Integrated National Energy and Climate Change Plan for 2021 - 2030

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List of acronyms

boe	Barrels of oil equivalent
bn	Billion
BRUA	Bulgaria-Romania-Hungary-Austria gas pipeline
CA	Contracting Authority
CACM	Commission Regulation (EU) 2015/1222 of 24 July 2015 capacity allocation and congestion management guidelines
CAPR	Center for Advanced Propulsion Research
CEE	Central and Eastern Europe
CHPSS	Centralized Heat Power Supply System
COM	European Commision
CS	Compressor Station
CWE	Central Western Europe
DO	Distribution Operator
EDN	Electric Distribution Network
ENTSO-E	European Network of Transmission System Operators for Electricity
ENTSO-G	European Network of Transmission System Operators for Gas
ETN	Electric Transmission Network
ETS	Emissions Trading System
EU	European Union
EUFHERDI	Executive Unit for Financing Higher Education, Research, Development and Innovation
EUGR	Energy Union Governance Regulation
EV	Electric Vehicles
GC	Green Certificates
G.D.	Government Decision
GHG	Greenhouse gases
GMS	Gas Measuring Station
G.O.	Government Ordinace
H&C	Heating and cooling

IMS	Intelligent Monitoring System
k	Kilo/ thousand
km	Kilometer
kW	Kilowatt
LRS	Last resort suppliers
LULUCF	Land Use, Land Use Change & Forests
LV	Low Voltage
MARD	Ministry of Agriculture and Rural Development
ME	Minsitry of Energy
MEn	Ministry of the Environment
MEF	Ministry of European Funds
mil.	Million
mil t	Million tons
mil t CO_2	Million CO_2 tons
mil. t. CO_2 eq/ $MtCO_2$ eq	Million CO_2 equivalent tons
MRC	Multi-regional Coupling
MRDPA	Ministry of Regional Development and Public Administration
MRI	Ministry of Research and Innovation
MS	Member States
MT	Ministry of Transport
MV	Mediu Voltage
MW/MWh	Megawatt/ Megawatt per hour
MWF	Ministry of Waters and Forests
NERA	National Energy Regulatory Authority
NES	National Electricity System
NIS	National Institute of Statistics
NRDIP	National Research & Development and Innovation Plan
NTC	Net Transfer Capacity

NTS	National Transmission System (for natural gas and for crude oil respectively)
OPCOM	Romanian gas and electricity operator
OPL	Overhead power line
PCI	Projects of Common Interest
PINECCP	Project of the Integrated National Energy and Climate Change Plan
PJ	Petajoule
PO	Priority Objective
RES	Renewable Energy Sources
RES-E	Renewable Energy Sources in Electricity
RES-H&C	Renewable Energy Sources in Heating & Cooling
RES-T	Renewable Energy Sources in Transport
SDAC	Single Day Ahead Coupling
SIDC	Single Intra-Day Coupling
SEE	South East Europe
SME	Small and medium enterprises
Stakeholder	Interested Party in INECCP 2021-2030 Project (individuals and entities with or without legal personality)
STS	System Technology Services
t	ton
TN	Technological Node
toe	Ton of oil equivalent
TSO	Transmission and System Operator
VTP	Virtual Trading Point
WACC	Weighted Average Cost of Capital
WB	Western Balkans
WEM	Modelling Scenario With Existing Measures
WPM	Modelling Scenario With Projected Measures

A. National Plan

1. Overview and process for establishing the Plan

1.1. Executive Summary

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

Following the adherence of the European Union to the Paris Agreement and the publication of the Energy Union Strategy, the EU has taken on an important role to fight against the climate change, through **5** main **dimensions**: **energy security, decarbonization, energy efficiency, internal energy market and research, innovation and competitiveness**.

The document related to the state of the Energy Union, published by the European Commission (EC) on 18th November 2015, indicates the necessity of an integrated strategic planning for energy and climate change from each member state, on all of the 5 dimensions. Therefore, the Member States (MS) are required to develop an Integrated National Energy and Climate Change Plan (INECCP) for 2021-2030, based on the governance system.

The present Plan reflects the set of national preferences, particularities and priorities, considering Romania's entitlement to establish its energy mix. Following this approach for determining the national targets, in the elaboration of the Plan we considered facilitating the selection of the most efficient (including from a cost point of view) policies, measures and commitments that will contribute to the achievement of the national targets presented in the current plan.

Rapid changes at European and global level in terms of technological developments and cost savings with RES technologies as well as new regulations in the context of climate change mitigation efforts can turn Romania into an important player in meeting EU ambitions and targets on energy prospects in 2030 and even in 2050.

Romania has a balanced and diversified energy mix. Our country benefits of important internal energy resources such as oil, natural gas and coal. Romania has a considerable potential for hydro-energy and sufficient uranium reserves for the supply of SNE Cernavoda. Romania has invested and supported the development of renewable energy sources such as wind power, solar power, biomass and electrical energy generated in micro-hydropower plants. The current energy mix is balanced, which could ensure a reasonable degree of energy security at national and regional level, in case of critical situations caused either by extreme meteorological conditions, or by operational causes.

In the elaboration of the Plan, we used with priority and diligence data and information collected from the Energy Strategy of Romania 2019-2030, with perspective of 2050, from central and local public authorities, own expertize at national and regional level as well as from other sources (e.g. relevant studies published on DG Energy website).

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

In approaching the five dimensions of the Energy Union multiple strategies were considered, in different development or approval stages, designed by ministries / stakeholders, considering the convergence and development priorities of Romania as a member of the European Union.

The current Plan integrates with priority the objectives and directions established through specific strategies in the energy and climate change sectors, relying also on programmatic documents initiated also by other ministries / authorities.

As such, the approach was to identify the set of priorities that would lead to the achievement of the assumed objectives, considering the available resources and the institutional capacity for implementation.

Similar to the EU perspective for designing the policy for energy and climate change for 2030 around 5 pillars, the current Plan was constructed on a series of constitutive elements, essential for defining the role and contribution of Romania to the consolidation of Energy Union.

In this regard, the main elements considered in the strategic approach of the Plan were the following:

- Economic growth and growth of revenue per household (until 2030);
- The holistic approach to energy, economy, environment and climate change should be closely linked to the economic reality of the Member States, so as the macroeconomic and internal social balance is not affected;
- Energy Security dimension: implementation of the projects included in the Energy Strategy of Romania 2019-2030, with perspective of 2050;
- Reduction of the energy poverty and accelerated electrification of transport;
- Restructuring of the market framework in the context of transition-induced costs and the ability of the Member States to support these costs in terms of accessibility and competitiveness.

Main objectives

In this context, the contribution of Romania to the achievement of the EU objectives for 2030 is highlighted in the table below:

Table 1 - Overview of the main objectives of INECCP 2021-2030 for 2030

Overview of the main objectives of INECCP 2021-2030 for 2030	
ETS emissions (% compared to 2005)	**-43.9%**
Non-ETS emissions (% compared to 2005)	**-2%**
Total share of renewable energy in final gross energy consumption	**27.9%**
⬇	
RES-E	39.6%
RES-T	17.6%
RES-H&C	31.3%
Energy Efficiency (% to PRIMES 2007 projection for 2030)	**-37.5%**

Source: Deloitte analysis based on the official documents issued by the authorities involved in the elaboration of INECCP

For the establishment and alignment of national objectives specific to **energy security** and **internal energy market** dimensions, we performed an inventory of different initiatives, decisions and current developments that highlight the objectives specific to this dimension, that form the basis of the activities and strategic action plans for 2021-2030, with perspective of 2050. As most of the objectives for these dimensions are of qualitative nature, no numerical targets have been set.

Related to the **energy security** dimension, Romania considers the electricity supply from internal sources as a primary objective for ensuring the national energy security and as a necessity linked to the currently diversified and balanced energy mix. Therefore, maintaining the current level of diversity of internal sources represents a priority objective for 2021-2030. Related to natural gas supply, Romania is considering the development of the national transmission system of natural gas on the Bulgaria – Romania – Hungary – Austria (BRUA) corridor and the development, on the Romanian territory, of the Southern Transmission Corridor for taking over the Black Sea gas. The existing interconnection points will continue to be used on the following directions: North-West (Mediesul Aurit), South-East (Isaccea) with Ukraine, West with Hungary, South with Bulgaria and East with Republic of Moldova.

In addition, Romania plans to replace by 2030 the power plants, which will come out of operation with new, efficient and low emission capacities. At the same time, the increase of energy efficiency in all economic sectors (especially in the industry sector) will contribute to the improvement of Romanian energy security through its impact on demand, respectively on lowering the energy import that covers the demand.

Related to the **internal energy market** dimension, Romania plans to extend the interconnection capacities at the horizon of 2030, considering socio-economic and environmental cost-benefit analyses, planning to implement projects where benefits are higher than costs

At the same time, through the primary and secondary legislation, but also through the projects related to the closure of the 400 kV national power ring (internal power lines), Romania will create the conditions for maximizing the offered interconnection capacities.

On the other hand, in pursuing the achievement of the priority objective for integration of internal European market, Romania will continue to integrate the day-ahead and intra-day electricity markets into the European Single Day-Ahead and Intra-Day Coupling power markets (SDAC and SIDC respectively), considering the implicit allocation of cross-border flow-based capacities applicable to the CORE region (implementation deadline: according to the roadmap of the implementation projects of the relevant European regulation) of which our country is part and without excluding the early implementation of the single coupled NTC-based electricity markets.

At regional level, a strategic action for Romania remains the integration into the single coupled markets for the day-ahead and intra-day markets (SDAC and SIDC) as a member state, which derives from the need to comply to European regulations.

Also, Romania will continue its collaboration with the contracting parties within the Energy Community and will support the accession of the South East Europe region to SDAC, process that will depend on the process of establishing market mechanisms in the Balkan area.

iii. Overview table with key objectives, policies and measures of the plan

The priority operational objectives (OP) are shown in the overview table below and cover 5 dimensions, in accordance with the Regulation on the Governance of the Energy Union, representing the pillars: P1 - Decarbonization, P2 - Energy Efficiency, P3 - Energy Security, P4 - Internal Energy Market, P5 - Research, Innovation and Competitiveness.

Table 2 - Overview table with key objectives, policies and measures of the plan

Operational objective	**Main policies and measures**	**P1**	**P2**	**P3**	**P4**	**P5**	Source
(OP1) DIVERSIFIED AND BALANCED ENERGY MIX	Continue the sustainable exploitation and use of all types of country's primary energy resources	**x**		**x**			Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Maintain diversified and flexible power generation capacities based on Romania's energy mix	**x**		**x**	**x**		
	Adopt advanced technologies in the energy sector by attracting private investments, supporting scientific research and developing strategic partnerships	**x**	**x**	**x**	**x**	**x**	
	Develop production capacities with low GHG emissions - nuclear, RES, hydropower	**x**		**x**			
(OP2) VALORIZATION OF NEW PRIMARY RESOURCES POOL FOR A LOW ENERGY DEPENDENCE LEVEL AND NATIONAL ENERGY SYSTEM RESILIENCE	A stimulating investment environment for the exploration and development of oil, natural gas and lignite deposits, as well as for increasing the recovery rate from the mature fields			**x**			Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Timely provisioning of the necessary infrastructure regarding market access for new natural gas fields production, both onshore and offshore	**x**		**x**	**x**		
	Establishing geographical areas for the development of energy capacities using renewable energy sources	**x**		**x**	**x**		

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
(OP3) ENHANCE THE INTERCONNECTIONS CAPACITY OF THE ENERGY TRANSMISSION NETWORK	Establish corridors for energy transmission networks and set up a specific legal framework to ensure land availability, authorizations and other measures necessary for their deployment.			**x**	**x**		Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Finalize the 400 kV power ring of the national electricity transmission system	**x**	**x**	**x**	**x**		
	Develop new lines to link the new production capacities with the interconnection points	**x**			**x**		
	Rehabilitation of the hydrocarbon transport systems		**x**	**x**	**x**		
	Regional coordination for on-time development, financing and put-in-function of the international energy infrastructure projects			**x**	**x**		
	Financing the development of bidirectional interconnection capacities and related components of the national energy transmission systems			**x**	**x**		
	Network codes and entry / exit tariffs harmonization among national energy transmission systems in order to facilitate the regional energy flows				**x**		
(OP4) ENSURE ENERGY STORAGE AND BACKUP SYSTEMS CAPACITIES	Enforcing mandatory reserves of crude oil, petroleum finished products and natural gas			**x**	**x**		Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Develop electricity storage capacities via hydroelectric pumping systems; build-up Tarnita-Lapustesti station	**x**	**x**		**x**		
	Develop capacities and mechanisms to integrate the intermittent RESs in the national energy system and in the electrical accumulators systems,	**x**	**x**		**x**	**x**	

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	including the small storage capacities at the prosumer premises						
(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT	Digitization of the national energy system in the transmission, distribution and consumption segments and introduction of the IoT and AI in the transport and distribution systems' management		**x**	**x**		**x**	Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Encourage domestic, industrial and agricultural prosumers build-up, along with the development of electrical grids and smart meters	**x**	**x**		**x**	**X**	
	Integration of distributed production systems and prosumers into the power grid system	**x**	**x**		**x**	**X**	
(OP6) PROTECT THE CRITICAL INFRASTRUCTURE AGAINST PHYSICAL , CYBER ATTACKS AND NATURAL DISASTERS	Implement measures to physically secure the critical infrastructure against any potential terrorist attack			**x**			Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Cybersecurity of the power grid control systems by re-enforcing protection barriers and international cooperation			**x**			
	Ensure the whole energy grid maintenance and upgrade in order to maintain the standard safety level of the critical objectives (lakes, dams, dykes, etc.)			**x**			
	Population warning / alert systems put in function and civil defense exercises implementation.			**x**			
(OP7) ROMANIA'S PROACTIVE PARTICIPATION IN	Romania's participation in configuring solidarity mechanisms to ensure energy supply security during crisis situations			**x**			Romania's Energy Strategy 2019-2030, including a 2050

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES	Technical assistance to acquire European financing for the development of strategic infrastructure projects and energy efficiency programs		**x**		**x**		perspective (November 16, 2018)
	Support for the awareness and submission of applications to include various projects in the EU projects of common interest lists				**x**		
(OP8) REPLACE ELECTRICITY PRODUCTION CAPACITIES TO BE DECOMISSIONED BY 2030 WITH NEW, EFFICIENT AND LOW EMISSION CAPACITIES	Invest in new power generation capacities while achieving the energy security, competitiveness and decarbonisation targets of the energy sector; consider investments in energy innovative technologies	**x**	**x**	**x**			Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018),
	Promote technological neutrality to ensure a national energy mix with a minimal environmental impact	**x**		**x**	**x**		Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Ensure the financing mechanisms for investments in new electricity production capacities with no GHG emissions while being economically efficient	**x**		**x**	**x**		Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Provide financing mechanisms to finalize hydro-energetic facilities for complex utilization (agricultural irrigations, flood protection, water supply, etc.)	**x**					
(OP9) INCREASE ENERGY EFFICIENCY	**Energy**						
	Reduce losses from electricity grids, natural gas and centralized heat		**x**		**x**		National Strategy for Competitiveness 2015

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	transport systems						– 2020
	Smart medium and low voltage power distribution systems (including smart grids and IT systems) and efficient use of local energy sources including assigned storage	x	x	x	x	x	Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Manufacturing						
	Stimulate economic competitiveness through investments to ensure energy efficiency within the industrial processes		x				Industrial Policy 2018 (Ministry of Economy)
	Allocate investments to energy efficiency increase of manufacturing industry processes, including the ones from renewable energy sources	x	x				
	Support SMEs to invest in energy efficiency		x				Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027), Deloitte expertise
	Establish, implement, maintain and improve an energy management system (EnMS) according to ISO 50001 and Romanian SRAC certification		x				
	Buildings						
	Exploit energy efficiency potential of the building sector, via thermal insulation programs for the public sector, apartment buildings and the		x				Romania's Energy Strategy 2019-2030,

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	energy poverty affected communities						including a 2050 perspective (November 16, 2018)
	Integrated approach on the district heating sector, with coordination of investment projects throughout the supply chain - production, transport and the efficient heat usage	**x**	**x**				
	Develop smart metering and smart grids	**x**	**x**		**x**	**x**	
	Promote heating systems with thermal panels for heated water production, especially in rural areas	**x**	**x**				
	Efficient use of biomass, modern heat generation systems, in particular for rural heating	**x**	**x**				
	Step-by-step implementation of smart city concept, integrating developed infrastructure; implementation of IoT at residential level		**x**			**x**	National plan for research, development and innovation for the period 2015 - 2020,
	Continue reimbursement of the energy efficiency investments through "Green House" (Casa verde) and "Green House Plus" (Casa Verde plus) programs.	**x**	**x**				National strategy for living
	Improve the energy performance of buildings (e.g. via audits, energy performance certificates, technical surveillance of heating and air conditioning systems, switching owners or tenants, change of the building's utilization, GHG emission footprint, etc.)	**x**	**x**				

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Ease the rental restrictions preventing energy performance improvements.		x				Strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private, on national level, 2nd version 2017
	Develop minimum renovation standards in accordance with the EPBD directive		x				
	Establish performance standards for buildings' renovation / insulation elements and HVAC systems		x				
	Restrictions on sale or rental of buildings belonging to the lowest energy performance categories		x				National strategy for living
	Opportunity analysis for efficient, non-polluting district heating systems	x	x				
	Monitor / Re-enforce the construction codes observance		x				
	Attract private capital to invest in energy efficiency of buildings		x				
	Support Green Mortgages / Green Loans for buildings renovation while observing high standards of energy efficiency and sustainability	x	x				
	Support the local operators' development - service, materials and equipment providers - for buildings' rehabilitation		x				
	Specialization and training programs for key professions and disciplines for building rehabilitation		x				

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Support research and development projects and demonstration projects, promoting new technologies and new extensive renovation techniques		x			x	
	Transport						
	Develop the infrastructure for alternative fuels	x			x		National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Increased efficiency allocation of energy resources throughout the transport sector by optimizing the fossil fuels and alternative fuels ratio	x					Strategy on the national market policy framework for alternative fuels in the transport sector and for the installation of relevant infrastructure in Romania and the establishment of the inter-ministerial coordination council for the development of the market for alternative fuels
	Develop sustainable, resilient, climate-friendly, smart, safe and		x				Proposal for a Regulation

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	intermodal TEN-T rail transport networks						COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Development of intelligent digital road and rail traffic management systems		x				
	Development of intelligent digital urban management systems		x				
	Optimize and reduce energy consumption in transport by supporting the development of multimodal transport (including TEN-T), national waterways and ports		x				
	Increase efficiency of urban transport, including the extension of the metro transport network		x				
	Cross-sectoral						
	Creation of an energy efficiency investment fund (FIEE), financed by private funds, European funds, state budget, complying with the provisions of Law no. 500/2002 and no.69/2010		x			x	Strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private, on national level, 2nd version 2017
	Elaborate the regulatory framework for the operation of ESCOs and energy performance contracts		x				
	Investments in high-efficiency cogeneration, district heating and cooling		x		x		Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							2027)
	Use of energy efficiency criteria for public procurement, where appropriate		x				
	Introduce quality and energy performance certifications for industrial installations and products		x				Strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private, on national level, 2nd version 2017
	End-user information and advice campaigns about the benefits of investing in energy efficiency	x	x				
(OP10) INCREASE COMPETITION ON DOMESTIC ENERGY MARKETS	Develop the internal gas market by increasing traded volumes on centralized, transparent and non-discriminatory markets, as well as increasing liquidity, whilst further enhance coupling with the European gas market			x	x		Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Integration of the Romanian energy markets into the single European energy market, in order to increase the regional role of the Romanian stock exchanges into the trading of energy products	x		x	x		
(OP11) LIBERALIZE ENERGY MARKETS AND ENSURE THEIR REGIONAL INTEGRATION, SO THE ENERGY CONSUMER MAY BENEFIT FROM	Further increase the degree of transparency and liquidity of energy markets			x	x		Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
THE BEST PRICE OF ENERGY							
(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY	Capitalize on national primary energy resources as much as possible within the domestic economy to generate an economic multiplier effect of the added value	**x**	**x**			**x**	Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Support scientific research of energy transition related subjects - RES technologies, energy efficiency, electro-mobility	**x**	**x**			**x**	Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Stimulate the public and private market for alternative fuel vehicles and correlate the development of their energy type production	**x**			**x**		The Strategy on the National Market Policy Framework for Alternative Fuels in the Transport Sector (…)
	Adopt support measures including research, establish common standards and develop the necessary infrastructure for electric and hybrid cars	**x**				**x**	Industrial Policy 2018 (Ministry of Economy)
(OP13) REDUCE GHG	**Energy Industry**						

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
AND NOx EMISSIONS	Current activities and projects of energy companies must comply with environmental legislation and apply best international environmental protection practices; extension of EMAS certification throughout the economy	**x**				**x**	Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Further reduce emissions of pollutants into the air, water and soil, related to the energy sector	**x**					Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Support scientific research to decarbonize the energy sector	**x**				**x**	
	Promote alternative fuels; the accelerated switch to vehicles with very low or no emissions; align with the development of the production of electricity, methane and other alternative fuels, as well as the development of the infrastructure related to transport	**x**					Romania's Energy Strategy 2019-2030, including a 2050 perspective (November 16, 2018)
	Co-financing of projects targeting de-carbonization technologies and processes, funded through the new EU-ETS support mechanisms (modernization and innovation funds, solidarity provisions)	**x**				**x**	2018 State of the EU ETS Report
	Extending the Article 10c derogation scheme until 2030 and its implementation according to EU-ETS IV	**x**					
	Incentives for private investment in new technologies and research and development in the field of low GHG technologies	**x**				**X**	
	Use ETS auction income for renewable energy and energy efficiency projects at national and international level	**x**	**x**				

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Transport						
	Introduce strong economic incentives for an environmentally friendly transport system through price instruments	**x**				**x**	National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Reinsertion of a pollution tax to reduce GHG and NOx emissions caused by imports of old cars	**x**					The Strategy on the National Market Policy Framework for Alternative Fuels in the Transport Sector (…)
	Expand smart transportation management systems in major cities	**x**					
	Develop cycling infrastructure	**x**					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Promote alternative fuel infrastructure, complement and simplify the related legal framework	**x**			**x**		National Action Plan to implement the national strategy on climate change and economic growth

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							based on low-carbon economy for the period 2016 – 2020, The Strategy on the National Market Policy Framework for Alternative Fuels in the Transport Sector (…)
	Manufacturing						
	Reduce carbon intensity of the industrial sector	**x**					Industrial Policy 2018 (Ministry of Economy)
	Implementation of Best Available Technologies (BAT) to reduce greenhouse gas emissions and increase energy efficiency, as well as the use of grants for training on resource efficiency and clean energy production	**x**					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020, Industrial Policy 2018
	Identify voluntary agreements to reduce GHG emissions in industry; provide technical know-how and economic support for new tools in order to stimulate the industrial sector to reduce GHG emissions	**x**					National Action Plan to implement the national strategy on climate change and

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							economic growth based on low-carbon economy for the period 2016 – 2020
	Conduct training courses on resource efficiency, clean production and energy efficiency	x					Industrial Policy 2018 (Ministry of Economy)
	Financial incentives for staff specialized in efficient usage of resources	x					
	Establishment / development of industrial parks operating on the principle of industrial symbiosis	x	x				
	Development of regional clusters for sustainable energy planning, smart energy use in SMEs, use of renewable resources and promotion of energy efficiency measures	x	x				
	Support organic production processes and resource efficiency initiated by SMEs	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Agriculture and rural development						
	Support investments to modernize farms	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon
	Promote good practices in the agricultural sector	x					
	Promote carbon sequestration in agriculture	x					

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							economy for the period 2016 – 2020
	Urban development						
	Promote more compact, cross-functional, transit-oriented development measures as a way to reduce distances travelled by vehicles, develop infrastructure and reduce maintenance costs	**x**				**x**	National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Encourage improvements at the level of energy efficiency in buildings and major urban infrastructure systems, monitor emissions footprint of administrative buildings and EMAS certification		**x**				
	Promoting "smart cities" and "green cities"	**x**	**x**				
	Encourage a wider use of green public procurement	**x**					Industrial Policy 2018
	Waste management						
	Promote waste generation prevention	**x**					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Increase the level of re-use or recycling of materials included in the waste stream, reduce the amount of materials to be managed as waste through promoting industrial symbiosis processes and applying the concept of resource efficiency in the sustainable waste management	**x**					
	Separate collection of biodegradable waste and composting	**x**					
	Energy generation from waste	**x**					

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Management of commercial, industrial and hazardous waste	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Domestic waste management, including prevention, reduction, sorting, recycling, biological mechanical treatment, heat treatment	x					
	Consolidate and expand integrated waste management systems, including energy recovery from waste	x					National Strategy for Competitiveness 2015 – 2020
	Promote the transition to a circular economy	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Organize information programs and public debates to educate citizens for the promotion of a circular economy	x					
	Forestry						
	Sustainable forest management, taking into account carbon storage	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Extension of wooded areas	x					
	Encourage the sustainable management of privately owned forests	x					
	Management of the carbon stocks in forests in protected areas, according to forestry legislation and regulations	x					

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
(OP14) SUPPORT THE SUSTAINABLE DEVELOPMENT OF THE NATIONAL ENERGY SECTOR, WHILE PROTECTING QUALITY OF AIR, WATER, SOIL AND BIODIVERSITY	Organize information programs and public debates on major energy projects, taking into account the interests of local communities and national interest, as well as introducing education courses for adults on the mentioned topics	**x**					Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Reducing greenhouse gas emissions emerging from the water supply and wastewater treatment sectors	**x**					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Acquisition of high efficiency pumps to reduce GHG emissions emerging from investments in water supply and wastewater treatment		**x**				
	Collection and treatment of waste water	**x**					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Air quality and noise reduction measures	**x**					
	Assess the vulnerabilities of natural habitats and species protected by flora and fauna based on the conservation status monitoring system	**x**					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Maintain and increase the resilience of ecosystems	**x**					
	Increase biodiversity capacity to adapt to climate change by promoting adaptive management	**x**					
	Evaluation of services provided by ecosystems and implementation of the	**x**					

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	ecosystem approach in decision-making processes						
	Improve / develop knowledge and understanding about the role and contribution of biodiversity to adaptation to climate change	x					
	Protection, restoration and sustainable use of Natura 2000 sites	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Protection of nature and biodiversity, green infrastructure	x					
	Rehabilitation of industrial and contaminated sites	x					
(OP15) FIGHT CLIMATE CHANGE	**Agriculture and rural development**						
	Rehabilitation and modernization of irrigation and drainage infrastructure	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Appropriate management of agricultural land in order to adapt to the effects of climate change	x					
	Drinking water and water resources						
	Reduce the risk of water scarcity			x			National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the
	Reduce flood risk			x			
	Increase the safety of dams and dikes			x			

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							period 2016 – 2020
	Improve water infrastructure			x			National Strategy for Competitiveness 2015 – 2020
	Human environment, infrastructure and urbanism						
	Holistic planning for climate-resilient cities				x		National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Adjust existing codes and norms in the construction industry, respective other codes and norms in the field, to meet climate conditions and extreme events			x			
	Adaptation of risk analysis, coverage plans and emergency response plans to climate change			x			
	Strengthen local capacities			x	x		
	Transport						
	Decrease pollution levels in urban centres, including noise	x					Strategy on the National Market Policy Framework for Alternative Fuels in the Transport Sector (...)
	Ensure the existence of a route crossing Romania with minimal impact on the environment	x					
	Increase awareness of the benefits of environmentally friendly transport	x					
	Adjust planning and decision-making processes to adapt to climate change: Emergency and response capacity planning, as well as revising planning and safety standards in road and rail sector				x		National Action Plan to implement the national strategy on climate change and

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							economic growth based on low-carbon economy for the period 2016 – 2020, Deloitte expertise
	Assess vulnerabilities of the transport sector by developing an inventory of the infrastructure, including areas vulnerable to climate change				**x**		National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Manufacturing						
	Increase use of preventive measures and good preparedness for climate-related emergencies in the energy sector and other key industries			**x**			National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Raising awareness of private industrial property owners with regard to climate change adaptation			**x**			
	Support use of insurances for industrial losses due to climatic events and the extension of EMAS certification			**x**			
	Forestry						
	Enhance forest management to improve their capacity to adapt to climate change adaptation	**x**					National Action Plan to implement the national strategy on

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Adapting forest regeneration practices to needs imposed by climate change	x					climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Minimize the risk of climate change for forests and through forests for the environment in general	x					
	Tourism and recreational activities						
	Protection and expansion of natural recreation areas in and around cities	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Strategic planning for the development of tourism destinations less dependent on climate change	x					
	Long-term planning for seasonal ecologic mountain resorts	x					
	Adapting and protecting coastal tourism in terms of infrastructure for climate change	x					
	Planning, policies and long-term development education for tourism to take into account the consequences of climate change	x					
	Protection, development and promotion of natural heritage and ecological tourism	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Public health and emergency response services						

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Develop capacities for monitoring events caused by various factors, which have an impact on public health, on the national level, using impact functions for continuous assessment of public health	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Protect the health of citizens from impacts of disasters by strengthening the national emergency management system	x					
	Education and increase of public awareness						
	Raise knowledge and awareness of the impacts of climate change and how to adapt to them; introduction of school courses to understand climate change and the associated activities	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020,
	Improve citizens' education on the reduction of GHG emissions and adaptation to climate change	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Increase investments in equipment and know-how to reduce energy consumption	x					National Strategy for Competitiveness 2015

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Implement a system for assessing and monitoring the effects of socio-economic development and coordinate measures to increase bio-capacity, including the reduction of the ecological footprint of Romania	x					– 2020
	Implementation of macro-region mobility schemes for the transfer of good practices and investment programs for mutual use of services (soft cooperation)	x					
	Insurances as tools for adaptation to climate change						
	Increase utilization of and access to insurance products designed for extreme events for vulnerable groups: economically disadvantaged individuals, farmers, SMEs	x					National Action Plan to implement the national strategy on climate change and economic growth based on low-carbon economy for the period 2016 – 2020
	Increase the institutional capacity of the insurance sector to develop insurance products for the adaptation to climate change	x					
	Apply measures to adapt to climate change, prevent and manage climate risks: floods, storms, frost, snow, fires and droughts (including awareness-raising, civil protection and disaster management systems and infrastructures); develop and update risk papers for each case and enhance the capacity of institutions in charge, such as the Meteorological Administration, to obtain data on temperatures, precipitation, water flows, etc.	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-2027)
	Prevention and management of non-climatic risks (e.g. earthquakes) and risks related to human activities (e.g. technological accidents), including awareness-raising, civil protection, as well as disaster and infrastructure management	x					Proposal for a Regulation COM(2018) 375 (Multiannual Financial Framework 2021-

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Support the compensation of additional costs due to climate conditions and difficulties for financial aid in outermost regions	x					2027)
(OP16) SECTORUL ENERGETIC ENSURE TRANSPARENCY OF THE ADMINISTRATIVE ACT, SIMPLIFICATION OF BUREAUCRACY OF THE ENERGY SECTOR	Reduce bureaucracy through transparency, digitization and the introduction of the "one-stop shop"	x			x		Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Introduce best practices on transparency and accountability in the interaction between consumers and the administrative system				x		
	Develop institutional mechanisms (such as integrity alerts), publish reports on completed public procurement processes and all sponsorship activities on a regularly basis				x		
	Eliminate conflicts of interest between public institutions and energy companies with state capital				x		
(OP17) SUPPORT EDUCATION AND PROMOTE SCIENTIFIC RESEARCH; OCCUPATIONAL SAFETY AND HEALTH	Develop higher education in the field of energy and align educational programs with the needs of the energy sector; promote partnerships for education and training with the energy industry and encourage gender equality					x	Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Support professional qualification in the field of energy at the intermediate level, encouraging gender equality					X	
	Support research in basic and applied energy science; developing partnerships with energy industry, as well as research entities in the EU and/or other countries					X	
	Develop the capacity to attract European and international funding sources for scientific research, through the participation in international consortia of institutes acting in field of research - development -					X	

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	innovation						
	Continuous training programs for specialists in administration positions within the energy sector					**X**	
	Continuous training to prevent occupational risks, protect workers' health and safety, eliminate risk and injury factors					**X**	
	Increase the number and quality of human resources in the field of R&D activities in priority areas, through stimulating young independent teams, scholarships for early stage researchers, international mobility projects and reintegration projects addressing researchers from diaspora					**x**	
	Capitalize the high level of specialization achieved in nuclear research through the development of technologies for advanced IV generation reactors, as well as the development of related infrastructure for lead-cooled fast reactors, through European and international partnerships					**x**	National plan for research, development and innovation for the period 2015 - 2020
	Conceptual development, construction and operation of the research infrastructures described in the national road map, aiming at alignment with ESFRI infrastructures and the SET Plan (e.g. ALFRED or CCAP) by providing investment funds and supporting the development of human resources					**x**	
	Train specialists to be compliant with new requirements of the energy sector and introduce dedicated courses on sustainable development and climate change					**x**	Industrial Policy 2018 (Ministry of Economy)
	Develop research partnerships to improve the quality of life between domestic and entities abroad					**x**	National Strategy for Competitiveness 2015 – 2020

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
	Stimulate research, development and innovation in transport					x	Strategy on the National Market Policy Framework for Alternative Fuels in the Transport Sector (...)
	Create new jobs, professional qualifications and opportunities for SMEs in the field of transport and energy efficiency				x	x	
(OP18) INCREASE THE ACCESS OF THE POPULATION TO ELECTRICAL ENERGY, HEAT AND NATURAL GAS	Improving access to alternative energy sources through the development of distribution networks	x			x		Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Develop, from various sources of funding, micro-networks and distributed power generation systems, with priority for communities without access to electricity	x			x		
	Develop public policies at the level of local administration units on how to ensure heat supply for communities		x				
	Develop gas distribution networks				x		
	Implement a new mechanism to support high-efficiency cogeneration	x	x				
(OP19) REDUCE ENERGY POVERTY AND PROTECT THE VULNERABLE CONSUMER TO ENSURE HUMAN RIGHTS	Implement public programs for thermal insulation of buildings for communities affected by energy poverty to reduce energy losses and lower heating costs		x		x		Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16, 2018)
	Consistent definition of the term vulnerable consumer, protection of the vulnerable consumer through appropriate social assistance				x		Romania's Energy Strategy 2019-2030, with a perspective for 2050 (November 16,

Operational objective	Main policies and measures	P1	P2	P3	P4	P5	Source
							2018)

Source: Deloitte analysis based on official documents submitted by the authorities involved in the elaboration of the NECP

Table 3 shows the alignment of NECP operational objectives with European policy objectives, which will enable investments from non-reimbursable grants will be supported during the programming period 2021-2027.

