the banking sector. 3. The contractual financing rules are not the same as the IGS model. 4. Lack of financial sector experience in financing via IGS.	1. Low energy prices. 2. High risk in relation to other investment options. 3. The projects available on the market are usually small-scale. 4. There are many buildings that are rented or have several co-owners.	1. Complex administrative procedures. 2. High transaction costs. 3. Complexity in verifying future savings. 4. Lack of knowledge and experience in IGS projects.	1. Customers' reluctance to take a risk arising from the implementation of an IGS. 2. Low confidence in the RIS. 3. Preference for solutions to be found through the organisation. 4. Reluctance to engage in long-term lending.

IBID. 4.2: ECOMPROMISES IN THE IMPLEMENTATION OF ENERGY SERVICES[18]

[18] GIZ (2017), An energy efficiency strategy for Cyprus up to 2020, 2030 and 2050 The following measures are ongoing:

1. Development of a methodology and software for the quality control of energy audits. The measure aims to increase and better target quality control which in turn will improve market confidence in energy audits and hence the IGS based on them.
2. Implementation of web-based services for the electronic management of all registers maintained by the Energy Service, including registers of Energy Auditors and Energy Service Providers. The aim is to speed up administrative procedures and easily access companies and other organisations interested in the purchase of energy audits and energy efficiency.
3. Preparation of model tender documents for the selection of Energy Service Providers for the conclusion of Energy Efficiency Contracts by the public and wider public sector. The aim is to create standardised documents, together with a short, step-by-step procedure, which will then be communicated to the authorities of both the central government and the wider public sector in order to facilitate the implementation of such projects. It is expected that the documents will help to increase the use of Energy Service Providers for the implementation of energy efficiency projects in the public sector.
4. Find and promote ways and structures aimed at facilitating access to finance for Energy Service Providers (EIS), which should result in facilitating the implementation of energy efficiency

projects.

4.1.6 Seismic upgrading of buildings

In the most numerous buildings built when there were no minimum energy performance requirements, there were also no seismic safety requirements. As a result, the vast majority of existing buildings are insufficient, both in terms of energy efficiency and seismic resistance. The combination of the two is bidirectional, as a static upgrade of the building will trigger its energy upgrading, while a renovation to improve the energy performance of the building can highlight the insufficient earthquake proofing of the building.

In accordance with the Law regulating the energy performance of buildings, in order to address issues related to intense seismic activity, prior to major renovation, the owner of a building or building unit for which the building permit was issued before 1994 must appoint a suitable designer to prepare a report on the assessment of the supporting body in accordance with the Eurocodes in force on the condition of the stationary building operator and its estimated remaining lifetime, accompanied by any recommendations regarding its structural reinforcement. This provision was drawn up following a public consultation with interested parties. It is intended to provide the building owner with appropriate information at the appropriate time, allowing for a more technically and economically integrated planning.

4.1.7 Special buildings

In Cyprus in 2018, there were 7000 buildings classified as listed or ancient monuments. However, this figure has a small but gradual increase, with around 70 buildings per year qualifying for conservation, while an average of 350 of them per year are renovated.

In order to make the best possible use of the energy saving potential of buildings designated as heritage or ancient monuments, with the latest amendment to the Energy Performance of Buildings Regulation Act, introduced in 2020:

1. The possibility of exempting such buildings from issuing EPCs at the time of sale or rent ceases to apply; and
2. Failure to apply minimum energy efficiency requirements shall only be possible after adequate documentation that it alters in an unacceptable manner its character or appearance.

This change in the legislative framework aims to increase energy efficiency measures in conserved buildings through energy certification, but also to encourage those involved in such renovations to find technical solutions that improve the energy performance of the building without breaching its character.

4.1.8 Recharging stations for electric vehicles in buildings

Electric vehicles will play a key role in reducing greenhouse gas emissions, further absorbing energy from RES and optimising the efficiency of the electricity system, as it will allow for flexibility, balancing and storage. It is of utmost importance to have charging points in buildings and in particular in homes and workplaces, as electric vehicles are stationed regularly and for long periods. The installation of recharging points with smart charging functionalities allows buildings to store energy and integrate energy and other systems.

In line with Directive 2014/94/EU on the deployment of alternative fuels infrastructure and the EPBD, minimum requirements for the installation and provision of recharging points in buildings have been included in the latest amendment to the Energy Performance of Buildings Act adopted in 2020. According to the Law, in dwellings with more than two parking spaces undergoing major renovation, cabling infrastructure must be installed for each parking space in order to allow the installation of recharging points at a later stage. In addition, in non-residential buildings undergoing major renovation with more than ten car parks, at least one recharging point must be installed, as well as ducting infrastructure for at least one parking space every five, in order to allow for the installation of recharging points at a later stage.

Also to support and promote electromobility, the Energy Service, through the RES and ES Fund in 2020, launched for the first time a sponsorship project (see Chapter 4.2.1) aimed at providing financial incentives in the form of government sponsorship for the installation/extension of a photovoltaic system, a recharging point and a smart electricity meter.

In addition, for the development of recharging infrastructure for electric vehicles, the Department of Electrical and Mechanical Services of the Ministry of Transport, Communications and Works has included in the National Recovery and Resilience Plan, in the Policy Axis ‘Rapid transition to a Green Economy – Sustainable Transport’, the Grants Plan ‘Electromobility with 1000’. The Plan has an overall budget
EUR 3.700.000 and its objective is to provide support for the installation of 1000 recharging stations for electric vehicles. Eligible locations are parking spaces for public use such as municipal and community car parks, private car parks (e.g. car parks, hotels, supermarkets, banks, private hospitals, shopping centres, etc.), petrol stations, recharging pools, and roadside parking spaces (on street parking or along the road).

The DSO estimates that the ‘Electromobility with 1000’ plan will meet the needs of electromobility by 2030 and that to connect publicly accessible recharging points, around 130 new distribution substations are expected to be needed, while responding to the increased electricity demand, resulting mainly from recharging points for electric vehicles, includes in the design of the Electrical Vehicle Lighting Management System (VAS).

Finally, it is worth noting the most ambitious attitude towards electromobility taken by the European Parliament and the Council of Europe in the proposal for a recast of the EPBD. Among other things, reference is made to smart charging grids, the correlation between recharging points and the smart readiness indicator (SRI), and the installation of at least one recharging point for each two parking spaces in new and under ‘large scale’ office buildings.

4.2 incentives

The incentives are intended to alleviate this obstacle. However, the success of the incentives is largely determined by the savings achieved. According to the Energy Performance of Buildings Regulation Law, financial measures for energy efficiency improvements in the renovation of buildings must be linked to targeted or achieved savings as determined by one or a combination of the following criteria:

1. The energy performance of the equipment or material used for the renovation; in which case, the equipment or material used for the renovation is to be installed by an installer with the relevant level of certification or qualification;
2. Comparing the Energy Performance Certificates before and after the renovation of the building;
3. The results of the energy audit;
4. Using standard values to calculate energy savings;
5. Using another similar and transparent method related to the above.

The above criteria apply to financial incentives, such as the 'Save – Upgrade' projects and Order No 1 of 2020 of the Minister for the Interior, which are listed in points 4.2.2 and 4.2.4 respectively.

Table 07 summarises all grants related to the buildings sector.

A/A	TYPE OF INVESTMENT	Save – I step up the **dwellings**	Save – I step up **businesses** and other bodies	For energy upgrading by ATA and wider public bodies	To encourage the use of RES and HE in **dwellings**	Replacing energy-intensive electrical appliances in **homes** of vulnerable consumers	For solar hot water systems in **dwellings**	For charging an electric or hybrid plug-in vehicle in **dwellings**
1	Thermal insulation of shell (roof, masonry, exposed floors, etc.)	✓	✓	✓	✓ (ceiling only)			
2	Replacement of frames (and external shading for dwellings only)	✓	✓	✓				
3	Installation of solar water heaters (solar panels and hot water cylinder)	✓					✓	
4	Installation of solar hot water or steam production system		✓	✓				
5	Installation of solar system for space heating/cooling		✓					
6	Installation of a stand-alone air conditioning unit	✓	✓	✓				
7	Installation of a heat pump (geothermal, aerothermal, hydrothermal)	✓	✓	✓				
8	Installation of a photovoltaic system	✓	✓	✓	✓			✓
9	Installation of a battery for photovoltaic system	✓	✓	✓				✓
10	Installation of charger							✓
11	Conversion of a household electrical installation from single phase to three-phase							✓
12	Installation of a high-efficiency boiler	✓	✓	✓				
13	Costs of services (energy audits and issuing of EPCs)	✓	✓	✓				
14	Replacement of energy-intensive electrical appliances (air conditioners, washing machines,					✓		
15	Replacement of refrigerators for preservation/storage of products		✓					
16	Installation of building automation and control system		✓	✓				
17	Installation of external removable shading of frames		✓	✓				
18	Thermal insulation of hot water pipes		✓					
19	Installation of a heat recovery system		✓					
20	Installation of high-efficiency combined heat and power system		✓	✓				
21	Install power factor correction and voltage optimisation systems		✓					
22	Installation of mature energy-saving technologies in the production process.		✓					
23	Replacement of engines, water pumps, circulators and compressors		✓					
24	Replacement of water pumps in water supply, irrigation and/or sewerage networks			✓				
25	Replacement of field irrigation pumps or pumps in sports swimming pools			✓				
26	Replacement of public lighting and building lighting with LED bulbs			✓				
27	Replacement of sporting stadiums/installations			✓				

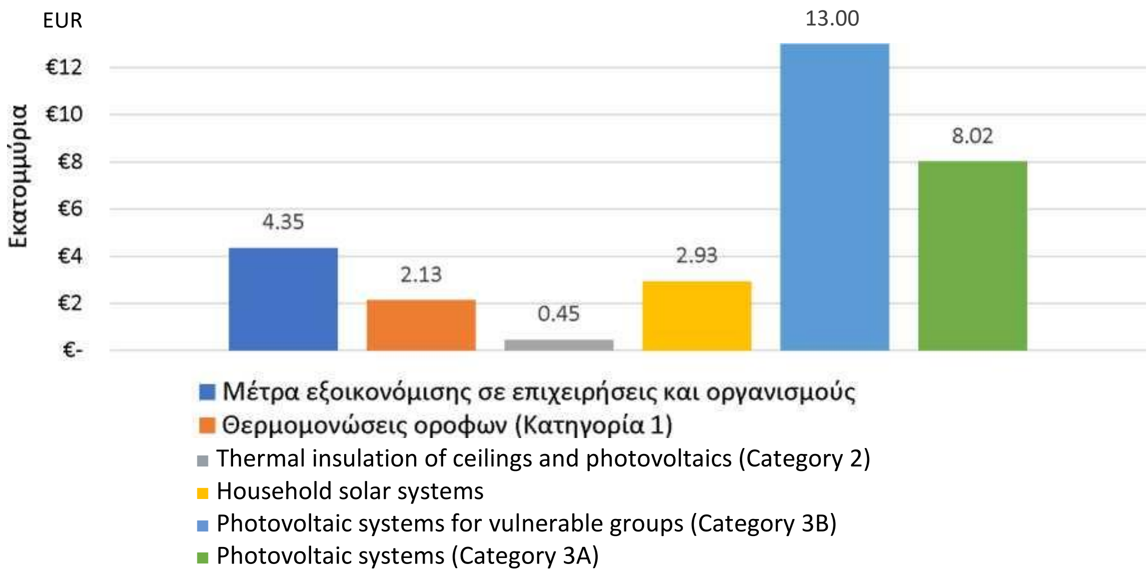
IBID. 4.3: KNON-CLASSIFIED INVESTMENTS BY GRANT SCHEME

4.2.1 projects Fund for Renewable Energy Sources (RES) and Energy Saving (E)

The RES and E Fund was established in 2003 and is the main financial tool of the Republic of Cyprus for the promotion of RES and energy savings, with a view to achieving the binding objectives of the Republic of Cyprus, as laid down in the legislation and the relevant European Directives. The revenue of the Fund comes from the imposition of an energy surcharge per kilowatt-hour on electricity consumption on all end-users. Since February 2004, when the grant schemes of the Fund were launched, by the end of 2022 a total of EUR 355.591.954 has been allocated to households, businesses and the public sector for investments in energy efficiency and RES measures. It is estimated that EUR 98.986.367 of the expenditure for the period 2004 – 2022 was granted as a subsidy to the building sector, to investments such as thermal insulation, windows and the installation of RES systems for air conditioning and heating.

Since 2008, when minimum energy performance requirements became applicable, the Fund has continued to grant measures only to existing buildings and RES systems for heating and cooling in new and existing buildings.

The following is a description of the existing grant plans of the RES and E & E Fund relating to the buildings sector. The types of investment in the Plans are presented in Chart 05 together with the level of investments by category, totalling more than EUR 30 million from 2013 to 2022.