Table 3 - Reflecting the operational objectives of the INECCP within the policy objectives 2021-2027 at the level of the European Union

Policy objective	INECCP operational objective
(1) A smarter Europe by promoting innovative and smart economic transformation	**(OP9) INCREASE ENERGY EFFICIENCY** **(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY** **(OP16) ENSURE TRANSPARENCY OF THE ADMINISTRATIVE ACT, SIMPLIFICATION OF BUREAUCRACY OF THE ENERGY SECTOR** **(OP17) SUPPORT EDUCATION AND PROMOTE SCIENTIFIC RESEARCH; OCCUPATIONAL SAFETY AND HEALTH**

(2) A greener, low-carbon Europe by promoting clean and fair energy transition, green and blue investment, the circular economy, climate adaptation and risk prevention and management	**(OP1) DIVERSIFIED AND BALANCED ENERGY MIX** **(OP2) CAPITALIZE ON NEW PRIMARY RESOURCES POOL FOR A LOW ENERGY DEPENDENCE LEVEL AND NATIONAL ENERGY SYSTEM RESILIENCE** **(OP3) ENHANCE THE INTERCONNECTORS CAPACITY OF THE ENERGY TRANSMISSION NETWORK** **(OP4) ENSURE ENERGY STORAGE AND BACKUP SYSTEMS CAPACITIES** **(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT** **(OP6) PROTECT THE CRITICAL INFRASTRUCTURE AGAINST PHYSICAL , CYBER ATTACKS AND NATURAL DISASTERS** **(OP7) ROMANIA PROACTIVE PARTICIPATION IN TO THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES** **(OP8) REPLACE ELECTRICITY PRODUCTION CAPACITIES TO BE DECOMISSIONED BY 2030 WITH NEW, EFFICIENT AND LOW EMISSION CAPACITIES** **(OP9) INCREASE ENERGY EFFICIENCY** **(OP10) INCREASE COMPETITION ON DOMESTIC ENERGY MARKETS** **(OP11) LIBERALIZE ENERGY MARKETS AND ENSURE THEIR REGIONAL INTEGRATION, SO THE ENERGY CONSUMER MAY BENEFIT FROM THE BEST PRICE OF ENERGY** **(OP13) REDUCE GHG AND NOx EMISSIONS** **(OP14) SUPPORT THE SUSTAINABLE DEVELOPMENT OF THE NATIONAL ENERGY SECTOR, WHILE PROTECTING QUALITY OF AIR, WATER, SOIL AND BIODIVERSITY** **(OP15) FIGHT CLIMATE CHANGE** **(OP17) SUPPORT EDUCATION AND PROMOTE SCIENTIFIC RESEARCH; OCCUPATIONAL SAFETY AND HEALTH** **(OP18) INCREASE THE ACCESS OF THE POPULATION TO ELECTRICAL ENERGY, HEAT AND NATURAL GAS** **(OP19) REDUCE ENERGY POVERTY AND PROTECT THE VULNERABLE CONSUMER TO ENSURE HUMAN RIGHTS**

(3) A more connected Europe by enhancing mobility and regional ICT connectivity	**(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT** **(OP9) INCREASE ENERGY EFFICIENCY** **(OP13) REDUCE GHG AND NOx EMISSIONS** **(OP15) FIGHT CLIMATE CHANGE** **(OP16) ENSURE TRANSPARENCY OF THE ADMINISTRATIVE ACT, SIMPLIFICATION OF BUREAUCRACY OF THE ENERGY SECTOR**
(4) A more social Europe implementing the European Pillar of Social Rights	**(OP15) FIGHT CLIMATE CHANGE** **(OP17) SUPPORT EDUCATION AND PROMOTE SCIENTIFIC RESEARCH; OCCUPATIONAL SAFETY AND HEALTH** **(OP18) INCREASE THE ACCESS OF THE POPULATION TO ELECTRICAL ENERGY, HEAT AND NATURAL GAS** **(OP19) REDUCE ENERGY POVERTY AND PROTECT THE VULNERABLE CONSUMER TO ENSURE HUMAN RIGHTS**
(5) A Europe closer to citizens by fostering the sustainable and integrated development of urban, rural and coastal areas and local initiatives	**(OP9) INCREASE ENERGY EFFICIENCY** **(OP13) REDUCE GHG AND NOx EMISSIONS** **(OP15) FIGHT CLIMATE CHANGE** **(OP19) REDUCE ENERGY POVERTY AND PROTECT THE VULNERABLE CONSUMER TO ENSURE HUMAN RIGHTS**

Source: Deloitte analysis based on official documents submitted by the authorities involved in the elaboration of the INECCP

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

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

The "Energy Union" is one of the ten current priorities of the Commission; this objective has been and still is consistently sustained since the publication of the Framework Strategy for an Energy Union[1], through the development by the EC of the proposal for complying with the principles related to energy efficiency priority, for supporting the EU's world leadership position in the field of renewable energy and climate change and for supplying a fair solution for energy consumers[2].

The Commission considers that the materialization of the Energy Union concept is a "common creation process"; in this context, the integrated national energy and climate change action plans become fundamental elements, its synchronization and validation in the first part of 2019 being essential.

The common perspective on Europe's energy transition is relevant here – it must be socially equitable, it needs to lead to innovation and be based on a future-oriented infrastructure. At the same time, the energy transition also has beneficial collateral effects – it is a "huge" investment opportunity, it favors energy security and it promotes the highest nuclear safety standards for the Member States and for EU neighbors.

The Commission reiterated the ambitious goal of achieving the Energy Union by the end of its current term (2019), which implies further efforts to adopt the legislative framework, implement the support framework and ensure the involvement of all segments of society.

The Energy Union is seen as an essential element in a complex engagement of flagship initiatives such as the Digital Single Market, the Union of Capital Markets and the Investment Plan for Europe[3].

[1] "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy" [COM (2015) 80]
[2] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, Brussels, 23.11.2017 [COM(2017) 688 final]
[3] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, "Clean Energy for all Europeans", Brussels, 30.11.2016 [COM(2016) 860]

Figure 1 - Modernization of the Economy – the Role of Energy Union and measures for fighting climate change

Source: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, "Clean Energy for all Europeans", Brussels, 30.11.2016 [COM(2016) 860]

In this context, besides the 3 objectives named in the "Clean Energy for all Europeans" Package (placing energy efficiency on first place, reaching the position of world leader in renewable energy and ensuring equity to consumers), EU proposes to establish the regulatory framework for the period after 2020 and to facilitate the transition towards clean energy through a set of specific policies related to implementing EU regulations, using EU financing and encouraging partnerships between stakeholders from the civil society at local and regional level. Cities, regions, companies, social partnerships and other stakeholders are asked to get actively involved in the discussions related to energy transition in general; in particular, in the integrated energy and climate change national plans they are asked to come with adequate solutions for local necessities[4].

The Romanian electricity system comprises the following main activities:

- Electricity generation in power plants, including cogeneration power plants;
- Transmission and distribution of electricity through power lines to final consumers;
- Sale and purchase of electricity (wholesale and end-users, including import-export activities).

Electricity production and sale / supply is carried out under competitive conditions, while transport and distribution are regulated. The competitive segment involves trading on centralized markets in a transparent and non-discriminatory manner, including concluding bilateral commercial contracts negotiated on centralized markets in a transparent and non-discriminatory manner (according the Law of electricity and natural gas no. 123/2012, with subsequent amendments), where prices are formed freely based on demand and supply; on this market NERA has the role to develop general rules for the functioning of the market. The regulated segment requires NERA's intervention in setting prices / tariffs.

[4] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, "Clean Energy for all Europeans", Brussels, 30.11.2016 [COM(2016) 860]

Additionally, the electricity market is comprising of other activities / secondary services, such as:

- System services;
- Allocation of cross-border interconnection capacities;
- Green certificates trading activities;
- GHG emission trading activities, etc.

All activities within this market are done based on the licenses granted by NERA. This is due to the specificity of this market of triggering activities of power generation, transport and distribution at the same time with consumption.

On the electricity market, the following participants and associated operational structures are active:

- Electricity producers;
- A transmission system operator (Transelectrica);
- An electricity market operator (OPCOM);
- Distribution operators;
- Suppliers;
- Traders;
- Final customers.

Related to the natural gas sector, in the last 20 years, as a result of Romanian transition towards a market economy and, later, of Romania's integration in the European Union, followed implicitly by the transposition of European legislation into the Romanian one, the Romanian natural gas sector went through an extensive restructuring and liberalization process that has not yet ended and which has mainly pursued the following directions:

- Separation of activities related to production, storage, transport, distribution and supply of natural gas;
- Regulating non-discriminatory access of third-party companies to the transmission system;
- Interconnection of the national transmission system with the systems of the neighboring countries;
- Gradual liberalization of regulated prices for both non-household and household consumers.

The natural gas market is characterized by a high degree of concentration with the two largest producers being OMV Petrom and SNGN Romgaz, which together have a market share of more than 90% of the country's production on the free market. As regards the market shares of the main suppliers, the situation is slightly differentiated between the liberalized market and the regulated market, with a higher degree of concentration on the regulated market. On the liberalized market, the main players in 2017 were OMV Petrom, Romgaz, Engie Romania and E.ON Gaz Furnizare, which accounted for over 70% of the market share, while on the regulated market the main domestic gas suppliers are Engie Romania and E.ON Gas Supply, with a combined market share of over 90% at the end of 2017.

In addition, on the Romanian market there is an operator of the National Transmission System – SNTGN Transgaz SA, which ensures the transport of natural gas, both at national and international level, the network being interconnected with Hungary, Bulgaria, Republic of Moldova and Ukraine.

The National Gas Transmission System is a radial-ring system interconnected with the points of departure from Transylvania, Oltenia and Muntenia Est areas and the Bucharest-Ploiesti, Moldavian, Oltenia and Central and Nordic Transylvania areas. At 31.12.2017, the system had over 13,000 km of main transport pipelines, of which 553 km of international transport

pipelines, over 1,100 measuring stations, 3 natural gas compressor stations with installed capacity of about 28.94 MW (draft of the Development Plan for the National Natural Gas Transmission System 2018-2027).

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

Current energy and climate policies are initiated and grounded on the Energy-Climate Change-2020 package, which was at that time a first ambitious leap to reduce greenhouse gas emissions, improve energy efficiency and increase the share of energy from renewable sources (20-20-20 objectives). More specifically, the EU has now proposed a 20% reduction in greenhouse gas emissions, 20% of the energy produced from renewable sources and energy efficiency increase by 20%.

This directive has led to the reform of the EU ETS, has led to the setting of national targets for emissions not covered by the EU ETS and national renewable energy targets, the establishment of a legal framework for carbon capture and storage and the Energy Efficiency Directive.

Finally yet importantly, at that moment, the desire to improve energy security and import dependency was stated; the creation of new jobs, coupled with increasing Europe's competitiveness, were also legitimate expectations of the EU.

Table 4 - Table of current policies and measures in Romania on energy and climate, related to the five dimensions of the Energy Union

Dimension/ Pillar	Policies/ Measures
Decarbonization	**Reduce GHG emissions:** <u>Environment Fund Administration (EFA):</u> • Prevent pollution; • Reduce impact on atmosphere, water and soil; • Reduce noise levels; • Use clean technologies; • Manage waste, including hazardous waste; • Protect water resources, treatment plants for local communities; • Integrated coastal management; • Conserve biodiversity; • Administrate protected natural areas; • Educate and increase public awareness on environmental protection; • Increase energy production from renewable sources; • Reduce greenhouse gas emissions; • Eco-redevelopment and sustainable forest management; • Improve the quality of environment by afforestation of degraded agricultural land, ecological reconstruction and sustainable forest management; • Close tailing ponds in the mining sector; • Perform activities designated to prevent, remote and / or mitigate the effects of dangerous meteorological phenomena in water management works related to public-sector objectives. <u>Environment protection:</u> • Program for stimulating the renewal of national car fleet; • Rabla Plus program, which offers the opportunity to buyers, including companies, to purchase electric cars with a 10,000 EUR grant for each car. At the same time, a subsidy of 20,000 RON is offered for the purchase of a new hybrid electric vehicle with an external power source, which generates a CO2 emissions of less than 50 g / km; • Program for installing heating systems using renewable energy, including the replacement or supplementation of classical heating systems for individuals; • Program for installing heating systems using renewable energy, including the replacement or supplementation of classical heating systems for legal entities;

Dimension/ Pillar	Policies/ Measures
	• National program for improving the quality of the environment by creating green spaces in the localities; • Program for producing energy from renewable sources: wind, geothermal, solar, biomass, hydro; • Program on reducing the impact on the atmosphere, including monitoring air quality; • Program on developing bicycle tracks.
	Renewable energy sources: The main measures taken at national level[5] to promote the increase of energy from renewable sources, taking into account the indicative trajectory for achieving the RES objectives, are found in the following normative acts (with subsequent amendments): • Adoption of Law no. 220/2008 for establishing the system to promote the production of energy from renewable energy sources; • Establishment of the Regulation for issuing green certificates, approved though NERA Order no. 4/2015; • Establishment of annual quota for the acquisition of green certificates according to the Methodology for establishing the mandatory annual quota for the acquisition of Green Certificates, approved by NERA Order 157/2018; • NARE Order no. 77/2017 approving the Regulation of organization and functioning of the green certificates market, with subsequent amendments; • Establishment of Methodology of monitoring renewables electricity support scheme promoted by green certificates, approved through NERA Order no. 52/2016; • Electricity producers and local authorities that own power plants from renewable sources which benefits from support scheme promoted by green certificates or that have benefited from the support scheme and own green certificates, with installed capacities of maximum 3 MW per producer, can directly conduct negotiated contracts only with end consumers for sale of electricity and / or green certificates (Law 184/2018); • Accreditation of Economic Operators with installed capacities between 125 and 250 MW and who did not benefit from green certificates promotion system (Law no. 122/2015); • Approval of the Regulation for the accreditation of producers from renewable sources for applying the GC promotion system; • Development of electricity transmission and distribution networks to ensure the evacuation of electricity generated by plants using RES (Power Transmission Grid and Power Distribution Grid Perspective Plans for 2018-2027); • Update of Sectoral Operational Plan Program "Increase of Economic Competitiveness", Axis 4 Increasing energy efficiency and security of supply in the context of combating climate change; • Operational Program for Large Infrastructure (POIM), Priority Axis 6 - Promoting clean energy and energy efficiency aiming at supporting a low carbon economy. Specific objective 6.1 Increase power generation from less exploited renewable sources (biomass, biogas, geothermal); • Regional Operational Program (POR), Priority Axis 3 Supporting the transition to a low carbon economy (National Environmental Fund); • Program for installing heating systems using renewable energy sources including replacing or complementing classical heating systems – GREEN HOUSE for individuals and legal entities; • Possibility to purchase electric and / or hybrid cars within the program for stimulating the renewal of national car fleet; • Establishment in 2013-2014 of the biofuels content for the gasoline and

[5] Mentioned in Romania's Progress Reports on the promotion and use of energy from renewable sources in accordance with art. 22 of Directive 2009/28 / EC, 2015-2016, as well as in other official documents (legislative provisions and drafting documents by the authorities)

Dimension/ Pillar	Policies/ Measures
	diesel placed on the market (Government Decision no. 935 / 2011); • Placing on the market only biofuels produced from raw materials meeting the defined durability criteria and the obligation to verify the compliance with these criteria (Government Decision no. 935 / 2011); • Certificate the compliance with the biofuels and bio liquids durability criteria, voluntary schemes recognized by the European Commission to demonstrate compliance with the sustainability criteria under Directive 2009/28/EC (Ministry of Economy, Commerce and Business Environment no. 136 / 2012); • Law 184/2018 for approving Government Emergency Ordinance no. 24/2017 on amending and completing Law no. 220/2008 on establishing the green certificates support scheme for the production of renewable energy.
Energy Efficiency	According to the National Energy Efficiency Plan, the current policies and measures are reflected through the implementation of 12 National Energy Efficiency Plan, as follows: • P0 Development of energy services; • P1 National Investment Plan; • P2 Increase energy efficiency in networks; • P3 Promote high efficiency cogeneration; • P4 Thermofication Program 2006-2015; • P5 Energy efficiency in ETS industry; • P6 Energy audit and management; • P7 Energy efficiency for households; • P8 Energy efficiency in governmental buildings and public services; • P9 Energy efficiency in services industry; • P10 Renewal of car fleet; • P11 Energy efficiency in transport.
Energy Security	• Law no. 85/2018 on the establishment and maintenance of minimum stocks of crude oil and / or petroleum products - The minimum stock level is at least the highest of the net imports per 90-day period, calculated on the basis of the daily average net imports, and the amount of domestic consumption for a period of 61 days, calculated on the basis of the daily average of domestic consumption; • G.D. no. 828/2018 on establishing the level of minimum stocks and approving the calculation of emergency stocks for crude oil and / or petroleum products constituted by the holders of storage obligations in order to maintain them in 2019; • Order no. 35/2016 for the approval of the Methodology for the annual determination of the level of the minimum natural gas stock for the natural gas supply license holders - The natural gas supply license holders have the obligation to store in the underground storage facilities a minimum stock of natural gas, in each "n" year until October 31st; • G.D. no.664 / 29.08.2018 - Government of Romania approving measures for the realization of the national electricity system's safety stocks in terms of lignite fuel; • Winter Program: – G.D. no. 773/2018 for the approval of the measures regarding the level of safety and security of operation of the National Power System, as well as the measures related to the realization of the national electricity system's safety stocks with regard to the fuel and the volume of water in the storage lakes for the period of 1st of November 2018 – 31st of March 2019; – Order no. 692/2018 approving the definition of the "protected customer" category - The definition of the "protected customer" is approved in accordance with the provisions of the Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25.10.2017 on measures to ensure the safety of gas supply and repealing Regulation (EU) No. 994/2010.
Internal Energy Market	The main current policies and measures related to the internal energy market are found both in the primary legislative framework (e.g. Law of electricity and

Dimension/ Pillar	Policies/ Measures
	natural gas 123/2012, as amended) and in the secondary one (e.g. NERA Orders), referring to: Policies: • Ensuring the functioning of competitive electricity markets; • Ensuring the non-discriminatory and regulated access of all participants to the electricity market and to the public electricity networks; • Transparency of tariffs, prices and taxes on electricity within a tariff policy, aiming at increasing the energy efficiency on the generation, transport, distribution and use of electricity cycles; • Improve the competitiveness of the internal electricity market and actively participate in the formation of both the regional market, and the internal energy market of the European Union and the development of cross-border exchanges; • Ensuring the operational safety of the NPS; Measures: • OPCOM management of Romania's DAM in price-coupled mode, based on available interconnection capacity (ATC) with markets in Hungary, Slovakia and the Czech Republic (4M MC); • Participation of OPCOM in the CORE flow-based coupling project; • Maintaining the OPCOM designation as the Next Day Market (DZU) market and the Intraday Market (IM) operator (OPEED) for the supply area Romania, within the provisions of Regulation (EU) 2015 / 1222; • Participation of OPCOM in the cooperation of all European OPEEDs on the functioning of the coupling mechanisms on the horizons of DAM and IM in the implementation of EU Regulation 2015/1222, including in the context of European multi-party cooperation dedicated to the implementation, operation and development of coupled energy markets (Single Day Ahead Coupling - SDAC and Single Intra-Day Coupling respectively); • Participation in the European implementation project for cross-border intra-day trading, through the development and local implementation of the XBID solution; • Development by Transelectrica, in co-operation with other TSOs, of the daily allocation rules for the coordinated allocation of inter-regional capacity across borders between different bidding areas; • Development by Transelectrica, in co-operation with other TSOs, of the Harmonized Allocation Rules – HAR for long-term physical transport rights at the borders of different bidding areas; • Development by Transelectrica, in co-operation with other TSOs, of trading platforms for balancing products; • Applying the Law no. 196/2016 on minimum inclusion income, which provides financial aid for thermal, electricity or natural gas heating, and the expenses will be paid directly by consumers who have a contract for the supply of thermal energy or an individual agreement, namely a gas supply contract natural or electrical energy, as well as heating aids paid by the territorial agencies for payments and social inspection or by the local public administration authorities under the present law, shall be collected in the ESCROW accounts opened to banks by distributors and producers of thermal energy, natural gas suppliers and electricity suppliers, as defined in the Government Emergency Ordinance no. 115/2001 on the regulation of certain measures to ensure the necessary funds for the supply of heating and natural gas for the population, approved with amendments through the Law no. 84/2002, with subsequent amendments and additions; • Energy invoicing standardization, with the aim of cost comparability and transparency, as well as fair consumer information; • Implementation by NERA of the comparator of supply offers for electricity and natural gas respectively. With regard to the gas market, the main measures and policies derive from the following provisions and initiatives:

Dimension/ Pillar	Policies/ Measures
	• Implementation of G.O. no. 21/2000 on the establishment, organization and functioning of the National Regulatory Authority for Natural Gas (ANRGN); • Adoption of G.D. no. 334/2000 regarding the reorganization of the National Natural Gas Company Romgaz - S.A. leading to the breaking of the ROMGAZ vertical integrated monopoly by establishing a distinct company for the transport of natural gas, exploration and production of natural gas, natural gas distribution and underground natural gas storage; • Adoption of G.O. no. 60/2000 on regulating the activities in the natural gas sector, establishing the new commercial relations between the economic operators operating on the natural gas market in Romania • Adoption of the G.O. no. 575/2001 on the establishment of the National Natural Gas Company Romgaz - S.A. through the merger of Exprogaz - S.A. Commercial Exploration and Production Company with the National Natural Gas Depot - Depogaz S.A.; • Establishment of the Market Operator, organized within the National Natural Gas Dispatcher in Bucharest, in the structure of SNTGN Transgaz SA in 2001; • Implementation of G.D. no. 890/2003 regarding the adoption of the Energy Route in Romania; • Adoption of Decision no. 133/2001 on establishing the initial gas market opening degree at 10%; • Adoption of the Oil Law no. 238/2004; • Adoption of the Natural Gas Law no. 351/2004; • Adoption of Law no. 563/2004 regarding some measures for the privatization of Distrigaz Nord - S.A. Targu Mures and the Distrigaz Sud - S.A. Natural Gas Distribution Company, Bucharest, finalizing the privatization process of the two companies in 2005 and legally and accounting separation of natural gas distribution activity from natural gas supply for the two companies privatized in 2006; • Adoption of G.D. no. 1397/2005 on the opening of the internal gas market at 65% • Adoption of G.D. no. 638/2007 on the full opening-up of the electricity and natural gas market • Adoption of the Law on Electricity and Natural Gas no. 123/2012 • Adoption of Law no. 160/2012 on the organization and functioning of NERA; • Applying the first step of the Phasing-out Calendar of the regulated natural gas to regulated customers in February 2013; • Achieving the first natural gas imports from the EU by starting the effective functioning of the interconnection of the Szeged-Arad pipeline (Hungary-Romania) in July 2013; • Concluding the first transactions on the centralized natural gas markets in October 2013; • Certification of SNTGN Transgaz SA as Transmission System Operator for the National Gas Transmission System in August 2014; • Completion of the scheduled elimination of regulated gas prices for non-domestic customers in January 2015; • Implementation of NTS Network Code provisions by daily calculation of imbalances and introduction of imbalance tariffs for NTS Network Users in November 2016; • Achieving natural gas imports from the EU via the Ruse-Giurgiu (Bulgaria-Romania) pipeline in January 2017; • Achieving the convergence between the prices of domestic and imported production and the abandonment of the idea that NERA is setting the blending structure for regulated customers in April 2017; • Adoption of Law no. 167/2018 amending and supplementing the Law on Electricity and Natural Gas no. 123/2012.
Research, Innovation and Competitiveness	The National Plan for Research & Development and Innovation for the 2015 – 2020 period (NRDIP III), approved by G.D. 583/2015 and modified by G.D. 8/2018, proposes the following programs related to the energy sector:

Dimension/ Pillar	Policies/ Measures
	• Program 3: European and International Cooperation – Sub-program 3.2 - Horizon 2020 / Europe Horizon. • Program 5: Research in areas of strategic interest – Sub-program 5.2 - Participation in international bodies and programs of atomic and subatomic research and development – Sub-program 5.5 - Research & Development and Innovation Program for the 4th Generation Reactors - ALFRED; – Other financing options are included in the Financial Mechanisms of the European Economic Space EEA - MF SEE 2014-2021 and Norwegian 2014-2021, within the programs coordinated by the Ministry of Regional Development, Public Administration and European Funds; • "Renewable Energy, Energy Efficiency, Energy Security" Program (Program Operator - Innovation Norway). • "Business Development, Innovation and SMEs" Program (Program Operator - Innovation Norway), through the Green Innovation in Industry. • "Research" program - for research projects and in the areas of generation efficiency, transport, smart grids and energy distribution, green energy production technologies, diversification / balancing of energy sources.

Source: Deloitte analysis based on official documents submitted by the authorities involved in the elaboration of the INECCP

iii. Key issues of cross-border relevance

Key regional / cross-border issues derive from the applicable EU / national legislation and refers to interconnections of energy / natural gas transmission systems, market integration and coupling as well as to national contribution / regional cooperation related to energy security.

These issues can be found in the current approach, in terms of existing policies and measures (described in Chapter 1.2.ii as well as in Chapters 4.4 and 4.5 respectively) as well as in the policies and measures proposed (described in Chapter 3.3 respectively, 3.4.).

iv. Administrative structure of implementing national energy and climate policies

The administrative structure for implementing national energy and climate policies is made up of ministries and other institutions with different responsibilities in implementing existing or under development strategies or plans in the field of energy and climate change.

In the case of the implementation of the INECCP, the main stakeholders are represented by the Ministry of Energy, Ministry of Environment, Ministry of Transport, Ministry of Waters and Forests, Ministry of Agriculture and Rural Development, Ministry of Regional Development and Public Administration, Ministry of Research and Innovation, Ministry of Economy, Ministry of European Funds , the Operator of the Electricity and Natural Gas Market "OPCOM" SA and the National Energy Regulatory Authority.

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

i. Involvement of the national parliament

During the public consultation phase carried out between 29th of November and 10th of December 2018, the Ministry of Economy submitted a information letter related to this matter to the Presidents of Senate Chamber and Chamber of Deputies on the 5th of December 2018.

At the time of drafting the latest version of the INECCP, no official response from these institutions was received.

ii. Involvement of local and regional authorities

Considering the importance and implications of the Integrated National Energy and Climate Change Plan 2021-2030 on the development of Romania in the following period, the Ministry of Energy has submitted the INECCP draft to a first stage of public consultation, for the purpose of collecting from stakeholders and within the short time until the deadline for submission to the COM, of suggestions and opinions with value of recommendation, on this strategic document.

The national public consultation was officially launched on 29th of November 2018 by the publication of the Ministry of Energy of the notice for initiating the public consultation process on the draft of Integrated National Plan for Energy and Climate Change 2021-2030.

The draft of the Integrated National Plan for Energy and Climate Change was annexed to this public consultation notice.

According to this notice, the proposals, opinions and suggestions, together with the respondents' contect details, could have been submitted in writing at the email address **mircea.sandu@energie.gov.ro** until 10th December 2018, 12.00.

At this stage of public consultation, no opinions were received from the local and regional authorities.

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

The table below presents the list of stakeholders who submitted comments to the INECCP draft during the public consultation phase presented in the prebious section.

Table 5 – List of respondents to the public consultation of the INECCP draft

No	Respondent	Response date
1	Greenpeace Romania	07.12.2018
2	Deloitte Consultanta	10.12.2018
3	World Wildlife Fund (WWF)	10.12.2018
4	The Association of Large Industrial Energy Consumers (ABIEC)	10.12.2018
5	Romanian Wind Energy Association (RWEA)	10.12.2018
6	Association of Romanian Electricity Suppliers (AFEER)	10.12.2018
7	ENGIE Romania	10.12.2018
8	SNTGN Transgaz	11.12.2018

Source: Ministry of Energy

The main issues and concerns raised in the public consultation are summarized in the table below, as general observations and comments, respectively as specific observations (related, for example, to a specific objective / policy and measure).

Table 6 - Main observations submitted by the respondents

No.	Respondent	General observations and comments	Specific observations
1	Greenpeace Romania	**1.1.1.** INECCP objectives without deadlines for implementation and without ensuring the necessary funding; **1.1.2.** Erroneous forecasts based on incorrect prices for different technologies, the carbon price of the EU ETS, etc. (with reference to the use of PRIMES modeling 2016 in Chapter 4. "Analytical Base"); **1.1.3.** No state aid for the upgrading of large combustion plants (LCP) to BREF standards should be provided, nor new derogations; **1.1.4.** No state aid must be granted for the acquisition of EU ETS emission allowances; **1.1.5.** The public consultation period was insufficient taking into account the strategic importance of the INECCP; **1.1.6.** Dissemination of relevant documentation, studies and assessments in the context of the ongoing drafting of the INECCP.	**1.2.1.** The proposal for the RES target of 27.9% is significantly lower than the 32% set for the European Union ignores the country's renewable energy potential and contributes negatively - through the reduced ambition of our country - to the achievement of the Union's objectives; **1.2.2.** Capacity capping of distributed generation owned by prosumers at 750 MW (threshold established artificially, without a technical basis, which discourages the development of those who want to produce their own energy and reduce their emissions); **1.2.3.** Romania needs to provide a concrete plan for the phasing-out of coal production, to be completed by 2030 at the latest; **1.2.4.** The internalization of external health costs of air pollutants, including GHG, using, for example, cost factors for the Value of Statistical Life (VSL) used by the European Environment Agency.
2	Deloitte Consultanta	N/A	**2.2.1.** Adding in Section 3.4.2, respectively, the Policies and Measures proposed to achieve the proposed energy infrastructure infrastructure objectives, the following measure: "Carry out an analysis during 2021-2022 on the possibility of injection of hydrogen in the form of synthesis gas from RES (after being brought to the methane standard by the reaction with CO2) in the natural gas transmission / distribution systems. The surplus electricity from variable renewable sources thus converted could be transported over large distances and / or stored. In this way, the transport / distribution systems could be used at the optimal capacity for the entire technical lifetime, without being limited to the duration of gas extraction from onshore / offshore internal perimeters"
3	World Wildlife Fund (WWF)	**3.1.1.** The PNIESC project does not provide a coherent vision on the specific ways Romania will	**3.2.1.** The majority of the measures addresses the Energy Security pillar and energy internal market pillar; the

No.	Respondent	General observations and comments	Specific observations
		achieve meaningful progress on energy sector decarbonization and does not take into account the new solar and wind technology advantages that would entitle a real push for them; **3.1.2.** The lack of an integrated approach with respect to the Romanian implementation of the IPCC recommendations will trigger irreparable damages to the few left running rivers sectors our country still possess, due to the open encouraging of extensive hydroelectric power investments to support 30 years old projects, despite the well-known facts these investments accelerate the rivers and rivers' resources loss; **3.1.3.** Although the plan states some positive initiatives like energy storage capacity increase, national power grid flexibility increase and energy efficiency increase, it does not detail a realistic plan to implement them, targets and timelines related to measurable actions; **3.1.4.** Short time horizon planning (up to 2030) while missing the 2050 perspectives; **3.1.5.** Lack of ambition of the Romanian targets compared to Paris COP21 agreed objectives; **3.1.6.** Lack of coherence within the Plan; although the energy efficiency increase and import dependency decrease are appreciated, it still prioritizes investments into the primary energy resources available at the national level; **3.1.7.** Although the Plan mentions the important role the heating pumps may have for the RES – H&C, it does not promote the new technologies via the proposed measures, hence lacking the acknowledgement of the role hydrogen based technologies or off-shore wind	decarbonization measures either lack ambition or are deem inadequate. **3.2.2.** If the photovoltaic parks would also extend within the urban and industrial areas, there would be countless install options (with respect to PO 8 titled "Energy producing capacities replacement); **3.2.3.** The Plan provided objectives and measures lack the precise individual contribution to the decarbonization targets achievement; according to the analytical basis document, there will be no real reduction of the emissions, but actually the emissions will increase between 2020 and 2030; **3.2.4.** The strategy foresees up to 37.5 % energy efficiency increase hence massive investments in gas production do not make sense; **3.2.5.** Because the Cooling and Heating will continue to represent more than 50% of the final energy consumption, there will be a need to find local solutions to cover this energy demand type, based on new technologies, local resources and sustenable biomass usage (investments in sustainable technologies for biomass and recyclables, local use as opposed to industrial use, producing energy instead of incinerating).

No.	Respondent	General observations and comments	Specific observations
		based technologies might have in the future Romanian energy mixt; **3.1.8.** The lack of a holistic integrated approach and alignment with other strategic documents related; **3.1.9.** The Plan does not provide a clear perspective of the way the energy efficiency increase can benefit from de-carbonization measures, in particular the ones referring to the replacement of the retired production capacities with new ones; **3.1.10.** Unclear financial sourcing (our suggestion – to list all potential financing and investments options coming out of public, EU and private funds; **3.1.11.** It is of upmost importance the Plan should include a commitment and a calendar to gradually eliminate the fossils subsidies and ensure the freed resources are redirected towards sustainable, long term climate change compatible investments; **3.1.12.** There are no information with respect to the Circular Economy potential, industrial reform and social transition	
4	The Association of Large Industrial Energy Consumers (ABIEC)	**4.1.1.** The entire INECCP document reflects ambitious plans for modernization, installation of new capacities; in this sense, we want to understand the mechanisms for supporting such projects (including funding sources) and whether impact studies on the final consumer have been conducted.	**4.2.1.** The costs determined by investment projects in capacities generation as well as other measures (e.g. upgrading and developing the T&D system of electricity, the need to increase storage capacities, etc.) are not mentioned on each branch and also the funding sources are not detailed; **4.2.2.** ETS auction revenues should be used to support energy-intensive companies to offset indirect emissions (for OP 13); **4.2.3.** We draw attention to this serious measure (concerning the transfer of energy from renewable sources) which would further hamper the activity of industrial companies, large energy consumers; **4.2.4.** What is the rationale for a new scheme (for the measure

No.	Respondent	General observations and comments	Specific observations
			"Implementing a new mechanism for supporting high efficiency cogeneration"), how will it look like and what will be the impact on the final consumer; **4.2.5.** In the event of a erroneous upwards estimation of the gross final energy consumption (in the context of population decline and the implementation of energy efficiency measures), the share of green certificates would increase or the end-user feed-in tariff would increase, thus overcompensating the renewable energy sector and, implicitly, a huge load on the cost of the bill to the final consumer; **4.2.6.** How will the balancing of the system be realized and how will the high unpredictability on renewable sources be controlled; **4.2.7.** Chapter 4.5.3. Electricity and gas markets, Chart 38 Evolution of the average quarterly electricity price for industrial consumers in Romania and the EU 28, the prices you refer to do not contain taxes, and after adding taxes to the electricity price, Romania will no longer be among the countries with the lowest price; **4.2.8.** What data supports the rise in the average electricity price, as long as the predominant sources of energy are the renewable ones, that are recognized as the cheapest; **4.2.9.** Given that the import price is higher due to the small quantities purchased, this measure (reaching the convergence between the prices of domestic production and imports, and the abandonment of ANRE's setting of the blending structure for the regulated customers in April 2017) means aligning the domestic price to the import price and implicitly the disadvantage of domestic consumers; **4.2.10.** Taking into account that the information available in the market, and also confirmed by the INECCP, according to which the costs for the energy produced from renewable sources - wind and solar - are continuously decreasing and at

No.	Respondent	General observations and comments	Specific observations
			European level there are projects that no longer require support schemes, we consider that the introduction in Romania a new support scheme (CfD) is not justified, especially since the costs will also be paid by the final consumer.
5	Romanian Wind Energy Association (RWEA)	**5.1.1.** The INECCP project does not pay enough attention to the technological and economic evolution of renewable energies, being especially built around a centralized concept and concentrated in traditional production areas, being very little oriented towards an energy system that connects the transport, heating and industry sectors, and in which the consumer assumes an active role; **5.1.2.** The document includes assumptions based on old documents and databases that do not provide credible data, in particular regarding to the current cost of EU ETS carbon price and the cost of energy production technologies; **5.1.3.** According to an RWEA study, Romania could reach a conservative and inertial 32.4% share of RES in gross final energy consumption in 2030, with a more ambitious potential to reach 35% with additional wind power capacities ranging from 3000 to 4000 MW; this is achievable with considerably lower investments than those considered by the INECCP and a lower electricity price to the consumer before taxes (in two of the three scenarios analyzed by RWEA).	**5.2.1.** The target of only 27.9% RES share in the gross final energy consumption of energy in the year 2030 announced by the INECCP is far below the national potential, and Romania will not be able to contribute equitably to the collective share of the European Union of 32% RES share in gross final energy consumption in 2030, with the possibility of a strictly superior revision in 2023; **5.2.2.** The wind capacity to be installed is projected to be only 1300 MW by 2030, surprisingly low given the significant potential of the resource at national level, the lack of adequacy study to limit capacity, the short installation time and especially the cost of technology which is drastically falling, being now the cheapest new form of electricity generation; also, no new capacities are forseen until 2025, given that certain projects are already economically feasible under current market conditions if there is a possibility of signing a PPA; **5.2.3.** The policies and measures listed to encourage renewable energy are generally fair but the deadline for drafting / implementing relevant legislation is too long (not later than December 31, 2024) and thus unproductive for planning and realizing the investments needed to achieve the objectives ; **5.2.4.** The deadline for setting development areas for energy capacities using renewable energy sources (2025) is also too long and in this way we signal its potential to act as a factor that will block investments in renewable energy by the year 2025.
6	Asociația Română a Furnizorilor	**6.1.1.** The INECCP draft does not mention directly negociated bilateral contracts, AFEER	N/A

No.	Respondent	General observations and comments	Specific observations
	de Energie Electrică (AFEER)	proposing to include this trading instrument in INECP for several reasons, including: ✓ A basic instrument for electricity trade at national and regional level is the directly negociated bilateral contract. A ban of this instrument places Romanian producers and suppliers in a discriminatory position compared to the other participants in those markets, with an increased risk in adjusting their trading positions. This discriminatory aspect will have a significant negative impact, considering that within the European Union the internal market for electricity will become operational; ✓ Even if all EU countries have highly developed, operational electricity markets and most of them have already implemented coupling mechanisms with other electricity market, and the physical market is complemented by financial instruments specific to the electricity market, none of them considered that such a power exchange can fully substitute, without negative consequences, the medium and long-term transactions on wholesale market through direct negociation; ✓ Migration of long-term transactions to short-term, observed within the timeframe from application of provisions of Law no. 123/2012, leads to the distorsion of the wholesale price on the wholesale market, with negative consequences on the supply of a fair price for electricity supplied to customers, and on the medium and long	

No.	Respondent	General observations and comments	Specific observations
		term it affects the investment in power generation capacities, raising questions about the assurance of security of electricity supply, at sustainable prices, to Romanian consumers.	
7	ENGIE Romania	**7.1.1.** The role of natural gas in the medium-term decarbonisation of the Romanian sector is undervalued; **7.1.2.** Energy efficiency must be a priority for the period 2020-2030, both due to the importance given to this topic at European level, but also due to the needs of the Romanian economy in terms of the need for competiveness and for responding to economic vulnerability and poverty.	**7.2.1.** Estimated trajectories per technology and per sector should be reviewed as they are not correlated with other projected developments in the Romanian energy sector; natural gas resources should play a more important role in heating and cooling; the accelerated development of renewable energy sources in transport sector is costly; **7.2.2.** Encourage and support the use of compressed natural gas in the transport sector.
8	SNTGN Transgaz	N/A	**8.2.1.** Rewordings, corrections, additions and data updates.

Source: Official adress of the respondents

Considering the continuation of the internal and regional consultation process during the next stage of the Project, which will result in an update of the INECCP 2021-2030 draft (according to the results of the negotiations with the European Commission, as well as the results of the internal and regional consultation), the general observations and comments will be evaluated during the technical assistance phase, along with the analysis of COM recommentations by the Romanian team (project team).

Regarding the specific observations (referring, for example, to objectives / policies and measures set out in the plan), comments 2.2.1 and 8.2.1 presented in the previous table were implemented and the other specific observations should be analyzed and evaluated also during the technical assistance period.

iv. Consultations with other Member States

Also during the public consultation phase, the Ministry of Energy has sent letters to the Bulgarian Ministry of Energy and the Hugarian Ministry of Innovation and Technology on 5th of December 2018, institutions that manage the INECCP issue within the respective Member States, enclosing an English summary of the INECCP, specifying that the full English document will be available soon and more discussions on this subject (including CESEC) will be developed over the next year.

At the time of drafting the latest version of the INECCP, no official response from these institutions of the Member States was received.

v. Iterative process with the Commission

Information related to this section will be completed after the start of the negotiations with the European Commission of the INECCP draft.

1.4.Regional cooperation in preparing the plan

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

Not applicable.

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

For the moment, not applicable.

2. National objectives

2.1. Dimension Decarbonisation[6]

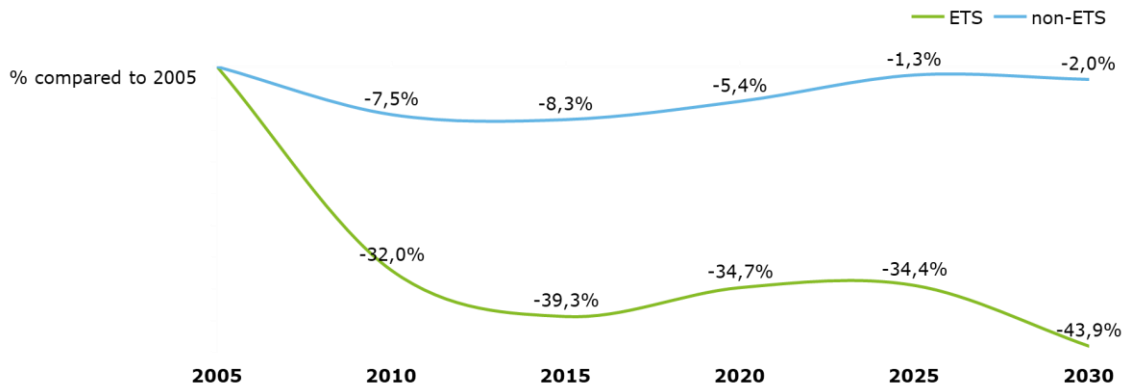
2.1.1. GHG emissions and removals

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

Romania aims to make a fair contribution in achieving the decarbonisation target of the European Union and will follow the best environmental protection practices. The implementation of the EU ETS scheme and compliance with the annual emission targets for non-ETS sectors are the key commitments to achieving the targets. For the sectors that are included in the EU-ETS scheme, Romania's emissions reduction target is about 43% by 2030 compared to 2005.[7]

As a result of the proposed policies and measures, detailed in Chapter 3, the GHG emissions from the in 2030 indicate a level of 39 mil. t. CO_2 equivalent.

Graph 1 - Historical and expected evolution of the ETS and non-ETS sectors emissions



Source: Ministry of Environment, National Inventory of Gases with Greenhouse Effect, 2018, Deloitte Calculations Based on Romania's Energy Strategy, 2019 – 2030, with 2050 perspective

Emissions from non-ETS economic activities for the period 2021-2030 are established in the *Regulation (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL from 30 May 2018 on the mandatory reduction of greenhouse gas emissions by Member States, during the period 2021-2030, with a view to contributing to climate action to meet the commitments made under the Paris Agreement and amending Regulation (EU) No. 525/2013*, so as to comply with the Community's greenhouse gas emission reduction commitments up to 2030.

For Romania, the European Commission has set a target of 2% reduction in 2030 compared to 2005[8], while the average for the EU28 is a 30% reduction. In order to achieve this target achieve this, Romania can contribute, *through the implementation of Regulation (EU) 2018/841 of the European Parliament and of the Council on the inclusion of greenhouse gas emissions and absorptions from activities related to land use, land use change and forestry within the climate and energy policy framework for 2030 and amending Regulation 525/2013 /*

[6] Consistency with long-term strategies under Article 15 must be ensured
[7] Regulation no. 2018/842 / EU of the European Parliament and of the Council on the mandatory annual reduction of greenhouse gas emissions by Member States during the period 2021-2030 with a view to contributing to the climate actions to honor the commitments made under the Paris Agreement and amending Regulation No. 525/2013 / EU
[8] Regulation no. 2018/841 / EU, Annex 1

EU and Decision no. 529/2013 / EU, by offsetting a maximum of 13.4 million tons of CO2 equivalent for the period 2021-2030.

According to the projections taken into consideration in the elaboration of the INECCP, total GHG emissions in 2030 (EU-ETS and non-ETS, excluding LULUCF) will be 118.35 mil. t. CO2 equivalent. [9]

Therefore, Romania will contribute to the decarbonisation process of the EU28, given that in 2030 the total greenhouse gas emissions in the sectors of the national economy will be reduced by about 50% compared to 1990. This reduction will contribute both to the sectors included in the ETS system and non-ETS activities.

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

Currently, this is not the case.

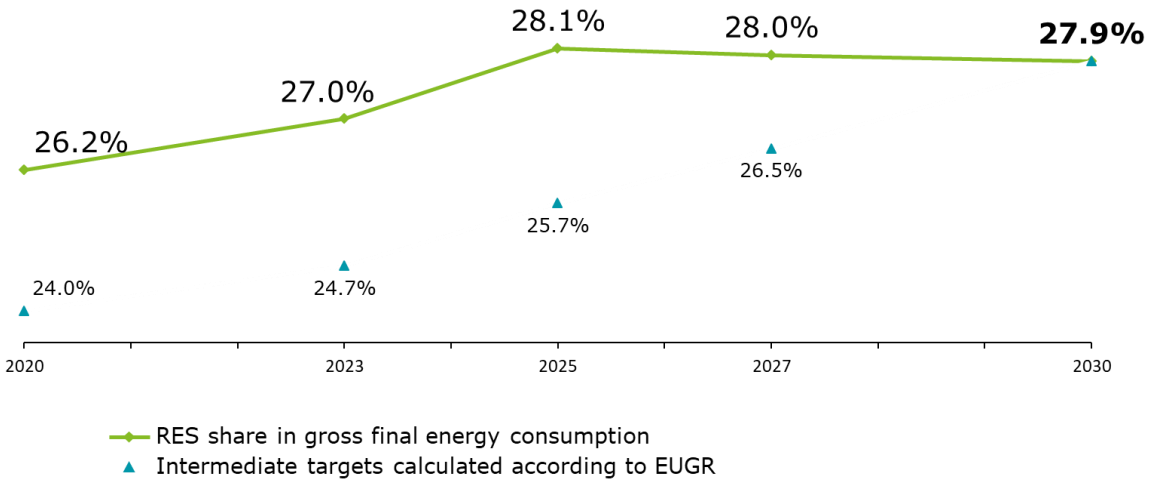
2.1.2. Renewable energy

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

In establishing the renewable energy targets, Romania has followed the recommendations of the European Commission and the provisions of the "Clean Energy for All Europeans" package.

Considering that the overall share of renewable energy in gross final energy consumption of 24% for 2020 was exceeded (25% in 2016, according to Eurostat) and its evolution (estimated at 26.2% in 2020), the projections based on the assumptions used to implement this Plan, indicate a global share of renewable energy in the gross final energy consumption of 27.9% for 2030.

Graph 2 - Indicative trajectory of RES share in final energy consumption, 2021 - 2030, [%]



Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

[9] Projections resulted in this plan, taking into account the expected emission levels in Romania's 7th National Communication

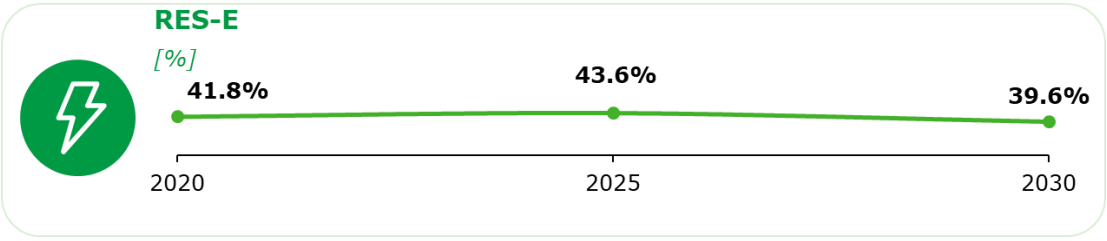
In line with the proposal for a Regulation of the European Parliament and of the Council of 28 June 2018 on the Governance of the Energy Union, the analyzes made during the elaboration of the Plan show that the intermediate targets for 2023, 2025 and 2027 have been exceeded.

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

The total share of energy from renewable sources in gross final energy consumption encompasses the contribution of the renewable energy of each sector to the final energy consumption.

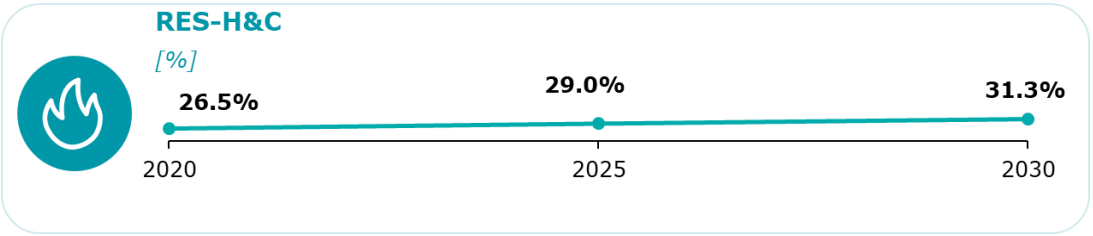
Romania's contribution in reaching the targets set for 2030 is illustrated in the graphs below, based on the WPM scenario, respectively the assumptions and calculations used.

Graph 3 - Indicative trajectory of the share of energy from renewable sources in gross final consumption of electricity, 2021-2030



Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

Graph 4 - Indicative trajectory of the share of energy from renewable sources in the gross final consumption of energy in the heating and cooling sector, 2021-2030



Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

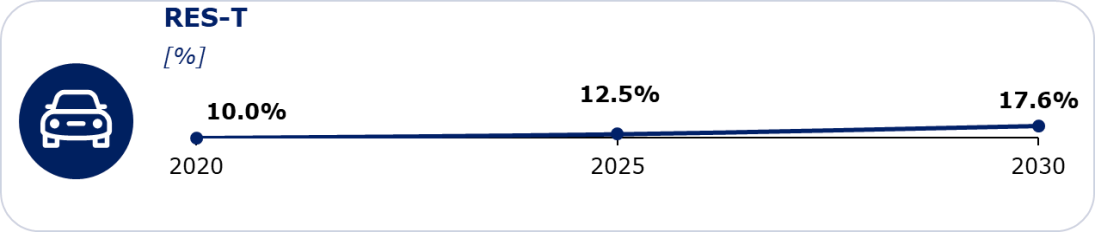
According to the assumptions used in the calculation, gross final consumption of energy from renewable sources used in the H&C sector is projected to increase by 33% between 2021 and 2030, given the availability of biomass sources (mainly firewood and agricultural waste) in compliance with the sustainability criteria. Another alternative valid for 2030 could be the introduction of heat pumps to meet heating needs (in the context of decreasing costs of heat pumps by at least 25% in 2030 compared to today's values, without taking into account the measures of support at national and European level, which could lead to an even wider decrease of these costs[10]).

The calculation assumptions took into account the most cost-effective investments to cover the national heat demand, given the increased availability of natural gas for use in heating and the dispersion of dwellings / inhabitants in the rural areas of Romania.

[10] Technology pathways in decarbonisation scenarios, E3 Modelling, Ecofys, Tractebel, July 2018

In the context of the provisions of the Directive on the promotion of renewable energy sources, amended in 2018 (Interinstitutional File 2016/0382), Romania aims at exploring different ways of overcoming the above-mentioned structural barriers in order to reach the indicative target of 1.1% increase per year, up to the year 2030, considering that no residual heat and cooling were taken into account.

Graph 5 - Indicative trajectory of the share of energy from renewable sources in gross final consumption of energy in the transport sector, 2021-2030



Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

In the case of renewable energy in the transport sector, a European target of 14% of the final energy consumption in transport was set for 2030 for each Member State. The projections of the plan indicate an accelerated electrification in the transport sector, based on the set of priorities identified, as well as on the assumption of the convergence of the cost of light electric vehicles with those of internal combustion cars at the level of 2024, according to independent studies.[11]

iii. Estimated trajectories by renewable energy technology that the Member State projects to use to achieve the overall and sectoral trajectories for renewable energy from 2021 to 2030 including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

Considering the assumption for the calculation, used by the project team (mainly based on the input data communicated in the Energy Strategy of Romania 2019-2030, with perspective of 2050, the estimated trajectories, broken down by renewable energy technology that Romania intends to use in order to accomplish the sectoral and global trajectories, can be found in the tables below:

Table 7 - Estimated trajectory, broken down by technology, of renewable energy in gross final consumption of electricity, 2021-2030, [ktoe]

ktoe	2020	2025	2030
Hydro	1,358.8	1,505.0	1,507.5
Wind	612.2	612.2	946.0
Solar	184,4	210,3	430,2
Other renewable sources	77.4	77.4	77.4
Total gross final consumption of electricity from renewable sources	**2,232.8**	**2,404.9**	**2,960.9**

Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

[11] Energy Transition Outlook 2018, Executive Summary, A global and regional forecast to 2050, DNV-GL

Table 8 - Estimated trajectory, broken down by technology, of renewable energy in gross final consumption of energy in the Heating & Cooling sector, 2021-2030, [ktoe]

ktoe	2020	2025	2030
Final energy consumption	3,366.0	3,892.1	4,216.2
Derived heat	129.4	181.8	298.0
Heat pumps	8.1	55.0	119.6
Total final gross renewable energy consumption in Heating & Cooling	**3,509.0**	**4,148.7**	**4,679.7**

Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

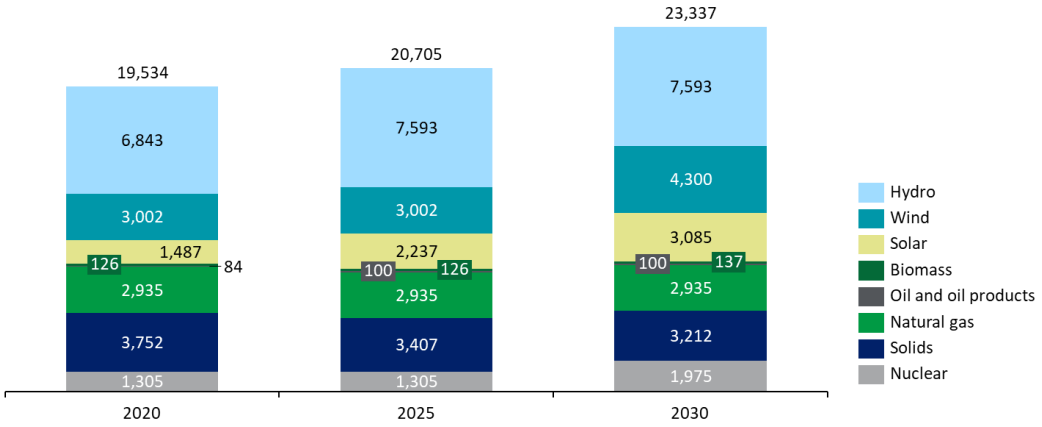
Table 9 - Estimated trajectory, broken down by technology, of energy from renewable sources in gross final consumption of energy in the transport sector, 2021-2030, [ktoe]

ktoe	2020	2025	2030
Renewable energy in road transport	1.8	9.7	95.3
Renewable energy in rail transport	66.3	82.6	105.5
1st generation biofuels	356.8	392.34	439.2
2nd generation biofuels	52.5	110.2	124.5
Total final gross renewable energy consumption in transport	**568.5**	**775.7**	**1,227.7**

Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

The evolution of installed capacities for the 2021 - 2030 period indicates an increase compared to the total installed capacity in 2018, according to the projections related to future policies and measures, based on the hypotheses foreseen in the Energy Strategy of Romania 2019-2030, with perspective of 2050. The projections for the year 2030 show **an increase in wind capacity up to 4,300 MW and photovoltaic capacity up to approx. 3,100 MW**, as illustrated in the graph below:

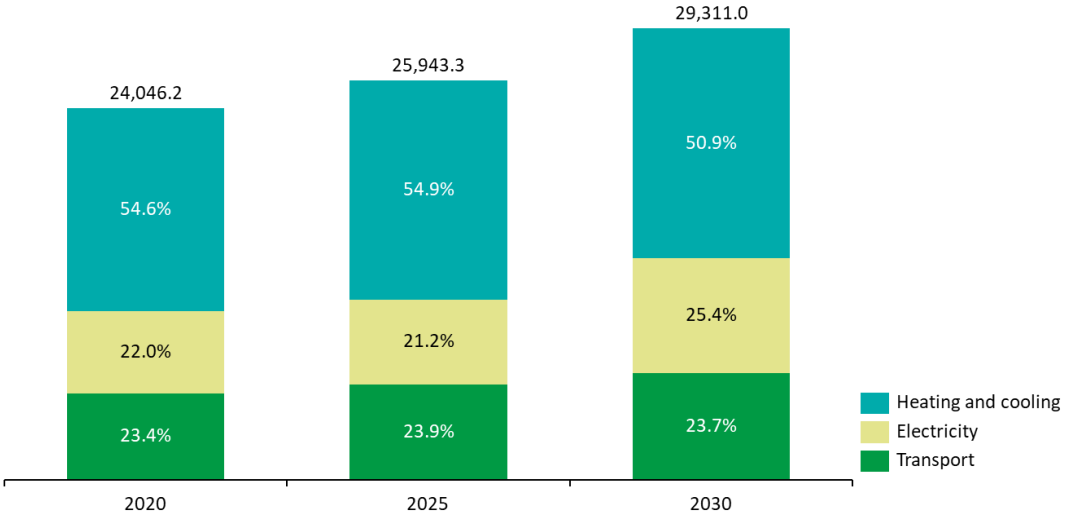
Graph 6 - Indicative trajectory of installed capacity, by sources, [MW]



Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

In terms of gross final energy consumption, according to the WPM scenario, an increase of approx. 18% is expected between 2021 and 2030, as can be seen in the graph below. This consumption is broken down into three sectors of interest: heating and cooling, electricity and transport. According to the projections calculated, in the year 2030, the heating and cooling sector is responsible for approx. 50% of the gross final energy consumption.

Graph 7 - The indicative trajectory of gross final consumption of energy by sector, [ktoe]



Source: Deloitte Calculation based on the Energy Strategy of Romania 2019-2030, with perspective of 2050

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

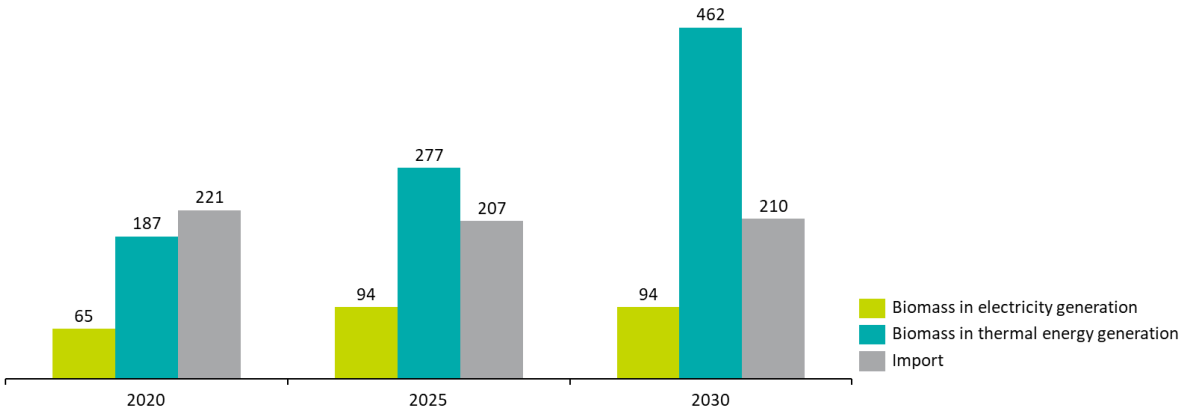
From the existing information, it appears that the biomass supply is made of firewood; the volumes used annually being about 7 million cubic meters, of which Romsilva can provide up to 4.5 million cubic meters, the difference of about 2.5 million cubic meters being provided by other administrators or forest holders in Romania.

The biomass potential in agriculture, mainly represented by strains, including corn cobs, was estimated to be between 21.5 and 35.8 million tons, referring to the production of 2017, according to the National Institute for Agricultural Research and Development Fundulea.

For forest biomass, there is currently no precise data on its source (especially with regard to private forest arrangements).

The graph below illustrates the indicative trajectory of the use of biomass in electricity and heat production as well as the imported quantity, during the reference period 2021-2030.

Graph 8 - The indicative trajectory of biomass demand for electricity and heat production as well as imported quantities, [ktoe]



Source: Deloitte Calculation based on the official documents issued by the authorities involved in the elaboration of INECCP

v. 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

According to the available data and the WPM scenario, the amount of renewable energy used in district heating, from geothermal energy, is projected to increase from 31 ktoe in 2016[12] to 45 ktoe in 2030.

Regarding the use of energy from renewable sources in buildings, more information can be found in Table 7 - Maximum specific annual energy consumption [KWh / m², primary energy], respectively RES share to meet the energy requirements of the building [%], section 2.2. ii.

In the context of "Smart City" strategies that are under development (e.g. Bucharest, Cluj-Napoca), local authorities have planned a series of projects oriented to the production of electricity and heat from renewable sources, using photovoltaic panels, thermal solar panels or biomass. Therefore, the information available at this time does not allow the development of a long-term trajectory

Information on the trajectory of renewable electricity production by autonomous consumers (as defined in the Directive on the promotion of renewable energy sources, amended in 2018 (Interinstitutional File 2016/0382) can be found in Section 3.1.2.

Regarding the option of energy recovery of the sludge, consisting of the dedicated sludge incineration and the recovery of the related energy, according to the National Strategy for Sewage Sludge Management, the operation implies high investments and operating costs that could only be feasible in some regions of Romania (Bucharest - Ilfov). In this context, there are no projects in this respect at this time.

[12] Romania's progress report on the promotion and use of energy from renewable sources according to art. 22 of Directive 2009/28 / EC

2.2.Dimension Energy Efficiency

i. The elements set out in point (b) of Article 4

The Energy Efficiency dimension is of significant importance in the INECCP 2021-2030, as the "Clean Energy for All Europeans" package prioritizes energy efficiency in the transition to clean energy.

Through the commitments in this area, Romania must contribute in reaching the target of the Union related to energy efficiency (a primary energy consumption of maximum 1,273 Mtoe or 956 Mtoe of final energy consumption respectively) [13]. Therefore, the global target is at least 32.5% at EU level, an objective that can be revised upwards in 2023.

Taking into account the assumptions and projections considered in the calculations, that rely on increase of the industrial production and living standards, the primary energy consumption is estimated to reach 36.7 Mtoe in 2030, compared to a primary energy consumption of 30.3 Mtoe in 2020.

Reported to the forecast for the primary energy consumption for 2030, as calculated in PRIMES 2007 scenario for Romania, respectively 58.7 Mtep, the WPM scenario estimates a 37.5% decrease in 2030.

From this perspective, energy efficiency measures will lead to a decrease in primary energy intensity, from 195 toe / EUR'15 in 2015 to around 150 toe / EUR'15 in 2030.

On the other hand, Romania should reach a real (indicative) annual energy savings rate (as stipulated in Article 7 of the amended 2012/27 / EU Directive) of at least 0.8% between 2021 and 2030. The measures related to the achievement of these economies will also be directed towards fighting energy poverty (see Chapter 2.4.4.).

In this context, Romania could use the flexibility mechanism provided by the applicable legislation, to cover up to 35% of the annual amount needed for energy savings, using one or more of the following measures:

- Exclusion from the energy savings calculation of the total or only part of the energy sales or from the final energy consumption, used in industrial activities under the ETS;
- Energy savings from transformation, transport and distribution, including efficient heating and cooling, to be taken into account for the total amount required for energy savings;
- Taking into account the energy savings achieved individually through activities undertaken after 2018, which continue to impact after 2020;
- Taking into account individual energy savings realized through activities started after 1 January 2018 and until 31 December 2020, which continue to register energy savings beyond 2020;
- Exclusion of 30% of the verifiable quantity of renewable energy sources / RES used for home use from the calculation of the energy savings target / requirement.

[13] Art 3, par. (4) EU Directive 2012/27 , see proposal to amend the Directive

ii. The indicative milestones for 2030, 2040 and 2050, the domestically established measurable progress indicators 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 measurable progress indicators for the residential sector in 2030 (as compared to 2015 and 2020) can be found in the Strategy for mobilizing investments in the renovation of the residential and commercial buildings fund, both public and private, existing at national level. The maximum annual energy consumption for buildings in Romania that meet the minimum energy performance requirements can be found in the table below. For this indicator, 3 scenarios were considered: Business as usual (BaU), Growth and Transform.[14]

Table 10 - Maximum specific annual energy consumption [KWh / m², primary energy], respectively RES share to meet the energy requirements of the building [%]

			Set of policies 1 (BaU)		**Set of policies 2 (Growth)**		**Set of policies 3 (Transformation)**	
			new	renovated	new	renovated	new	renovated
Apartment buildings	2015	[KWh/m²]	90	100	80	100	70	90
	2020	[KWh/m²]	80	100	70	90	60	70
		RES share			>30%		>40%	>20%
	2030	[KWh/m²]	70	80	60	70	40	50
		RES share			>40%		>50%	>40%
Individual homes	2015	[KWh/m²]	150	180	130	150	90	110
	2020	[KWh/m²]	120	150	100	120	80	90
		RES share			>30%		>40%	>20%
	2030	[KWh/m²]	100	130	70	90	40	60
		RES share			>40%		>40%	>40%
Offices, schools, hospitals, hotels	2015	[KWh/m²]	120	140	100	120	90	110
	2020	[KWh/m²]	100	120	90	100	70	100
		RES share			>20%		>30%	>20%
	2030	[KWh/m²]	80	100	70	90	40	60
		RES share			>30%		>40%	>30%

Source: The strategy for mobilizing investment in the renovation of residential and commercial buildings fund, both public and private, existing at national level - Version 2/2017

With regards to the period 2040-2050, there are no indicative milestones and progress indicators at national level.

[14] The strategy for mobilizing investment in the renovation of residential and commercial buildings fund, both public and private, existing at national level - Version 2/2017

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

See Chapter 3.2.ii and 3.2.iv.

2.3. Dimension energy security

i. The elements set out in point (c) of Article 4

For the establishment and alignment of national objectives specific to energy security, we performed an inventory of different initiatives, decisions and current developments that highlight the objectives specific to this dimension, that form the basis of the activities and strategic action plans for 2021-2030, with perspective of 2050. As most of the objectives for this dimension are of qualitative nature, no numerical targets have been set.

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

Romania considers the electricity supply from internal sources as a primary objective for ensuring the national energy security and as a necessity linked to the currently diversified and balanced energy mix. Therefore, it has included in the Energy Strategy PO1 as a priority objective. [15] As such, this priority objective materializes, in fact, in maintaining the current diversity of sources of internal energy.

Another strategic objective[16] is considered to be **OP3**. Although the immediate and relevant impact is related to the development of the Romanian energy market (see Chapter 2.4.1.), this objective includes also resilience elements of the national energy system and also of the regional systems[17]. Related to natural gas supply, Romania is considering the development of the national transmission system of natural gas on the Bulgaria – Romania – Hungary – Austria (BRUA) corridor[18] and the development on the Romanian territory of the Southern Transmission Corridor for taking over the Black Sea gas[19]. The existing interconnection points will continue to be used on the following directions: North-West (Mediesul Aurit), South-East (Isaccea) with Ukraine, West with Hungary, South with Bulgaria and Est with Republic of Moldova.

The resilience capacity of the national energy system is also taken into account through the implementation of the **OP6** priority objective.[20]

Romania's participation in the European energy diplomacy initiatives **(OP7)** raises at a strategic level the activity of strengthening the resilience capacity at regional and European level.

Through another objective **(OP8)**, Romania aims at replacing, in the year 2030, the electricity generation capacities that will come out of operation with new, efficient and low-emission capacities. At the same time, the increase in energy efficiency in the economic sectors (especially in the industrial sector) **(OP9)** will also contribute to the improvement of Romania's energy security through the impact on demand, respectively the decrease of energy imports that meet the demand.

[15] Energy Strategy of Romania 2019-2030, with perspective of 2050
[16] Energy Strategy of Romania 2019-2030, with perspective of 2050
[17] The Plan for Development of the Electric Transmission Network, 2018-2027, Transelectrica
[18] Development plan for the national gas transmission system, 2018-2027, SNTGN Transgaz SA – draft
[19] Development plan for the national gas transmission system, 2018-2027, SNTGN Transgaz SA – draft
[20] Energy Strategy of Romania 2019-2030, with perspective of 2050

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

Romania considers that it still has primary resource deposits, so their capitalization has been included as an objective in this Plan **(OP2)** in order to maintain a low level of energy dependence, as well as for the safety of the functioning of the NPS.

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

According to the adequacy analyzes of the transmission system operator, Transelectrica, the acceptable limits for the power produced from wind and photovoltaic sources are currently strongly influenced by the level of hydraulics and thermal regime. Thus, from the point of view of the residual power flexibility (produced from sources other than wind / photovoltaic - thermal, hydro, nuclear, biomass), critical for the year level are considered to be high winter / summer hours, minimum / maximum thermal and extreme hydraulic hours (minimum / maximum).

The above-mentioned analyzes point out the need to install additional capacity of at least 400 MW in the 2020 horizon, i.e. 600 MW (in addition to 2020) in 2025.

In response to variations in demand, Romania has implemented a legal framework for consumption management in 2012[21], using a power limitation norm for each distribution concession dealer. At the same time, another important objective in the management of consumption is the operationalization of the dynamic tariffs provided for in the secondary legislation applicable to OTS and OD (see Chapter 3.3.3).

Based on the assumptions for the calculations and all information available at TSO level, Romania aims to integrate battery energy storage systems in NPS at a capacity of over 400 MW, in particular with the aim of flattening the load curve and providing an additional reserve exploitable in the form of technological system services (TSS) - fast and tertiary regulation.

2.4. Dimension internal energy market

2.4.1. Electricity interconnectivity

i. 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:

1) Price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones;
2) Nominal transmission capacity of interconnectors below 30% of peak load;
3) Nominal transmission capacity of interconnectors below 30% of installed renewable generation.

According to the analysis of the Romanian transport and system operator, Romania fulfills the peak load indicators (between 66% and 75% in terms of the ratio between current interconnection capacities and the peak load according to the forecasting scenario) and the installed power of production of renewable energy (indicator ranging from 30 to 44% depending on the RES scenario).

[21] Government Decision 83/2012 on the adoption of safety measures on the electricity market

Romania intends to supplement its interconnection capacities by 2030, taking into account socio-economic and environmental cost-benefit analyzes, having the intent to implement projects where the potential benefits are higher than costs.

At the same time, through the primary and secondary legislative framework, as well as the projects related to closing the 400kV national ring (internal lines), Romania will also create the conditions for maximizing the offered interconnection capacities.

2.4.2. Energy transmission infrastructure

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

Essential projects for electricity and natural gas transport infrastructure are presented in Chapter 4.5.2.ii.

ii. Where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)[22]

The main network development projects (except PCI) communicated by CNTEE Transelectrica are the following:

- Connection of OPL 400kV Stupina – Varna (Bulgaria) entry – exit in the 400Kv Medgidia station through a OPL 400 Kv d.c.;
- Connection of OPL 400kV Rahman – Dobrudja (Bulgaria) entry – exit in the 400Kv Medgidia South station through a OPL 400kV d.c.;
- Second transformer 250MVA, 400 / 110kV in Sibiu South station;
- Connection of 220kV Ostrovu Mare (CHE Iron Gates II) station entry – exit in a OPL 220 Kv d.c. circuit Iron Gates - Cetate;
- Second auto-transformation 400MVA, 400/220kV in Iernut station;
- Second auto-transformation 400MVA, 400/220kV in Brazi West station;
- Switching to 400 kV of the OPL Brazi Vest - Teleajen - Stalpu;
- OPL 400 kV d.c. (1 equipped circuit) Medgidia South – Constanta North;
- OPL 400kV s.c. Gadalin – Suceava;
- OPL 400kV s.c. Suceava – Balti;
- OPL 400 kV d.c. Stalpu – Brasov (1 equipped circuit).