DFIELD 4.1: XALLOWANCES FOR BUILDINGS FROM THE TAMIO RES AND EE 2013 – 2022

1. **A grant scheme to encourage the use of renewable energy sources and energy savings in dwellings.**

The plan aims to provide financial incentives, in the form of government sponsorship, to encourage the use of RES and implement energy saving measures in existing residential buildings and contribute to tackling energy poverty. In addition, the Plan promotes the implementation of actions included in the National Strategy for the Development of Mountain Communities (ESMRL).

The main objective of the Plan, in conjunction with the 'Grant Plan for the installation or replacement of solar hot water systems in dwellings', is to achieve a reduction in primary energy consumption of at least 30 % on average for all dwellings supported under the two Plans.

The Plan has a total budget of EUR 70.000.000 and is included in the Cyprus Recovery and Resilience Plan (RRP) for the period 2021-2026. It will be financed by the European Union's Recovery and Resilience Facility (RRF) and its implementing body is the Management Committee of the RES and EXE Fund.

Between 2019 and 2022, 1973 roofs of dwellings with a total area of 202.852 m² have been insulated and 63.8 MW of photovoltaic systems have been installed.

In summary, the Plan contains four categories of sponsorship for investment in:

Category 1:
Thermal insulation of the ceiling of an existing dwelling, with a grant of 45 % of the eligible costs of each application, with a maximum grant amount per application of EUR 2250. For mountain areas, the grant amount is increased by 50 %. In 2022, 280 applications were received.

Category 2:
Thermal insulation of the roof of an existing dwelling in combination with the installation of a photovoltaic system using the Net Metering or Virtual Net Metering method, with a grant of 55 % of the eligible costs for the thermal insulation of a roof with a maximum grant of EUR 2750 and a grant of EUR 450 per installed kW of PV with a maximum grant of EUR 1800. For mountain areas, the grant amount is increased by 50 %. In 2022, 77 applications were received.

Category 3A:
Installation of a photovoltaic system using the Net Metering or Virtual Net Metering method in an existing dwelling, with a sponsorship of EUR 375 per installed kW PV with a maximum grant of EUR 1500. For mountain areas, the grant amount is increased by 50 %. In 2022, 4781 applications were received.

Category 3B:
Installation of a photovoltaic system using the Net Metering or Virtual Net Metering method in an existing dwelling of a vulnerable energy consumer, with a grant of EUR 1000 per installed kW PV with a maximum grant of EUR 5000. In 2022, 2781 requests for prior approval were submitted and the Plan has been launched every year since 2013 and 2018 applications for a total funding of EUR 13.001.014 have been approved and implemented to date.

2. **Sponsorship plans for the installation/replacement of solar hot water systems in dwellings.**

The plan aims to provide financial incentives, in the form of government sponsorship, for the installation or replacement of solar hot water systems in existing dwellings.

In addition, the revised plans for 2021 and 2022 promoted the implementation of actions included in the National Strategy for the Development of Mountain Communities (NMRL) by doubling the grant to homes in mountain areas.

In the period 2020 – 2021, 2729 applications were approved, with a total investment cost of EUR 3.221.127, with an average of 2.8 m² of solar panels and an average energy saving of 0,05 ktoe per year. 1800 applications were submitted to the 2022 Plan, exhausting the total funding amount of EUR 600.000.

Projects are launched each year from 2005 and up to 2022 a total funding of EUR 12.963.044 has been allocated.

3. Grant plan for the installation/extension of a photovoltaic system for charging an electric vehicle or a plug-in hybrid vehicle.

The Plan is implemented in the context of the Cyprus Recovery and Resilience Plan (RRP) and in particular the Policy Axis 'Rapid transition to a green economy', under the measure 'Creating infrastructure for electromobility'. The budget of the Plan is EUR 1.500.000 and the body implementing it is the Management Committee of the RES and EXE Fund.

With a view to ensuring the widest and fastest possible penetration of RES in transport, the Plan aims to provide financial incentives in the form of government sponsorship for the installation (or extension of an existing) photovoltaic system for charging an electric vehicle or a plug-in hybrid vehicle. In addition, the Plan seeks to collect information on the charging profile of electric vehicles and/or plug-in hybrid vehicles in Cyprus.
In 2022, 20 applications were submitted, with a total requested funding amount of EUR 42.000. In the corresponding Plan of 2020, 6 applications were submitted, with a total amount of funding of EUR 9634 from the EOE Fund.

4. Sponsorship scheme for the replacement of energy-intensive electrical appliances in homes of vulnerable electricity consumers.

The purpose of the Grant Scheme was to provide financial incentives, in the form of government sponsorship, for the implementation of E & E measures, namely the replacement of energy-intensive electrical appliances in homes of vulnerable electricity consumers.

In addition to energy savings, the specific objectives of the project were to inform and raise public awareness of heavy electrical appliances and familiarise them with the energy labelling of electrical appliances.

5350 requests for prior approval were submitted to the Plan, with a total requested amount of funding of EUR 5.000.000.

4.2.2 "Save – Upgrade" projects

The programme finances renovations of dwellings and buildings owned or occupied by Small and Medium-sized Enterprises (SMEs) and for which an application for planning or building permit has been submitted before 21 December 2007.

The plan provides financial support for a package of measures to upgrade the building to a minimum level of increased energy efficiency. Eligible costs include envelope thermal insulation, windows, high-efficiency technical systems, lighting and RES for heating, cooling and hot water. A larger subsidy is granted to buildings renovated in NZEBs and to homes of vulnerable consumers.

Save – I step up in business

The first call for proposals (2014-2016) was co-financed by the Republic of Cyprus and the EU's European Regional Development Fund under the 2014-2020 Operational Programme "Competitiveness and Sustainable Development".

Its second call (2022-2023), you are implementing under the 'Cyprus the tomorrow' Plan and funding from the European Union's (EU) Recovery and Resilience Facility, the central tool of NextGenerationEU, the temporary instrument to finance the EU's recovery and exit from the crisis caused by the pandemic.

The beneficiaries are the existing small and medium-sized enterprises (SMEs) in almost all economic sectors. Investments by specific non-profit organisations (NGOs) that do not carry out an economic activity are also covered.

Save – I step up in the homes

The project aims at the large-scale energy upgrading of existing housing by using incentives in the form of grants. The first (2015-2016) and the second (2018) notice of the project was co-financed by the Republic of Cyprus and the EU Cohesion Fund under the Operational Programme 2014-2020 'Competitiveness and Sustainable Development'.

The success of the first two calls led to the relaunch of the project in 2021 under the 2021-2027 programme "ΘΑΕΙΑ" and was co-financed by the EU's European Regional Development Fund (ERDF) and the Republic of Cyprus.

Table 08 presents the most important statistics for the projects.

Year	Project name	Number of applications submitted	Number of applications approved	Number of building units approved	Number of building units that implemented subsidised investments	Total sponsorship of projects included (EUR)	Total private investment of projects included (EUR)	Paid applications up to 31/12/2022	Payment amount up to 31/12/2022 (EUR)	Average surface area of buildings (m^2)	Average selected investment cost (EUR)	Average annual energy savings (comparing initial to final EPCs) (kWh/year)	Saving indicator A kWh/1000 investment/year	Saving indicator B kWh/m^2EUR house/year
2014 2016	'Energy savings/ Upgrading in Business"	165	132	132	118	8,7EC		115	7,35EC	D/E				
2015 2016	Energy Saving/Housing Upgrading (1th Notice)	1079	872	920	812	8.121.125	7.931.812	767	6.865.274	160,97	19.473	56.444	2898,58	350,65
	NZEB	102	87	87	76	1.824.113	829.634	76	1.583.597	175,15	30.503	71.734	2351,70	409,56
2018	Energy Saving/Housing Upgrading (2th Notice)	1155	1085	1104	833	10.924.698	11.976.670	815	7.504.523	150,02	20.308	49.127	2419,09	327,47
	NZEB	75	71	71	55	1.374.145	1.432.176	55	990.380	202,70	39.526	76.165	1926,96	375,75
2021	'Save – Upgrading in Housing' (1th Notice)	2.165	2.041	2.083	371	33.846.142	23.388.586	371	5.314.253	159,65	28.042	55.774	1988,95	349,35
2021	'Save – I step up the homes of the British Base Areas' (1th Notice)	38	17	17	— —	262.694	175.751	— —	— —	170,95	25.791	57.820	2241,87	338,23
2022	"Save – upgrade to businesses and other bodies"	133	32	133	133	6.876.676		0	0					

IBID. 4.4: THE" R & E A STEP" SECTION IN TIME MAGAZINES

4.2.3 Plan to produce electricity from RES for own consumption

Photovoltaic systems started to be installed in the buildings in 2005 with the support of the RES and ES Fund. The decrease in PV prices and the increase in electricity prices have transformed the development model of these systems into methods of coupling production to consumption. The first net metering programme was launched in 2013. Until the end of 2015 it was possible to install a photovoltaic system only in dwellings and with a maximum capacity of 3 kW. In December 2015, the programme was revised allowing all types of buildings to be included in the project and increasing the maximum authorised capacity of the photovoltaic system to 5 kW. From 2018 onwards, the maximum permitted power of a photovoltaic system installed by offsetting measurements is up to 10.4 kW.

Net-metering, net-billing and self-generation schemes enable all electricity consumers to cover some or all of their electricity needs through photovoltaic and/or other RES systems.

An amended Plan was published in April 2023, the main changes of which compared to the previous implementation period concern:

1. The carry-over of any surplus production to the next tariff period for a total period of 36 months for the net-metering category and 12 months for the bet-billing category. At the end of the above period, any surplus shall be reduced to zero without any compensation.
2. The dimensioning of the photovoltaic system based on consumption of the premises served for the net-billing category and for photovoltaic systems of less than 4.16 kW for net-metering is completely abolished. For net-billing the maximum capacity of each photovoltaic system may not exceed 80 % of the allocated load (Load entitlement) of premises served.
3. Introduction of a new virtual net-billing category
4. Introduction of a new category of beneficiaries (wine-making enterprises) in category D virtual net-metering and an increase of the installed capacity limit for farmers and wine-making enterprises to 100 kW.

The Plan covers the following investments:

Category A:
Installation of photovoltaic systems with a net-metering method with a capacity of up to 10.4 kW for all consumers (household and non-household/commercial consumers).

Class B:
Installation of RES systems (photovoltaic systems, biomass/biogas operating units, wind turbines, etc.) with a capacity of up to 8 MW, using net-billing for all consumers (household and non-household/commercial consumers).

Category C:
Installations of autonomous RES systems not connected to the grid, without limitation to the maximum power of each system.

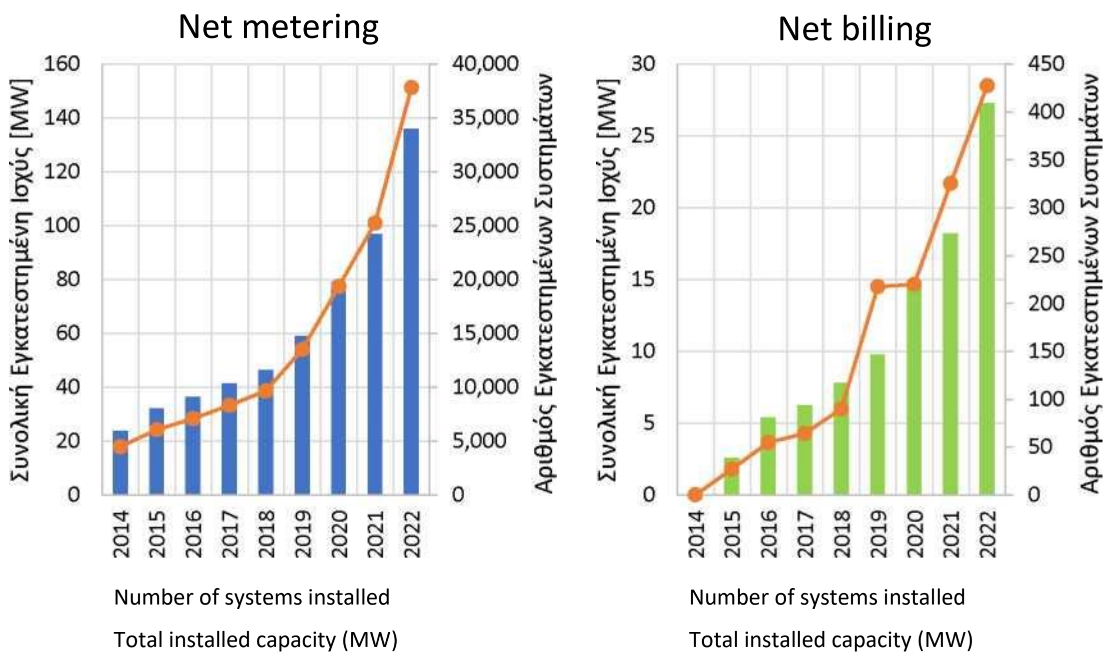
Category D:
Installations of photovoltaic systems connected to the grid using virtual net-metering. The beneficiaries are household consumers and professional farmers. The most important difference between this category of systems is that they are installed in a different location from the premises served, as opposed to the first two categories, where they can only be installed on the roof of legally erected premises or on the ground within the same parcel where the legal premises and/or adjacent parcels are located as the premises they will serve. The maximum power of each PV system that can be installed is 10.4 kW for household consumers and 100 kW for professional farmers and wine-making businesses.