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

Electricity and natural gas prices are currently set in a competitive manner in the wholesale market of Romania. On the other hand, the regulator currently endorses the prices of last resort suppliers in relation to final customers (domestic and non-household) supplied in the framework of the universal service regime (representing approximately 7.5 million consumption places in Q2 2018), taking into account the wholesale purchase prices, as well as

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

the operational costs of supply. The regulated tariffs for household gas consumers will be maintained according to current policies by July 2021.

On the other hand, the increase in the degree of flexibility is foreseen through the establishment of a short term (quarter, year) capacity market for power reserves, if possible, and if it is economically efficient.

In the context of defining and implementing measures for the protection of vulnerable consumers, Romania will include in the relevant legal framework provisions guaranteeing the free formation of delivery prices, as a result of market mechanisms (centralized and transparent trading), while pursuing - through the instruments of regulators - to ensure an increased level of accessibility, correlated with household incomes (projected to sustainably increase by 2030 as a result of expected economic growth).

In pursuing the achievement of the priority objective for integration of internal European market, Romania will continue to integrate the day-ahead and intra-day electricity markets into the European Single Day-Ahead and Intra-Day Coupling power markets (SDAC and SIDC respectively), considering the implicit allocation of cross-border flow-based capacities applicable to the CORE region (implementation deadline: according to the roadmap of the implementation projects of European relevant regulations) of which Romania it is part and without excluding the early implementation of the single coupled NTC-based electricity markets

At regional level, a strategic action for Romania remains the integration into the single coupled markets for the day-ahead and intra-day markets (SDAC and SIDC) as a member state, which derives from the need to comply to European regulations.

In addition, Romania will continue its collaboration with the contracting parties within the Energy Community and will support the accession of the South East Europe region to SDAC, process that will depend on the process of establishing market mechanisms in the Balkan area.

One of the objectives will be to increase the marketable capacity of existing interconnections by aligning them to the European / regional targets, depending on the configuration of the regions / supply areas. Another priority objective of Romania should be the early implementation of the Balancing Regulation (including by aligning with the tendencies of unification of the system services markets by participating in pilot projects supported by ENTSO-E (PICASSO, MARI, TERRE, etc.)

Regarding the objectives referring to the orderly / dispatchable consumption (response to demand variations), Romania has already introduced a secondary legislative framework on:

- TSO's obligation to provide, at the request of end customers connected to the PTN, dynamic transport rates starting with 2019;
- DO obligation to provide dynamic distribution tariffs, at the request of users or their suppliers, from 2020.

a) 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

Not the case.

b) 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

The objective of Romania up to 2030 is to install a power of at least 750 MW, made in the form of production capacities owned by prosumers.

It is also essential to establish a framework for defining the market flexibility portfolio by:

- Assessment of flexibility needs over a number of periods (day, week, year);
- Identification and characterization of local flexibility solutions:
  - Flexible generation;
  - Storage;
  - Demand-response;
  - Interconnections.
- Environment-friendly technologies (modernization, advanced wind turbines);
- Optimizing the flexibility portfolio at Member State level.

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

The aforementioned objectives were also addressed in Chapter 2.3.iv. The deadlines for meeting the targets depend on the updating and the accuracy of the available information (especially with regard to the feasibility of the proposed projects), most of them having as timeframe the year 2020 and 2025, respectively.

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

Romania will continue to apply a series of measures to protect vulnerable consumers, by keeping / extending the categories of customers where disconnection is prohibited (especially in the cold season), improving the right to information for customers (the price comparator developed by the regulator being a useful tool in this respect), introducing smart metering (at the latest in 2028).

On the other hand, Romania has implemented all the legislative provisions that give final customers the right to choose / change their supplier without additional costs with a 21 calendar day notice; at the same time, suppliers are denied unilateral denunciation of supply contracts. Regarding complaints management, the regulator has implemented a series of normative acts on how to manage misunderstandings in the sector both at the pre-contractual stage and during the deployment of the contracts.

2.4.4. Energy poverty

i. If applicable, national objectives with regard to energy poverty including a timeframe for when the objectives shall be met

According to the recommendations of the European Commission, Romania defines national targets for energy poverty. Member States with a significant number of households in energy poverty must include in their integrated national energy and climate change plans an indicative target for reducing energy poverty.

According to Eurostat data, Romania had in the second semester of 2017, the sixth lowest average EU electricity price for household consumers. However, given the relatively low purchasing power, price supportability is a first-rate problem that leads to a high level of energy poverty.

In order to measure as accurately as possible the level of energy poverty in the EU member states, the EU Energy Poverty Observatory requires the use of key indicators, and the source of the values is given by the Eurostat databases. Indicators for which there is sufficient data available at country and EU level are the percentage of arrears on utility bills and the inability to warm the household at an adequate level.

In Romania, 18% of households had registered arrears on utility bills in 2016. In comparison, the EU average was 8.1% in the same year. The evolution of the indicator for Romania and the EU for the period 2010-2016 can be found in the table below.

Table 11 - Arrears on utility bills [%], 2010-2016

	2010	2011	2012	2013	2014	2015	2016
EU average	9.1	9.0	9.9	10.2	9.9	9.1	8.1
Romania	26.5	27.3	29.7	29.7	21.5	17.4	18.0

Source: Eurostat, Arrears on utility bills - EU-SILC survey [ilc_mdes01]

The inability to ensure household heating at a suitable level is another indicator that measures the share of households that do not have this capacity, relying on the question, "Can you warm your home to the right level?". The evolution of the indicator for Romania and the EU for the period 2010-2016 can be found in the table below.

Table 12 - Inability to ensure household heating at a suitable level [%], 2010-2016

	2010	2011	2012	2013	2014	2015	2016
EU average	9.5	9.8	10.8	10.7	10.3	9.4	8.7
Romania	20.1	15.6	15.0	14.7	12.9	13.1	13.8

Source: Eurostat, Arrears on utility bills - EU-SILC survey [ilc_mdes01]

The comparison of the indicators shows, on the one hand, Romania's progress in fighting energy poverty and, on the other hand, highlights the need to recover the gap with the EU average. Therefore, the national objective in this regard is to reduce the level of energy poverty and protect vulnerable consumers in order to guarantee human rights, given the average level of EU Member States in 2015.

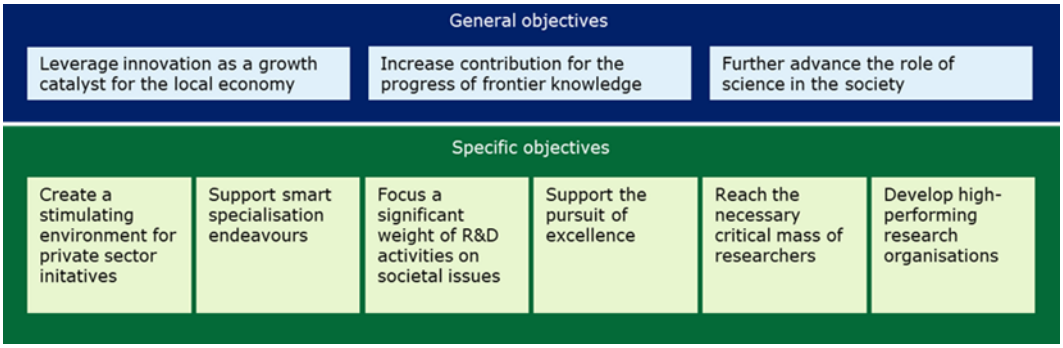
Appropriate measures to achieve the objective can be found in Chapter 3.4.4.

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, if appropriate, a timeframe for when the objectives shall be met

The national objectives addressing the Research and Innovation pillar are outlined in the 2014-2020 National Strategy for Research, Development and Innovation.

Figure 2 - The 2014-2020 national objectives for the Research and Innovation domain



Source: The 2014-2020 National Strategy for Research, Development and Innovation, approved by Government Decree No. 929/2014 issued on October 21st 2014, modified through Government Decision No. 81/2017

The objectives were designed to reduce Romania's current gap compared to both its potential and the EU average. These are based on the assumption that by the end of 2020, public spending for Research and Innovation will gradually grow up to 1% of the National GDP, incremental to the indirect support to be provided for the private sector. Nevertheless, achieving the objectives to mobilise public spending are subject to changes in the Program for Government and fiscal policies, which would potentially be implemented through the budgetary and fiscal strategies for the selected period.

Table 13 - General targets rendered in the 2014-2020 National Strategy for Research-Development and Innovation

Indicators	2011 reference	2020 target
R&D Public spending weight (% GDP)	0.31	1
Number of PhD graduates (ISCED 6) aged between 25-34, per 1,000 inhabitants	1.4	1.5
Public sector researchers (Number, Full Time Equivalent)	12,409	17,000
Scientific publications placed top 10% in worldwide rankings (% total publications at national level)	3.8	7
Scientific publications, co-authored internationally (number per 1 million inhabitants)	148	300
Risk capital (% of GDP)	0.033	0.090

Indicators	2011 reference	2020 target
R&D private spending weight (% of GDP)	0.17	1
Private sector researchers (Number, Full Time Equivalent)	3,518	14,500
Public/private co-authored materials (number / 1 million inhabitants)	8.3	16
Weight of innovative SME with cooperation agreements (%)	2.93	6
EPO patent applications (number / year)	40	120
USPTO patent applications (number / year)	17	60
Trademark applications at community level (number / 1 billion EUR, adjusted for purchasing power)	2.14	4
Innovative companies registering fast growth (number)	-	150
SMEs, which introduce products or innovative services (%)	13.17	20
Revenue from foreign licenses and patents	0.13	0.17

Source: The 2014-2020 National Strategy for Research, Development and Innovation, approved by Governmental Decree No. 929/2014 from October 21st 2014, amended and supplemented through Government Decision No. 81/2017

Even though the objectives underlined under this section are not Energy-specific, the ancillary benefits to be gained by implementing the strategy will be reflected in the Energy sector as well.

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

Not applicable.

iii. If applicable, National objectives with regard to competitiveness

The 2014-2020 National Competitiveness Strategy, developed by the Ministry of Economy, depicts five strategic priorities:

1. Improve the regulation environment
2. Encourage partnerships between public and private sectors
3. Provide supporting factors and services - aimed at developing the research, development and innovation activities of enterprises, including through the promotion of support measures financed from national and European funds
4. Promote the 10 promising sectors with competitive advantage, correlated with smart specialization areas mentioned in the National Strategy of Research, Development, and Innovation 2014-2020

5. Prepare the Generation 2050 and societal challenges, aiming to ensure grounds in education, adapted to modern society.

For crossover activities applicable in Energy areas, the following expectations are set:

Table 14 - Action areas and expected results described in the 2014-2020 National Competitiveness Strategy, applicable for the Energy Sector

Action areas	Expected results
2.1 Long-term institutionalization of public-private foresight centers for industry / technology / RD&I	• Create regional competency centers which will establish sectorial policies, RD&I agenda, support services for the sector development, based on profiled specialties at territory level
2.3 Consolidate and develop specific clusters / centers	• Cluster contribution in total exports: 20% in 2020
3.2 Research, development and innovation: ensure the 1% public financing equivalent to increase the demand and uptake for research in the private sector	• By 2020, increase private sector expenditure up to 1% of GDP (from 0.17% in 2011)
3.3 Support SMEs to launch innovative products and services through venture capital funding, other grants and collaborative projects	• By 2020, reach 20% SME which introduce innovative products and services (from 13.2% in 2011)
3.7 Reduce losses in the electricity distribution networks	• By 2020, reduce the primary energy consumption by 19% (from 16.6% in 2012)
4.2 Increase the attractiveness of investments in the 10 sectors with potential for smart specialization.	• Increase foreign investment level in the prioritized sectors, by an aggregated 5 p.p.

Source: The 2014-2020 National Competitiveness Strategy

3. Policies and measures for reaching the proposed objectives

3.1.Dimension Decarbonisation

3.1.1. GHG emissions and removals

i. 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

National policies and action plans to reduce GHG emissions are a key element in limiting the effects of climate change on the environment, the economy and society. In order to support green growth for the reduction of carbon content, the EU has introduced ambitious climate and energy targets by 2030. Romania's obligations as an EU member state include participation in the scheme for greenhouse gas emission allowance trading, EU-ETS for all energy-intensive installations. Additionally, emissions from non-ETS economic activities are regulated by Regulation (EU) 2018/842. The provisions of Article 4 of Regulation (EU) 2018/841 state that each EU Member State must ensure that emissions do not exceed absorptions.

A set of policies and measures have been developed in order to achieve the overall GHG reduction target and national GHG absorption. These policies and measures are in line with the Operational Objectives of the Energy Strategy of Romania 2019-2030, with perspective of 2050, of the National Strategy for Climate Change and Economic Growth, based on low carbon emissions for the period 2016-2030, of the National Action Plan for the implementation of the national strategy for climate change and economic growth, based on low carbon emissions for the 2016 – 2020, and other strategies and documents that are considered crucial in the energy, climate change or related ETS and non-ETS industries.

In case that the measures to reduce GHG emissions fall within the scope of more than one dimension, a separate reference will be made (Pillars 2 - 5: P2, P3, P4 or P5). The recapitulative table of the main objectives, policies and measures of the 5 dimensions of the plan can be found in Chapter 1.1.iii.

Cross-sectorial policies and measures

(OP9) INCREASE ENERGY EFFICIENCY

See Ch. 3.2.

(OP13) REDUCE GHG AND NOx EMISSIONS

- Encourage a wider use of green public procurement.

(OP14) SUPPORT THE SUSTAINABLE DEVELOPMENT OF THE NATIONAL ENERGY SECTOR, WHILE PROTECTING QUALITY OF AIR, WATER, SOIL AND BIODIVERSITY

- Organize information programs and public debates on major energy projects, taking into account the interests of local communities and national interest, as well as introducing education courses for adults on the mentioned topics.

(OP16) ENSURE TRANSPARENCY OF THE ADMINISTRATIVE ACT, SIMPLIFICATION OF BUREAUCRACY OF THE ENERGY SECTOR

- Reduce bureaucracy through transparency, digitization and the introduction of the "one-stop shop".

Sectorial policies and measures

Policies and measures presented under this chapter will be pursued to achieve those key objectives for decarbonisation - GHG emissions and removals: **(OP13) REDUCE GHG AND NOx EMISSIONS, (OP14) SUPPORT THE SUSTAINABLE DEVELOPMENT OF THE NATIONAL ENERGY SECTOR, WHILE PROTECTING QUALITY OF AIR, WATER, SOIL AND BIODIVERSITY** and **(OP15) FIGHT CLIMATE CHANGE,** but also by implementing the other relevant objectives, according to the recapitulative table presented in Chapter 1.1.iii.

Energy Industry

(OP1) DIVERSIFIED AND BALANCED ENERGY MIX

See par. 3.3.i

(OP2) CAPITALIZE ON NEW PRIMARY RESOURCES POOL FOR A LOW ENERGY DEPENDENCE LEVEL AND NATIONAL ENERGY SYSTEM RESILIENCE

See par. 3.3.i

(OP8) REPLACE ELECTRICITY PRODUCTION CAPACITIES TO BE DECOMISSIONED BY 2030 WITH NEW, EFFICIENT AND LOW EMISSION CAPACITIES

- Provide financing mechanisms to finalize hydro-energetic facilities for complex utilization (agricultural irrigations, flood protection, water supply, etc.). For other OP8 measures, see Chapters 3.1.2., 3.3. and 3.4.

Contracts for Difference (CfD)

Currently, there is an initiative in Romania that envisages the development of Contract for Difference (CfD) support mechanism to encourage priority investments with low-carbon technologies that are needed in the Romanian energy sector.

In the context of the targets set out in the current plan for 2030 on the share of renewable energy production, the mechanism will provide adequate support for achieving these targets.

Unlike the current renewable energy support mechanism for the green certificates market, implementing a CfD-type mechanism can provide additional benefits and create an attractive and predictable environment for investors, such as:

- Improves revenue safety and stability, by eliminating the exposure to volatile wholesale prices;
- Avoids overcompensation of producers when the electricity price increases above the value of the exercise price;
- Protects the producers from price fluctuations on the market;

- Protects consumers from support payment, when the market price of electricity increases;
- Guarantees a contractual agreement under the law, over a predetermined period, which provides a reasonable level of flexibility for project developers and protection against unanticipated changes;
- Provides increased security for investors: once the contract has been signed, investors are able to carry out projects without being affected by political risk or by the fact that the development of the market could critically affect the projects' profitability;
- In order to support the necessary investments, the CfD mechanism must create a clear and transparent framework that addresses the risks related to long-term investments and provides investors with confidence and predictability;
- In line with the development of withdrawals from operation of some capacities, but also with the additional capacity needs (driven by increased demand), new production units could benefit from the CfD mechanism based on auctions, in the sense that the support would target the lowest price offered by an investor / developer;
- The transition from fixed subsidies for RES to their establishment through competition is a cost-effective mechanism, as it leads to a more efficient allocation of capital expenditures in the context of constructing RES power plants.

Thus, the materialization of this initiative should be a priority in order to optimize the current market design.

(OP13) REDUCE GHG AND NOx EMISSIONS

- Current activities and projects of energy companies must comply with environmental legislation and apply best international environmental protection practices; extension of EMAS certification throughout the economy (P5);
- Further reduce emissions of pollutants into the air, water and soil, related to the energy sector;
- Support scientific research to decarbonize the energy sector (P5);
- Promote alternative fuels;
- Co-financing of projects targeting de-carbonization technologies and processes, funded through the new EU-ETS support mechanisms (modernization and innovation funds, solidarity provisions) (P5);
- Extending the Article 10c derogation scheme until 2030 and its implementation according to EU-ETS IV[23];
- Incentives for private investment in new technologies and research and development in the field of low GHG technologies (P5);
- Use ETS auction income for renewable energy and energy efficiency projects at national and international level (P2).

<u>Transport</u>

(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY

- Adopt support measures including research, establish common standards and develop the necessary infrastructure for electric and hybrid cars.

[23] 2018 State of the EU ETS Report, written by Andrei Marcu , Emilie Alberola, Jean-Yves Caneill, Matteo Mazzoni, Stefan Schleicher, Wijnand Stoefs, Charlotte Vailles and Domien Vangenechten

(OP13) REDUCE GHG AND NOx EMISSIONS

- Introduce strong economic incentives for an environmentally friendly transport system through price instruments (P5);
- Develop a plan for the implementation of public charging networks, as well as encouraging private investment to develop infrastructure through a stimulus mechanism;
- Continue to apply tax reductions and exemptions for the purchase and use of electric or hybrid vehicles - especially for fleets of companies;
- Develop regulations to support agents interested in investing in electromobility infrastructure;
- Apply an attractive tariff for new electrical applications such as electric mobility, reflecting the current purchase cost and system costs; It kind of application must deliver an attractive level of profitability and guarantee economic sustainability;
- Introduce high and strict environmental taxes to limit the purchase of used vehicles;
- Limit the circulation of conventional vehicles in city centers in order to improve air quality;
- Introduce special traffic bands for public transport and electric cars;
- Elaborate municipal regulations for the organization of limited access parking spaces, thus ensuring a guaranteed space with charging spaces for EVs owners who do not own their own garage;
- Prepare actions to promote the importance of electromobility, harmonized with long-term decarbonisation objectives;
- Reinsertion of a pollution tax to reduce GHG and NOx emissions caused by imports of old cars;
- Expand smart transportation management systems in major cities;
- Develop cycling infrastructure;
- Promote alternative fuel infrastructure, complement and simplify the related legal framework (P4);

(OP15) FIGHT CLIMATE CHANGE

- Decrease pollution levels in urban centers, including noise;
- Ensure the existence of a route crossing Romania with minimal impact on the environment;
- Increase awareness of the benefits of environmentally friendly transport;
- Extend or modernize public urban transport through ecological means, such as trolleybuses, trams, metro and suburban railway networks.

Residential sector

- Elaborate mandatory quality standards for energy conservation and efficiency, including thermal insulation, lighting, use of air conditioning, etc;
- Attract investment in network infrastructure, in order to encourage heating from electrical sources;
- Promote efficient solutions in residential communities, such as heat pumps;
- Prepare information campaigns to define emissions from different types of equipment or property;
- Identify alternative solutions to support vulnerable consumers;
- Identify specific actions to encourage the use of LED / smart light bulbs instead of conventional ones.

Manufacturing

(OP13) REDUCE GHG AND NOx EMISSIONS

- Reduce carbon intensity of the industrial sector;
- Implementation of Best Available Technologies (BAT) to reduce greenhouse gas emissions and increase energy efficiency, as well as the use of grants for training on resource efficiency and clean energy production;
- Identify voluntary agreements to reduce GHG emissions in industry; provide technical know-how and economic support for new tools in order to stimulate the industrial sector to reduce GHG emissions;
- Conduct training courses on resource efficiency, clean production and energy efficiency;
- Financial incentives for staff specialized in efficient usage of resources;
- Establishment / development of industrial parks operating on the principle of industrial symbiosis (P2);
- Development of regional clusters for sustainable energy planning, smart energy use in SMEs, use of renewable resources and promotion of energy efficiency measures;
- Support organic production processes and resource efficiency initiated by SMEs.

(OP14) SUPPORT THE SUSTAINABLE DEVELOPMENT OF THE NATIONAL ENERGY SECTOR, WHILE PROTECTING QUALITY OF AIR, WATER, SOIL AND BIODIVERSITY

- Rehabilitation of industrial and contaminated sites.

Agriculture and rural development

(OP13) REDUCE GHG AND NOx EMISSIONS

- Support investments to modernize farms (P5);
- Promote good practices in the agricultural sector;
- Promote carbon sequestration in agriculture.

(OP15) FIGHT CLIMATE CHANGE

- Rehabilitation and modernization of irrigation and drainage infrastructure
- Appropriate management of agricultural land in order to adapt to the effects of climate change.

Urban development

(OP13) REDUCE GHG AND NOx EMISSIONS

- Promote more compact, cross-functional, transit-oriented development measures as a way to reduce distances travelled by vehicles, develop infrastructure and reduce maintenance costs (P2);
- Encourage improvements at the level of energy efficiency in buildings and major urban infrastructure systems, monitor emissions footprint of administrative buildings and EMAS certification (P2);
- Promoting "smart cities" and "green cities" (P5).

Waste management

(OP13) REDUCE GHG AND NOx EMISSIONS

- Promote waste generation prevention;
- Increase the level of re-use or recycling of materials included in the waste stream, reduce the amount of materials to be managed as waste through promoting industrial

symbiosis processes and applying the concept of resource efficiency in the sustainable waste management;
- Separate collection of biodegradable waste and composting;
- Energy generation from waste;
- Management of commercial, industrial and hazardous waste;
- Domestic waste management, including prevention, reduction, sorting, recycling, biological mechanical treatment, heat treatment;
- Consolidate and expand integrated waste management systems, including energy recovery from waste;
- Promote the transition to a circular economy;
- Organize information programs and public debates to educate citizens for the promotion of a circular economy.

Forestry

(OP13) REDUCE GHG AND NOx EMISSIONS

- Sustainable forest management, taking into account carbon storage;
- Extension of wooded areas;
- Encourage the sustainable management of privately owned forests;
- Management of the carbon stocks in forests in protected areas, according to forestry legislation and regulations.

(OP15) FIGHT CLIMATE CHANGE

- Enhance forest management to improve their capacity to adapt to climate change adaptation;
- Adapting forest regeneration practices to needs imposed by climate change;
- Minimize the risk of climate change for forests and through forests for the environment in general.

Protecting quality of air, water, soil and biodiversity

(OP14) DEZVOLTAREA SUSTENABILA A SECTORULUI ENERGETIC NATIONAL, CU PROTECTIA CALITATII AERULUI, A APEI, A SOLULUI SI A BIODIVERSITATII

- Reducing greenhouse gas emissions emerging from the water supply and wastewater treatment sectors;
- Acquisition of high efficiency pumps to reduce GHG emissions emerging from investments in water supply and wastewater treatment;
- Collection and treatment of waste water;
- Air quality and noise reduction measures;
- Assess the vulnerabilities of natural habitats and species protected by flora and fauna based on the conservation status monitoring system;
- Maintain and increase the resilience of ecosystems;
- Increase biodiversity capacity to adapt to climate change by promoting adaptive management;
- Evaluation of services provided by ecosystems and implementation of the ecosystem approach in decision-making processes;
- Improve / develop knowledge and understanding about the role and contribution of biodiversity to adaptation to climate change;
- Protection, restoration and sustainable use of Natura 2000 sites;
- Protection of nature and biodiversity, green infrastructure.

Tourism and recreational activities

(OP15) FIGHT CLIMATE CHANGE

- Protection and expansion of natural recreation areas in and around cities;
- Strategic planning for the development of tourism destinations less dependent on climate change;
- Long-term planning for seasonal ecologic mountain resorts;
- Adapting and protecting coastal tourism in terms of infrastructure for climate change;
- Planning, policies and long-term development education for tourism to take into account the consequences of climate change;
- Protection, development and promotion of natural heritage and ecological tourism.

Public health and emergency response services

(OP15) FIGHT CLIMATE CHANGE

- Develop capacities for monitoring events caused by various factors, which have an impact on public health, on the national level, using impact functions for continuous assessment of public health
- Protect the health of citizens from impacts of disasters by strengthening the national emergency management system.

Education and increase of public awareness

(OP15) FIGHT CLIMATE CHANGE

- Raise knowledge and awareness of the impacts of climate change and how to adapt to them; introduction of school courses to understand climate change and the associated activities;
- Improve citizens' education on the reduction of GHG emissions and adaptation to climate change;
- Increase investments in equipment and know-how to reduce energy consumption;
- Implement a system for assessing and monitoring the effects of socio-economic development and coordinate measures to increase bio-capacity, including the reduction of the ecological footprint of Romania;
- Implementation of macro-region mobility schemes for the transfer of good practices and investment programs for mutual use of services (soft cooperation).

Insurances as tools for adaptation to climate change

(OP15) FIGHT CLIMATE CHANGE

- Increase utilization of and access to insurance products designed for extreme events for vulnerable groups: economically disadvantaged individuals, farmers, SMEs;
- Increase the institutional capacity of the insurance sector to develop insurance products for the adaptation to climate change;
- Apply measures to adapt to climate change, prevent and manage climate risks: floods, storms, frost, snow, fires and droughts (including awareness-raising, civil protection and disaster management systems and infrastructures); develop and update risk papers for each case and enhance the capacity of institutions in charge, such as the Meteorological Administration, to obtain data on temperatures, precipitation, water flows, etc.;

- Prevention and management of non-climatic risks (e.g. earthquakes) and risks related to human activities (e.g. technological accidents), including awareness-raising, civil protection, as well as disaster and infrastructure management;
- Support the compensation of additional costs due to climate conditions and difficulties for financial aid in outermost regions.

ii. Where relevant, regional cooperation in this area

According to the provisions of art. 5 par. (4-7), Regulation no. 2018/842 / EU, Romania could transfer part of the annual emissions allocations to non-ETS sectors. These transfers can be made through a tender, by using market intermediaries acting as agents or by bilateral agreements.

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

The funding lines of the 2021-2027 multiannual framework proposed in COM (2018) 375 are presented in the recapitulative table in Chapter 1.1. iii.

Green investment schemes

The use of CO2 emission certificates has led to the accumulation of significant amounts of money resulting from transactions with certificates, both at project level and between governments, during the application period of the Kyoto Protocol and also in the future (after the Paris Agreement), when transactions are made in dedicated markets.

In order to capitalize these investments, specific financial structures have been created, called "green investment schemes". The basic principle is to use non-service debt funds to attract additional funds provided by banks and / or IFIs (international financing institutions).

The funds for the capitalization of emission allowances can be used in two main ways, in the capital injection to a project, namely in the creation of investment guarantee funds.

In the case of capital injections, the funds secured by selling emission allowances on dedicated markets (e.g. EU-ETS) can be allocated on a competitive basis to the various projects (including energy efficiency) made by Romanian companies in cooperation with foreign partner companies. Thus, the project financing is composed out of three main components:

a) Of government issued emissions, that increase the return on investment rate;
b) Of emission reductions from projects producing Emission Reduction Units (ERUs);
c) Of credit (debt).

According to similar Union-wide funding experiences, a sum originating from funds without cost attracts about twice as much credit. The number of projects to be funded depends on the level of participation in each project, as well as on the total existing amount.

In the case of guarantee funds, the projects financing include the last components mentioned above, and the fact that there is a guarantee from the funds without cost leads to a lower risk, which is reflected in a lower debt service. As the level of guarantee can vary, projects of interest with higher guarantees can be supported. Given the level of guarantee, the number of projects to be funded may be higher than in the first case.

In conclusion, as an alternative to the existing legislative framework[24], according to which the revenues from the auctioning of emission allowances are managed by the Ministry of Transport, the central public environmental authority (The Ministry of Environment) and the Environment Fund Administration, Romania will consider the possibility of creating a fund especially for the non-commissioned funds originating from the emission allowance trading, that allow for the realization of projects, including through collaboration with other Romanian and foreign investment funds as well as with the international financial institutions.

3.1.2. Renewable energy

i. Policies and measures to achieve the national contribution to the binding 2030 Union target for renewable energy and trajectories as referred to in point (a)(2) Article 4, and, where applicable or available, the elements referred to in point 2.1.2, including sector- and technology-specific measures[25]

The main policies and measures considered by Romania for reaching the renewable energy target in 2030 will focus on adapting the primary and secondary legislative framework according to the provisions of the new Directive, but also on ensuring a stable and predictable tax regime that will limit the occurrence of unforeseeable or unjustified subsequent charges.

The adaption of the legislative framework will take into account both administrative aspects (related to simplifying the authorization procedures and, implicitly, the granting period) and the functioning of the electricity market in order to facilitate the integration of renewable sources. In this respect, the measures for operationalizing the coupling of intraday electricity markets, respectively introducing flexible long-term trading mechanisms on centralized markets (PCCB-FLEX, market for long-term contracts) will be essential.

The timeline for drafting / implementing relevant normative acts will consider not only the evolution of the national generation inventory, but also cost of available technologies, so that by 2025 (latest until 31st December 2024) they would have been subject to public consultations and approved in order to take effect by (the latest) 1st January 2025.

The policies and measures presented fall under priority objectives set out in different national sectorial strategies, at different stages of promotion and adoption.

(OP1) DIVERSIFIED AND BALANCED ENERGY MIX

- Increase renewable energy in energy mix

  Long-term energy production from renewable sources can be ensured by developing the infrastructure to increase the capacity for renewable energy production, by developing feasible market mechanisms and transforming the transmission and distribution network, considering modernization and digitalization projects.
  In order to stimulate national energy consumption and the integration of RES on fair market conditions, the following actions can be considered:
  - Introducing the possibilities for storage and aggregated production between multiple producers and / or consumers;
  - Introducing long-term risk insurance instruments for energy and green certificates;

[24] Government Emergency Ordinance no. 37/2018 amending and supplementing the Government Emergency Ordinance no. 115/2011 on establishing the institutional framework and authorizing the Government, through the Ministry of Public Finance, to auction the greenhouse gas emission allowances allocated to Romania at EU level
[25] Member States shall take into account the end of life for existing installations and the potential for repowering

  - Adapting the mechanisms / rules applicable to the electricity market so that they will consider the provisions of the "Clean Energy for All Europeans" legislative package;
  - Introducing a unique pricing mechanism that compensates for the imbalances of unscheduled RES plant, which are not disadvantaged by traditional operators due to fluctuations in the availability of RES resources;
  - Introducing the virtual power plant concept, which aims to integrate a large number of renewable units into existing power systems, by increasing flexibility of the grid-connected sources (for example, controlling the delivery frequency or interruption of energy delivery, with short notice period). Smart control of these elements could standardize the predictability of RES supply, delivering energy in a fluid and cost-effective manner, without overloading the network.

- Adopt advanced technologies in the energy sector by attracting private investments, supporting scientific research and developing strategic partnerships;
- Organize competitive bidding procedures to award the contracts to the development of installed capacities for wind and solar energy.

(OP2) CAPITALIZE ON NEW PRIMARY RESOURCES POOL FOR A LOW ENERGY DEPENDENCE LEVEL AND NATIONAL ENERGY SYSTEM RESILIENCE

- Establish geographical areas for the development of energy capacities using renewable energy sources:
  By 2025 studies allowing at least ten wind and solar development areas within national territory will be developed; for each area the delimitation and maximum capacity to be installed will be determined. In these development areas, simplified procedures will be put in place for authorization of works, for connection to the network and for obtaining authorizations after commissioning.

(OP4) ENSURE ENERGY STORAGE AND BACKUP SYSTEMS CAPACITIES

- Develop capacities and mechanisms to integrate the discontinuous RESs in the national energy system and in the electrical accumulators' systems, including the small storage capacities at the prosumer premises.

(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT

- Digitization of the national energy system in the transmission, distribution and consumption segments:
  The digitalization of the Romanian energy system, including of transmission and distribution networks ("smart grids") plays an important role in increasing the energy production from renewable sources and in transforming the Romanian energy market in a "fit-for-RES" market and in increasing the RES integration.

  <u>Smart metering</u>

  The introduction of smart meters in energy systems must be a national priority as a first step in the digitalization of infrastructure. Currently the complete transition from classical meters system to a smart one is estimated to end the latest at the end of 2028. The main objective of smart metering is to streamline meter reading, optimize operating costs, reduce technological losses, reduce interruptions and improve the fixing time in case of interruptions.

Smart grids

Smart grids allow bidirectional communications and real-time monitoring and coordinating systems that lead to a more efficient network operation (for example, for forecasting and identifying congestion, network flexibility) and ultimately a lower cost for distribution.
Distribution operators may use this data to streamline work processes, for predicting maintenance services and / or the need to replace certain assets, for projecting and quickly remedying supply interruptions, as well as increasing asset performance.

- Encourage domestic, industrial and agricultural prosumers build-up, along with the development of electrical grids and smart meters;

- Integration of distributed production systems and prosumers into the power grid system:
- In Romania, solar capacities are expected to be developed in the next years either though medium-sized solar parks, made on degraded or poorly productive land, and also though small dispersed capacities made by energy consumers who can make the transition towards prosumers.
- By adopting the Law no. 184 / 2018 establishing the system for promoting the production of energy from renewable sources of energy, a forward step was done in regulating the prosumer activity in Romania. According to the new legislation, prosumers have benefits, as follows:
    - The scheme applies to prosumers that own power generation units from renewable sources with an installed power capacity of maximum 27 kW per household in individual houses, apartment blocks, residential areas, commercial or industrial areas, etc.;
    - Electricity distribution operators are obliged to connect the prosumers in accordance with the specific regulations issued by the regulator;
    - The prosumers have the possibility to sell the electricity to the suppliers with whom they concluded electricity supply contracts at a price equal to the weighted average price recorded in the day-ahead-market in the previous year; suppliers who have contracts with prosumers are obligated to take over energy at their request;
    - Prosumers are exempted from excise duty on the amount of electricity produced from renewable sources for self-consumption, as well as for the surplus sold to suppliers;
    - Prosumers, individuals, are exempted from the annual and quarterly green certificates purchase obligation for electricity produced and used for own final consumption, other than losses of the power plant;
    - Prosumers benefit from electricity suppliers with whom they have concluded electricity supply contracts, of regularization service between the value of the delivered electricity and the value of the electricity consumed by the network;
    - These measures aim to increase the amount of electricity from renewable sources produced by prosumers; the Energy Strategy of Romania 2019-2030, with perspective of 2050, estimates that, for 2030, from the total installed power capacity of solar, 750 MW will be realized as capacities owned by prosumers.

(OP8) REPLACE ELECTRICITY PRODUCTION CAPACITIES TO BE DECOMISSIONED BY 2030 WITH NEW, EFFICIENT AND LOW EMISSION CAPACITIES

- Invest in new power generation capacities while achieving the energy security, competitiveness and decarbonisation targets of the energy sector; consider investments in energy innovative technologies;
- Promote technological neutrality to ensure a national energy mix with a minimal environmental impact;
- Ensure the financing mechanisms for investments in new electricity production capacities with no GHG emissions, while being economically efficient;
- Provide financing mechanisms to finalize hydro-energetic facilities for complex utilization (agricultural irrigations, flood protection, water supply, etc.)**.**

(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY

- Support scientific research of energy transition related subjects - RES technologies, energy efficiency, electro-mobility;
- Adopt support measures including research, establish common standards and develop the necessary infrastructure for electric and hybrid cars.

Transport

(OP9) INCREASE ENERGY EFFICIENCY

- Develop the infrastructure for alternative fuels;
- Increased efficiency allocation of energy resources throughout the transport sector by optimizing the fossil fuels and alternative fuels ratio.

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

Statistical transfers of renewable energy

The statistical transfer mechanism stipulates the transfer of a RES surplus produced in one EU country to other Member States. This mechanism allows for higher flexibility in reaching the quotas established for EU's Member States, providing them with a tool for developing the RES potential in a mutually advantageous way. In this way, countries with increased RES potential may support other member countries to achieve individual targets. This way the cooperation between Member States was introduced with the approval of Directive 2009 / 28 / EC on the promotion of the use of energy from renewable sources, and the continuance of this mechanism is foreseen in the "Clean Energy Package".

In this context, the tools provided by this cooperation mechanism (statistical transfer by two or more Member States of RES projects) could represent an opportunity to increase the RES installed capacity in Romania.

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

Power Purchase Agreements on long term with final customers (PPA)

Primary and secondary legislation will be amended to offer possibility to the final customers and projects developers to conclude, on centralized markets, according to the regulation project elaborated by NERA, a long-term contract (with the aim of uniformizing revenues and reduce the risk of price volatility), in fact a market instrument (without adjacent support measures), which can also attract private funding.

Typically, a PPA is a bilateral long-term energy supply contract concluded by the final customer (buyer) and the energy producer (seller). The contract stipulates the hourly supply of electricity (with related origin guarantees) depending on the consumption profile of the final customer. This type of contract comes to support customers who want to buy exclusively renewable energy. In addition, it gives the customer the opportunity to directly negotiate the contract with the energy producer, being also independent and insured against energy price fluctuations in high demand situations.

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

- Reduce bureaucracy through transparency, digitization and the introduction of the "one-stop shop".

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

There is no clear set of policies and measures for this section at the time of drafting the document.

vi. 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
– other biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production

To encourage the power generation from renewable sources, starting with 2012, by the Order of the Ministry of Agriculture and Rural Development no. 46 from 5th March 2012, the procedure for issuing the certificate of origin of biomass from agriculture and related industries used as fuel or raw material in power generation was introduced. For the purpose of this procedure, biomass from agriculture and related industries, used as fuel or raw material for power generation, one could understand the biodegradable fraction obtained from:

a) Agricultural crops and non-agricultural crops intended for the production of biomass, used for power generation, according to the list in Appendix no. 1 of the Order of the Ministry of Agriculture and Rural Development no. 46 from 5th March 2012;
b) Waste from agriculture, horticulture, aquaculture, fishing and from the preparation of food processing, according to the list in Appendix 2. of the Order of the Ministry of Agriculture and Rural Development no. 46 from 5th March 2012;
c) Certificates of origin for biomass from agriculture and related industries, used as fuel or raw material for power generation, provided in art. 3 par. (9) of the Law no. 220/2008, are issued by the Ministry of Agriculture and Rural Development, through the Regional and Bucharest Agricultural Departments;
d) Also, starting with 2016 the procedure for issuing certificates of origin for biomass from forestry and related industries and used in the power generation (approved by Ministry Order no. 1534/2016) from RES was introduced. For the purpose of this procedure, biomass from forestry and related industries, for which certificates of origin are issued, means:

I. the biodegradable fraction of the products resulting from the primary and secondary processing of wood in the Romanian territory – bark, sawdust, chips resulting from processing, heads, holes from profiling lines, wood scraps resulting from processing or recycling of wood and / or of wood products, including imports, which do not fall within the category of wood materials, according to the legal provisions in force, as well as downgraded timber in its own premises as a result of the technological process of wood processing;

II. wood chips, only from the categories listed under a).

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

See ch. 3.1.1.

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

Not applicable.

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

For the gradual phase out of energy subsidies, especially from fossil fuels, as well as for encouraging the transition to electromobility in transport, the planned measures are found within OP 9, OP 12 and OP 13.

(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY

- Support scientific research of energy transition related subjects - RES technologies, energy efficiency, electromobility.

(OP13) REDUCE GHG AND NOx EMISSIONS

- Introduce strong economic incentives for an environmentally friendly transport system through price instruments;
- Develop cycling infrastructure;
- Promote alternative fuel infrastructure, complement and simplify the related legal framework.

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

See par. 4.6. iv.

3.2.Dimension Energy Efficiency

The policies, measures and programs planned to achieve the national indicative contributions related to energy efficiency at the level of the year 2030, as well as other targets mentioned in point 2.2 of the EUGR, including measures and instruments (also the ones of a financial nature) planned to promote the energy performance of buildings, in particular as regards 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

According to Article 7, paragraph (1) of Directive 2012/27/EU, in order to achieve energy efficiency objective, it would be necessary to achieve energy savings each year, from 1 January

2014 to 31 December 2020, of 1.5% of the annual energy sales volume to the final consumers, by all energy distributors or all energy suppliers, calculated as an average over the three-year period prior to 1 January 2013. [26] On the other hand, Romania should reach a real (indicative) annual rate of savings of at least 0.8% between 2021 and 2030 (as set out in Article 7 of the amended 2012/27/EU Directive). Energy efficiency policy measures for the period 2021-2030 will reflect the continuation of the National Energy Efficiency Action Plan IV.

ii. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private[27] , 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

(OP9) INCREASE ENERGY EFFICIENCY

- Exploit energy efficiency potential of the building sector, via thermal insulation programs for the public sector, apartment buildings and the energy poverty affected communities;
- Integrated approach on the district heating sector, with coordination of investment projects throughout the supply chain - production, transport and the efficient heat usage (P1);
- Develop smart metering and smart grids (P1, P4, P5);
- Promote heating systems with thermal panels for heated water production, especially in rural areas (P1);
- Efficient use of biomass, modern heat generation systems, in particular for rural heating (P1);
- Step-by-step implementation of smart city concept, integrating developed infrastructure; implementation of IoT at residential level;
- Continue reimbursement of the energy efficiency investments through "Green House" (Casa verde) and "Green House Plus" (Casa Verde plus) programs (P1);
- Improve the energy performance of buildings (e.g. via audits, energy performance certificates, technical surveillance of heating and air conditioning systems, switching owners or tenants, change of the building's utilization, GHG emission footprint, etc.) (P1);
- Ease the rental restrictions preventing energy performance improvements;
- Restrictions on sale or rental of buildings belonging to the lowest energy performance categories;
- Establish performance standards for buildings' renovation / insulation elements and HVAC systems;
- Develop minimum renovation standards in accordance with the EPBD directive;
- Opportunity analysis for efficient, non-polluting district heating systems (P1);
- Monitor / Re-enforce the construction codes observance;
- Attract private capital to invest in energy efficiency of buildings;
- Support Green Mortgages / Green Loans for buildings renovation while observing high standards of energy efficiency and sustainability (P1);
- Support the local operators' development - service, materials and equipment providers - for buildings' rehabilitation;
- Specialization and training programs for key professions and disciplines for building rehabilitation;
- Support research and development projects and demonstration projects, promoting new technologies and new extensive renovation techniques (P5).

[26] Energy Efficiency National Action Plan IV
[27] In accordance with Article 2a of the 2010/31/EU Directive

iii. Description of policy and measures to promote energy services in the public sector and measures to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models[28]

(OP9) INCREASE ENERGY EFFICIENCY

- Elaborate the regulatory framework for the operation of ESCOs and energy performance contracts (deadline: T2 2019);

iv. Other planned policies, measures and programs 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[29], consumer information and training measures[30] , and other measures to promote energy efficiency[31]

(OP7) ROMANIA'S PROACTIVE PARTICIPATION IN THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES

- Technical assistance to acquire European financing for the development of strategic infrastructure projects and energy efficiency programs (P4).

(OP9) INCREASE ENERGY EFFICIENCY

Cross sectorial

- Creation of an energy efficiency investment fund (FIEE), financed by private funds, European funds, state budget (P4);
- Investments in high-efficiency cogeneration, district heating and cooling (P4);
- Use of energy efficiency criteria for public procurement, where appropriate;
- Introduce quality and energy performance certifications for industrial installations and products;
- Restrictions on sale or rental of buildings belonging to the lowest energy performance categories;
- End-user information and advice campaigns about the benefits of investing in energy efficiency (P1);

Manufacturing

- Stimulate economic competitiveness through investments to ensure energy efficiency within the industrial processes;
- Allocate investments to energy efficiency increase of manufacturing industry processes, including the ones from renewable energy sources (P1);
- Support SMEs to invest in energy efficiency;
- Establish, implement, maintain and improve an energy management system (EnMS) according to ISO 50001 and Romanian SRAC certification.

Transport

- Develop the infrastructure for alternative fuels (P4);
- Increased efficiency allocation of energy resources throughout the transport sector by optimizing the fossil fuels and alternative fuels ratio;

[28] In accordance with Article 18 of the 2012/27/UE Directive
[29] In accordance with Article 8 of the 2012/27/UE Directive
[30] In accordance with Articles 12 and 17 of the 2012/27/UE Directive
[31] In accordance with Article 19 of the 2012/27/UE Directive

- Develop sustainable, resilient, climate-friendly, smart, safe and intermodal TEN-T rail transport networks;
- Development of intelligent digital road and rail traffic management systems
- Development of intelligent digital urban management systems;
- Optimize and reduce energy consumption in transport by supporting the development of multimodal transport (including TEN-T), national waterways and ports;
- Increase efficiency of urban transport, including the extension of the metro transport network.

(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY

- Capitalize on national primary energy resources as much as possible within the domestic economy to generate an economic multiplier effect of the added value (P1, P5);
- Support scientific research of energy transition related subjects - RES technologies, energy efficiency, electro-mobility (P1, P5);
- Stimulate the public and private market for alternative fuel vehicles and correlate the development of their energy type production.

(OP19) REDUCE ENERGY POVERTY AND PROTECT THE VULNERABLE CONSUMER TO ENSURE HUMAN RIGHTS

- Implement public programs for thermal insulation of buildings for communities affected by energy poverty to reduce energy losses and lower heating costs (P4).

See ch. 3.4.4.

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

See par. 3.2.ii.

vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure [32]

(OP9) INCREASE ENERGY EFFICIENCY

- Reduce losses from electricity grids, natural gas and centralized heat transport systems (P4);
- Increase energy efficiency of pumps from large water supply systems;
- Smart medium and low voltage power distribution systems (including smart grids and IT systems) and efficient use of local energy sources including assigned storage (P1, P3, P4).

(OP18) INCREASE THE ACCESS OF THE POPULATION TO ELECTRICAL ENERGY, HEAT AND NATURAL GAS

- Implement a new mechanism to support high-efficiency cogeneration (P1).

vii. Regional cooperation in this area, where applicable

Not applicable.

[32] In accordance with Article 15, paragraph (2) of the 2012/27/UE Directive

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

See par. 1.1.iii, table with financing measures.

3.3.Dimension energy security[33]

i. Policies and measures related to the elements set out in point 2.3[34]

This section presents the policies and measures applicable to the energy security dimension. If measures to maintain and increase energy security fall within the scope of several dimensions, a separate reference will be made (Pillars 1-5: P1, P2, P4 or P5). The recapitulative table of the main objectives, policies and measures of the 5 dimensions of the plan can be found in Chapter 1.1.iii.

(OP1) DIVERSIFIED AND BALANCED ENERGY MIX

- Continue the sustainable exploitation and use of all types of country's primary energy resources (P1);
- Maintain diversified and flexible power generation capacities based on the Romania's energy mix (P1, P4);
- Adopt advanced technologies in the energy sector by attracting private investments, supporting scientific research and developing strategic partnerships (P1, P2, P5);
- Develop production capacities with low GHG emissions - nuclear, RES, hydropower (P1).

(OP2) CAPITALIZE ON NEW PRIMARY RESOURCES POOL FOR A LOW ENERGY DEPENDENCE LEVEL AND NATIONAL ENERGY SYSTEM RESILIENCE

- A stimulating investment environment for the exploration and development of oil, natural gas and lignite deposits, as well as for increasing the recovery rate from the mature fields;
- Timely provisioning of the necessary infrastructure regarding market access for new natural gas fields production, both onshore and offshore (P1, P4);
- Establishing geographic areas for the development of energy capacities using renewable energy sources) (P1, P4).

(OP3) ENHANCE THE INTERCONNECTORS CAPACITY OF THE ENERGY TRANSMISSION NETWORK

- See ch. 3.4.1 and 3.4.2.

Romania will maintain and expand the "Black Sea Corridor" and "Mid Continental East Corridor", included in Priority Corridor 3 "North-South Interconnections for Electricity in Central and Southeast Europe". These projects are meant to integrate renewable production from both member states (Bulgaria, Czech Republic, Hungary, Poland, Slovakia) and non-member states (Serbia). Furthermore, the existing link with Ukraine (Rosiori Mukacevo) will remain functional and used. The BRUA corridor is aimed at developing the natural gas transmission capacities between the interconnections of the Romanian transport system and the similar systems of Bulgaria and Hungary. [35] The southern transport corridor, although national, has regional strategic relevance and is designed to facilitate the transport of future deep-sea productions

[33] All policies and measures must reflect the "energy efficiency first of all" principle
[34] Must ensure consistency with the Preventive Action Plans and Emergency Plans under Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 on measures to ensure the security of gas supply and repealing Regulation (EU) 994/2010 (JO L 280, 28.10.2017, p. 1), and also with the plans for risk preparation in the electricity sector and) nr. (EU) 2018 / ... [proposed by COM (2016) 862 on risk preparation, based on the Regulation (EU) 2018/... [proposed by COM (2016) 862 on preparing for risks in the electricity sector and repealing Directive 2005/89 / EC]
[35] Development plan for the national natural gas transmission system 2018-2027, SNTGN Transgaz SA - draft

from the Black Sea plateau to the European gas pipelines. At the same time, the existing interconnection pipeline between Romania and Moldova (Iasi - Ungheni) requires further development of the Romanian natural gas transmission system in the area. Consequently, a number of 4 sub-projects have been initiated to meet this requirement, namely two new pipelines (Onesti - Gheraesti and Gheraesti Letcani) and two new compressing stations (Onesti and Gheraesti). [36]

(OP4) ENSURE ENERGY STORAGE AND BACKUP SYSTEMS CAPACITIES

- Enforce mandatory reserves of crude oil, petroleum finished products and natural gas (P4);
- Develop electricity storage capacities via hydroelectric pumping systems; build-up Tarnita-Lapustesti station (P1, P4);
- Develop capacities and mechanisms to integrate the discontinuous RES in the national energy system and in the electrical accumulators systems, including the small storage capacities at the prosumer premises (P1, P4);
- Encourage initiatives to modernize existing natural gas storage capacities in order to achieve increased flexibility by using multi-cycle storage capacities[37];
- Increase the capacity of natural gas storage by promoting the respective projects as projects of common interest[38];
- Increase of natural gas storage capacity in the Sarmasel warehouse (cluster 6.20.6);
- Promote the Depomures natural gas storage project (Cluster 6.20.4);
- Establish a short-term power reserve market (quarter, year).

(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT[39]

- Digitization of the national energy system in the transmission, distribution and consumption segments and introduction of the IoT and AI in the transport and distribution systems' management;
- Encourage domestic and industrial consumers to build-up different services;
- Encourage domestic, industrial and agricultural prosumers build-up, along with the development of electrical grids and smart meters;
- Integration of distributed production systems and prosumers into the power grid system;
- Providing dynamic transport / distribution tariffs starting with 2019 and 2020, respectively

(OP6) PROTECT THE CRITICAL INFRASTRUCTURE AGAINST PHYSICAL, CYBER ATTACKS AND NATURAL DISASTERS

- Implement measures to physically secure the critical infrastructure against any potential terrorist attack;
- Cybersecurity of the power grid control systems by re-enforcing protection barriers and international cooperation;
- Ensure the whole energy grid maintenance and upgrade in order to maintain the standard safety level of the critical objectives (lakes, dams, dykes, etc.);
- Population warning / alert systems put in function and civil defense exercises implementation.

[36] PDSN 2018-2027, pag 44
[37] Development plan for the national natural gas transmission system 2018-2027, SNTGN Transgaz SA - draft
[38] Development plan for the national natural gas transmission system 2018-2027, SNTGN Transgaz SA - draft
[39] NERA Order 53/2013 amended and supplemented by 16/2017, Art. 80 and NERA Order 169/2018, Art. 114

(OP8) REPLACE ELECTRICITY PRODUCTION CAPACITIES TO BE DECOMISSIONED BY 2030 WITH NEW, EFFICIENT AND LOW EMISSION CAPACITIES

- Invest in new power generation capacities while achieving the energy security, competitiveness and decarbonisation targets of the energy sector; consider investments in energy innovative technologies (P1);
- Promote technological neutrality to ensure a national energy mix with a minimal environmental impact (P1, P4);
- Ensure the financing mechanisms for investments in new electricity production capacities with no GHG emissions, while being economically efficient (P1, P4).

(OP9) INCREASE ENERGY EFFICIENCY

See ch. 3.2.

- Smart medium and low voltage power distribution systems (including smart grids and IT systems) and efficient use of local energy sources including assigned storage.[40]

(OP10) INCREASE COMPETITION ON DOMESTIC ENERGY MARKETS

See ch. 3.4.3.

(OP11) LIBERALIZE ENERGY MARKETS AND ENSURE THEIR REGIONAL INTEGRATION, SO THE ENERGY CONSUMER MAY BENEFIT FROM THE BEST PRICE OF ENERGY

See ch. 3.4.2.

(OP15) FIGHT CLIMATE CHANGE[41]

- Reduce the risk of water scarcity;
- Reduce flood risk;
- Increase the safety of dams and dikes;
- Improve water infrastructure;
- Adjust existing codes and norms in the construction industry, respective other codes and norms in the field, to meet climate conditions and extreme events;
- Adaptation of risk analysis, coverage plans and emergency response plans to climate change;
- Strengthen local capacities (P4);
- Increase use of preventive measures and good preparedness for climate-related emergencies in the energy sector and other key industries;
- Raising awareness of private industrial property owners with regard to climate change adaptation;
- Support use of insurances for industrial losses due to climatic events.

ii. Regional cooperation in this area

(OP7) ROMANIA'S PROACTIVE PARTICIPATION IN THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES[42]

- Romania's participation in configuring solidarity mechanisms to ensure energy supply security during crisis situations;
- The Memorandum of Understanding complementing the Central and South-Eastern European Connectivity (CESEC) initiative with a Joint approach on electricity market, energy efficiency and renewable development;

[40] Multiannual European Funds Framework
[41] The Single National Plan for the Implementation of the National Climate Change Strategy
[42] Memorandum of Understanding complementing the Central and SouthEastern European Connectivity (CESEC) initiative with a Joint approach on electricity market, energy efficiency and renewable development 11742 / 2017 si EU 2017/1938

- Ensuring the security of gas supply by ensuring the proper and continuous functioning of the internal gas market;
- Allowing exceptional measures to apply when the market is no longer able to supply the necessary gas quantities, including a last resort solidarity measure;
- Establishing a clear definition and attribution of responsibilities between natural gas undertakings, the Member States and the Union, both in terms of preventive action and response to actual supply disruptions;
- Establish transparent mechanisms for coordination of emergency planning and response planning at national, regional and Union level.

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

(OP3) ENHANCE THE INTERCONNECTORS CAPACITY OF THE ENERGY TRANSMISSION NETWORK

The BRUA project, with both phases (Phase I and Phase II), is included in the TYNDP 2018 European Natural Gas Transport Development Plan, with TRA-F-358.zvo identification code, and on the up-to-date List of Projects of Common Interest, adopted in 2017, (List 3/2017) in the form of two distinct projects, with their own encodings:

I. the development of transport capacity in Romania, from Podisor to Recas, including a new pipeline, a new metering station and three new compressor stations in Podisor, Bibesti and Jupa-ROHUAT/BRUA, phase I, code 6.24.1, 2nd position;
II. the expansion of the transport capacity in Romania from Recas to Horia towards Hungary, up to 4.4 bcm/a and the expansion of the compressor stations from Podisor, Bibesti and Jupa-ROHUAT/BRUA, phase II, code 6.24.4, 4th position.

Given the status of a project of common interest, since the first PCI list, SNTGN Transgaz SA has received a grant from the Connecting Europe Facility (CEF) to design the three compression stations. The BRUA-Phase I project was proposed to receive a grant of EUR 179.3 million. On September 9, 2016, the financing contract was signed.

On the list 3 PCI / 2017, position 5 was also included "Black Sea Coast – Podisor Pipeline for the Black Sea natural gas uptake". Given that the project will meet all the eligibility criteria set out in the Regulation 347/2013, SNTGN Transgaz SA intends to submit an investment application to access an irredeemable grant for works through the Connecting Europe Facility mechanism.

The project "Interconnection of the national natural gas transmission system with the international natural gas pipeline T1 and Isaccea reverse flow" was included in the 3rd PCI / 2017 list in 1st position, as part of the priority NSI East corridor.

The project "Developments of the NTS in the North - East area of Romania in order to improve the natural gas supply of the area as well as to provide transport capacities to / from the Republic of Moldova" was accepted as eligible, according to the conditions set by POIM for the priority axis 8, and has a financial allocation of about EUR 55 million.

On the same large operational infrastructure program, Transelectrica submitted a request for financing from European funds for the 400 KV Gutinas - Smardan line.

The project of common interest 400 kV Cernavoda - Stalpu 400 kV line received a favorable opinion for financing about 50% of the eligible costs.

Additionally, see 3.4.1 and 3.4.2.

(OP8) REPLACE ELECTRICITY PRODUCTION CAPACITIES TO BE DECOMISSIONED BY 2030 WITH NEW, EFFICIENT AND LOW EMISSION CAPACITIES

- Ensure the financing mechanisms for investments in new electricity production capacities with no GHG emissions, while being economically efficient (P1, P4)[43].

3.4.Dimension internal energy market[44]

3.4.1. Electricity infrastructure

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

(OP3) ENHANCE THE INTERCONNECTORS CAPACITY OF THE ENERGY TRANSMISSION NETWORK

- Establish corridors for energy transmission networks and set up a specific legal framework to ensure land availability, authorizations and other measures necessary for their deployment;
- Finalize the 400 kV power ring of the national electricity transmission system;
- Develop new lines to link the new production capacities with the interconnection points
- Rehabilitation of the hydrocarbon transport systems;
- Regional coordination for on-time development, financing and put-in-function of the international energy infrastructure projects;
- Financing the development of bidirectional interconnection capacities and related components of the national energy transmission systems;
- Network codes and entry / exit tariffs harmonization among national energy transmission systems in order to facilitate the regional energy flows.

(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT

- Digitization of the national energy system in the transmission, distribution and consumption segments and introduction of the IoT and AI in the transport and distribution systems' management;
- Encourage domestic and industrial consumers to build-up different services;
- Encourage domestic, industrial and agricultural prosumers build-up, along with the development of electrical grids and smart meters;
- Integration of distributed production systems and prosumers into the power grid system.

(OP16) ENSURE TRANSPARENCY OF THE ADMINISTRATIVE ACT, SIMPLIFICATION OF BUREAUCRACY OF THE ENERGY SECTOR

- Reduce bureaucracy through transparency, digitization and the introduction of the "one-stop shop";
- Introduce best practices on transparency and accountability in the interaction between consumers and the administrative system;
- Develop institutional mechanisms (such as integrity alerts), publish reports on completed public procurement processes and all sponsorship activities on a regularly basis;
- Eliminate conflicts of interest between public institutions and energy companies with state capital.

[43] Strategia Energetica a Romaniei pentru perioada 2019-2030 cu perspectiva anului 2050
[44] Politicile si masurile trebuie sa reflecte principiul „eficienta energetica pe primul loc"

ii. Regional cooperation in this area [45]

Romania will continue to participate in projects related to market coupling (based on a common methodology for the calculation of interconnection capacities) in the CORE region, covering former CWE and CEE regions, with EEA / WB cooperation actions to take place considering the achievement of the priority objectives.

Stakeholders, including Romania, agreed upon further extending their cooperation, set out in the Memorandum of Understanding, which extends the initiative to integrate the central eastern and south eastern European gas and electricity markets (CESEC), following a common approach with respect to electricity market, energy efficiency and development of renewable energy sources. The associated action plan includes main common objectives:

- Electricity markets, infrastructure and security of supply (e.g. the development of a competitive regional energy market in Southeastern Europe to ensure security of supply at the lowest cost for final consumers, development of regional energy sales, through common methodologies for calculating interconnection capacities, as well as pilot projects for market coupling)
- Renewable energy (e.g. the need to adopt measures in order to meet global / sectoral targets (transport) and, in this context, ensure the exchange of information and best practices between the contracting parties);
- Energy efficiency (e.g. a tool to increase security of supply, facilitating the reduction of GHG emissions while boosting economic growth; stimulate job creation and reduce energy poverty).

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

(OP7) ROMANIA'S PROACTIVE PARTICIPATION IN THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES

- Technical assistance to acquire European financing for the development of strategic infrastructure projects and energy efficiency programs.

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

(OP7) ROMANIA'S PROACTIVE PARTICIPATION IN THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES

- Support for the awareness and submission of applications to include various projects in the EU projects of common interest lists.

(OP18) INCREASE THE ACCESS OF THE POPULATION TO ELECTRICAL ENERGY, HEAT AND NATURAL GAS

- Improving access to alternative energy sources through the development of distribution networks
- Develop, from various sources of funding, micro-networks and distributed power generation systems, with priority for communities without access to electricity
- Develop public policies at the level of local administration units on how to ensure heat supply for communities

[45] In afara grupurilor regionale pentru proiecte de interes comun, instituite in temeiul Regulamentului (UE) nr. 347/2013

- Develop gas distribution networks, respectively the elaboration of a National plan for the development of natural gas distribution networks in order to supply both communities, which are not connected to the networks, and economic agents, who use gas in their production process.

Romania also proposes to carry out an analysis during 2021-2022 on the possibility of injection of hydrogen in the form of synthesis gas from RES (after being brought to the methane standard by the reaction with CO2) in the natural gas transmission / distribution systems. The surplus electricity from variable renewable sources thus converted could be transported over large distances and / or stored. In this way, the transport / distribution systems could be used at the optimal capacity for the entire technical lifetime, without being limited to the duration of gas extraction from onshore / offshore internal perimeters.

Studying and subsequently implementing this alternative could benefit Romania's economic development in a consistent way with European decarbonisation policies by increasing the use of RES in final consumption.

ii. Regional cooperation in this area [46]

Concerning the implementation of regional projects, Romania collaborates with Serbia, Montenegro and Italy (Mid Continental East Corridor), and with Bulgaria (Black Sea Corridor).

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

(OP7) ROMANIA'S PROACTIVE PARTICIPATION IN THE EUROPEAN ENERGY DIPLOMATIC INITIATIVES

- Technical assistance to acquire European financing for the development of strategic infrastructure projects and energy efficiency programs.

3.4.3. Market integration

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

(OP10) INCREASE COMPETITION ON DOMESTIC ENERGY MARKETS

- Develop the internal gas market by increasing traded volumes on centralized, transparent and non-discriminatory markets, as well as increasing liquidity, whilst further enhance coupling with the European gas market;
- Integration of the Romanian energy markets into the single European energy market, in order to increase the regional role of the Romanian stock exchanges into the trading of energy products;
- OPCOM's participation in all relevant initiatives aiming to facilitate the integration of Romania's electricity market in the internal energy market.

(OP11) LIBERALIZE ENERGY MARKETS AND ENSURE THEIR REGIONAL INTEGRATION, SO THE ENERGY CONSUMER MAY BENEFIT FROM THE BEST PRICE OF ENERGY

- Further, increase the degree of transparency and liquidity of energy markets.

[46] In afara grupurilor regionale pentru proiecte de interes comun, instituite in temeiul Regulamentului (UE) nr. 347/2013

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

The main measures for market integration include the following actions:

- Address the obstacles and lacking conditions that interfere with the implementation of market coupling;
- Introduce a new method to calculate capacity, agreeing on the method to calculate capacity in the region; increase availability of cross-regional capacities;
- Ensure market liquidity through the implementation of policies and measures, in order to eliminate the barriers to participate in the energy exchange;
- Ensure market flexibility by improving markets in the short term, provide a framework and eliminate barriers to facilitate demand response;
- Ensure market access for independent aggregators;
- Implement the smart meter system and accelerate the digitization of transmission and distribution grids;
- Encourage suppliers to offer dynamic electricity price contracts;
- Eliminate market entry barriers for new suppliers or energy service providers.

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

Not applicable at the moment.

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

- Implement energy efficiency measures for vulnerable consumers
- Implement programs for social assistance / social transfers addressed to vulnerable consumers
- Implement disconnection guarantees for vulnerable consumers

v. Description of measures to enable and develop demand response including those addressing tariffs to support dynamic pricing [47]

See ch. 2.4.3.

3.4.4. Energy poverty

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

Romania's Energy Strategy 2019-2030, including a 2050 perspective, defines objectives, policies and measures aiming to protect vulnerable consumers through properly adjusting the level of social assistance for energy costs, especially in the poor areas of the country.

Operational objectives, policies and measures to reduce energy poverty are:

(OP18) INCREASE THE ACCESS OF THE POPULATION TO ELECTRICAL ENERGY, HEAT AND NATURAL GAS

[47] In conformitate cu articolul 15 alineatul (8) din Directiva 2012/27/UE

- Develop, from various sources of funding, micro-networks and distributed power generation systems, with priority for communities without access to electricity.

(OP19) REDUCE ENERGY POVERTY AND PROTECT THE VULNERABLE CONSUMER TO ENSURE HUMAN RIGHTS

The implementation of this objective will be achieved through the following two main measures, while targeted at consumers with an acute need for assistance.

- Implement public programs for thermal insulation of buildings for communities affected by energy poverty to reduce energy losses and lower heating costs;
- Consistent definition of the term vulnerable consumer, protection of the vulnerable consumer through appropriate social assistance.

OP5 and OP9 also refer to the topic in question, while they mainly relate to the fight against energy poverty through energy efficiency, as well as to improve the transmission, distribution and consumption of electricity.

Operational actions are grouped into two categories of measures, both financial and non-financial.

Non-financial measures

1. Adapt a clear political and legal framework

Energy poverty should be understood as a cumulation of factors of which the most important is income-related (taking into account the income / energy expenditure ratio within a household). A holistic approach to this phenomenon should lead to the diversification of measures to combat energy poverty.

The concept 'vulnerable consumer' has to be defined in an integrated way and should include all the factors that may cause vulnerability: commercial behavior, market design, structural factors and access to energy, the consumer's individual situation and socio-demographic factors. At present, the incomplete definition of the vulnerable consumer has a negative impact on the efficiency of both financial and non-financial measures in Romania.

2. Improve the system for collecting and monitoring data on poverty and energy vulnerability

A single database has to be introduced to circumscribe the phenomenon of energy poverty and to define and update the number of vulnerable consumers by the authorities involved.

The Ministry of Energy collaborates with the Ministry of Labor, Family, Social Protection and Elderly, the latter being responsible for the implementation of the national action plan for energy poverty. The plan sets out the definition of critical situations and consumers who cannot be disconnected in those situations, and how operators can recover associated costs, based on a specific procedure approved by Government Decision and proposed by the Romanian Energy Regulatory Authority (ANRE).

According to the National Strategy on Social Inclusion and Poverty Reduction for the period 2015-2020 and the Strategic Action Plan for 2015-2020, policies aim directly at reducing poverty and increasing social inclusion in several key areas: social assistance and social security rights, energy poverty, employment, education, health, social participation and social services.

As part of the Strategic Action Plan, social protection measures also include improving the performance of the social assistance system to protect consumers with low incomes, one of the specific objectives being to protect low-income and vulnerable consumers against shocks from rising energy prices. Responsibility for achieving these objectives lies with the Ministry of Labor.

3. Ensure non-financial support for vulnerable consumers with low-income through the possibility of preferential payment arrangements (installment scheme for payment for utility bills);

4. Implementation of the National social security IT system.

Financial measures

Romania provides assistance for domestic heating according to government emergency ordinance no. 70/2011, repealed and replaced by Law no. 196/2016, which will enter into force from 1 April 2021.

In order to grant equitable subsidies for thermal energy, the implementation of the National social security IT system is a necessary prerequisite to build capacity at the level of local public administration authorities. Those authorities will ensure the processing of data on applicants and the verification of eligibility criteria for vulnerable consumer categories. In this way, the subsidy, currently applicable to all heat consumers, will be granted only to vulnerable consumers who have been identified by the responsible authorities, in accordance with Law no. 196/2016.

Currently, the Law of Electricity and Natural Gas no. 123/2012, as amended, offers the possibility to establish a solidarity fund for the financial support of the vulnerable consumer. In the future, this fund may be fed by additional contributions and / or taxation of unexpected profits from producers and suppliers of electricity and natural gas, resulting from favorable market conditions and / or short-term transactions.

3.5.Dimension research, innovation and competitiveness

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

The Programs for stimulating the research / innovation activities developed at Cabinet level have a general scope, with fundamental research being prioritized across all domains, including Energy. Per existing constraints, the progress of the research sector would continue upon priorities, in order to optimize the capacity of the existing research infrastructure in Romania.

The applicable measures for Energy & Environment are depicted below:

(OP1) DIVERSIFIED AND BALANCED ENERGY MIX

- Adopt advanced technologies in the energy sector by attracting private investments, supporting scientific research and developing strategic partnerships.

(OP4) ENSURE ENERGY STORAGE AND BACKUP SYSTEMS CAPACITIES

- Develop capacities and mechanisms to integrate the discontinuous RESs in the national energy system and in the electrical accumulators systems, including the small storage capacities at the prosumer premises.

(OP5) INCREASE THE NATIONAL ENERGY SYSTEM FLEXIBILITY VIA DIGITALIZATION, INTELLIGENT GRIDS AND ACTIVE CONSUMER (PROSUMER) DEVELOPMENT

- Encourage domestic, industrial and agricultural prosumers build-up, along with the development of electrical grids and smart meters;
- Integration of distributed production systems and prosumers into the power grid system.

(OP9) INCREASE ENERGY EFFICIENCY

- Develop smart metering and smart grids;
- Support research and development projects and demonstration projects, promoting new technologies and new extensive renovation techniques;
- Smart medium and low voltage power distribution systems (including smart grids and IT systems) and efficient use of local energy sources including assigned storage;
- Creation of an energy efficiency investment fund (FIEE), financed by private funds, European funds, state budget.

(OP12) ECONOMIC INVESTMENT POLICIES TO STIMULATE THE DEVELOPMENT OF THE MANUFACTURING INDUSTRY, RES EQUIPMENT, ENERGY EFFICIENCY AND ELECTROMOBILITY

- Capitalize on national primary energy resources as much as possible within the domestic economy to generate an economic multiplier effect of the added value;
- Support scientific research of energy transition related subjects - RES technologies, energy efficiency, electromobility.

(OP13) REDUCE GHG AND NOx EMISSIONS

- Current activities and projects of energy companies must comply with environmental legislation and apply best international environmental protection practices; extension of EMAS certification throughout the economy;
- Support scientific research to decarbonize the energy sector;
- Co-financing of projects targeting de-carbonization technologies and processes, funded through the new EU-ETS support mechanisms (modernization and innovation funds, solidarity provisions);
- Incentives for private investment in new technologies and research and development in the field of low GHG technologies;
- Introduce strong economic incentives for an environmentally friendly transport system through price instruments;
- Support investments to modernize farms
- Promote more compact, cross-functional, transit-oriented development measures as a way to reduce distances travelled by vehicles, develop infrastructure and reduce maintenance costs.