E-Class:
Installations of photovoltaic systems connected to the grid using virtual net-billing. The beneficiaries and the installation site of the systems are the same as category D, while the maximum power of each PV system that can be installed is 150 kW per electricity bill per beneficiary. In case an energy storage system is installed, the maximum power of each PV system may reach up to 500 kW.

The total capacity of the photovoltaic systems installed under the Plan up to December 2022 is shown in Table 4.4.

Year	PV net-metering systems		PV auto-production and net- billing systems	
	Number of systems installed	Total installed capacity (MW)	Number of systems installed	Total installed capacity (MW)
2014	5.973	17,925	0	0
2015	8.045	24,160	39	1,792
2016	9.135	28,250	81	3,653
2017	10.360	33,213	94	4,276
2018	11.613	38,602	117	5,994
2019	14.780	54,000	147	14,500
2020	19.768	77,403	221	14,653
2021	24.262	100,920	273	21,687
2022	33.970	151,330	409	28,510

IBID. 4.4: THEelectrical power of the Photovoltaic systems installed in the framework of the GHEDIOx of thehorseradish, until D in 2022



DField 4.2: THEelectric power of the Photovoltaic systems installed in the framework of the Heidio Xorphagus, asfrom the FOURTHday of 2022

The above projects play a catalytic role in increasing RES in existing buildings, where their installation either as part of a renovation or as an individual measure is an important element in the effort to decarbonise the building stock.

4.2.4 Order 1 of 2020 of the Minister of the Interior

Another incentive is Order No 1 of 2020, as issued by the Minister for Interior on the basis of the Town and Country Planning Law. The mandate was formed by recommendations from the Energy Service for the revision of Order 1 of 2014. Under the new mandate, new buildings and buildings being renovated may increase the building coefficient by 5 % if they are energy class A and the primary energy consumption per year does not exceed 50 kWh/m², thus setting higher requirements than those set for NZEB. It is noted that there is a gradual increase in interest in using the incentive. It is reported that in 2022, the Energy Service issued attestations that the criteria of the Mandate for 726 deployments were met, compared to 160 in 2018. This certificate is a prerequisite for the urban planning authority to grant the incentive to the applicant. Authorised inspectors of the Energy Service inspected 631 buildings that received the incentive in 2022.

4.2.5 Reduced VAT rate for residential renovations

Since 2015, a reduced VAT rate (5 % instead of 19 %) has been applied to renovations of dwellings for which at least three years have elapsed since the first date of residence. The reduced rate applies to all savings measures relating to the building envelope and the installation of photovoltaic systems. This measure, combined with sponsorship schemes such as ‘Save – Upgrade’ and the projects of the RES and E & E Fund, help to reduce renovation costs.

4.2.6 I am working for the climate

The Business for Climate/Business4Climate initiative was piloted by the Federation of Manufacturers Employers (OEB), in cooperation with TEPAS for the required support in terms of scientific knowledge, and the Department of Environment. The aim of the initiative is to voluntarily commit non-ETS companies and help them take action to reduce CO2 emissions. The initiative, officially launched in September 2018, provides Cypriot companies from all economic sectors with the necessary tools to determine the greenhouse gas emissions from their activities and to draw up an action plan for each undertaking to reduce these emissions.

The proposal was presented and funded by the Climate-KIC through the Regional Innovation Scheme of the European Institute of Innovation and Technology (EIT).

The Business4Climate initiative builds on the following steps:

1. Signing of the voluntary declaration by companies to reduce greenhouse gas emissions by more than 8 % by 2030.
2. Organisation by partners of the initiative of skills development seminars for business personnel.
3. Development of an online tool for enterprises to help prepare the emission reference report for the reporting year.
4. Development of a template for the submission of the undertaking's greenhouse gas emission reduction action plan. The action plan may be submitted by the undertaking within one year of the date of signature of the notice.

The benefits of the initiative are significant and manifold for businesses, as the reduction of greenhouse gas emissions will come from reduced energy consumption and more rational management of resources, thus reducing their operating costs.

Climate-KIC funding for the implementation of the Business for Climate Initiative/Business4Climate was completed on 31/12/2018. To date, 67 Cypriot enterprises from various sectors of economic activity have voluntarily committed themselves. Additional incentives for companies to participate in the initiative were considered necessary in 2019 to step up efforts to reduce emissions by 2030. For the mobilisation of businesses, a plan is being prepared by the Department of Environment following a decision of the Council of Ministers dated 28/08/2019 (Decision No 88.020). It is expected that the Sponsorship Plan will be operational in 2020-2023. The Plan is financed by the Recovery and Resilience Plan with a budget of EUR 20 million.

The Sponsorship Plan will aim at reducing greenhouse gas emissions from the commercial and industrial activity of enterprises and will aim at financing companies that demonstrably reduce greenhouse gas emissions through the implementation of actions related to the adoption of one and/or more measures referred to in the template of the Action Plan. From the date of implementation of an emission reduction measure until

2030, the current carbon permit price (tCO 2eq)for each tCO 2eq thathas been reduced, compared to the base year not yet determined, will be paid as a sponsorship to undertakings that are able to reduce their emissions.

Some of the energy saving measures that may be implemented by the enterprises that will participate in the 'Climate Business' are the renovation of buildings housed and individual energy saving measures in buildings housed such as roof thermal insulation, thermal insulation of walls, replacement of lighting systems, replacement of air-conditioning systems, installation of external fixed or mobile shading, installation of a solar system for hot water for use, installation of a central solar system for space heating and/or space cooling, installation of a biomass boiler for space heating or production of hot water for use, installation of a waste energy recovery system.

It is estimated that the cumulative end-use energy savings from the implementation of this measure for the period 2021 – 2030 will amount to around

15.200 toe, without taking into account that in the future other undertakings may also participate.

4.3 Information measures

4.3.1 Public information campaign on energy efficiency

The public information campaign on energy efficiency was carried out in September – December 2022 with national resources. Four separate information packages were carried out as part of the campaign, concerning the creation of a culture and the encouragement of citizens to implement energy-saving measures at zero cost, low cost and high cost, and to encourage the use of the Ministry's grant plans.

The main actions of the campaign were:

1. Promotion of information and information material via the website of the Energy Service and the Ministry of Energy, Commerce and Industry.
2. Creation and broadcasting of radio spots.
3. Creation and transmission of TV spots.
4. Promotion of information and information material via the social media (Facebook and Twitter) of the Energy Service and the Ministry of the Interior.
5. Google Ads online advertisements.
6. Advertisements on online information platforms.

In addition, advice on a range of simple energy saving measures at home and in the workplace was published and promoted to all the media in 2022.

4.4 Research and innovation in the field of energy efficiency of buildings

According to the NECP, in the effort to reduce CO2 emissions, research and innovation can play an important role. Although major technological developments are difficult to materialise only as of 58

research in Cyprus, the existence of a critical mass of researchers on issues such as energy efficiency, renewable energy and fuels can accelerate:

1. Demonstration and development of new technologies in Cyprus.
2. The implementation of innovative measures under the particular conditions of the Cypriot market.
3. Develop expertise for innovative services related to low-carbon technologies.

In particular in the field of energy efficiency in buildings, significant work has been reported in recent years by universities and other research institutes in the field of energy upgrading of buildings. The Energy Service supports such initiatives, mainly by giving direction to energy policy issues, but also by disseminating results. Moreover, the results of these projects are also used as feedback to improve the existing arrangements and incentives relating to the energy upgrading of existing buildings. Some of these research projects are listed below:

1. The SupERB project, 'Novel integrated approach for seismic and energy upgrading of existing buildings', developed a holistic and innovative methodology for the optimal simultaneous seismic and energy upgrading of existing buildings, taking into account economic, technical, geographical and environmental factors. This multi-target genetic algorithm optimisation methodology was integrated into software. The project also proposes guidelines for combined energy and seismic upgrading of existing buildings with filling walls or a load-bearing masonry system, including a regulatory framework. The project (INTEGRATED/0916/0004) was contracted by the Cyprus University of Technology and nine cooperating bodies including the Ministry of Energy, Commerce and Industry, and was co-financed by the European Regional Development Fund and the Republic of Cyprus through the Research and Innovation Foundation under the Restart 2016 – 2020 programme. The project was completed in June 2022 with a duration of 42 months.

2. The OEB participated in the European SMEmPower Efficiency programme, which has the general objective of supporting SMEs in the implementation of the European Energy Efficiency Directive 2012/27/EU. In particular, the project is based on a holistic framework that aims to help SMEs improve the skills and competences of their staff by developing specific training programmes for energy managers, but also to undergo energy audits and, above all, to take action and implement the proposed energy saving measures.

As part of the implementation of SMEmPower Efficiency, among other actions, the following have been completed:

a. Results of research in SMEs on the level of energy efficiency.

b. Qualification systems for energy auditors and energy managers and training sessions provided.

c. Available financial tools and mechanisms for improving energy efficiency in SMEs at EU level.

D. Implementation of three training programmes for energy managers. These programmes have been approved by the Energy Service as training programmes for energy managers that comply with the provisions of the legislation. The programmes involved 79 people from enterprises in various sectors of economic activity.

e. Development of training materials for energy managers as well as specialised energy analysis tools.

f. Two information workshops with stakeholders are held.

Educational programmes may also be implemented after completion of the project, as they have been included as a postgraduate course of the Mechanical Engineering Department of the University of Cyprus.

Also, on the project portal, www.smempower.com, everyone can find and use free of charge the training manual, the educational platform hosting the educational and training materials used during the course, the online 'Monitoring Targeting' and 'Measurement and Verification' tools together with guides and webinars on their use.

The project has started on 1 September 2019 and will be completed on 31 December 2022.

3. The Energy Office participates in the "SRI2MARKET" project, funded by the EU LIFE programme. The project started in November 2022 and will last for 36 months and its main objectives, during its implementation, are:

specifically support Member States (Austria, Croatia, Cyprus, France, Portugal and Spain) to incorporate the Intelligent Preparedness Index (SRI) of buildings into their national legislation.

B. propose public funding plans to finance building upgrades based on the Intelligent Readiness of Buildings Index.

C. develop tools to guide the evaluators of this indicator and promote relevant building reviews.

D. train energy performance certificate assessors on the Intelligent Preparedness Index of buildings and the methodology for calculating it.

e. Design and pilot on the basis of the Intelligent Preparedness Index of Buildings at national level to identify best practices for relevant assessments.

f. Advise building owners and facility managers on cost-effective building upgrades based on the Intelligent Preparedness Index.

4. Frederick University participates in the EasySRI project funded by the EU LIFE programme. The project started in November 2022 and is expected to be completed on 31 October 2025. The easySRI aims to create an online platform for the automated calculation of the SRI.easySRI aims to introduce additional parameters related to energy efficiency and economic dimensions to make the information more understandable for the building user. In addition, easySRI will support the implementation of a range of ML services, which will help to assess and assess the smartness of the building stock and provide tailor-made recommendations for upgrades, taking into account the cost of the investment. The project seeks to update existing standards, as well as to include its results in new or future standards, and will explore links with other EU initiatives, such as energy performance certificates and building digital identities, in order to maximise the use of the SRI.

5. The Smart² project, funded by the EU LIFE programme, brings together two actors from Cyprus, Cymric Ltd and Euphyia Tech Ltd.The project aims to develop and deliver the right tools and applications to promote and introduce a smart building rating in Europe through the Smart Building Readiness Index (SRI). Smart² aims to provide an open platform for building intelligence assessment, tailored for building designers, facility managers and building users. The Smart² tool will be available in all 24 official EU languages, also taking into account the specificities of Member States, with a view to maximising synergies with other EU initiatives. In Smart², the performance rate of smart readiness improvements of buildings will be determined, based on existing CEN standards, thus allowing the definition of smart building upgrade at optimal cost, as well as setting the conditions for the development and creation of minimum cost-optimal SRI requirements for new buildings. The project will also develop an SRI screening process, with relevant protocols and procedures, to act as the precursor of a standard procedure. Smart² SRI certificates will be issued using the open platform, following specific quality standards, allowing visibility and confidence in the SRI system.

The Energy Service participates in the advisory committee of these three projects relating to the Intelligent Preparedness Index (SRI) of a building.

4.5 new measures and actions

4.5.1 Energy efficiency obligation scheme

The energy efficiency obligation scheme is a legislative mechanism that sets requirements on energy distributors, designated as obligated parties, to achieve part of the national mandatory cumulative end-use energy savings target. The obligated parties shall be determined by means of a Ministerial Decree issued on an annual basis where the annual cumulative target is allocated to them, on the basis of updated official statistics on energy sales.

According to the national planning, as reflected in the NECP, the energy efficiency scheme will contribute to the 2030 national mandatory target by 41.1 % or around 100 thousand toe.

The energy efficiency obligation scheme shall include measures that the obligated parties should implement with a view to improving energy efficiency in residential, commercial and industrial installations as well as in vehicles. In particular, the measures are divided into awareness-raising and technical measures. Awareness raising measures concern actions for behavioural change and rational use of energy by final consumers, while technical measures concern intrusive work such as, for example, thermal insulation of building envelope, replacement of technical systems, etc.

The implementation of the energy distributors obligation scheme is estimated to lead to investments of EUR 150 million for the period 2020-2030, but not all of them concern the building sector. More details on the Energy Efficiency Obligation Enforcement Scheme can be found in Chapter 3.2 and Annex 4 of the NECP.

4.5.2 Development of a new online platform for digital one stop shop (Doss) for RES projects and building renovation.

At the current level of transition towards a nearly zero-energy building stock, it will be difficult to meet the energy efficiency targets. The renovation of public and private buildings is key to achieving these objectives, as outlined in the Renovation Wave Strategy that is part of the EU Green Deal.

In the context of accelerating the energy upgrading of the building stock in Cyprus and the penetration of RES in final consumption, an online platform will be set up to provide support for the implementation of building renovation works and RES projects. The aim is to relieve owners/users of financial, technical and administrative costs by simplifying the required procedures and direct access to guidance, financing, implementation, management and maintenance services for these projects.

The platform will cover the entire “user journey” from the pre-advisory phase to implementation and maintenance, while attracting building owners, credit institutions, energy service providers, qualified experts and installers to the same site, contribute to the growth and competitiveness of the economy, reduce fragmentation in the construction sector and strengthen the local network of specialised renovation companies.

Building Renovation Passport (BRP) is planned to be implemented through the platform to facilitate better planning/planning of energy renovations (prioritising individual renovation steps) and ensure a more cost-effective implementation of the EPC recommendations.

The digitalisation of the above procedures and needs on a platform will facilitate the future implementation and interconnection of systems such as digital building logbooks, i.e. a database containing all relevant information on the building stock (e.g. information from a cadastre, town planning, building information system).
Information Management System, energy providers and distributors/CERA, building automation system, etc.) and smart readiness indicators (SRI). (see Chapter 7 and Subchapter 7.1).

4.5.3 Smart metering infrastructure

Smart metering systems are electronic systems that can measure the amount of electricity fed into the grid or the energy consumption from the grid, providing more information compared to a conventional meter, and can transmit and receive data for information, monitoring and control purposes, using a form of electronic communications. Smart metering systems have the capacity to cooperate with consumer energy management systems allowing building owners and occupants to better understand their energy needs, assess their costs and become active customers.

They can also provide valuable data on the energy performance of a building before and after renovation, making it extremely important in the implementation of building renovation passports. This data can help owners and tenants understand the impact of renovation measures on energy consumption and can be used to develop an energy renovation plan in order to implement economically optimal energy saving and RES measures.

By providing a clear picture of a building's energy consumption, smart metering systems can help building owners and occupants to make informed decisions on energy upgrades that can improve the energy performance of a building and reduce energy costs and waste.

In summary, smart metering systems can play an important role in the implementation of building renovation passports, but also in increasing the smart readiness indicator of buildings.
In addition to the above advantages for tenants and building owners, these systems will provide many benefits to the electricity distribution system operator (DSO). Some of the most important are facilitating the detection of damage and a faster return to supply, and strengthening the analysis and study of the distribution network through direct and detailed information on consumption needs, which will help to optimise the grid and maximise the penetration of RES electricity.

The Distribution System Operator plans to install the infrastructure of 400.000 smart metering systems. It is expected to start in 2023 and will last 42 months, i.e. the project is expected to be completed in 2026. The expected capital expenditure will amount to EUR 60 million.

4.5.4 Tax bill on increased capital deductions for energy upgrading of enterprises

The purpose of the draft law is to amend the basic Income Tax Act so that, for capital expenditure incurred in the tax years 2023, 2024 and 2025, an increased capital discount is granted to improve the energy efficiency of the building envelope, for machinery and equipment connected to renewable energy systems and technical energy efficiency improvement systems, as well as for new commercial electric vehicles, taxis and buses.

4.5.5 Amendment of the Roads and Buildings Regulation Act on the installation of

photovoltaic systems

A proposal for a law signed by all members of the Energy Committee proposes to amend the Roads and Buildings Regulation Law to avoid the need for a building permit for photovoltaic systems installed on the existing building envelope. The proposed regulation was deemed necessary in order to cut red tape and speed up the process of installing photovoltaic systems in buildings.

4.5.6 Creation of a National Development Agency

Through the Recovery and Resilience Fund of the Ministry of Finance, it promotes the establishment of a National Development Agency. The Agency will promote financial tools (loans, guarantees, equity financing, etc.) which will inter alia support investments in energy efficiency projects, mainly in buildings of small and medium-sized enterprises. One such tool may be the on-bill-scheme, which is promoted by the Ministry of Finance and the Ministry of Finance, in order to give the Energy Service Providers (EIS) access to funding. The Agency will not operate with a banking licence and therefore it will not be necessary to capitalise in advance. The funding will come from a variety of sources, such as the European Investment Bank and the State. The processes for its implementation are expected to be completed in 2026 and are monitored by a steering committee with the participation of representatives of the Ministry of Finance and the Ministry of Finance.

4.5.7 Reconstruction and maintenance of refugee apartment blocks (Building Plan)

Following a study demonstrating the static adequacy of refugee multi-apartment buildings carried out in 2020, the Ministry of the Interior will gradually repair/maintain all 358 apartment blocks (3128 apartments) in government housing, with an immediate priority of 43 apartment blocks which have serious static and construction problems, so that they cannot be maintained and must be rebuilt. Depending on the static adequacy of the buildings, the size of the renovation they will receive and whether they fall under “major renovation” will lead to the energy upgrading of buildings that are among the worst energy performers while at the same time, most of them are inhabited by energy vulnerable consumers. The State will also pay the costs to civil engineers of ETEK members to take responsibility for the design and supervision of the projects, while the total cost of the project is expected to exceed EUR 130 million over a decade.

4.5.8 EU Emissions Trading System

Building on [100] the agreement recently reached in the EU Chambers, a new Emissions Trading System (ETS II) is being introduced for fuels used in buildings, road transport and light industry. This system, which is essentially a carbon tax, will become operational in 2027, unless there are very high oil and gas prices, in which case implementation of the system will be postponed to 2028. In this system, the European Commission expects prices to reach moderate levels by 2030 (up to EUR 45 per tonne of CO2), so that heating and motor fuel prices will not increase by more than 10-15 cents/litre. In any case, and regardless of the international fuel prices in force at the end of the decade, the implementation of ETS II is expected to make energy renovations of buildings even more advantageous, as it will pass the signal to the market that fossil fuel use will remain quite high in the medium and long term, ensuring a low payback period for an energy upgrade. The implementation of ETS II will be accompanied by the creation of the Social Climate Fund, a pan-European fund that collects a large part of ETS II revenues and redistributes it to households and businesses facing high energy costs.

4.5.9 Green tax reform

Green tax reform is the most important additional policy worth considering its implementation in order for Cyprus to meet its 2030 climate targets and transition to a zero-carbon economy by 2050. The green tax reform will include carbon pricing in sectors outside the Emissions Trading Scheme of the Cypriot economy. Such a reform may indeed further stimulate investment in energy efficiency and RES measures. In particular in the buildings sector where the cost of emissions is currently not passed on to private investments.

An important part of the green tax reform is the introduction of a carbon tax on motor and heating fuels. This measure is a commitment of the Republic of Cyprus included in the Recovery and Resilience Plan. This reform is currently the subject of consultation between government departments, with a view to submitting a proposal to the Council of Ministers (and then to the Parliament) in autumn 2023. Should a national carbon tax be introduced in the sectors to which the ETS II referred to above will apply, the country is entitled not to apply ETS II, provided that the national tax is at least at the same level as the price prevailing in ETS II. Therefore, if a national carbon tax is applied as part of the green tax reform, the market signal that fuel prices will remain relatively high would be even earlier,

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European Council press100 release: Council adopts key pieces of legislation delivering on 2030 climate targets.

which would again encourage investment in energy renovations of buildings.

4.5.10 Environmental, social and corporate governance indicators

The widespread use of environmental, social and corporate governance (ESG) indicators in the financial sector will encourage banks to take into account the energy performance of a building in their loan decisions.

The above policies, together with Regulation (EU) 2020/852 of the European Parliament and of the Council on the establishment of a framework to facilitate sustainable investment, will strengthen the role of the EPC and will have a positive impact on the energy upgrading of Cyprus' building stock.

5. Policies and actions targeting worst performing segments of the national building stock, dilemmas due to conflicting interests and contributing to alleviating energy poverty.

Buildings for which a planning or building permit has been applied for before 21 December 2007 are typically buildings with the lowest energy performance, as there were no minimum energy performance requirements before that date. Recognising that this is also the part of the building stock with the greatest potential for energy savings, the 'Save Upgrade' projects and the thermal insulation plans of the RES and ES Fund focus on financing buildings for which an application for planning or building permit was submitted before December 21, 2007.

In buildings with low energy performance, it is more difficult to implement an energy upgrade when one or more of the following factors coexist:

1. The final energy user bears the energy costs but cannot decide on the implementation of energy efficiency improvement measures, as is usually done in rented dwellings and commercial buildings
2. There are several owners or tenants and it is necessary to obtain consent from all of them to implement energy upgrading measures, e.g. in multi-apartment buildings.
3. The building often changes uses and/or occupants, either due to its type or location, such as shops located on commercial streets and frequently changing tenants or dwellings rented on a temporary basis. In such cases the time of use of the building is not long enough or uncertain and does not justify the depreciation of the initial capital expenditure;
4. Households in the range of energy poverty.

The main problems arising from these factors and ways to mitigate them are then analysed.

5.1 Rented buildings and multi-owner buildings

In a proportion of the building stock stakeholders are deterred from making energy efficiency investments as the resulting benefits, part or all, will not end up in the part that has assumed the initial investment costs.

The occupants and/or owners of apartments are a category representing about 60 % of all dwellings in the building stock and are highly likely to face these challenges. This is mainly due to:

1. The different levels of understanding of the benefits of energy efficiency between joint owners;
2. The different incentives and priorities between joint owners;
3. The different levels of credit rating and income between joint owners;
4. Organisational issues associated with the collective decision-making process.

Rented homes represent 24 % of all homes. The implementation of energy upgrading measures in these homes may be prevented by the fact that the investment cost borne by the building owner results in benefits for the tenant alone. Tertiary sector buildings have a similar problem. Although data for the commercial sector are insufficient, we are aware that renting buildings for office, retail and food use is a widespread practice in Cyprus.

	Owner	**Rented**	**Other**
Single-family houses	35.9 %	6.9 %	2.9 %
Apartments, dual dwellings, mixed use buildings	33.1 %	17.5 %	3.7 %
Other types of houses	0 %	0.1 %	0 %

IBID. 5.1: OWNERSHIP AND RENTAL OF DWELLINGS

The technical report prepared by the JRC for the Ministry of Energy, Commerce, Industry and Industry, entitled 'Simen incentives and energy efficiency in Cyprus', analyses the barriers to the energy upgrading of buildings stemming from the existing structure of the property market. To overcome the roadblocks, the technical report cites examples of successful policies and measures implemented in other countries, as well as proposals for measures that can be implemented in Cyprus. The measures proposed are the following:

1. Strengthening the implementation of the role of EPCs by applying better quality control mechanisms, tougher penalties for those infringing the relevant legislation and improving the methodology for calculating energy efficiency;
2. Promoting the installation of energy meters in each apartment so that owners have accurate consumption data;
3. Implementing policies to simplify the decision-making process in the case of buildings owned by several owners
4. Financial incentives specific to multi-apartment buildings and rented buildings
5. The implementation of voluntary agreements between owner and tenant to share the

costs and benefits of an energy upgrade

6. Gradual introduction of minimum energy performance requirements in rented buildings
7. Certification of installers of building components

Some of the above measures have already been adopted, such as the revision of the methodology for calculating energy efficiency and the creation of a register of installers of small-scale technical and RES systems. The ‘Save – Upgrade’ project also tried to solve the obstacles to energy upgrades of rented buildings and buildings with multiple owners. Buildings that were rented could also be included in the plans. In the case of SMEs, the applicant and beneficiary were the SME using the building, regardless of whether he was the owner or tenant. For dwellings, rented buildings could also be integrated, but the application could only be made by the owner. In addition, there was special provision for the inclusion in the project of a multi-apartment building, where the management committee was the applicant and recipient of the grant. However, the participation of such building cases in the “Save – Upgrade” was low.