(OP17) SUPPORT EDUCATION AND PROMOTE SCIENTIFIC RESEARCH; OCCUPATIONAL SAFETY AND HEALTH

- Develop higher education in the field of energy and align educational programs with the needs of the energy sector; promote partnerships for education and training with the energy industry and encourage gender equality;
- Support professional qualification in the field of energy at the intermediate level, encouraging gender equality;
- Support research in basic and applied energy science; developing partnerships with energy industry, as well as research entities in the EU and/or other countries;
- Develop the capacity to attract European and international funding sources for scientific research, through the participation in international consortia of institutes acting in field of research - development – innovation;
- Continuous training programs for specialists in administration positions within the energy sector;
- Continuous training to prevent occupational risks, protect workers' health and safety, eliminate risk and injury factors;
- Increase the number and quality of human resources in the field of R&D activities in priority areas, through stimulating young independent teams, scholarships for early stage researchers, international mobility projects and reintegration projects addressing researchers from diaspora;

- Capitalize the high level of specialization achieved in nuclear research through the development of technologies for advanced IV generation reactors, as well as the development of related infrastructure for lead-cooled fast reactors, through European and international partnerships;
- Conceptual development, construction and operation of the research infrastructures described in the national road map, aiming at alignment with ESFRI infrastructures and the SET Plan (e.g. ALFRED or CCAP) by providing investment funds and supporting the development of human resources;
- Train specialists to be compliant with new requirements of the energy sector and introduce dedicated courses on sustainable development and climate change;
- Develop research partnerships to improve the quality of life between domestic and entities abroad;
- Stimulate research, development and innovation in transport;
- Create new jobs, professional qualifications and opportunities for SMEs in the field of transport and energy efficiency.

Moreover, the 2014-2020 National Strategy for Research, Development and Innovation includes measures with general scope which can be applicable in the energy sector, mainly addressing measures to encourage smart specialization. These are manifested mainly for continuing to capitalize on the high level of research in the nuclear field through the development of technologies for the advanced IV generation reactors and the development of research infrastructures for lead-cooled fast reactors in a European and International partnerships. It also aims to leverage fossil fuels, diversify national sources, multifunctional transport (smart grids), increasing energy efficiency for the consumer and scaling the smart city concept.

Romania intends to achieve tangible progress by implementing the projects described in the national roadmap, through the phased financing of research infrastructures and existing maintenance and operation costs, the construction of new facilities addressing specific needs and the completion of previously assumed European commitments. The projects for the development of the energy research infrastructure are detailed under section 4.6.

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

The cooperation with other member states is described per applicability, based on projects mentioned under section 4.6.i.

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

Romania needs to capitalize upon the major opportunity elicited by the new Horizon Europe program, which will mobilise more than 100 billion euro in R&D funding (out of which, 2.4 billion euro for Euroatom), during the 2021 – 2027 period. Horizon Europe will build upon the success of Horizon 2020, the most ambition R&D program ever at the time, having financed more than 18,000 projects with over 31 billion euro[48].

Romania will identify implementation options in order to balance the R&D capabilities. It will also continue priorities set for the current Horizon 2020 cycle, such as widened participation, simplification of procedures, or ensuring non-discriminatory wages for all participants.

[48] Source – European Comission, EU budget for Research and Innovation: https://ec.europa.eu/commission/sites/beta-political/files/budget-proposals-research-innovation-may2018_en.pdf

B. Analytical basis[49]

4. Current situation and projections with existing policies and measures

4.1. Projected evolution of main exogenous factors influencing energy system and GHG emission developments

i. Macroeconomic forecasts (GDP and population growth)

The forecast created in 2016 regarding the path of economic growth in Romania during the period 2020-2030 is presented in the following table:

Table 15 - Development of Romanian economic growth in the context of the existing policies

Indicator	2020-2025	2025-2030
Annual economic growth (%)	2.7%	2.0%

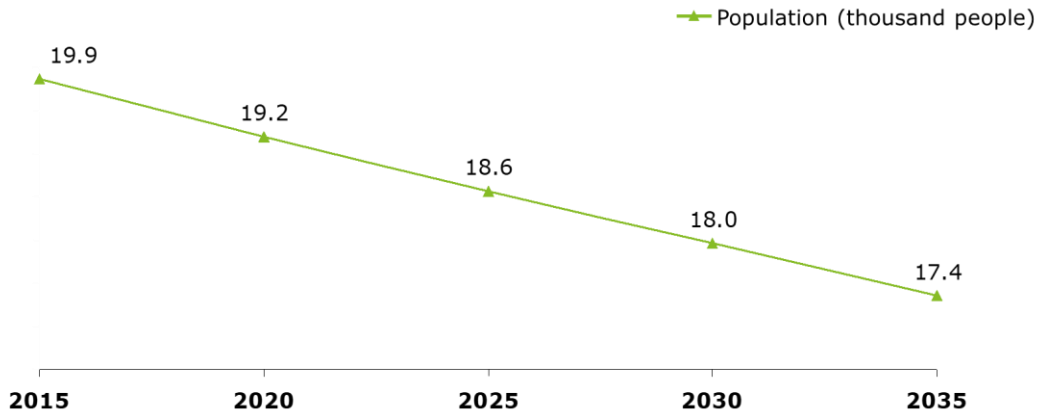
Source: PRIMES 2016 scenario, prepared for the Ministry of Energy[50]

This evolution was foreseen in the context of the policies and measures existing at the moment when this one was prepared. Currently, there are additional measures expected for implementation so that the economic growth is accelerated.

As regards the population growth, a decrease beyond 12% is expected during the period 2015-2035, the population reaching approximately 17.4 million persons in 2035, according to PRIMES model prepared for the Ministry of Energy in 2016 within the reference scenario (scenario with current policies and measures).

[49] See part 2 for a detailed list of parameters and variables that must be reported in section B of the plan
[50] All references regarding PRIMES as source concerning the presentation of forecasts with the current measures and policies refer to Reference Scenario 2016 ("RM: Reference Scenario"), prepared for the Ministry of Energy 2016

Graph 9 - Evolution of Romanian population during the period 2015-2035



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

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

The Ministry of Environment has presented within "National strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030" the developments of the sectors that contribute the most to the GHG emissions. These are:

1. **Energy**
2. **Transport**
3. **Industry**
4. **Agriculture and rural development**
5. **Urban development**
6. **Waste management**
7. **Water and water resource sector**
8. **Forestry**

1. **Energy**

The energy sector is currently contributing the most to the carbon emissions in Romania. GHG emissions in this sector represent approximately 55% of total emissions (LULUCF excluded), excluding the transport sector, in 2016.

The sectoral changed are predicted taking into account the current situation and the projections for the main energy indicators. Thus, the development need of this sector involves firstly the implementation of new technology in the fossil fuel power plants and in the electricity distribution grids, as these are very old. The modernization of the fossil fuel power plants is also necessary given that wind and solar power represents a variable source and does not provide coverage for the energy demand, so that cannot be taken into account as sole sources of electricity generation, especially under extreme weather conditions.

In addition, MDRAP (Ministry of Regional Development and Public Administration) is carrying out the program "District heating 2006-2020 heat and comfort" related to the central heating systems of the cities. The results of this program materialized, among others, in an improved energy efficiency by streamlining production, transmission and distribution of heat.

For the future period, the development of the energy sector will concern the following aspects:

- Taking measures to improve energy efficiency and implicitly to reduce the energy demand;
- Making significant investments in the generation and distribution of electricity in order to satisfy the demand, especially given the increasingly strict requirements occurred in relation to the reduction of GHG emissions.

To this effect, national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030, stipulates the strategic objectives in this sector in order to reduce GHG emissions:

a) Reduction of the intensity of CO_2 emissions related to energy-related activities; the achievement of this objective implies investments for the following purposes:
   - ✓ Supply with energy from renewable sources;
   - ✓ Consolidate the infrastructure for the energy transmission, distribution and storage.

b) Increase of energy efficiency of the final users, especially in residential buildings and in industrial sectors; to ensure the achievement of this objective, the following are required:
   - ✓ Implement national programs to support on a large scale the thermal refurbishment of buildings;
   - ✓ Implement a charging system within the central heating system in order to reflect the cost for the production of natural gas and of heat.

c) Granting access to energy to the economically vulnerable groups; in the context of implementing a charging system, which reflects the cost for the production of various energy sources, it is necessary to take into account granting financial support so that groups of vulnerable consumers have access to energy.

2. Transport

The transport industry, although it is not the main sector as regards the share of the total GHG emissions in Romanian, has had an increasing development in the last years (increase of 29.3% according to EEA during the period 1990-2015), due to the growth of the road transport. The road transport is, at national and European level, the main source of GHG emissions in the transport sector. In addition, in Romania, the number of owners of motor vehicles is still low compared to the EU average (261 vehicles/1,000 inhabitants in 2015 in Romania, compared to the EU average of 476 vehicles/1,000 inhabitants[51]). To this effect, it is expected that the future number of motor vehicles to increase in Romania, so that this indicator approaches the EU average.

Such expected growth of road transport, along with the trend of reduction in the number of persons using the rail transport given the degradation of Romanian infrastructure, would result in an increase of GHG emissions on medium and long term. Thus, measures are required to counterbalance such effect, so that the rate of growth of GHG emissions in the transport sector is slower than that of the economy. This is possible by reducing the demand of motor cars or by encouraging the use of transport alternative means with low emissions. Although technology has evolved and will continue to evolve substantially in the future, helping to slow down the increase of emissions, this is not sufficient, as additional measures are required to encourage the change of the transport conduct and of people's choices.

In order to ensure the reduction of GHG emissions in this sector, national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030 stipulates the following strategic objectives:

[51] Source: Eurostat, indicator: road_eqs_carhab

a) Use of pricing tools meant to offer incentives for ensuring an ecological transport. This objective may be achieved by encouraging the acquisition of environmentally friendly motor vehicles, the use of ecological fuels and the reduction of using motor vehicles. The specific tools that are already in place to achieve such objectives are represented by:
   - ✓ Exemption from paying the excise duty for the use of biofuels obtained from biomass (and not mixed with traditional fuels);
   - ✓ Applying tax reductions for the environmentally friendly motor vehicles (e.g. motor vehicles based on hydrogen, methane, electrical, etc.);
   - ✓ Establish parking fees to discourage the use of motor vehicles.

b) Increase of urban transport efficiency; for the achievement of this objective, the following are required:
   - ✓ Implement some Sustainable Urban Mobility Plans (SUMPs) – e.g. investments in the infrastructure for bicycles and pedestrians, development of subway networks, etc.;
   - ✓ Efficient management of demand.

c) Inversing the trend of reducing the rail transport and including the projects of intermodal terminals' development – restructuring and modernizing the rail system.

3. Industry

In Romania, the GHG emissions caused by industrial processes are quite high, even if these ones have dropped by 64% during the period 1989-2011 due to the slowdown of industrial activity after the communist era. Thus, a potential for improvement of energy efficiency exists in this sector by: reducing the pollutant emissions, reusing and recycling the production materials, promoting the use of clean technologies, etc.

In order to ensure the increase of energy efficiency and the reduction of GHG emissions in this sector, the national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030 stipulates the following strategic objectives:

a) Reduction of the intensity of carbon emissions in industry – especially in heavy industries: steel, non-ferrous metals, minerals, chemicals, by the implementation of new technology.
b) Implementation of the best available techniques from GHG emissions perspective – adopting the techniques put in practice in EU.
c) Exploitation of voluntary approaches, trading the emissions and the related taxes – voluntary agreements for the improvement of industrial processes, implementation of plans for emissions trading, etc.

4. Agriculture and rural development

In this sector, GHG emissions in Romania have had a downward trend (until 2016). Although the sector's contribution to the total GHG emissions is of approximately 16%, this is not intensive, as most emissions are caused by the use of energy in this sector.

The future trends in this sector suppose an increased agricultural productivity and a reduced number of small-sized farms, which could influence the level of GHG emissions. One of the objectives in this sector is maintaining a reduced level of GHG emissions generated by the agricultural sector. In order to achieve such objective, the national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030 mentions the following specific objectives:

a) Promotion of the transfer of knowledge and of advisory services regarding aspects of climate changes among farmers:
   - ✓ Offering such services for the farmers to acquire knowledge related to the methods for reducing the GHG concentration in the air generated by the performance of key activities (animal breeding and use of fertilizers);
   - ✓ Promotion of technologies and practices for carbon sequestration, enveloping the buildings, using energy from renewable sources.

b) Support of investments for the modernization of farms; this objective may be achieved by:
   - ✓ Encouraging the investments for the creation of facilities and the acquisition of performant equipment for the storage and use of manure;
   - ✓ Encouraging the investments for an increased energy efficiency of the farms' buildings;
   - ✓ Encouraging the generation and the use of energy from renewable sources (on a small scale).

c) Promotion of the good agricultural practices:
   - ✓ Avoiding the use of mechanized machinery;
   - ✓ Interdicting / limiting the use of chemical and organic fertilizers;
   - ✓ Reduction of the number of animals on pasture lands;
   - ✓ Use of crops with a high capacity to fix nitrogen in the soil;
   - ✓ Encouraging the ecological agriculture.

d) Promotion of carbon sequestration in agriculture:
   - ✓ Incorporating vegetal mass in the soil on the farming lands where green crops are created.

5. Urban development

Several local authorities in Romania have shown their interest in taking measures in relation to the reduction of GHG emissions. Several city halls chose to be part of the EU program "City Halls Agreement", which encourages the generation and the use pf sustainable energy. The developed plans take into account mainly the improvement of energy efficiency of the buildings and the identification of solutions for the improvement of local transport system.

The trends in this sector foresee a suburbanization of population by reducing the population density, despite the growth of the built area. This entails a raise of the number of kilometers driven by motor vehicles, of the demand for utilities (water supply, energy supply, etc.) as well as for street infrastructure. This trend may determine an increase of GHG emissions. In order to fight against this effect and to ensure the reduction of GHG emissions in this sector, the national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030 provides the following strategic objectives:

a) Promotion of certain development measures that are more compact, having a combined utility, oriented towards transit activities, as method to reduce the distances driven by motor vehicles, to develop the infrastructure and to reduce the maintenance costs:
   - ✓ Adopting policies for the lands management;
   - ✓ Offering incentives for the development of deserted areas;
   - ✓ Limiting the maximum size of allotted land;
   - ✓ Increasing the level of development allowed on a certain plot.

b) Promotion of the improvement of the energy efficiency level in buildings and in the major systems of urban infrastructure:
   - ✓ Applying economic incentives for the refurbishment of the existing buildings;
   - ✓ Encouraging the purchase of lodgings located in recently built buildings which are more efficient from an energy point of view;
   - ✓ Increasing the efficiency of the central heating systems;

- ✓ Modernizing the systems of water supply, wastewater and collection of solid wastes.

6. Waste management

At present time in Romania, GHG emissions from wastes result from the fact that, at national level, the waste management is based on the storage of the same, and the decomposition of organic wastes produces methane. In addition, the frequency of waste collection in Romania is low. To this effect, measures are necessary to encourage an efficient waste management, so that they contribute to the reduction of GHG emissions.

In order to ensure increased energy efficiency and the reduction of GHG emissions in this sector, the national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030 provides the following strategic objectives:

a) Promotion of the prevention of waste generation:
   - ✓ Generation of a smaller amount of wastes by:
     - o Increasing the awareness about the wastes' effects;
     - o Encouraging the ecological production;
     - o Encouraging the change of the consumers' behavior;
     - o Granting financial incentives to decrease the amount of wastes created.

b) Increase of the level of reusing or recycling the materials included in the wastes flow, reduction of the amount of material which must be managed as waste by promoting the industrial symbiosis processed and by applying the concept of efficiency of the resources for the sustainable waste management:
   - ✓ Development of storage and collection facilities;
   - ✓ Implementation of programs to deposit/redeem.

c) Separate collection of biodegradable wastes and their composting:
   - ✓ Selective waste collection.

d) Production of energy from wastes – co-incineration.

7. Water and water resource sector

The measures to reduce GHG emissions in this sector must take into account the current context. Thus, although in this sector the operations of water supply and of treatment of wastewater generate significant quantities of GHG emissions, the reduction of the same must be made in the context, for instance, of the need to solve the lack of water in agriculture. To this effect, the national strategy on climate changes and economic growth based on low-carbon emissions for the period 2016-2030 stipulates the following strategic objectives for the reduction of GHG emissions:

a) Reduction of GHG in the sector of water supply and of treatment of waste water, in the context of the need to extend the availability of water supply and sewage services:
   - ✓ Ensuring the methane capture;
   - ✓ Using the pumping and blowing systems that are energetically efficient.

b) Increase of the energy efficiency of the pumps within the large systems for water supply.

8. Forestry

The main activity in this sector determining the reduction of GHG is the reforestation. Romania has a high potential in terms of lands proper for reforestation from a technical point of view, mainly in the Southern area of the country. For reducing the climate changes and of reducing GHG emissions through this sector, the national strategy on climate changes and economic

growth based on low-carbon emissions for the period 2016-2030 stipulates the following strategic objectives:

a) Management of existing forests for storing carbon in the context of a sustainable forest management:
   - ✓ Naturally regenerated arboreta;
   - ✓ Fight against pests;
   - ✓ Prevention of forests' degradation;
   - ✓ Increased accessibility to forestry fund.

This may be achieved by the implementation of certain measures for:
   - ✓ Adapting forestry technical rules to the requirements of the climate changes management, based on the research conducted to this effect;
   - ✓ Financing programs to this effect.

b) Extension of wooded lands:
   - ✓ Reforestation of degraded lands, improper for agricultural crops;
   - ✓ Creation of shelterbelts.

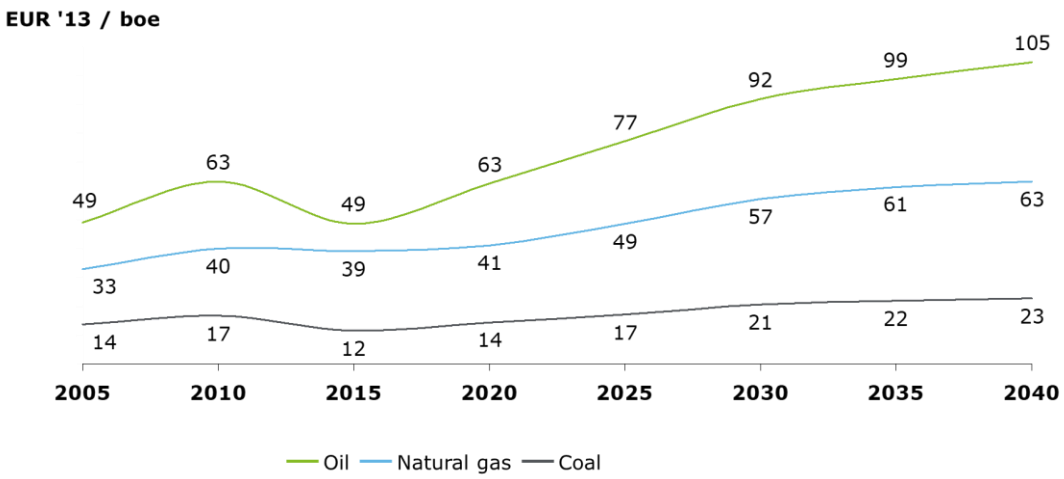
c) Encouraging sustainable management of forests that are private property:
   - ✓ Provide advice for forests sustainable management;
   - ✓ Simplify the requirements related to forests management;
   - ✓ Provide technical support for the implementation of innovative technologies in the field of forests management, of timber logging;
   - ✓ Grant compensatory payments to the forest owners for the losses of income due to restrictions to exploitation of the forests included in protected areas or which have various protection functions;
   - ✓ Improve and extend the accessibility to the forestry fund.

d) Materialization of the opportunities to manage the carbon stock in the forests located in protected areas.

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

The expected evolution of import prices for fossil fuels at international level is shown in the graph below:

Graph 10 - Expected development of prices for fossil fuels at international level

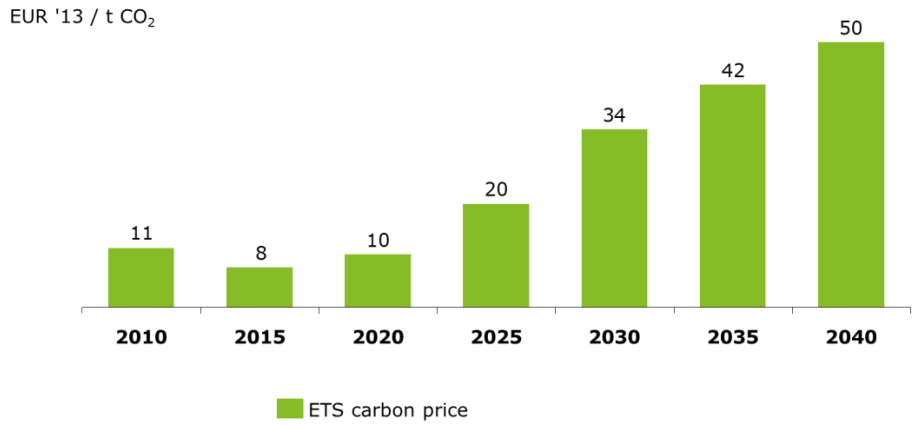


Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

One may notice in this graph the fact that a price increase is expected for all categories of fossil fuels, the highest increase being predicted for oil.

The projection regarding the EU ETS carbon price was made according to PRIMES model, which is similar to the projections of the European Commission.

Graph 11 - Evolution of EU ETS carbon price



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

iv. Technology cost developments

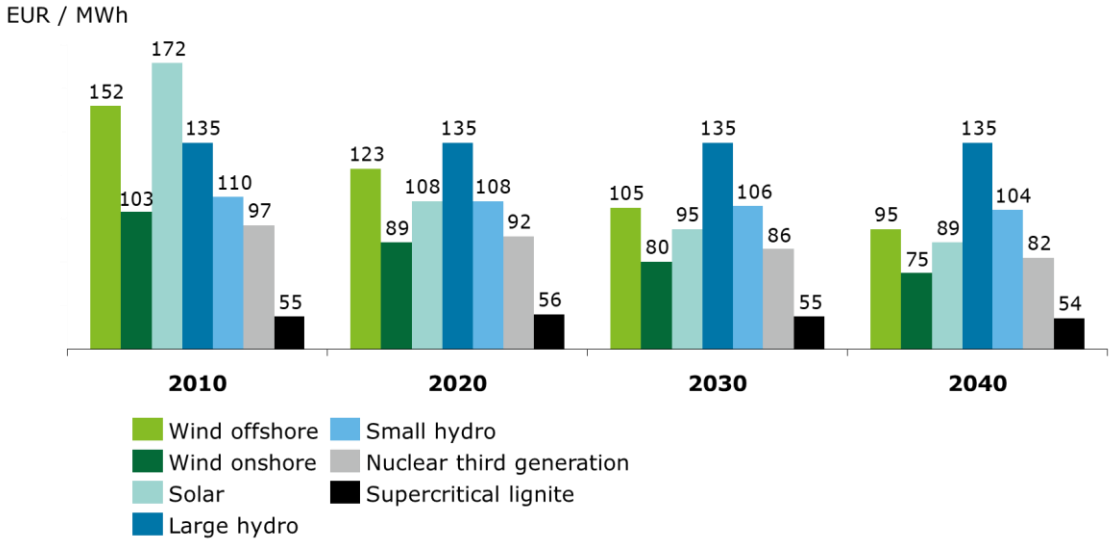
The cost of technologies is expected to suffer significant changes in principle as regards the renewable energy, where decreases are expected due to the development of such technologies. The main evolutions of the costs of the main technologies are presented herein below[52]:

- Solar power – the development of technologies within this source will cause a decrease of the costs for producing energy from solar source;
- Onshore wind power – the costs are influenced by the evolution of the metal price; the trend of the cost for this technology is also downwards;
- Offshore wind power – the costs for this technology are highly uncertain given that not all logistic details and difficulties that this technology implies are known; decreases are expected for the costs of this technology on long term (around year 2030) due to clarification and identification of solutions regarding the current logistic impossibilities, as well as by getting economies of scale;
- Costs for the generation of electricity from biomass – the costs are quite high due to the environmental restrictions and to the efficiency of this technology; the evolution of these costs depend a lot on the evolution of the raw material price;
- Nuclear power – the costs for the implementation of nuclear projects are raising further to the need of applying additional security systems and procedures (as a result of recent accidents / incidents in this sector).

The expected development of the costs of the main technologies is presented in the graph below. The main hypotheses regarding such evolutions are represented by capital cost (WACC) of 7.5% and the annual operation hours according to the current data.

[52] According to the reference scenario "EU Reference Scenario 2016"

Graph 12 - Expected development of the cost for various technologies



Source: PRIMES 2016 reference scenario of European Union, "EU Reference Scenario 2016"

4.2.Dimension Decarbonisation

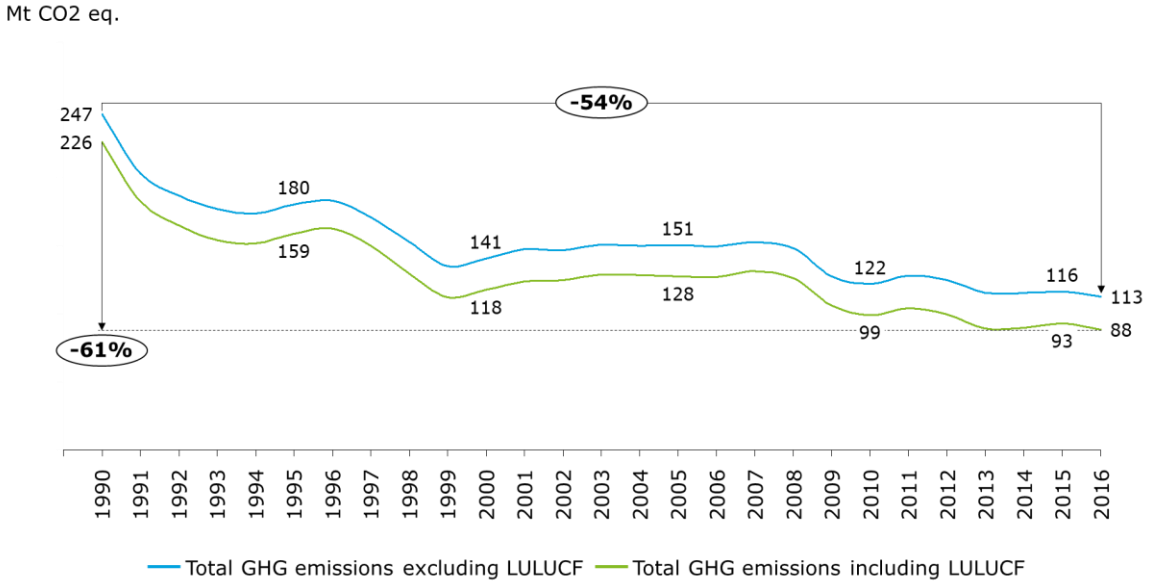
4.2.1. GHG emissions and removals

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

In Romania, the trend of the greenhouse gas emissions' progress is downward, the largest decrease having occurred in 1991, approximately 19% compared to 1990. This was in principle due to the slowdown of the industrial activity, which dropped by 27% during the same year. In 2016 GHG emissions had a value of 88 million tons CO_2 equivalent, representing a decrease by 61% (LULUCF included) compared to the emissions of 1990 (226 Mt eq. CO_2) and by 54%, LULUCF excluded. At present time, Romania contributes to the total GHG emissions at European Union level by approximately 2.5% of the total emissions, LULUCF excluded, which is lower than in 1990 when the contribution was beyond 4%[53].

[53] According to the data for the emissions in the European Union from Eurostat, indicator env_ac_io10

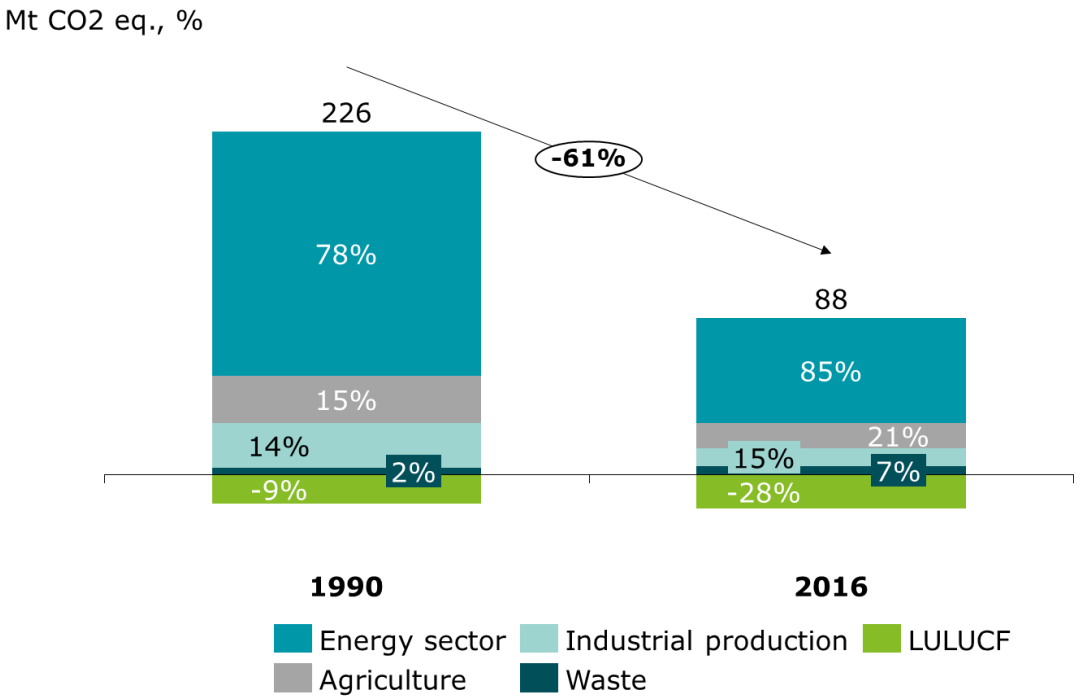
Graph 13 - Development of greenhouse gas emissions from 1990 to 2016



Source: Ministry of Environment, National Inventory of Greenhouse Gas Emissions, 2018

The largest share of these emissions is represented by the emissions caused by the energy sector. Even if, in this sector too, a significant decrease has occurred, it was lower than the decrease of the total GHG emissions during the period 1990-2016, so that this sector (which includes also the transport sector) is currently representing 85% of the total GHG emissions, LULUCF included, and 68% of the total emissions, LULUCF excluded. Furthermore, the reduction of GHG emissions was caused also by an increased reduction of emissions caused by LULUCF.

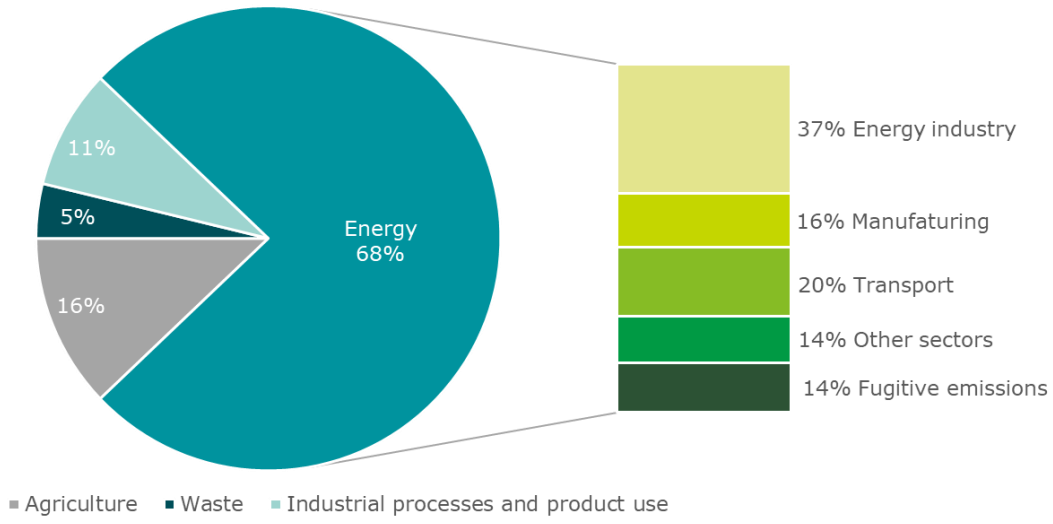
Graph 14 - Development of GHG emissions' structure, by each sector, from 1990 to 2016, LULUCF included



Source: Ministry of Environment, National Inventory of Greenhouse Gas Emissions, 2018

As regards the emissions of 2016, LULUCF excluded, the energy sector causes 68% of the total emissions during 2016, the energy industry representing the main source (37% of the total emissions caused by the entire energy sector, a quarter of the total GHG emissions during 2016), followed by agriculture (16%) and industrial production (11%).

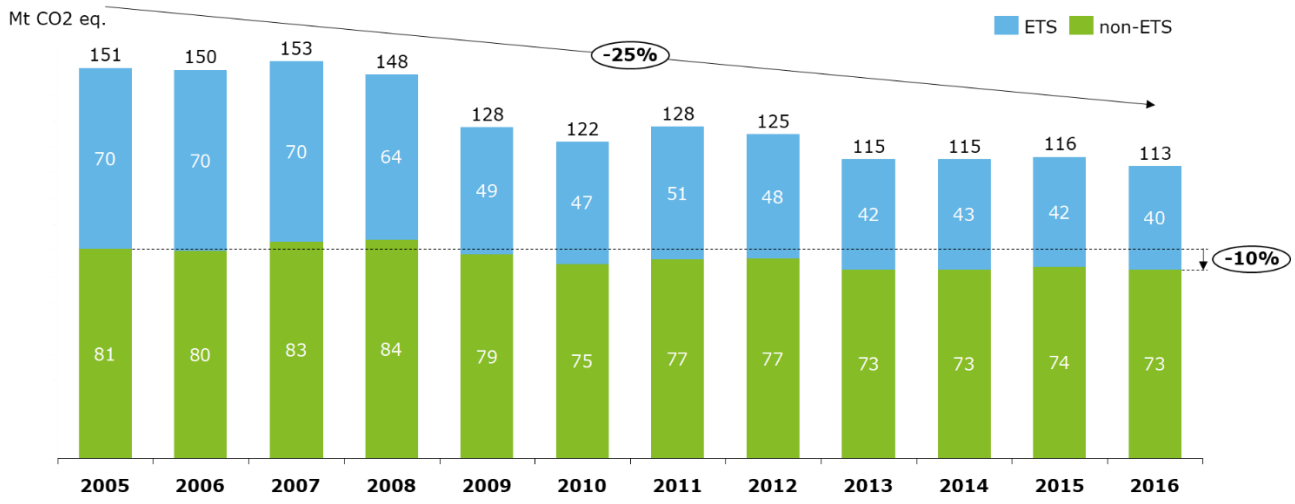
Graph 15 - GHG emissions' structure by each sector in 2016, **LULUCF EXCLUDED**



Source: Ministry of Environment, National Inventory of Greenhouse Gas Emissions, 2018

After reviewing the development of GHG emissions' structure (LULUCF excluded) from the point of view of the ETS non-ETS allotment, it may be noticed in the graph below the fact that the reduction of GHG emissions per total was caused in principal by the decrease of ETS emissions. In the non-ETS sector, the emissions dropped during the period 2005-2016 by 7%, which is lower than the 23% reduction of the total emissions.