In addition to the above, there are two other important obstacles to strengthening the building renovation process. The[101] first is the law on rent control. In short, the Law stipulates that the rent of dwellings and offices constructed before 1999, where there is a contract between the owner and the tenant, is regulated and its increase may not exceed a percentage decided by the Council of Ministers. In addition, eviction procedures in such cases must follow a lengthy procedure in accordance with the relevant legislation. This obviously creates an additional obstacle to renovating an old and energy-inefficient building. It should be noted that rent control and the legal framework for communal properties are of high interest and modernisation and/or modifications have a variety of political and social implications.

The second obstacle is the problematic legal framework for their co-ownership and management committees. Unfortunately, this creates more complexity and explains the low interest of multi-apartment buildings to benefit from energy renovation grants. An effort is currently being made by the Ministry of the Interior to improve the legal framework for common properties and to provide solutions to the non-functioning of

101“Review of Cyprus Energy and Climate Plan – Task 5-11: Report on publications and policy elements to update the Cypriot National Long-Term Renovation Strategy’ by Trinomics consultant in cooperation with the Cyprus Institute.

Building Management Committees.

5.2 energy poverty in Cyprus

In 2020, 20.9 % of the population reported being unable to have a warm house in winter, while 9.2 % were unable to pay their energy bills on time due to financial difficulties[102].
On the basis of Directive (EU) 2019/944, each Member State shall define the concept of vulnerable customers that may refer to energy poverty and, inter alia, to the prohibition of disconnection of their electricity in critical times. According to the Electricity Market Regulation Law, energy poverty may concern the situation of customers who may be in a difficult situation due to their low income, as shown in their tax declarations, in conjunction with their professional status, family status, the energy efficiency of homes and their dependence on electrical equipment for health reasons, and are therefore unable to meet the costs for reasonable electricity supply needs, as these costs represent a significant part of their disposable income.

On the basis of the above Law, a relevant Decree of the Minister for Energy, Commerce and Industry entered into force in 2015, laying down energy poverty, categories of vulnerable electricity consumers and measures to protect such consumers.

Today, measures to protect vulnerable electricity consumers include:

1. The right to submit an application for inclusion in the special household price under Code 08 of the EAC. This price is about 20 % lower than the normal house price.
2. The measure of non-cutting or reconnecting electricity at critical times to those of vulnerable consumers who fall under the Decree and experience serious health problems.
3. Financial incentives, depending on the budget available, for the installation of a net-metering domestic photovoltaic system.
4. Providing financial incentives, depending on the budget available, for the energy upgrading of their homes through the "Save Upgrade" project. This plan provides for the provision of an increased rate of sponsorship (80 % instead of 60 % for other consumers) for the energy upgrading of their dwelling. In addition, individual energy

102Turning up the heat on Egypt's fuel poverty crisis – ESPN Flash Report 2022/21.

saving measures are sponsored.

On the basis of the Electricity Market Regulation Laws 2021 and 2022, the Decrees laying down the criteria for energy poverty, the concept of vulnerable customers and the categories thereof, as well as measures to tackle energy poverty and the protection of vulnerable customers, have been revised and sent to the Legal Service for legal checking. The new Decrees inter alia widen the categories of vulnerable customers.

Policies and plans to empower economically vulnerable consumers do not have the expected effect, even if they provide for a higher financial grant. This is mainly due to the lack of financial capacity of these people. Moreover, even if a pre-grant is given to vulnerable households/consumers, they should find the remaining amount, usually by applying for a loan, which is assessed by banks on the basis of their low income, thus rendering them unreliable customers for lending.

Therefore, energy poverty and energy vulnerable households need a focused and tailor-made approach. Energy and social policies are clearly interlinked and should not be treated separately. In addition, each grant scheme should be designed in such a way that there is a minimal and, where possible, no administrative burden. This could be achieved with a special status where the beneficiary is the contractor offering the key energy renovation services to vulnerable households.

6. Policies and actions concerning all public buildings

The exemplary role of public buildings in the field of energy efficiency is underlined by a number of legislative measures. They are.

1. An obligation to renovate 3 % per year of the total surface area of buildings owned or occupied by central government authorities to meet minimum energy performance requirements or to take other measures that lead to equivalent energy savings in such buildings;
2. All new public buildings must be NZEB from 1 January 2019, i.e. two years earlier than the remaining buildings;
3. Central government authorities should purchase and rent only energy-efficient buildings;
4. In public buildings with a useful floor area of more than 250 m², an EPC must be issued and displayed in a prominent place that is visible to the public.

In addition to legislative measures, there are other actions aimed at improving the energy efficiency of public buildings. The subchapters below show the most important policies and actions.

6.1 action plan for the energy upgrading of buildings owned and occupied by central government

Article 5 of Directive 2012/27/EU requires Member States to renew annually 3 % of the total area of buildings owned and occupied by central government authorities or to opt for an alternative approach, including deep renovations and behavioural change measures, in order to achieve equivalent energy savings by 2020.

Cyprus opted for the alternative approach as it provides more flexibility in the implementation of effective energy saving measures. The annual target has been calculated assuming that 3 % of the public building will be renovated from energy class E to energy class B. Primary energy consumption before and after renovation is considered to be the one calculated for the standard building as defined in the calculation of the cost-optimal levels of minimum energy performance requirements. A report has been submitted to the European Commission indicating and quantifying the measures to be taken.

By Decision of the Council of Ministers of 14 April 2016, the Committee for the Upgrading of the Energy Performance of Buildings of Central Government Authorities was set up. The Committee shall consist of representatives of the Directors of the Energy Service of the Ministry of Energy, Public Works, the Department of Electrical and Mechanical Services and the Audit Directorate of the Ministry of Transport, Communications and Works (MEE). It is responsible for planning the implementation of energy saving measures on the basis of technical data and available financial resources. In order to fulfil the alternative approach to the obligation under Article 5 of Directive 2012/27/EU for deep renovation of buildings owned and occupied by central government authorities, EUR 20 million was secured from the European and Structural Funds for the period 2014-2020 and a further EUR 20 million for the period 2024-2030.

The same approach will be followed for the period 2021 – 2030, but the annual energy savings target has been recalculated on the basis of changes in the central government building stock.

The following table shows the central government buildings, the total surface area and the energy savings that could be achieved if 3 % of the total area were renovated per year. The annual energy savings target for the period 2021 – 2030 is 1.31 GWh or 0,11 thousand toe (Table 07).

Type of building	Number of buildings	Primary energy before refurbishment r-4µ5] Lm yearJ	Primary energy after refurbishment [-4] Lm yearJ	Total area [m²]	Estimated energy savings [GWft]
Offices	93	332	177	210.042	32,55
Education buildings	17	96	50	52.200	2,4
Other	41	332	177	57.369	8,89
Total	**151**			**318.831**	**43,85**
Annual energy savings to be achieved to be equivalent to an annual renovation of 3 % of the total area					**1,31**

IBID. 6.1: EBUILDING THE ENERGY SAVINGS TARGET IN BUILDINGS OCCUPIED AND OCCUPIED BY THE **CENTRAL GOVERNMENT**

The above savings target is only part of the full energy savings potential that could be achieved in central government buildings. In the theoretical scenario that all buildings owned and used by the central government will be renovated to NZEB, the annual energy savings are estimated to be 2.2 GWh or 0,189 thousand toe (Table 08). The technical and financial aspects of this calculation have not been taken into account, but serve as a reflection on future policy measures in view of the 2050 targets.

Type of building	Number of buildings	Primary energy before renovation r] Lm yearJ	Primary energy after refurbishment [-4] Lm yearJ	Total area [m²]	Estimated energy savings [GWft]
Offices	93	332	71	210.042	54,32
Education buildings	17	96	24	52.200	3,76
Other	41	332	71	57.369	14,97
Total	**151**			**318.831**	**73,55**
Annual energy savings that can be achieved by annual renovation in NZEBs of 3 % of total area					**2,2**

IBID. 6.2: EBUILDING ENERGY SAVINGS BY UPGRADING THE BUILDINGS OCCUPIED AND USED BY THE CENTRAL GOVERNMENT TO **NZEB**

As part of the alternative approach, the central government buildings whose energy upgrading was co-financed by the Cohesion Policy Funds for the 2014-2020 programming period are:

1. A complex of government lids in Paphos, with a surface area of 11.000 m² in energy class B +. The project cost EUR 8 million and was completed in 2021;
2. The Commissioners' building, with a surface area of 1 800 m² in energy class B +. The project

cost EUR 1,5 million and was completed in 2022.

3. The building of the Central Offices of the Public Works Department, with a surface area of 7 000 m² in energy class A. The project is ongoing and is estimated to cost EUR 9,3 million.

Although the financing of the above projects concerns the 2014-2020 programming period, they were completed after 2020 and will therefore be taken into account in the 2021-2030 target.

The target for the period 2021 – 2030 is planned to be implemented mainly through the following measures:

1. Deep renovation of the following, with co-financing from the Cohesion Policy Funds, for the 2021-2027 programming period:
    1.1. Building of the Audit Office
    1.2. Ministry of Finance building
    1.3. Building of the Public Service Commission
    1.4. Directorate-General for Development Building
    1.5. Aradippou Police Station Building (currently being offered)
2. Individual measures: Measures identified as cost-optimal as well as measures that can be combined with maintenance works will be implemented by the Department of Public Works and the Department of Electrical and Mechanical Services and are mainly financed from national resources.
3. Behavioural measures: The Energy Saving Officer appointed in each public building has the task of recording energy consumption and promoting energy efficiency mainly through behavioural and information measures. It plays a central role in changing the behaviour of civil servants towards a more rational use of energy.

The budget for the project of the alternative approach for the programming period 2021-2027 is EUR 45 million. There is therefore scope for additional projects to be implemented. This depends on the progress of the implementation of the ongoing and planned projects managed by the Public Works Department.

In addition to funding from the Cohesion Policy Funds, energy upgrading projects are also financed from other resources. The energy upgrading of the Presidential Palace has been awarded and will be implemented under the Greece-Cyprus Cross-Border Programme Interreg V-A 2014-2020 and is expected to be completed in 2023.

6.2 Energy Savings Operators (EPE) in public buildings

The institution of the EPE Officer started to apply on a voluntary basis from 2011. Following a decision of the Council of Ministers (Decision No 80.534) in 2016 and following a joint proposal from the Ministry of Merchant Shipping and the Ministry of Education and Exploration, E & E officers must be appointed in all public buildings, owned and rented.

In addition, at its meeting on 07/12/2022, the Council of Ministers approved a proposal setting out a series of energy-saving measures which must be implemented by public bodies (with a recommendation that they also be implemented by the private sector). The responsibility for implementing the measures lies with the relevant heads of the public bodies, who should inform the Energy Service on an annual basis.

The EPE Officers must monitor and collect data related to the use of energy in the buildings where they have been designated as responsible persons, and provide the relevant information annually to the Energy Service. The information will be provided by filling in a standard electronic form, including various energy data of the building, such as consumption. electrical energy costs, of oil and/or LPG, electromechanical equipment, RES systems, lighting and others.

The building in which the Department of Fisheries and Marine Research and the District Agricultural Office of Nicosia/Kyrenia are co-located is a remarkable and successful example of the implementation of the institution of the EPE. This is a rented building which, at the invitation of the EPE Officer, was inspected by representatives of the Energy Service and energy saving measures (zero cost and technical interventions) were proposed. In cooperation with the EPE Officers of the two Departments, it was possible for the owner to upgrade the building radically and transform it into an energy class A building. The upgrading works were completed at the beginning of November 2018.

6.3 Renting and purchase of energy-efficient buildings by central government

According to Article 15 of the Energy Efficiency Law (31 (I)/2009):

1. Central government authorities purchase and rent only energy-efficient buildings, as long as this is consistent with cost-effectiveness and economic feasibility, the more general viability; the technique

adequate as well as sufficient competition. A circular on the subject has been issued. adopted the General Accounting Office (circular) GL/ISAD 101 dated 30/06/2017, Annex XI).

2. The competent public procurement authority shall encourage public bodies, in the process of awarding service contracts with significant energy content, to assess whether it is possible to conclude long-term energy performance contracts, which bring long-term energy savings.

The Ministry of Finance has requested offers for the purchase of buildings to replace rented buildings occupied by central government authorities. It is expected that this measure will, at least in part, change the current situation where central government rents many buildings with low energy efficiency.

6.4 "STRATENERGY project"

As part of the submission of proposals under the Interreg V-A cooperation programme GREECE – CYPRUS 2014-2020, the programme managing authority approved the project Strategic Cross-Border Cooperation Capitalisation of a Common Approach to Energy Saving in Public Buildings (STRATENERGY). The project concerns the promotion of energy savings in municipalities and organisations in the wider public sector in the cross-border cooperation area of the Programme, by developing tools for use by the above bodies, as well as the implementation of demonstrative energy saving projects. Please note that the projects are 85 % co-financed by the European Regional Development Fund and 15 % by national funds from Greece and Cyprus.