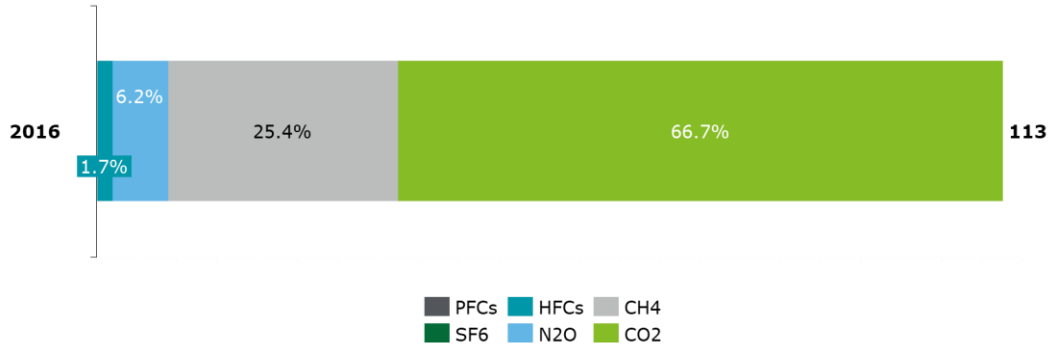
Graph 16 - Development of GHG emissions (LULUCF excluded) from 2005 to 2016, with an allotment by ETS and non-ETS sectors



Source: Ministry of Environment

GHG emissions' structure according to the categories of pollutants is presented in the graph below. It was made for year 2016, taking into account the total emissions, LULUCF excluded. Thus, it is noticed that most GHG emissions (66.7%) is represented by CO_2 emissions, followed by CH_4 emissions by 25.4% of the total emissions, while SF_6 and PFC_s emissions represent less than 1% of the total emissions.

Graph 17 - GHG emissions' structure (LULUCF excluded) for year 2016 by categories of pollutants

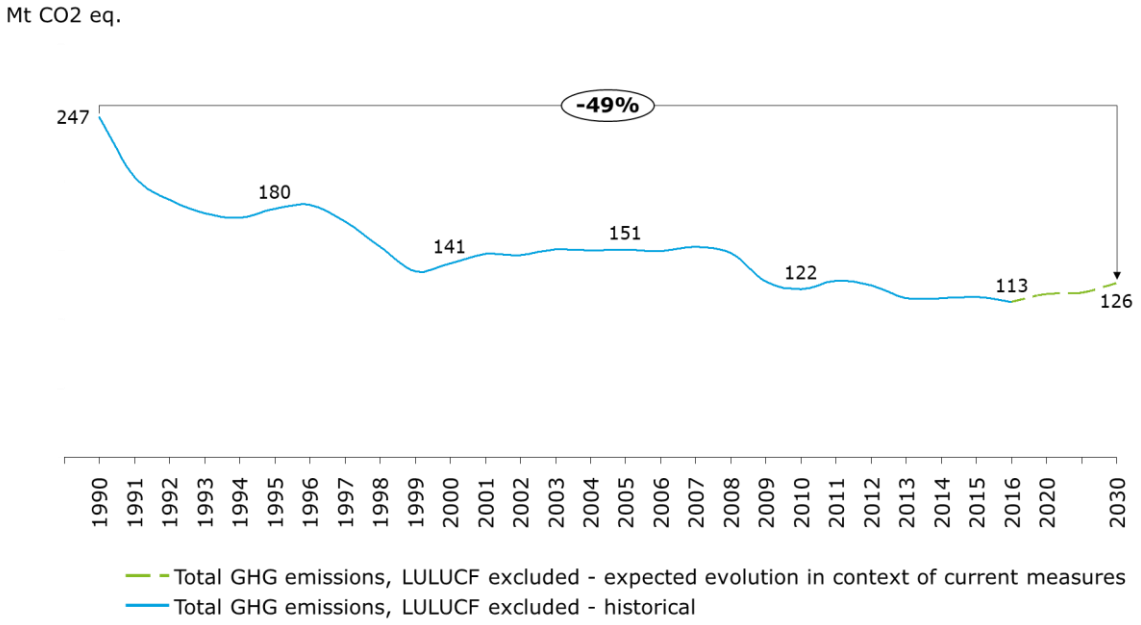


Source: Ministry of Environment, National Inventory of Greenhouse Gas Emissions, 2018

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

Given the existing measures, the development of GHG emissions (LULUCF excluded) is predicted in the following graph. In this context, the trend of the emissions' reduction recorded historically would maintain in the future too, resulting a reduction of the emissions by 49% in 2030 compared to 1990, a decrease that is expected to continue also after this reference year.

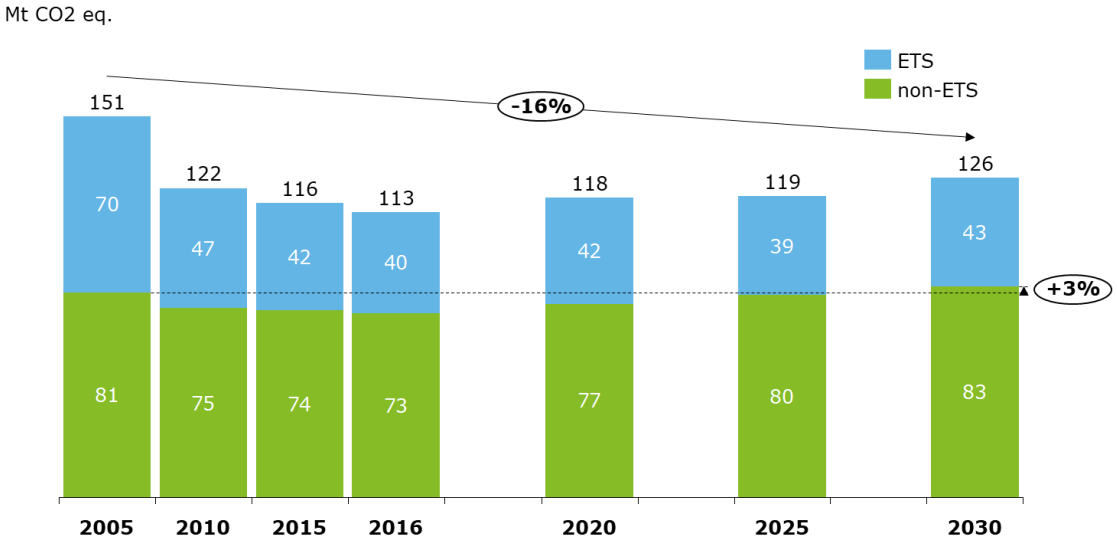
Graph 18 - Expected development of GHG emissions (LULUCF excluded) in the context of current measures



Source: Ministry of Environment, Romania Reporting in compliance with EU Regulation 749/2014

Following the historical trend, the main source of the reduction of GHG emissions (LULUCF excluded) will be represented by the reduction in ETS sector. As regards the non-ETS sector, an increase is expected by approximately 3% until 2030, compared to the emissions during 2005. The total GHG emissions (LULUCF excluded) could reach 126 Mt CO_2 equivalent, which would mean a decrease of emissions compared to year 2005 by 15% and by reference to year 1990 by approximately 49%.

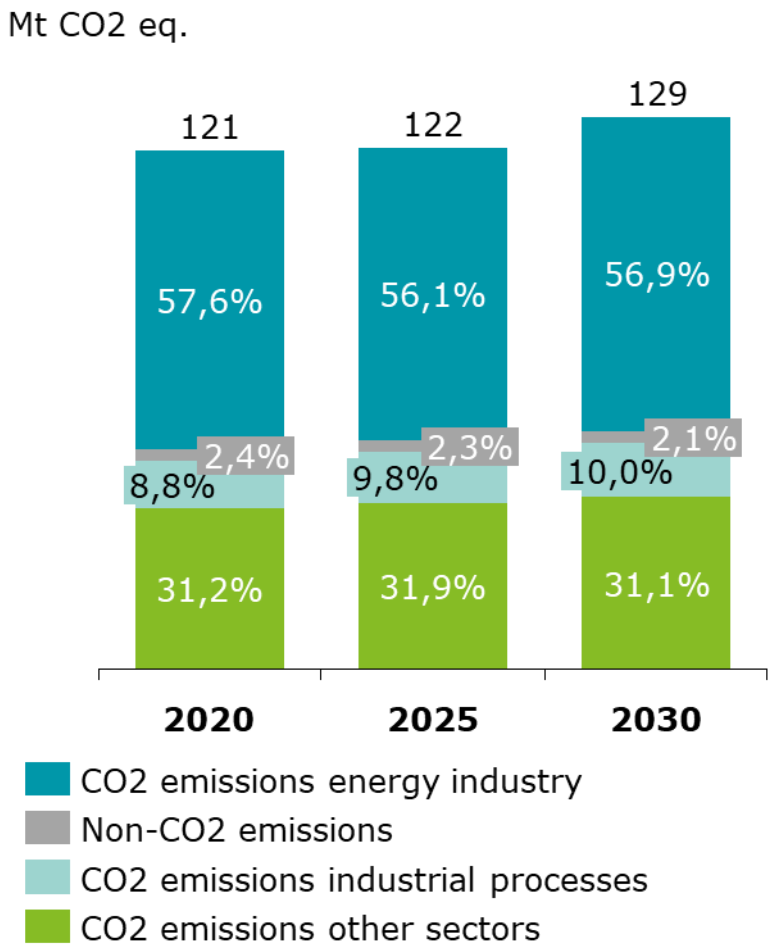
Graph 19 - Expected development of GHG emissions (LULUCF excluded) in the context of current measures, including with the allotment by ETS and non-ETS sectors



Source: Ministry of Environment, Romania Reporting in compliance with EU Regulation 749/2014

According to the graph below, it may be noticed that the largest reductions of emissions will be caused by those in energy industry, while in the other sectors no significant changes are expected.

Graph 20 - Expected development of GHG emissions (LULUCF excluded) by sectors, in the context of the current measures



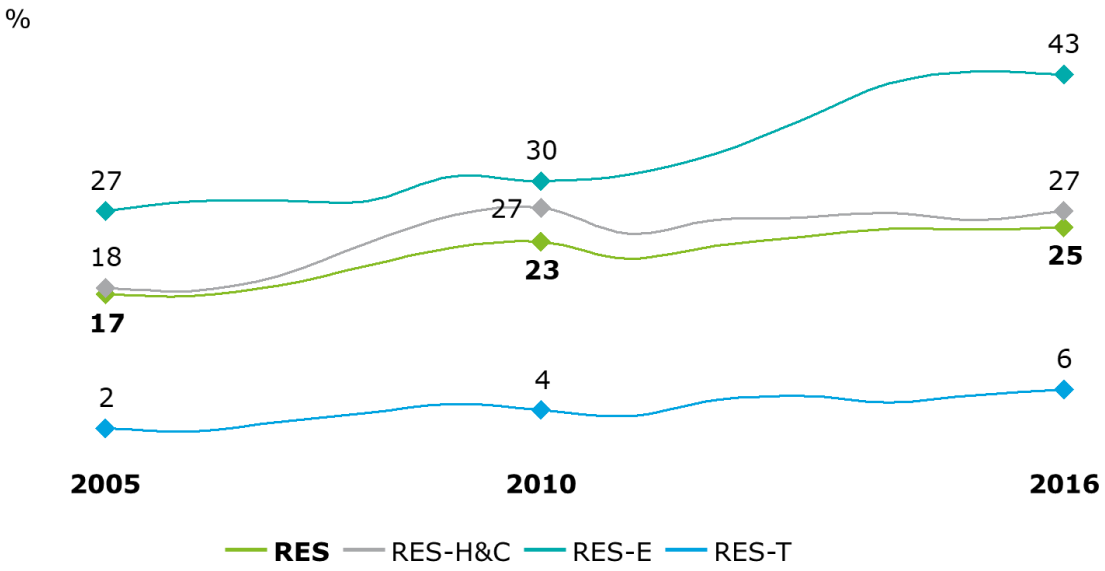
Source: Romania Reporting in compliance with EU Regulation 749/2014

4.2.2. Renewable energy

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

According to the latest information publicly available, in 2016 Romania had a share of energy from renewable sources in the gross final consumption of 25%, and this indicator increased from 17% in 2005. The same trend occurred also in the sectors presented, the highest development being recorded in the share of electricity from renewable sources in the electricity consumption.

Graph 21 - Current share and development of energy from renewable sources and allotment by sectors

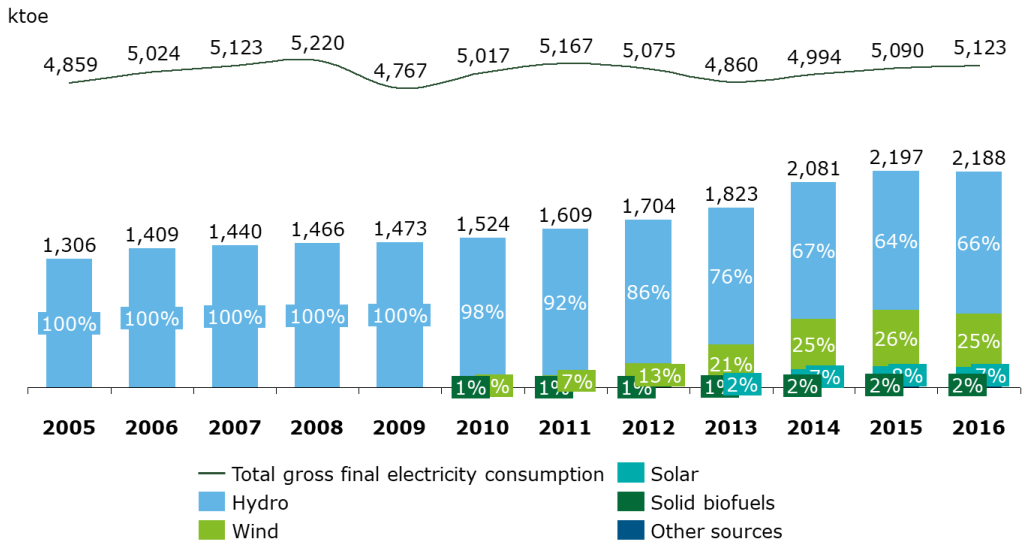


Source: Eurostat

Structure of final consumption of renewable energy – electricity (SRE-E)

The graph below presents the structure of the electricity generation from renewable sources, as well as the gross final energy consumption, both indicators being included in the calculation of the renewable energy share presented above. Until and including 2009, such share was entirely determined by the production of hydropower. To this effect, the increase of SRE-E share during the period 2010-2016 was triggered by the development of wind and solar technologies, a significant increase being recorded in the production of onshore wind power. On the other hand, the gross final electricity consumption followed a slightly increasing progress.

Graph 22 - Development of the electricity gross final consumption and generation from renewable sources from 2005 to 2016, by categories of sources

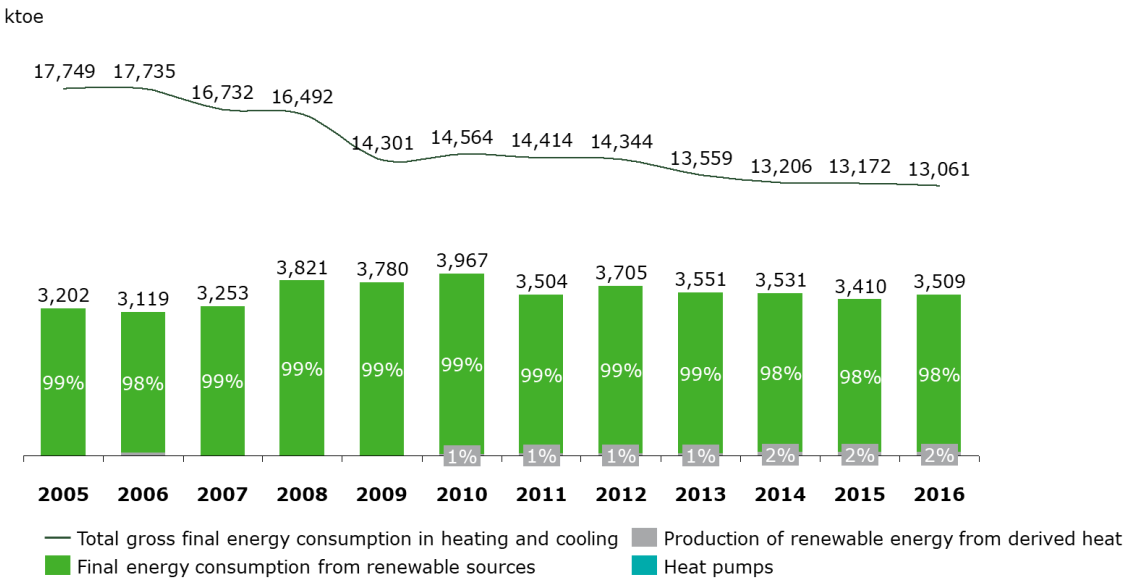


Source: Eurostat

Structure of the final renewable energy consumption - heating and cooling (SRE-H&C)

In the heating and cooling sector, the increase of SRE share was achieved based on the reduction of the gross final energy consumption by the increase of energy efficiency. As regards the sources of renewable energy consumption / generation, no significant changes took place. The final consumption of energy from renewable sources is represented in the total consumption of biomass (fire wood, agricultural waste). At the same time, no significant gross final energy consumption existed in Romanian until present time (<0.1%) from the use of heating pumps.

Graph 23 - Development of gross final consumption and of the consumption from renewable sources for heating and cooling from 2005 to 2016, by categories of sources



Source: Eurostat

Structure of final renewable energy consumption – transport (SRE-T)

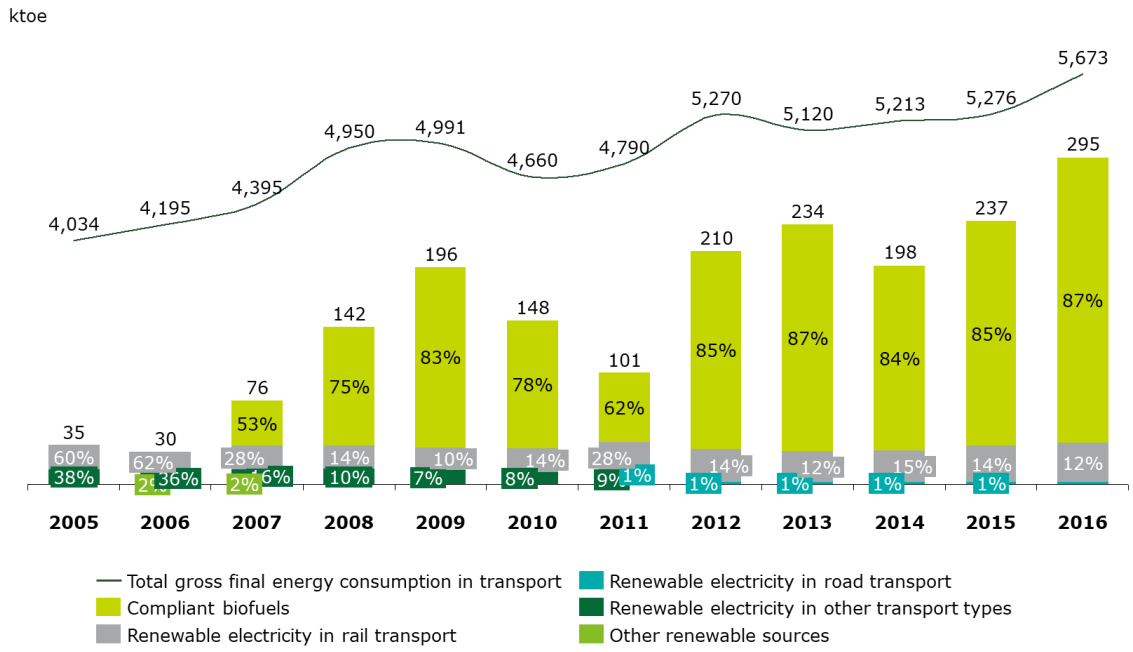
As regards the transport sector, the graph below presents the development of the gross final energy consumption (total and from renewable sources), without any multiplication factor being applied, as when calculating SRE-T share. However, these indicators are pertinent for analyzing the development of the main factors based on which the share is established.

During the period 2005-2016, the final energy consumption in this sector had a general increase, the only exception having been occurred in 2010 and 2013. The renewable energy consumption followed mainly the same development. As regards the development of the structure of the final renewable energy consumption from transport, the main changes were marked by:

- ✓ A significant increase of the consumption of compliant biofuels to taking it into consideration for the calculation of the renewable energy share; in 2011 the reduced value of this indicator was the result of the fact that a significant quantity was not deemed corresponding;
- ✓ An upward trend in the consumption of electricity from renewable sources in the road transport;
- ✓ A slight increase of the consumption of electricity from renewable sources in the rail transport;

✓ A decrease of the renewable energy consumption in other categories of transport than road and rail transport.

Graph 24 - Development of the gross final consumption and of the consumption from renewable sources in transport from 2005 to 2016, by categories of sources



Source: Eurostat

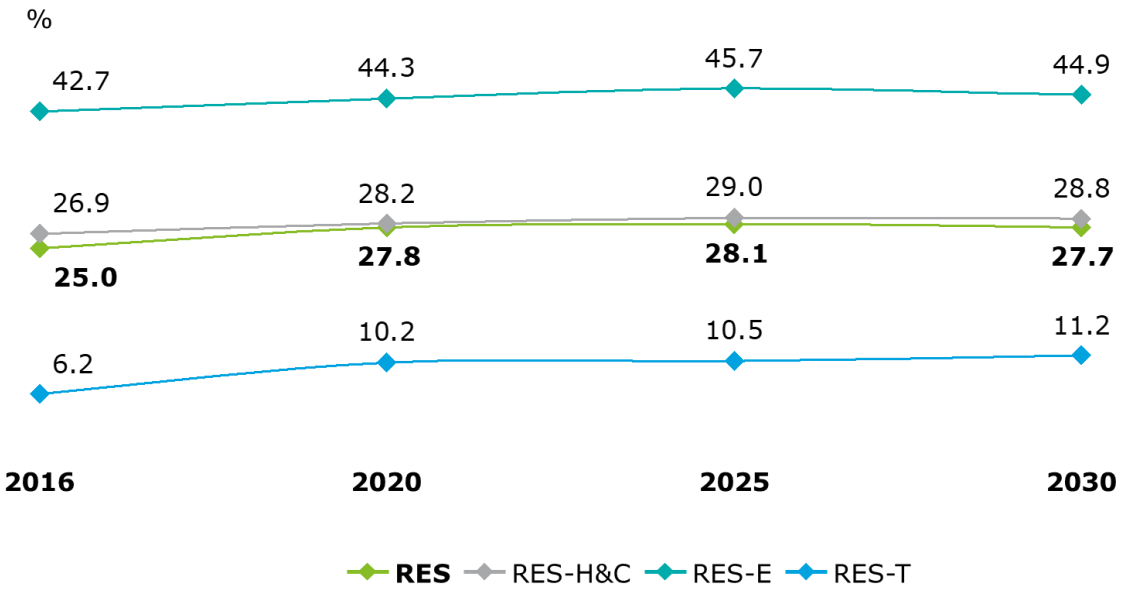
ii. Indicative projections of development with existing policies for the year 2030 (with an outlook to the year 2040)

In the context of current policies, an increase of SRE share is expected for all indicators. The largest increase may be for the renewable energy share in transport, which could reach 11.2% in 2030. Such development, though favorable, would not be sufficient for attaining EU target of 14% (established afterwards by the amendment of RED[54]), so that additional measures will be necessary to increase this indicator. In addition, SRE-T share projection does not take into account the new methodology for the calculation of this indicator, which involves different multipliers for the biofuels and the consumption of electricity from renewable source.

Also, the improvements in the heating and cooling sector are not considerable, so that this sector too should be taken into account when developing policies for the purpose of encouraging the renewable energy consumption, with a linear increase, according to Directive on the promotion of energy renewable sources, amended in 2018 (Interinstitutional File 2016/0382).

[54] Renewable Energy Directive

Graph 25 - Projections regarding the development of RES shares with existing policies

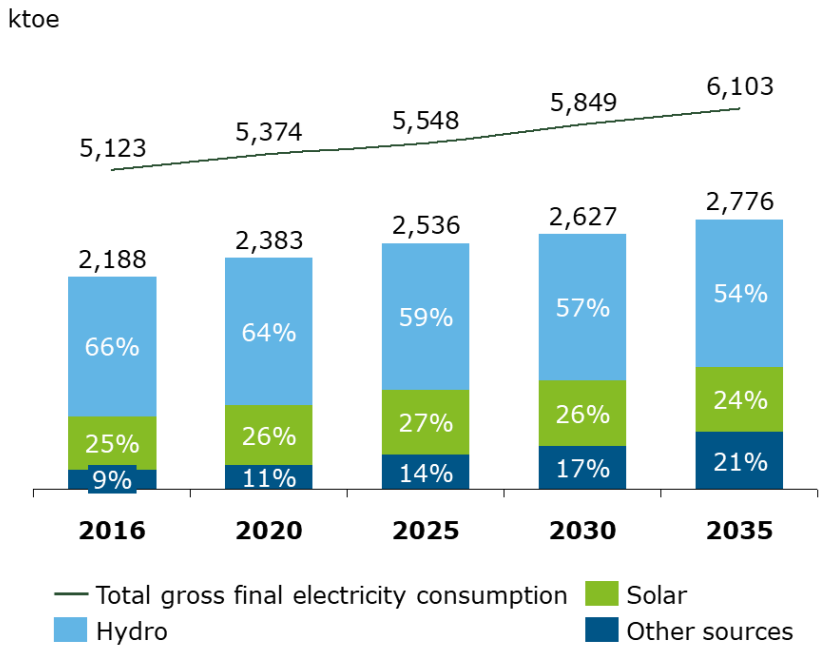


Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

Expected development of the final renewable energy consumption with existing policies – electricity (SRE-E)

In the near future, all sources for the generation of renewable energy are expected to increase (especially the solar power), given the downward trend of the costs for the wind and solar power as a result of the technological progress. Hydropower is expected to slightly increase until 2020, and then decrease a bit and then remain relatively constant until 2035. However, this increase of the consumption of energy from renewable sources will not materialize in significant increases of the SRE share, due to the increase almost to the same extent of the total gross final consumption of electricity.

Graph 26 - Expected development with existing policies of the gross final consumption and of the electricity generation from renewable sources, by categories of sources



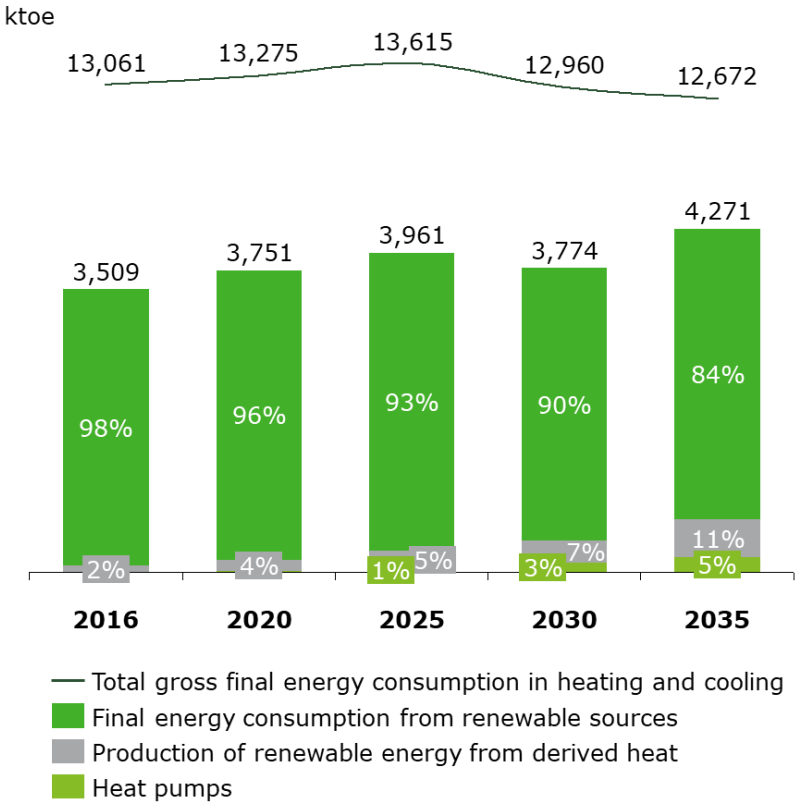
Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

Expected development of the final renewable energy consumption with existing policies – heating and cooling (SRE-H&C)

The development expected in the heating and cooling sector with existing policies supposes, firstly, an increase of the gross final energy consumption until 2025, followed then by a decrease caused by the increased energy efficiency. As regards the final renewable energy consumption, this will increase constantly until 2035, except for year 2030 when a decrease will take place.

As regards the structure of the final renewable energy consumption, the main change compared to the historical trend will be marked by the occurrence of the energy consumed through heating pumps, as well as by an increase of the generation of renewable energy derived from heat, especially in year 2035.

Graph 27 - Expected development with existing policies of the gross final consumption and of the consumption from renewable sources for heating and cooling, by categories of sources



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

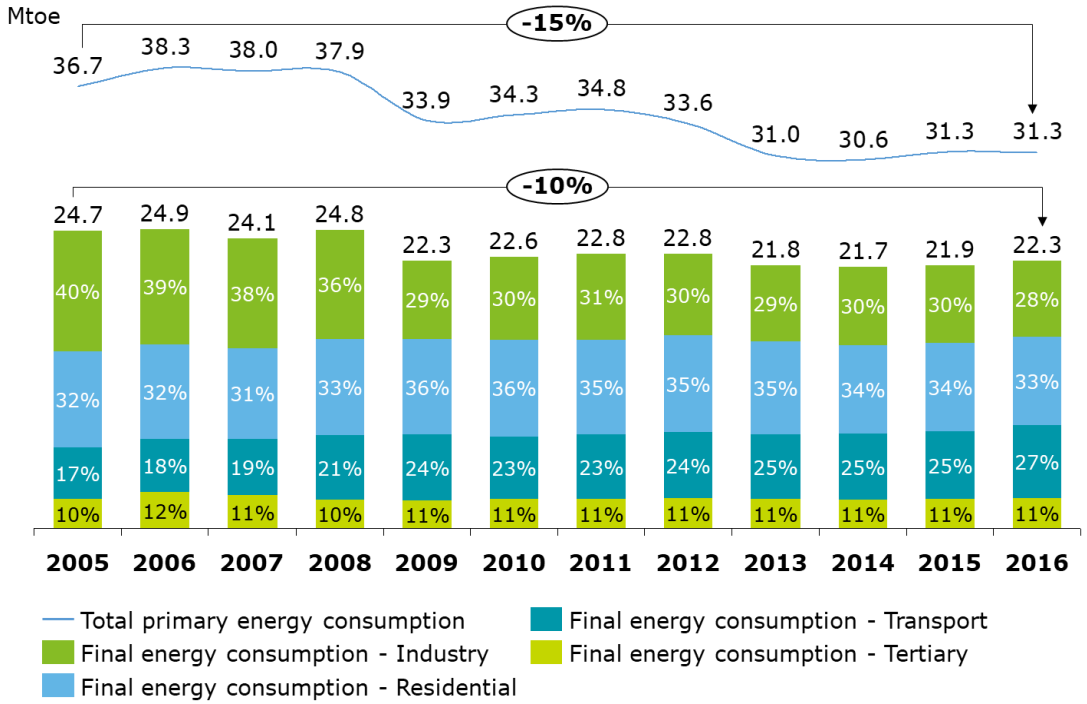
4.3.Dimension Energy Efficiency

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

The graph below presents the historical development of the primary and final energy consumption during the period 2005 – 2016, including per sector of final consumption. This development shows, firstly, a decrease by 15% of the primary energy consumption and by only 10% of the final energy consumption, which indicates an increase of energy intensity.

As for the sectors, the residential sector had the largest share in the total final energy consumption, almost in all the years under analysis (with a few exceptions). As progress, such final consumption did not change significantly. The second source of final consumption is the industrial sector. In this sector, the final energy consumption had a downward trend, and this is the main determinant of the decrease of the total energy final consumption. The tertiary sector, in this case, includes also the consumption in agriculture sector.

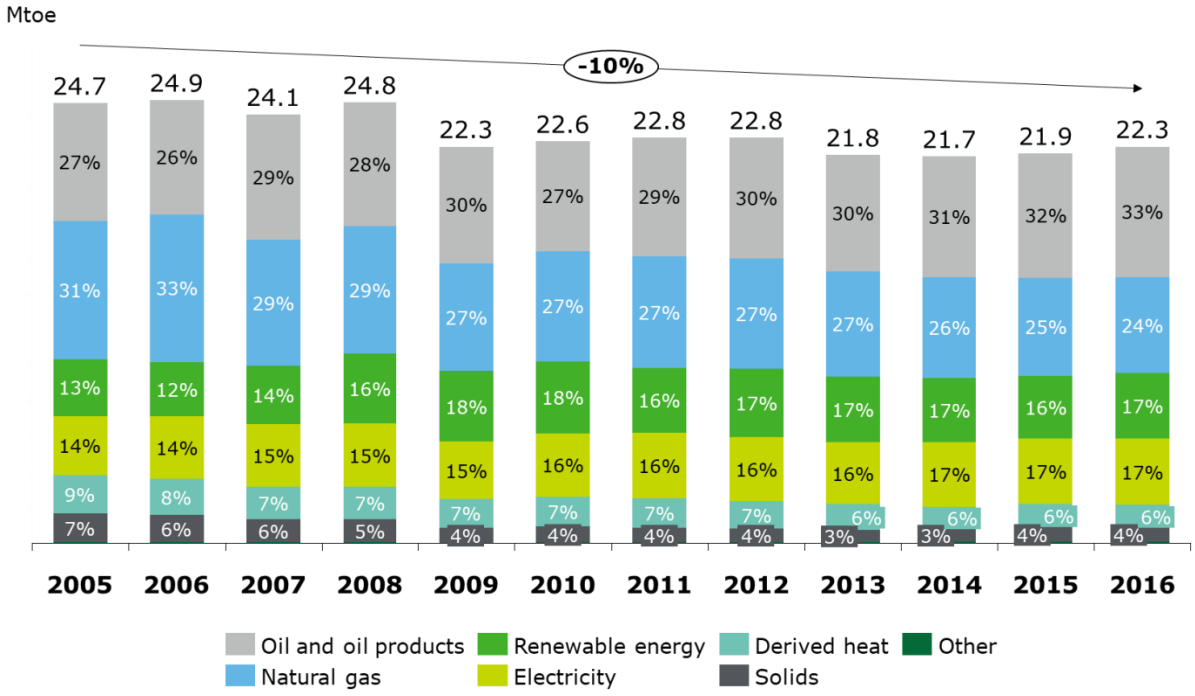
Graph 28 - Development of the primary and final energy consumption, including the allotment by sectors, during the period 2005-2016



Source: EU Commission, Energy datasheets – EU 28, 20 August 2018

As regards the energy sources consumed, the largest share was recorded by the consumption of crude oil and petroleum products, followed by the consumption of natural gas, which had a decreasing development. During this period, the renewable energy and electricity consumption did not change significantly, although it was slightly increasing.

Graph 29 - Development of the structure of the final energy consumption by energy source, during the period 2005-2016



Source: EU Commission, Energy datasheets – EU 28, 20 August 2018

ii. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling [55]

The potential for the application of high-efficiency cogeneration and efficient district heating and cooling is presented in the Report on the assessment of the national potential for the application of high-efficiency cogeneration and efficient district heating and cooling, drafted by the Ministry of Regional Development and Public Administration and the Ministry of Energy in December 2015. According to that report, such potential is assessed for the urban environment where the ratio between the built area and the aggregate area is 0.3. This indicator is expected to increase once the useful floor space per housing units increases.

The main elements of the potential are:

- Reconnections to SACET;
- Extension of SACET to new buildings.

The total efficient heating/ cooling potential was assessed in 2015 at 86.4 PJ, out of which 70.8 PJ from reconnections and 43.2 PJ have been executed.