The main objectives of STRATENERGY are to implement mature strategic projects in public buildings, to finalise a common strategic and operational planning framework for public sector bodies for 2030 to integrate energy savings into their building stock and to maximise results through piloting using modern specialised IT applications/decision support methodologies and broadening the common framework in consistency with related policies.

As part of the implementation of the project, in Cyprus the municipal buildings of the municipalities of Geroskipou, Agios Dometriou, Sotiras, the technical services building of the Municipality of Limassol and a building of the Cyprus University of Technology will be upgraded in energy. The YEEB is the main beneficiary of the project with a budget of EUR 2,3 million, while the total project budget for all partners is approximately EUR 4,32 million. The project is expected to be completed in 2023. The partnership also includes the Nicosia Development

Company (ANEL), the Centre for Renewable Sources of Greece (KEPE), the Region of Crete (PE), the Municipality of Thira, the Municipality of Samos, the Municipality of Kos and the Union of Regions of Greece (ENPE). Information on the energy saving measures to be implemented in each building in Cyprus, the expected annual energy savings and the category in which each building's EPC is classified before and after the energy upgrading is given in Table 09.

A/A	Organisation	The building	Energy saving measures to be implemented	Category of EPC (before upgrading)	Category of EPC (after upgrading)	Expected annual primary energy savings based on EPC in kwh
1	Municipality of Limassol	BUILDING OF ITS TECHNICAL SERVICES MUNICIPALITY OF LEMESOS	Roof thermal insulation, replacement of frames, installation of LED lamps, replacement of air-conditioning system.	E	B	191.360
2	Municipality of Agios Dometriou	MUNICIPAL MAJOR	Roof thermal insulation, replacement of frames, installation of LED lamps, replacement of air-conditioning system.	G	B	1.536.502
3	Municipality of Geroskipou	MUNICIPAL MAJOR	Roof thermal insulation, thermal insulation of external walls, replacement of frames, installation of LED lamps, replacement of air-conditioning system.	D	B	216.927
5	Municipality of Sotiras	MUNICIPAL MAJOR	Roof thermal insulation, replacement of frames, installation of external shading systems in windows, installation of LED lamps, replacement of air-conditioning system, installation of photovoltaic system	D	B	440.269
6	CUT	FORMER BUILDING LAÏKI — LEMESOS	Roof thermal insulation, thermal insulation of external walls, replacement of air-conditioning system, installation of photovoltaic system	D	B	455.896
Total expected annual primary energy savings based on EPCs in kWh						**2.840.954**

IBID. 6.3: THE VALUES TO BE UPGRADED TO THE STATE **asPART** OF THE FRAMEWORK FOR THE IMPLEMENTATION OF THE **'STRATENERGY' project**

6.5 Public schools

The Ministry of Education, Sport and Youth (YPAN) has concluded an agreement with the Electricity Authority of Cyprus (EAC) for the installation of photovoltaic metering systems with a total capacity of 4.9 MW and thermal roof insulation in public school buildings. The project is expected to contribute to:

1. The financial savings of the State.
2. The production of additional electricity and during school hours.
3. Efficient and rational production and consumption of electricity.
4. Achieving the targets set by the European Union for its Member States in terms of renewable energy production.

5. Protecting the environment and reducing pollutant and greenhouse gas emissions.
6. Fulfilling the harmonised and exemplary role that public buildings should play in the energy sector.
7. To foster energy and environmental awareness among students and in particular to familiarise them with renewable energy technologies.

The agreement has been signed in November 2019 and the projects are expected to be completed in 2023. This measure is expected to apply to 405 schools.

In addition, the Ministry of Development and, in particular, the Education Unit for the Environment and Sustainable Development of the Pedagogical Institute, with the cooperation of the Technical Services and in particular the Cyprus Energy Office (Implementing Body), are implementing the PEDIA programme (Promoting Energy Efficiency Developing Innovative Approaches in Schools), which aims to transform 25 schools into zero-energy buildings. The PEDIA project has secured funding of EUR 500.000 from the European Commission for technical assistance and aims to improve the energy efficiency and comfort conditions of 25 public school buildings in Cyprus, thereby also contributing to Cyprus' national and European energy and climate targets.

More specifically, the Programme, funded by the European Commission and Horizon 2020, will implement holistic solutions relating to thermal insulation of roofs and masonry, the installation of energy-efficient windows, the implementation of shading systems, photovoltaic systems, automation, efficient comfort and ventilation solutions, and the creation of green roofs. The programme, lasting five (5) years (2020 – 2025), aims to change from piecemeal temporary and isolated solutions to long-lasting holistic and permanent approaches, where schools themselves, apart from zero-energy buildings, will become an organic part of the school's pedagogical and social functions.

The PEDIA project aims to mobilise public and private investments of at least EUR 7.500.000 and to develop a long-term energy renovation strategy for all public school buildings, introducing a procedural framework for energy upgrades, based on environmental, energy and socio-economic criteria. It should be noted that the YPAN itself has committed a budget of EUR 4.500.000 with its own resources, while one of the obligations of the PEDIA partnership was to raise further funding. In addition, the YPAN aims to extend the PEDIA programme in order to upgrade a larger number of schools, with co-financing from the Cohesion Policy Funds (the

2021-2027 THAEIA programme).

In March 2022, the Education for the Environment and Sustainable Development Unit of the Ministry of the Environment and Sustainable Development announced that the selection procedure for the 25 pilot schools to be upgraded to zero-energy buildings under the PEDIA project had been completed.

Tenders have already been launched for the energy upgrading of the first five schools (Agios Domepiou Gymnasium, Agios Trimithia Primary School, Idalion B Primary School, Aglantzia St. kindergarten and Agiou Antoniou kindergarten) and work is expected to start by the end of 2023.

Also in March 2023, the Evaluation Committee selected the next five schools to be upgraded.

6.6 Public Nurses

The Organisation of State Health Services (OYPY), through the Recovery and Resilience Plan, plans the renovation and energy upgrading of hospitals. Table 10 lists these projects.

<table>
<tr><th>A/A</th><th>Project/Building</th><th>Financial Plan/Programme *</th><th>Implementation Horizon</th><th>Comments</th></tr>
<tr><td>1</td><td><u>Nicosia General Hospital:</u> Renewal/Extension of Emergency Department</td><td>NRRP</td><td>May 2024</td><td rowspan="10">The initial EPC was issued for the entire hospital, while the interventions are carried out in its individual departments. Has been requested through the contract by the contractor:
1. carry out an energy efficiency audit per Department before and after the completion of the project; and
2. upon completion of the works, the renovations of the sections lead to an energy upgrade that contributes to reducing primary energy demand by at least 30 % per segment.</td></tr>
<tr><td>2</td><td><u>Nicosia General Hospital:</u> Refurbishment/Extension of Interactive Radiation Department</td><td>AR 2022</td><td>May 2024</td></tr>
<tr><td>3</td><td><u>Larnaca C.N.:</u> Renewal/Extension of Emergency Department</td><td>NRRP</td><td>May 2024</td></tr>
<tr><td>4</td><td><u>Larnaca C.N.:</u> Renovation/Extension of Radiation Department</td><td>AR 2022</td><td>February 2025</td></tr>
<tr><td>5</td><td><u>C.N. Paphos:</u> Renewal/Extension of Emergency Department</td><td>NRRP</td><td>May 2024</td></tr>
<tr><td>6</td><td><u>C.N. Paphos:</u> Refurbishment/extension of day nursing</td><td>NRRP</td><td>May 2024</td></tr>
<tr><td>7</td><td><u>C.N. Paphos:</u> Renovation/extension of paediatric-nursing unit, obstetric-gynaecological clinic and clinic of pregnant women</td><td>NRRP</td><td>May 2024</td></tr>
<tr><td>8</td><td><u>C.N. Limassol:</u> Renewal/Extension of Emergency Department</td><td>NRRP</td><td>May 2024</td></tr>
<tr><td>9</td><td><u>C.N. Limassol:</u> Refurbishment/upgrade of the substrate – washing machine</td><td>NRRP</td><td>June 2026</td></tr>
<tr><td>10</td><td>Hospital of Archbishop Makariou III
- Refurbishment/upgrading of gynaecological clinic
- Refurbishment/upgrading of paediatric surgery clinic</td><td>NRRP</td><td>June 2026</td></tr>
</table>

NRRP: National Recovery Plan for Resilience – OP 2022: National Budget 2022

Ibid. 6.4: Energyrenovations carried out by **SOYY**

6.7 Grant scheme to encourage energy upgrading by local authorities and bodies in the wider public sector.

The purpose of the Grant Scheme is to provide financial incentives to encourage the implementation of energy upgrading investments by local authorities (ATA) and legal persons governed by public law.

The aim of the Plan is, in particular, to significantly upgrade the existing building infrastructure of ATAs and legal persons governed by public law and to contribute to the achievement of national renewable energy and energy saving obligations.

The main objective of the Plan is to achieve a reduction in primary energy consumption of at least 30 % on average from all supported investments under the Plan. In particular, for each subsidised building it should be converted into NZEB, while for any other infrastructure, primary energy savings of at least 30 % should be achieved.

The Plan has a total budget of EUR 9.000.000 and is included in the Cyprus Recovery and Resilience Plan (RRP) for the period 2021-2026. It will be financed by the European Union's Recovery and Resilience Facility (RRF) and its implementing body is the Management Committee of the RES and EPE Fund.

7. Promoting digitalisation, smart technologies and well-connected buildings and communities

Promoting smart technologies and well-connected buildings and communities is a key pillar for digitalisation of the energy sector. The main and most important feature of “smart” systems is that they can communicate and exchange information in a digital environment to optimise building performance and energy use. The implementation of smart systems in buildings and the interconnection between them in energy communities comes to improve the flexibility of the energy system, as the arrangements and measures to date have been limited to energy production and use. In addition, data collection through the digitisation of the buildings sector is expected to help implement more targeted energy saving and RES measures during renovation, but also to better integrate new technologies such as electromobility and energy storage.

Despite the benefits of applying digital technologies in buildings, there are still challenges that hamper the faster and wider uptake of these technologies in the sector. The lack of skilled human resources in the field of digitalisation, low expected returns as well as low user awareness of the benefits of using digital technology are the main obstacles to further penetration of digitalisation in the development of energy-efficient buildings. This is due to the perception that the use of digital technology often requires high upfront investment costs to purchase the necessary equipment and software and upskill workers. Stakeholders are therefore often concerned that the adoption of digital technology will not bring significant advantages to compensate for the initial investment[103].

The challenges of digitalisation of the construction sector are even greater for Cyprus due to its small size, fragmented construction

103Review of Cyprus Energy and Climate Plan – Task 5-11: Report on publications and policy elements to update the Cypriot National Long-Term Renovation Strategy by Trinomics consultant in cooperation with the Cyprus Institute.

industry and the overall negative perception of Digitalisation, where Cyprus is lagging behind EU counterparts. For example, the use of Building Information Modelling (BIM) systems is very limited in Cyprus, both in the private and public sectors, and there is no strategy to promote it in construction sector [22].

It is well known that public procurement policies with a particular focus on policies or requirements that contribute to promoting digitalisation in the construction sector – such as BIM requirements in public tenders – promote digitalisation.

Government e-services also play a key role in facilitating the digitalisation of construction processes. This is the case, for example, with the digitalisation of building permit systems. Until recently, the system of planning and building permits was based on paper applications and paper plans/calculations. This has recently changed with the creation of 'IPPODAMOS', an integrated information system for issuing planning and building permits and managing them.

In addition, the Land Registry Portal of the Land Registry and Surveys Department was launched a few years ago. It is a modern online platform, which provides comprehensive and easy access to geographic data related to real estate through digital services. The portal serves as the central reference point and as the future central platform for all spatial and other data included in the INSPIRE Directive, enhancing interoperability between the various governmental, semi-governmental and general public organisations.

In addition to the above, since the start of the application of the EPBD, the Energy Service of the Ministry of Energy has developed a central electronic database of EPCs together with their relevant data. At the same time, it intends to implement building renovation passports through the online platform one stop shop (see Chapter 4.5.2).
The European Union (EU) Renovation Wave initiative builds on and complements other policy areas, such as the EU's Clean Energy Package for all Europeans. In fact, the Renovation Wave [104] goes a step further in terms of digitalisation, as its provisions, proposed to be reflected in the revised EPBD[105], include:

1. Introduction of digital building logbooks, integrating all building data provided by the upcoming Building Renovation Passport (BRP), Smart Readiness Indicators (SRI) and EPCs,

104Communication from the European Commission "A Renovation Wave for Europe – green buildings, jobs, better lives"
105Proposal for a recast European Directive on the Energy Performance of Buildings

thus ensuring that the data collected is compatible and available throughout the renovation pathway of buildings.

2. Support investment and uptake of digital technologies in the construction sector by creating synergies with Digital Hubs innovation, testing facilities and Horizon Europe; and
3. Support BIM systems by promoting them in public procurement of construction works [106] (including a methodology for public authorities to carry out a cost-benefit analysis for the use of BIM).

Finally, as announced in the Renovation Wave Strategy, the European Commission is also expected to develop a unified framework for digital building permits and establish a reliable system for the certification of energy performance meters in buildings that can measure actual energy efficiency improvements.

In view of the developments mentioned above, the main challenge for Cyprus is the development of a plan for the digitalisation of the building sector and the administration and coordination of these various initiatives to serve this planning.

7.1 Smart readiness indicator of buildings

The smart readiness indicator of buildings shall be used to measure the ability of buildings to use information and communication technologies and electronic systems in order to adapt the operation of buildings to the needs of occupants and the network and to improve the energy performance and overall performance of buildings.

The purpose of the smart readiness indicator of buildings is to raise awareness among owners and occupants of the value of automation and electronic monitoring of technical building systems and to inspire confidence in occupants about the actual savings that these new enhanced functionalities can achieve.

Based on the EPBD, the European Commission has adopted Delegated Regulation (EU) 2020/2155 establishing a common system for rating the smart readiness of buildings. The

106Handbook for the Introduction of Building Information Modelling by the European Public Sector assessment of the smart readiness of buildings shall be based on an assessment of the building or building unit in terms of the ability to adapt its operation to the needs of the occupants and the network, and the potential to improve its energy performance and overall performance. In particular, its calculation methodology will be based on three key functions in terms of the building and its technical systems:

1. The ability to maintain energy performance levels and the functioning of the building by adapting energy consumption, for example through the use of energy from renewable sources;
2. The ability to adapt the mode of operation of the building to the needs of the occupants, while taking into account user-friendliness, the maintenance of healthy indoor climate conditions and the possibility to inform about energy consumption;
3. The flexibility of a building in terms of total electricity demand, including its ability to enable participation in

   active and passive as well as direct and indirect demand response, related to the network, for example through flexibilities and load transmission.

In addition, the European Commission has adopted Implementing Regulation (EU) 2020/2156 which clarifies the technical details for the effective implementation of the system and clarifies the complementary relationship of the system to EPCs. In addition, two technical studies have been carried out on behalf of the European Commission to define the smart readiness indicator for buildings and the methodology for its calculation.

The implementation of the smart readiness indicator rating scheme by Member States shall be optional. The Law regulating the energy performance of buildings allows the Minister for Energy, Commerce and Industry to issue a decree allowing it to determine matters relating to the common smart readiness indicator assessment scheme and not covered by the delegated regulation adopted by the European Commission.

7.2 Energy communities

In accordance with Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, Member States shall ensure that final customers, in particular household customers, have the right to participate in a renewable energy community. In addition to their participation, they retain their rights or obligations as final customers without being subject to conditions or procedures that are not justified or discriminatory and would prevent them from participating in a renewable energy community. In the case of private undertakings, their participation is permitted provided that they do not constitute their principal commercial or professional activity.

At the same time, in line with Directive (EU) 2019/944 on the internal market in electricity, Member States provide for an enabling regulatory framework for citizen energy communities. A citizen energy community is defined as a legal entity that:

1. It shall be based on voluntary and open participation and shall be effectively controlled by partners or members who are natural persons, local authorities, including municipalities, or small enterprises.
2. Its primary purpose is to provide environmental, economic and social benefits at community level for its members or partners or the local areas where it operates rather than to generate economic profits.
3. It may be active in the generation, including production from renewable sources, distribution and supply of electricity, consumption, aggregation, energy storage, energy efficiency services, charging services for electric vehicles, or other energy services to its partners or members.

As regards energy communities, the provisions of Directive (EU) 2019/944 concerning common rules for the internal market in electricity have been transposed into the Electricity Market Regulation Acts of 2021 and 2022, which provide for the establishment of a regulatory framework ensuring that citizen energy communities are open to cross-border participation and have the right to own, establish, purchase or lease distribution networks and manage them autonomously. In addition, the Laws ensure, inter alia, open and voluntary participation in citizen energy communities, the possibility of partners or members of an energy community to leave the community, access to all electricity markets, directly or through aggregation, in a non-discriminatory manner, and the organisation within the energy community of citizens of the shared use of electricity produced by the generation units owned by the community.

The provisions of Directive 2018/2001/EC on the promotion of the use of energy from renewable sources (recast) relating to renewable energy communities have been transposed into the 2022 Law on the Promotion of the Use of Renewable Energy Sources (Law 107 (I)/2022). On the basis of Article 37 of the Law, CERA issues a regulatory decision laying down the framework for the operation of the93

it is based on communities and is carrying out an assessment of the barriers and development potential of renewable energy communities in the Republic.

At local level, the municipalities of Nicosia, Paphos and Aradippou have developed initiatives to transform them into smart cities. Many of the actions they plan are not purely energy related, but provide for the development of applications and infrastructure through a package of advanced digital services that can also be used by energy communities in the future.

In 2019, the Commissioner for Mountain Areas also prepared the National Strategy for the Development of Troodos Mountain Communities, which includes an overview of the current energy situation of this area and measures to improve it. These measures include the energy upgrading of private and public buildings, energy visits to households to inform and raise awareness, and the collection of parcels and green waste with a view to their energy recovery. The total indicative cost for the implementation of the proposed measures for the period 2019 – 2030 is estimated at EUR 4.940.000. This initiative is the first structured energy planning in a large, Cyprus' data geographical area comprising 115 communities.

8. Improving skills and education in the construction and energy efficiency sectors

Training all professionals involved in the energy performance of buildings and in particular the energy upgrading of existing buildings is a fundamental measure to increase energy renovations. The most important are professionals whose main task is the design of buildings, the study of the installation of technical systems in buildings, including RES systems, and installers of building components that affect their energy performance.

It is important to recognise that workers in the construction sector are gradually acquiring the skills required for energy-efficient building renovations even without specialised training, as the statutory obligations for high energy performance of new buildings have led many workers in the sector to acquire these skills already (e.g. in thermal insulation materials and techniques, installation of efficient windows, etc.). This knowledge is easily transferred from construction works to new buildings to those of existing buildings[107].

Cyprus also, unlike most European countries, has an experienced and properly trained workforce in terms of heat pumps. This is an asset for electrification and energy upgrading of buildings and results from the fact that as a Mediterranean island we have mainly cooling needs which are almost entirely covered by heat pumps.

8.1 Technical education and training

Middle Technical and Vocational Education (MTEE) is secondary education and is provided to pupils aged between 15 and 18, within a three-year cycle. Through the theoretical and practical direction and through a

107Review of Cyprus Energy and Climate Plan – Task 5-11: Report on publications and policy elements to update the Cypriot National Long-Term Renovation Strategy by Trinomics consultant in cooperation with the Cyprus Institute.

a balanced programme of general education and technological/laboratory specialisation aims to prepare graduates for immediate employment, or for continuing their academic career in higher education institutions. The TBT aims to provide specific professional knowledge, skills and competences which among others, also relate to the energy performance of buildings.

In the engineering sector in the theoretical direction, the speciality 'Mechanical Building Facilities' and the corresponding speciality 'Engineering Engineering of Buildings' are offered in the practical direction. These two specialisations offer, inter alia, training in heating, air-conditioning, ventilation, ventilation and hot water installations and information on the role of these systems in saving energy. Both specialisations started operating in their current form in the school year 2016-2017. Since then, there are 190 graduates in the practical direction, with particular emphasis on laboratory courses in the sector and direct integration into the labour market. A corresponding specialisation in the practical direction operated from 1976 until it was replaced by the one mentioned above in 2016. In the practical direction of the electrical and electronic applications sector, the speciality 'Household appliances, refrigeration and air-conditioning technicians' is offered to train the installation, checking, repair and maintenance of various electrical household appliances and refrigeration and air-conditioning installations. The specialty has been in operation since the 2016-2017 school year and so far has 341 graduates.

The Post-Secondary Institutes for Vocational Education and Training (MIVET) are a Public School of Higher Vocational Education and Training. They aim to provide modern curricula that provide scientific, technical and professional knowledge and skills, which smoothly and effectively integrate students into the modern working environment. They have developed, among other things, a curriculum for 'Cooling and air-conditioning facilities', which at the end of the programme graduates possess the necessary professional skills and technical skills in the procedures and methods for installing, maintaining, managing and repairing refrigeration and air-conditioning systems safely and environmentally conscious. At the same time, graduates are able to determine the qualitative and economic criteria for the operation of an air-conditioning system or a refrigeration plant. The programme operated for the first time in the 1990-1991 school year and so far has 1425 graduates.

Graduates of the MIVET and 'Household appliances, refrigeration and air-conditioning technicians' study programme of MITs, following written and practical examinations, may obtain a certificate of suitability for fluorinated greenhouse gases. This certificate is issued by the Environment Service of the Ministry of Agriculture and the Environment of the Republic of Cyprus and is recognised by all EU countries. The first courses to obtain the relevant certification were carried out by the OEB in April 2010. Since then, 5979 category I, 391 class II, 14 class III and 4 class IV certificates attesting that their holder meets the requirements for carrying out relevant activities as referred to in Article 3 of Implementing Regulation (EU) 2015/2067 laying down minimum requirements and the conditions for mutual recognition for the certification of natural persons as regards stationary refrigeration equipment, air conditioning and heat pump equipment, and refrigeration units in refrigerated trucks and trailers containing fluorinated greenhouse gases have been issued by various organisations.

8.2 System of Professional Qualifications (EWS)Human Resources Development Authority

The Human Resources Development Authority (HRDA) has established and manages a Professional Qualifications System (EWS) with a view to upgrading human resources by assessing and certifying candidates' professional qualifications. The assessment of candidates' professional qualifications is carried out on the basis of Standards of Professional Qualifications (PEPs) developed by the MA.

Applicants' learning outcomes are determined and documented, taking into account their previous learning, by the AnAD Centres for the Assessment of Professional Qualifications (KEP).

Professional qualifications are certified by the AnAD on the basis of the assessment reports of the Professional Qualifications Assessors. The certificates of professional qualifications awarded to successful candidates are included in 97.

The Cypriot Qualifications Framework (CyQF), which is linked to the European Qualifications Framework (EQF) and is a reliable and valid resource for careers, also facilitating the mobility of their holders within the European Economic Area.

Among the sectors of the economy in which Standards of Professional Qualifications have been developed are the building industry with professional fields including issues such as ‘Central heating systems technician’, ‘air conditioning and cooling equipment technician’, ‘external thermal insulation and thermal insulation technician’, ‘shading installation technician’, ‘glazed installation technician’, ‘technician for installing and maintaining solar thermal systems for space heating, air conditioning and hot water for use’, ‘Engineering and maintenance technique for automation and electronic building systems’ and ‘technician for installing heat and geothermal pumps’.

8.3 Independent energy efficiency experts

Through legislation, independent experts have already been set up to provide objective and independent advice on the energy improvement of the building as a whole or components. This legislation ensures an adequate level of expert knowledge through qualification, experience, training and examination requirements (Table 09).

Independent experts	Qualifications required
Specialist Residential Expert	(1) Architect, Civil Engineer, Engineer Engineer, Electrician Engineer, Chemist Engineer, Engineer Environment (Member of ETEK) (2) At least 1 year proven experience in buildings or energy issues or in technical building systems; (3) Pass an exam
Specialist Expert on Non-Residence	(1) Architect, Civil Engineer, Engineer Engineer, Electrical Engineer (Member of ETEK) (2) At least 3 years proven experience in buildings or energy issues or in technical building systems; (3) Pass an exam
Inspector Heating systems	(1) Mechanical Engineer (Member of ETEK) (2) At least 3 years' professional experience in studies, contracting, maintenance of building heating systems; (3) Pass an exam
Air conditioning system inspector	(1) Mechanical Engineer (Member of ETEK) (2) At least 3 years' professional experience in studies, contracting, maintenance of building air-conditioning systems; (3) Certificate of Fitness Class I, F-gas management issued by a certification body
Energy Controller A	(1) Engineer registered with ETEK (2) At least 3 years documented professional experience in energy audits of buildings and/or industrial facilities or in subjects; energy production and more specifically; in themes savings energy/energy efficiency improvement in buildings and/or industries and/or in the design and/or operation of complex electromechanical installations in buildings and/or industries (3) Follow a training programme (4) Pass an exam
Energy Manager	Follow a training programme

IBID. 8.1: INDEPENDENT EXPERTS IN THE FIELD OF ENERGY EFFICIENCY OF BUILDINGS

The designation in 2009 of the Specialised Experts responsible for calculating the energy performance of buildings and issuing EPCs and recommendations was an opportunity to train architects, civil engineers, mechanical engineers and electrical engineers in energy matters.

performance of buildings. Although the qualifications laid down by the Law for Specialised Experts do not provide for training, the Energy Service organised dozens of training seminars to prepare the persons concerned for the relevant examination. The seminars intended for qualified experts concerning homes lasted for 16 hours and covered topics relating to legislation, energy efficiency calculation and cost-optimal measures for improving the energy performance of buildings. There are currently two approved evaluation bodies of candidates for specialised experts from the Energy Service. The first is the Energy Office of Cyprus approved in 2016 and has so far organised 25 seminars to train candidate specialists, while the second is Frederick University approved in 2022 and organised the first training seminar in April 2023.

For energy auditors in buildings, it is compulsory to monitor and complete successfully on the basis of an examination of a 80-hour theoretical and practical training programme. Training sessions are conducted by organisations authorised by the Energy Service. These organisations are the University of Nicosia – Energy Agency cooperation and Frederick University.

There is also a training activity on technical building systems. Frederick University has been approved by the Energy Service as the evaluating body for prospective inspectors of heating systems and has organised a total of 5 trainings on this subject.

In 2016, a decree of the Minister for Energy, Commerce and Industry created the legal framework for energy managers. In accordance with the legislation, any organisation and company may appoint its sender as Energy Manager, provided that it attends a training programme approved by the Energy Service. The Energy Manager undertakes to monitor matters relating to energy use in the undertaking or organisation in which it works and undertakes the planning and monitoring of actions to increase energy efficiency and reduce energy consumption. Unlike the above independent experts, the Energy Manager is a member of the undertaking or organisation that promotes energy efficiency through its hierarchy and structures. Especially in small enterprises that do not 100

resources are available for the purchase of external services from energy auditors and/or large investments, the Energy Manager can help with a cultural shift in energy use and other low-cost measures. A survey carried out by the OEB as part of the implementation of the European SMEmpower Efficiency programme in January 2020, involving 32 enterprises, showed that:

1. 7 undertakings have a designated Energy Manager
2. 15 companies do not have a specific Administrator, but a member of its staff operation is responsible for energy issues
3. 10 companies do not have a specific energy manager

As a result, 69 % of the companies surveyed have a person dealing with energy issues.

The training of Energy Managers shall take place in training organisations designated by the Energy Service, which, after attending the training, shall provide trainees with a relevant certificate of attendance of the training programme. Until April 2020, the approved programme is the European Energy Administrator – EUREM Seminar organised by the Energy Office and three trainings have taken place. In addition, through the European SMEmPower Efficiency project, the OEB, in cooperation with the University of Cyprus, implemented 3 educational programmes for energy managers, where a total of 79 people were trained and certified, coming from 52 companies from different sectors of economic activity.

8.4 installers

As regards building element installers, professional education and training is provided to them through initial and ongoing training programmes. The secondary and technical and vocational training provided in secondary technical schools also includes disciplines directly related to the energy performance of buildings such as mechanical engineering, electrical engineering and building.

However, in order to achieve the targets in the area of energy efficiency of buildings, a sufficient number of reliable installers are required to be available. The establishment of the register of installers by the Energy Service was carried out with the aim of ensuring a certain minimum quality of system installation and energy efficiency. Quality assurance is expected to gradually increase trust of building owners towards technical staff working in the field of small-scale technical and RES systems.

As regards installers of technical systems, natural persons are entered in the Register as installers if, inter alia, they hold relevant certificates of qualification for specific categories, as shown in Table 10.

A/A	Categories	Required certificates of professional qualifications issued by the Professional Qualifications Certification Body for the level of qualified technician.
1.	**<u>Category A</u>:** Installers of heating equipment	1. Building Industry, Professional Skills "Central Heating Systems" (Level 4) 2. Building Industry, Professional Qualification "Hydraulics" (Level 4)
2.	**<u>Class B:</u>** Installers of equipment for air conditioning and ventilation systems.	1. Building industry, Professional qualification "hydraulics". (Level 4) 2. Building Industry, Professional Skills "Cooling and Air Conditioning Systems" (Level 4)
3.	**<u>Category C:</u>** Installers of equipment for hot water systems.	Building Industry, Professional Qualification "Hydraulics" (Level 4)

IBID. 8.2: INSTALLATION OF TECHNICAL BUILDING SYSTEMS

Legal persons shall also be registered as installers of technical systems, provided that they have at least one registered installer within their capacity or have entered into a contract with at least one natural person installer. When registering a legal person as an installer, the category or categories of systems for which the installer is authorised to carry out such work shall be specified, depending on the categories of natural persons of installers employed or contracted. 37 limited liability companies and 3 natural persons are registered in the Register of Technical Building Systems installers.

In addition, in the context of the Promotion and Encouragement of the Use of Renewable Energy Sources (Certification of small scale renewable energy installers) Regulations of 2015, the Energy Service shall certify small-scale RES installers and register them in the register of technical systems installers. The certification shall apply to the following categories of RES installers:

1. Category A: Biomass boiler and stove installers
2. Class B: Heat pump installers
3. Category C: Solar photovoltaic installers
4. Category D: Solar thermal system installers

Registration in the installer register shall certify professional competence for RES system installers with a rated power up to 30 kW. 245 installers in the category of photovoltaic systems and 43 in the category of solar thermal systems have been registered in the register.

Before registering, applicants must attend a training course by an authorised body and pass an examination organised by an authorised examination body. The Energy Service has so far authorised six training bodies and four examination bodies, which organise training programmes and examinations at regular intervals.

The certification of installers shall be voluntary. Nevertheless, under certain support programmes or sponsorship schemes, it is necessary that RES systems be installed by certified installers. For example, in accordance with the provisions of the 'Plan for the generation of electricity from renewable energy sources (RES) for own consumption', installations of photovoltaic net-metering and net-billing systems with an output of up to 30 kW must be carried out by certified installers registered in the register of photovoltaic system installers.

9. Assessment of energy savings and overall benefits

Chapter 9 will be revised upon finalisation of the National Energy and Climate Plan.

10. Roadmap 2030, 2040 and 2050

Chapter 10 will be revised upon finalisation of the National Energy and Climate Plan.

11. Conclusions

Chapter 11 will be revised upon finalisation of the National Energy and Climate Plan.

Annex I: Best economical examples of the life-cycle of the building, combinations of energy-saving measures that can be made in a deep renovation, as demonstrated by the results of these calculations

1) Renovation of a single-family house of construction 2003 in NZEB

General building details

- Location: Nicosia
- Useful area 172 m^2
- Two floors
- Three bedrooms

Technical characteristics of the building before any intervention is made:

- Roof: Ceramic roof without thermal insulation (U = 3,39W/m^2K)
- Pillars/beams: Concrete without thermal insulation (U = 3,33W/m^2K)
- Walls: Standard 20 cm brick. (U = 1,39W/m^2K)
- Boxes: Double glazing with an aluminium frame without thermal break (U = 2,46 W/m^2K)
- Shading: Without external shading
- Heating system: Central heating system with radiators and an oil boiler with an efficiency rating of 80 %
- Air-conditioning system: Independent air conditioners with a cooling efficiency rating of 2,6
- Hot water system: The same oil boiler as that used for heating, and solar panels
- Lighting: Compact fluorescent lamps
- Energy efficiency class in the energy performance certificate: D

Energy-saving measures and initial cost:

- Installation of 8 cm thick thermal insulation on the roof (U = 0,33W/m^2K)
- Installation of 10 cm thick thermal insulation in masonry, columns and beams (U = 0,25W/m^2K)
- Replacement of frames with double-glass and thermobreak frames (U = 1,68W/m^2K and low – e)
- Replacement of the boiler with a heat pump

- Replacement of air conditioners with high-efficiency air conditioners
- External moving shades
- Replacement of lamps with LED
- Installation of a photovoltaic system 5 kW
- Additional costs in relation to the planned renovation = EUR 34.070

Energy consumption for:	Before renovation (kWh/m² year)	After renovation (kWh/m² year)
Heating	43	5
Air conditioning	101	20
Domestic hot water	10	2
Lighting	17	13
Production electricity from RES	0	38

Table II.1: Renovation of a dwelling in NZEB

2) Refurbishment of a multi-apartment building 2006 to an energy class A building

General characteristics

- Location: Limassol
- Useful area 2 192 m²
- Four floors
- Four apartments of three bedrooms and one apartment of one sleeping room per floor.

Technical characteristics of the building before any intervention is made:

- Ceiling without thermal insulation (U = 3,39 W/m²K)
- Pillars/beams: Concrete without thermal insulation (U = 3,33W/m²K)
- Walls: Standard 20 cm brick. (U = 1,38W/m²K)
- Boxes: Double glazing with an aluminium frame without thermal break (U = 2,46 W/m²K)
- Shading: Without external shading
- Heating system: Central heating with bodies and an oil boiler with an efficiency of 80 % for the apartments of the three bedrooms and stand-alone air conditioners with an efficiency of 1,9 for the apartments of a sleeping room 109

- Air-conditioning system: Independent air conditioners with a cooling efficiency rating of 2,6
- Hot water system: Same oil boiler as heating and solar frames for the three bedroom apartments and electrical resistance and solar frames for the apartments of a bedroom
- Lighting: Compact fluorescent lamps
- Energy efficiency class in the energy performance certificate: D

Savings measures taken:

- Installation of 7 cm thick thermal insulation on the roof and pilot (U = 0,38 W/m²K)
- Installation of 7 cm thick thermal insulation in masonry, columns and beams (U = 0,33 W/m²K)
- Replacement of air conditioners with high-efficiency air conditioners for heating and cooling
- Replacement of lamps with LED
- Installation of a photovoltaic system 10 kW
- Additional costs in relation to the planned renovation = EUR 121.688

Energy consumption for:	**Before renovation (kWh/m² year)**	**After renovation (kWh/m² year)**
Heating	12	0,64
Air conditioning	102	24
Domestic hot water	5	0,63
Lighting	19	13
Production electricity from RES	0	9

Table II.2: Renovation of a multi-apartment building to energy class A

3) Refurbishment of an office building in NZEB

General building details

- Location: Nicosia
- Useful area 1 922 m²
- Four floors

Technical characteristics of the building before any intervention is made:

- Roof: Without thermal insulation (U = 3,39W/m²K)
- Pillars/beams: Concrete without thermal insulation (U = 3,33W/m²K)

- Walls: Standard 20 cm brick. (U = 1,39W/m²K)
- Boxes: Single glazing with aluminium frames (U = 5,8 W/m²K)
- Shading: Without external shading
- Heating system: Stand-alone air conditioners with a heating efficiency of 1,9
- Air-conditioning system: Stand-alone air conditioners with a cooling efficiency of 2,6
- Hot water system: Electric fast
- Lighting: Compact fluorescent lamps
- Energy efficiency class in the energy performance certificate: D

Energy-saving measures and initial cost:

- Installation of 15 cm thick thermal insulation on the roof (U = 0,19 W/m²K)
- Installation of 12 cm thick thermal insulation in masonry, columns and beams (U = 0,21 W/m²K)
- Replacement of frames with double-glass and thermobreak frames (U = 1,68W/m²K and low – e)
- High-efficiency heat pump
- Replacement of air conditioners with high-efficiency air conditioners
- External moving shades
- Installed lighting power below 10 W/m²
- Installation of a photovoltaic system 20 kW
- Additional costs in relation to the planned renovation = EUR 67.530

Energy consumption for:	**Before renovation (kWh/m² year)**	**After renovation (kWh/m² year)**
Heating	21	2
Air conditioning	101	14
Ventilation	0	3
Domestic hot water	0	0
Lighting	48	14
Production electricity from RES	0	17

Table II.3: Refurbishment of offices in NZEB

4) Refurbishment of a 1987 building hotel to energy class B +

General building details

- Location: Paphos
- Useful area 4 831 m²
- Five floors
- 116 bedrooms

Technical characteristics of the building before any intervention is made:

- Roof: Without thermal insulation (U = 3,39W/m²K)
- Pillars/beams: Concrete without thermal insulation (U = 3,33W/m²K)
- Walls: Standard 20 cm brick. (U = 1,39W/m²K)
- Boxes: Single glazing with aluminium frames (U = 5,8 W/m²K)
- Shading: Without external shading
- Heating system: Central heating system with radiators and an oil boiler with an efficiency rating of 80 %
- Air-conditioning system: Stand-alone air conditioners with a cooling efficiency of 3,2
- Hot water system: Same oil boiler as heating with solar
- Lighting: Compact fluorescent lamps
- Energy efficiency class in the energy performance certificate: C

Energy-saving measures and initial cost:

- Installation of 7 cm thick thermal insulation on the roof (U = 0,38 W/m²K)
- Installation of 7 cm thick thermal insulation in masonry, columns and beams (U = 0,33 W/m²K)
- Replacement of frames with double-glass and thermobreak frames (U = 1,1 W/m²K and low – e)
- Replacement of the boiler with a heat pump
- Installation of a photovoltaic system 20 kW
- Additional costs in relation to the planned renovation = EUR 108.280

Energy consumption for:	**Before renovation (kWh/m² year)**	**After renovation (kWh/m² year)**
Heating	46	3
Air conditioning	114	80
Ventilation	0	7
Domestic hot water	82	17
Lighting	33	33
Production electricity from RES	0	11

Table II.4: Renovation of a hotel to energy class B +