Table 1 - Efficient heating potential until 2030

Efficient heating potential	u.m.	2015	2020	2025	2030
Reconnections	PJ	70.8	66.3	59.2	52.7
New buildings	PJ	15.7	18.6	23.1	27.7
TOTAL	**PJ**	**86.4**	**84.9**	**82.3**	**80.3**

Source: Report on the assessment of the national potential for the application of high-efficiency cogeneration and efficient district heating and cooling, Ministry of Regional Development and Public Administration and Ministry of Energy

In order to encourage the achievement of such potential, the following measures need to be taken:

1. SACET and the sources adaptation to the new heat consumptions, under efficient operation conditions and in compliance with the environmental protection rules;
2. Increase of energy efficiency along the entire chain: resources, generation, transmission, distribution, consumption;
3. Due to the advantages and the mature high-developed technology, cogeneration is promoted as essential vector for the restructuration of the heat production and distribution system;
4. Acceleration of the process for the modernization of the infrastructure related to energy services of local interest, using public and/or private financial support;
5. Increase of the involvement of the local public administration authorities in strict accord with the duties and competences provided by law;
6. Promotion of the use of renewable energy resources in order to reduce the heat price and to comply with the environmental requirements.

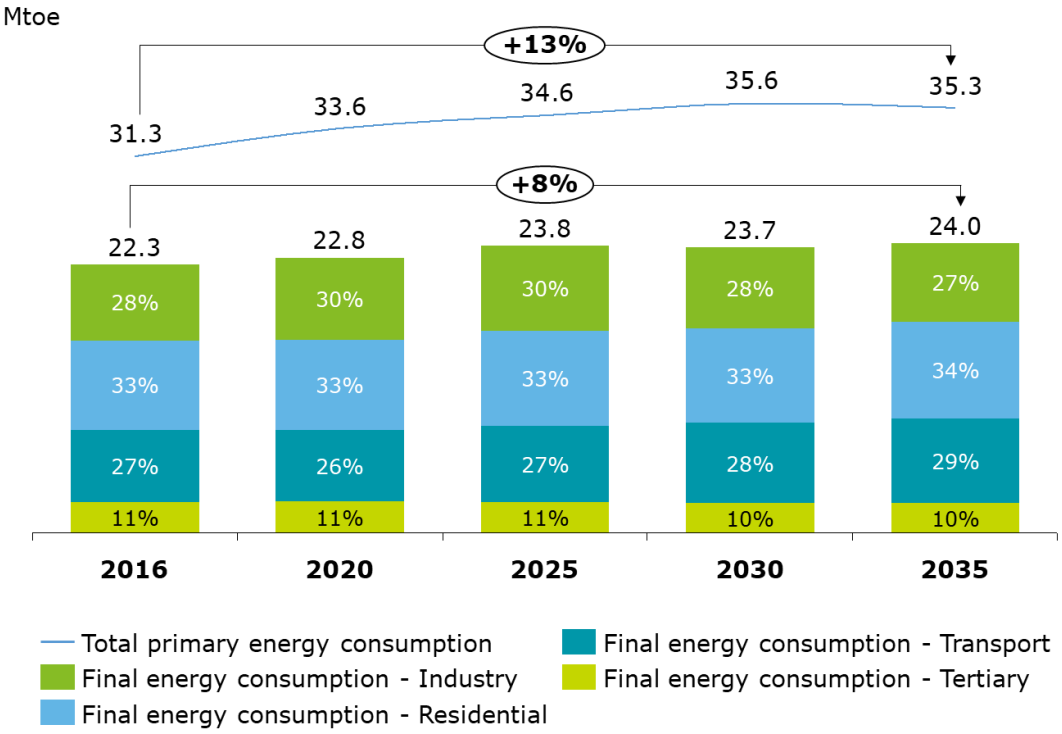
[55] In conformitate cu articolul 14 alineatul (1) din Directiva 2012/27/UE

iii. Projections considering existing energy efficiency policies, measures and programs 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)[56]

The projections of consumption in Romania, considering the existing measures[57], involve an increase of the primary and final energy consumption, as a result of the economic growth. However, a decrease is foreseen for the energy intensity, as the increase slope of primary consumption is more abrupt than that of the final consumption.

As regards the sectoral developments, it is expected that the energy consumption in transport to increase the most further to the increase of the number of motor vehicles / 1,000 inhabitants (as described also in section 4.1, ii). The final energy consumption will increase also in the residential sector, but less than in transport sector.

Graph 30 - Expected development of the primary and final energy consumption, including the allotment by sectors, with existing measures and policies

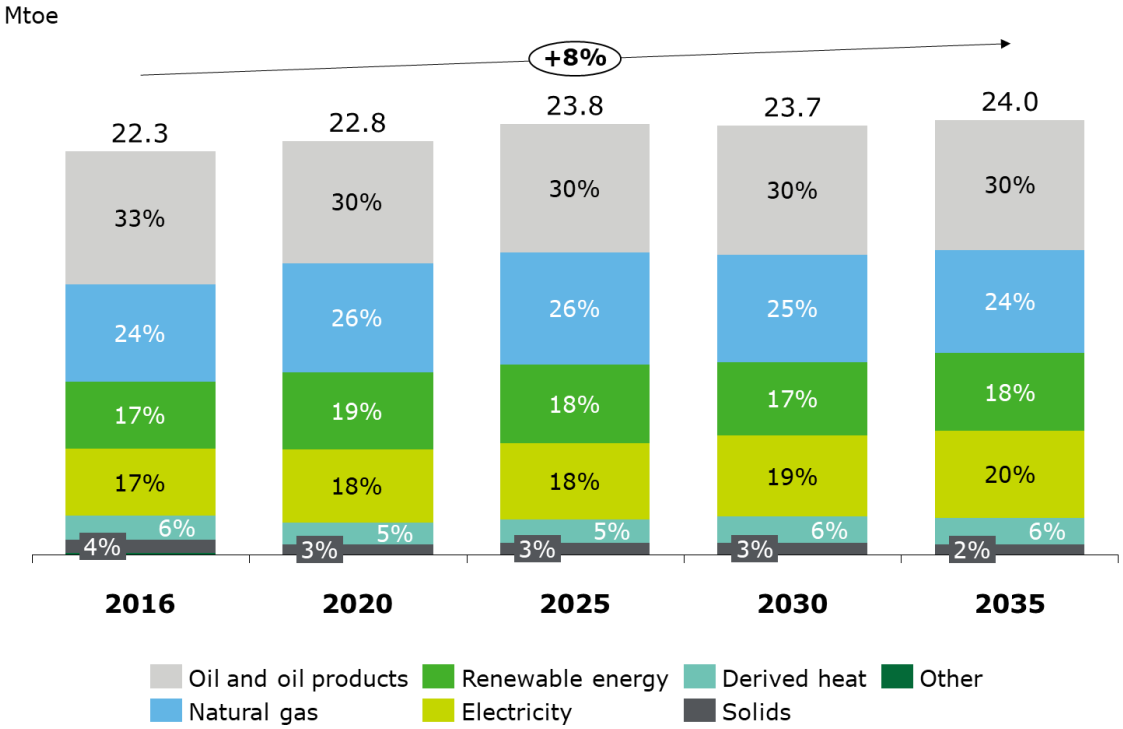


Source: PRIMES 2016 scenario, prepared for the Ministry of Energy, EU Commission, Energy datasheets – EU 28, 20 August 2018

From the perspective of the energy sources, an increase is expected in the electricity and renewable energy consumption. Natural gas will have also a slight increase in the final consumption, as a result of exploiting the Black Sea deposits. The consumption of crude oil and petroleum products, as well as of solid fuels, is expected to decrease by the end of the period under analysis.

[56] This status-quo reference forecast is the basis of the objective regarding the primary and final energy consumption for 2030 which is described at point 2.3 and the conversion factors
[57] Presented in section 1.2 ii.

Graph 31 - Expected development of the structure of the final energy consumption by energy source, with existing measures and policies



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy, EU Commission, Energy datasheets – EU 28, 20 August 2018

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

There is no sufficient information at present time in order to be able to establish the cost-optimal levels of minimum energy performance requirements from national calculations, in accordance with Article 5 of Directive 2010/31/EU.

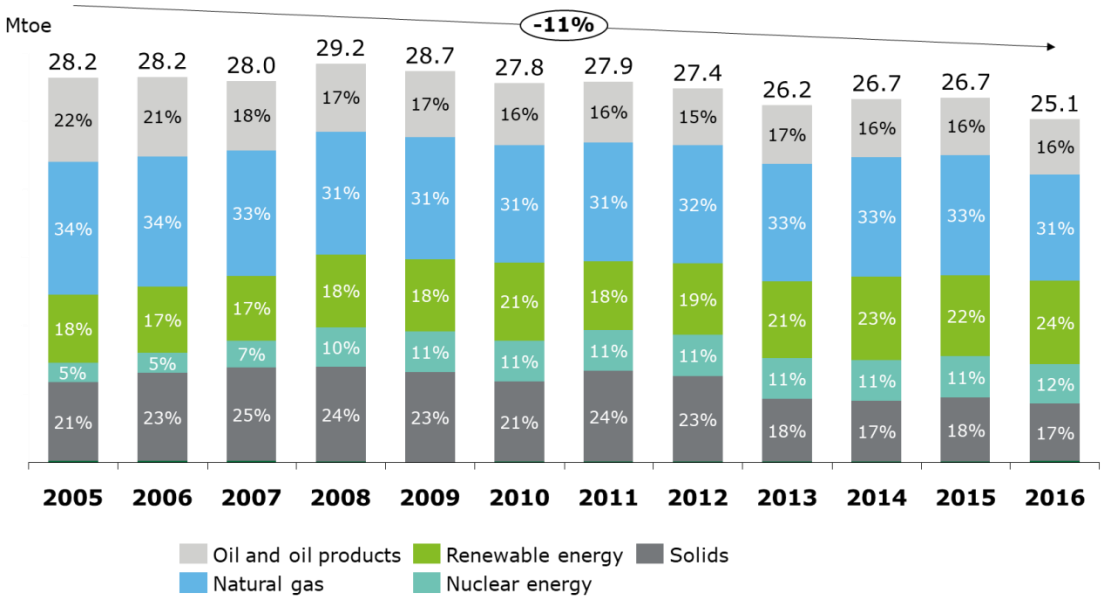
4.4. Dimension energy security

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

The energy resource with the largest share in the total production in 2016 is represented by the natural gas production, by more than 30% of the total, followed by the renewable energy (24%). In addition, a downward trend is noticed in the production of solid fuels as well as of crude oil and petroleum products.

The development in Romania of the primary energy generation indicates a downward trend, as the total production of 2016 was by 11% lower than the production of year 2005. Such reduction is, however, lower than the decrease of the energy quantity from import; in 2016 Romania has imported 33% less energy compared to that of year 2005.

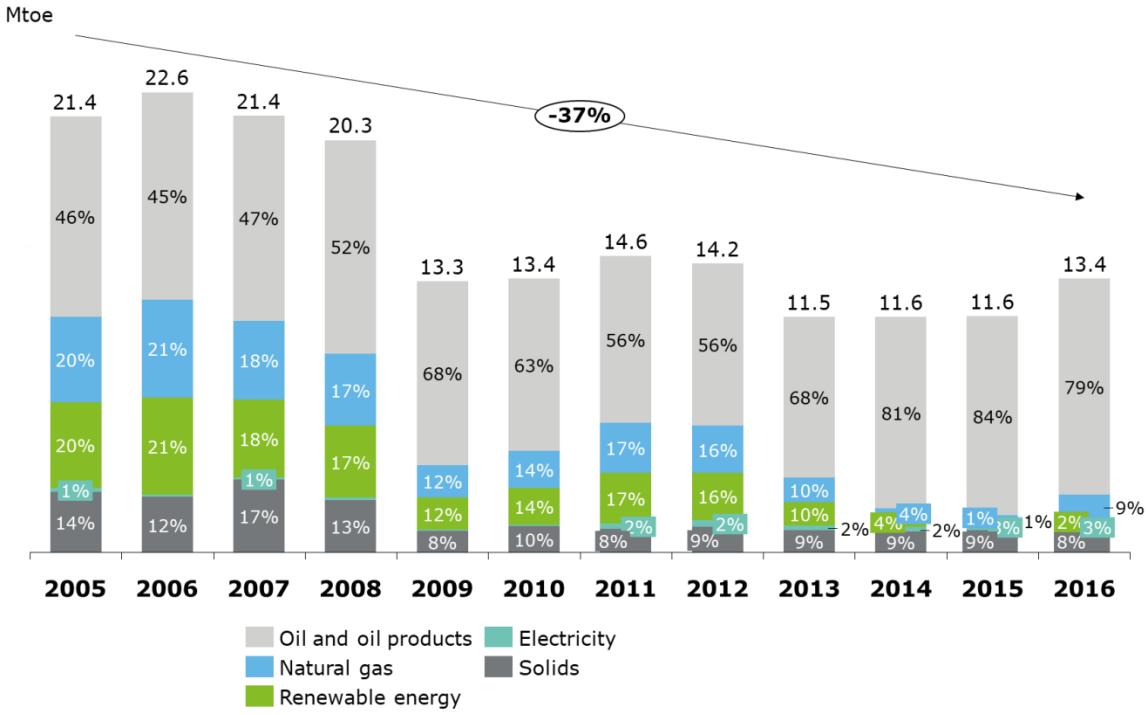
Graph 32 - Historical development of primary energy generation in Romania, by energy sources, 2005-2016[58]



Source: EU Commission, Energy datasheets – EU 28, 20 August 2018

The largest share in the energy imports during 2016 was held by the crude oil and petroleum products, an amount that remained quite constant during the period under analysis. The reduction of the import dependency was entailed by the reduction of natural gas, renewable energy and solid fuels import.

Graph 33 - Historical development of energy import in Romania, by energy sources, 2005-2016

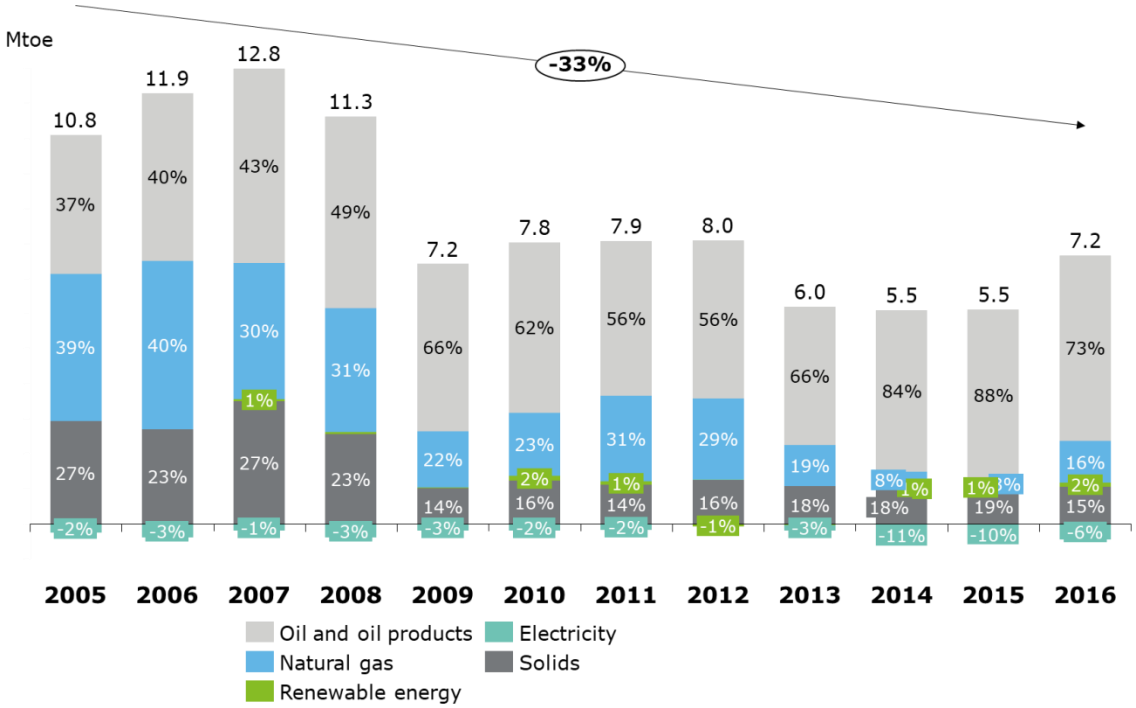


Source: EU Commission, Energy datasheets – EU 28, 20 August 2018

[58] The definition of the indicator may be found at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Primary_production_of_energy

As regards to the net import of energy, Romania is and has been from 2005 to 2016 (with one exception) a net exporter of electricity.

Graph 34 - Historical development of the import of net energy in Romania, by energy sources, 2005-2016



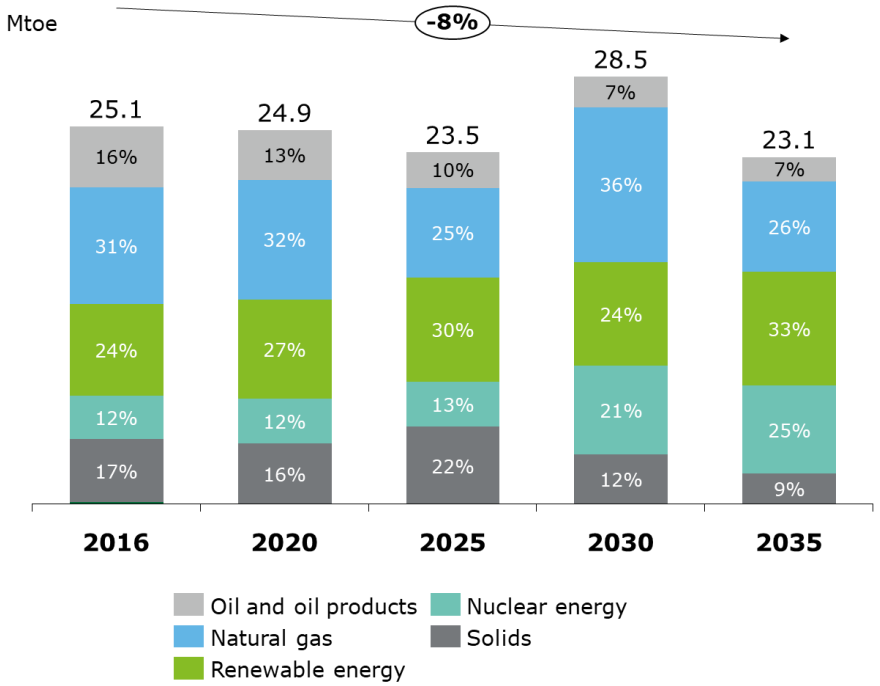
Source: EU Commission, Energy datasheets – EU 28, 20 August 2018

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

With existing policies and measures, the projection shows a decrease of energy generation, which is mainly caused by a reduction of solid fuels and natural gas production. On the other hand, an increase of nuclear energy production is expected after the Nuclear Energy Units 3 and 4 in Cernavoda are put into operation, as well as of an increased energy generation from renewable sources.

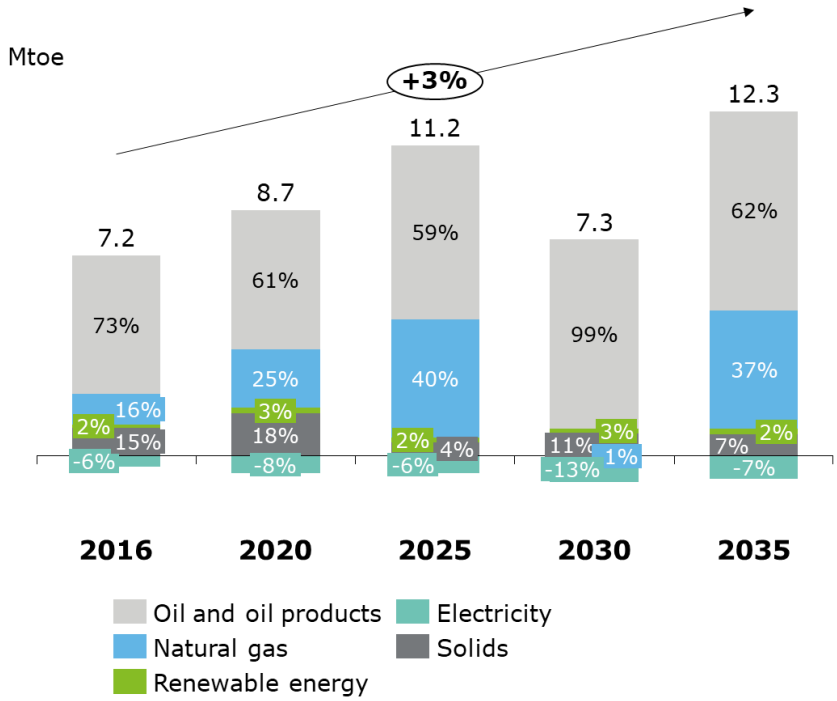
As regards the net import, it is expected that Romania to still remain a net exporter of electricity. In addition, the imports of crude oil and petroleum products are expected to continue to be high in order to cover the demand. Altogether, the import dependency is expected to increase given the forecast regarding the increase of primary consumption and the decrease of generation.

Graph 35 - Expected development of the primary energy generation, by energy sources, with existing policies and measures



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy, EU Commission, Energy datasheets – EU 28, 20 August 2018

Graph 36 - Expected development of net import of energy, by energy sources, with existing policies and measures



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy, EU Commission, Energy datasheets – EU 28, 20 August 2018

4.5.Dimension internal energy market

4.5.1. Electricity interconnectivity

i. Current interconnection level and main interconnectors [59]

The current interconnection capacity of Romania is 7%, as this is presented in the Country Report - Romania of 2017 *("SWD (2017) 88 final")*, and for year 2020 an increase is expected beyond 9%, thus facilitating the achievement of the 10% objective for year 2020. This increase of the current interconnection level of 7% to over 9% will be accomplished by extending the capacity of interconnection with Serbia.

The total length of the electricity transmission grid is 8,834.4 km, and the interconnectors amount to 426.9 km of the total. The electricity transmission grid (RET) is made of: 81 power substations, out of which: 1 power substation 750 kV, 38 power substations 400 kV, 42 power substations 220 kV; 8,834,4 km overhead electricity lines (LEA), out of which: 3.1 km 750 kV, 4,915.2 km 400 kV, 3,875.6 km 220 kV, 40.4 km 110 kV (interconnectors with the neighboring countries).

The existing interconnections are presented in the table below:

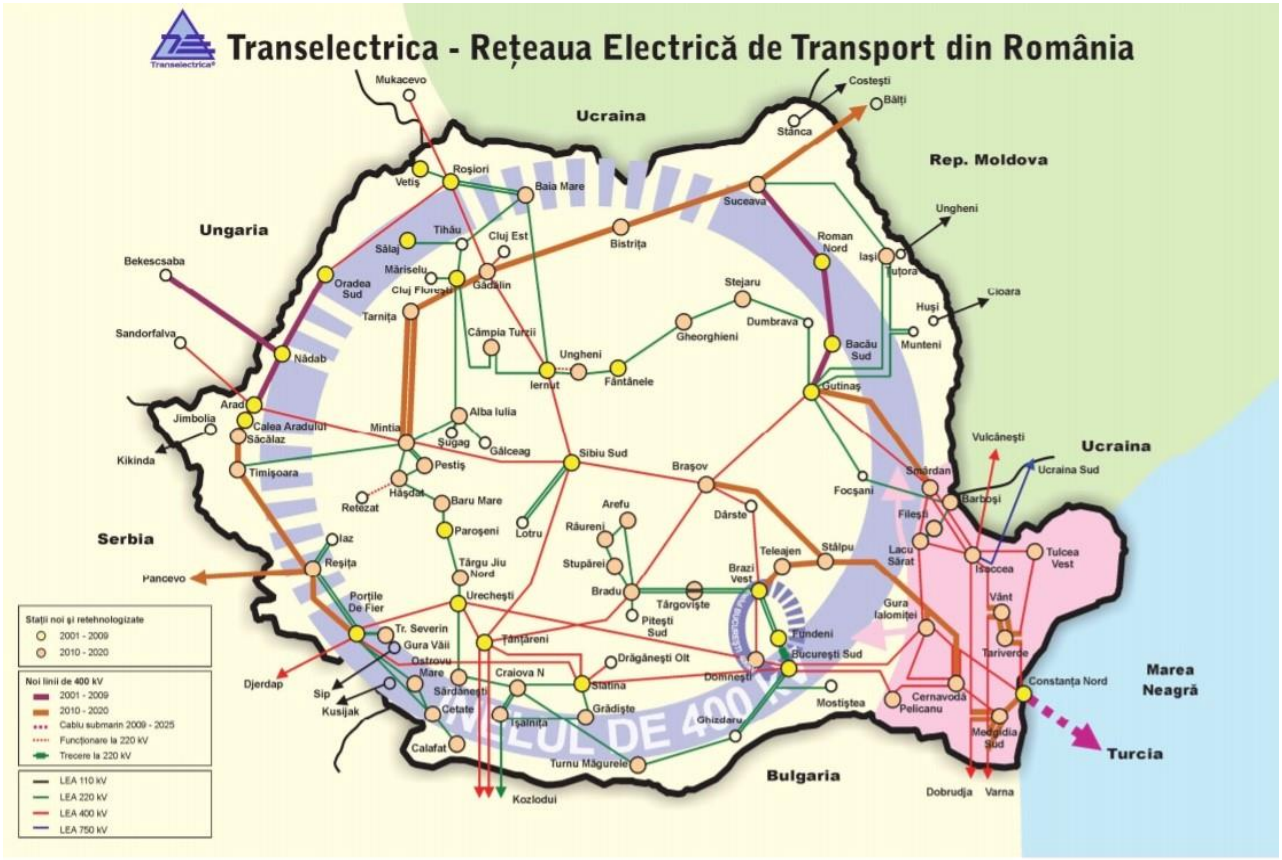
[59] Referring to the general presentations of the existing transmission infrastructure executed by the transmission and system operators (OTS)

Table 2 – Interconnectors between the national system of electricity transmission and those of the neighboring countries

No.	Border	Interconnection OPL
1	Bulgaria	400 kV LEA Tantareni - Kozlodui c.1
2	Bulgaria	400 kV LEA Tantareni - Kozlodui c.2
3	Bulgaria	400 kV LEA Stupina - Varna
4	Bulgaria	400 kV LEA Rahman - Dobrudja
5	Serbia	400 kV LEA Portile de Fier - Djerdap
6	Serbia	400 kV LEA Resita – Pancevo
7	Serbia	110 kV LEA Jimbolia – Kikinda
8	Serbia	110 kV LEA Gura Vaii - Sip
9	Serbia	110 kV LEA Ostrovu Mare - Kusjak
10	Hungary	400 kV LEA Arad - Sandorfalva
11	Hungary	400 kV LEA Nadab - Bekescsaba
12	Ukraine	400 kV LEA Rosiori - Mukachevo
13	Ukraine	110 kV LEA Siret - Porubnoe
14	Republic of Moldova	400 kV LEA Isaccea - Vulcanesti
15	Republic of Moldova	LEA 110 kV Stanca - Costesti
16	Republic of Moldova	LEA 110 kV Cioara - Husi
17	Republic of Moldova	LEA 110 kV Tutora - Ungheni
18	Republic of Moldova	LEA 110 kV Falciu - Gotesti

Source: Transelectrica, RET Development Plan, period 2018 – 2027, Annex B-2, Romanian Electricity Transmission Grid, http://www.transelectrica.ro/web/tel/transport-detalii

Figure 3 - Current status of Romanian electricity transmission grid



Source: NERA National Report 2017, RET Development Plan for the period 2018-2027 Transelectrica

ii. Projections of interconnector expansion requirements (including for the year 2030)[60]

According to the NERA National Report 2017, as regards the objective for year 2030, which is an interconnection level of 15%, the implementation of the Projects of Common Interest (PCIs) and the execution of the other projects for the development of the electricity transmission grid, included in the RET Development Plan for the period 2018-2027, will be extremely helpful for achieving this objective.

The European plan for the development of the electricity grid is completed through six regional groups within ENTSO-E. CNTEE Transelectrica SA is part of the following Regional Groups: Continental Central East and Continental South East.

For the implementation of the priorities related to the European energy infrastructure, the European Commission has included certain projects for RET development (included in the National Plan for RET Development) in the third European list of Projects of Common Interest (PCIs), approved on 23 November 2017, in the priority electricity corridor no. 3: *North-south electricity interconnections in central eastern and south eastern Europe (NSI East Electricity)*: Interconnections and internal lines in north-south and east-west directions to complete the EU internal energy market and integrate renewable energy sources, grouped as follows:

[60] Referring to the national plans for grids development and the regional plans for OTS investments

Along with a project promoted by the initiator ESO – EAD Bulgaria:

- 400 kV LEA d.c. Dobrudja – Burgas (BG).

- **Romania – Serbia Cluster, also known as Mid Continental East Corridor and Italia – Montenegro, which includes the following Projects of Common Interest:**
  - 400 kV LEA d.c. Resita (RO) – Pancevo (Serbia);
  - 400 kV LEA Portile de Fier – Resita and extension of substation 220/110 kV Resita by building the new substation of 400 kV;
  - conversion to 400 kV of 220 kV LEA d.c. Resita –Timisoara – Sacalaz – Arad, including the construction of substations of 400 kV Timisoara and Sacalaz.

Along with a project promoted by the initiator TERNA Italia:

- 400 kV HVDC between Villanova (IT) and Lastva (ME).

The above projects are included in the latest issue of the pan-European Ten-Year Network Development Plan for electricity – TYNDP 2018, drafted by ENTSO-E pursuant to Article 8 of Regulation (EC) no. 714/2009.

A brief presentation of the projects Black Sea Corridor and Mid Continental East Corridor is found herein below:

- **Black Sea Corridor:**

This project aims to reinforce the electricity transmission corridor along Black Sea coast (RO – BG) and between the coast and Western Europe.

This project, which contributes significantly to the implementation of European Union strategic objectives regarding the energy infrastructure, is supported by the increase of the interconnection level between Romania and Bulgaria and by the development of the infrastructure that will sustain the power flows transmission between Black Sea coast and North Sea coast, respectively Atlantic Ocean. At the same time, this project will result in an increase of the exchanges within the area, thus reinforcing the integration of the regional and European energy market.

The development of renewable energy sources of an intermittent nature will increase significantly along with the increase of the grid capacity to transmit energy generated by renewable sources, from South East Europe up to the main consumption centers and storage sites located in Central and Northern Europe.

- **Mid Continental East Corridor:**

This project is included in the electricity priority corridor North-south electricity interconnections in Central Eastern and South Eastern Europe (NSI East Electricity), and this will help increasing the exchange capacity at Romania, Hungary and Serbia borders. In addition, this project will allow a durable integration of electricity markets, as well as an enhanced security of supply in South Eastern Europe.

Criteria to determine the interconnection level

In the light of the amendments brought by the Proposal for a Regulation of the European Parliament and of the Council of 28 June 2018 on the Governance of the Energy Union, the interconnection strategy will have to consider, in addition to the interconnection targets established at European level, also ***the following indicators of the urgency of action in this field:***

- Differences in the wholesale market prices which exceed an indicative threshold of 2 EUR/MWh between Member States, regions or bidding zones;

- The nominal transmission capacity of interconnectors below 30% of their peak load;
- The nominal transmission capacity of interconnectors below 30% of the installed renewable generation capacity.

According to the data sent by CNTEE Transelectrica SA, two of these indicators exceed the 30% threshold, and that is why no urgency exists to implement the measures stipulated in the proposal of a regulation mentioned above, as follows:

- For the nominal interconnection capacity percentages of the peak load (the peak load was deemed to be the winter of 2018 = 9700 MW) the current value is 113%[61];
- For the nominal interconnection capacity percentages of the capacity installed in renewable energy sources, the current value is 97%.

4.5.2. Energy transmission infrastructure

i. Key characteristics of the existing transmission infrastructure for electricity and gas

Energy transmission infrastructure

The electricity transmission grid (RET) is made of overhead electricity lines (LEA) with nominal voltage of 750 kV/400 kV/220 kV/110 kV and power substations with higher voltage of 750 kV/400 kV/220 kV, which represents a total length of the electricity transmission grid of 8,834.4 km, out of which the interconnectors represent 426.9 km.

In the total LEA length, 83.6% were put into operation during the period 1960-1979, 14.07% from 1980 to 1999, and approximately 2.3% after 2000.

It is noticed a low percentage of LEA put into operation after 2000. The use of LEA is calculated as the percentage ratio between their operation time and their operating life according to the rules (which is 48 years according to the latest issue of Directory for the classification and normal operation times of fixed assets). According to the analysis conducted in 2017, the use level is very high, of 95.7% for LEA put into operation until 1979, and these ones represent 83.6% of the total overhead electricity lines that are managed by OTS.

As regards the total capacity installed in transformers, approximately 20.7% was put into operation from 1960 to 1979, 22.1% from 1980 to 1999, and 57.2% after 2000. As regards the transformers and auto-transformers, it is noticed that most of them have an obsolete operation time, approximately 43% of their total power being in this situation, being those put into operation before year 2000. For those put into operation after 2000, the average use by reference to the installed capacity is approximately 33%. The use of the transformers/auto-transformers is determined in a similar manner as the use of LEA, but in this case, the operating life under the rules is 24 years.

The high-voltage electricity transmission lines and electricity distribution lines put into operation after 2000 have a small share, the average being below 4% of the total length of these categories of electrical installations. Therefore, most of the installations related to transmission and distribution electricity grids that are currently in operation have a long operation time, mainly over 35 years.

As regards the medium and low voltage electricity lines (including connections) put into operation after 2000, it is noticed that these ones represent a higher percentage of the total length of this kind of electrical installations, which is up to 10% for medium voltage and 20% for low voltage.

[61] Transelectrica analysis table, New criteria for interconnection capacities, 2030

As for the number of substations within the distribution grids, put into operation after 2000, these ones represent approximately 9% of their total number. The number of transformer substations and of supply units reached, in 2017, approximately 28% of the total number of both categories of electrical installations.

Natural gas transmission infrastructure

Natural gas is transported through main pipelines, their total length totaling over 13,350 km (data for reference year 2017), as well as through their related installations, equipment and facilities, the natural gas supply connections having diameters from 50 mm to 1,200 mm at pressures from 6 bar to 63 bar, through which the natural gas extracted from the generation areas or from import is taken-over and transported for the purpose of supply to final customers on the natural gas internal market and external market.

The natural gas transmission system (SNT) is made of the following elements: 13,350 km main pipelines for transport and connections for supply of natural gas, out of which 553 km transit pipelines: 1,233 natural gas regulating and metering stations (directions); 58 regulator stations (SCV, NT); 6 stations for metering the import natural gas; 6 metering stations located on gas transit pipelines (SMG); 3 gas compressor stations (SCG); 1,042 cathodic protection stations (SPC) and 872 gas odorizing stations (SOG).

As regards the technical condition of the natural gas distribution systems, a total length of 49,444 km is noticed, held by 37 natural gas distribution operators. Out of these pipelines, 58.1% are made of polyethylene, and had an enhanced development during the last 20 years. Thus, out of the total 49,444, representing the length of the networks in the national distribution system, 31.5% of them are less than 10 years old, 40.5% are 10 to 20 years old and only 7.3% are more than 30 years old.

The Plan for Development of National Gas Transmission System - PDSNT 2018-2027 includes also the projects for the development of the natural gas storage system, among which two are of common interest that are in the 3rd List of TYNDP. It's the project of SNTGN Romgaz S.A. – Filiala de Inmagazinare gaze naturale DEPOGAZ S.A. "Extension of the storage capacity at Sarmasel (Transylvania) facility", reference no. 6.20.6, and the project promoted by S.C. DEPOMURES "Storage facility at Depomures-Targu Mures", List reference no. 3/2017 - 6.20.4. At the same time, there are other 3 major strategic projects for Romania, suggested by Romgaz- DEPOGAZ Branch, included in 2018-2027 plan, namely "Upgrading the infrastructure for the natural gas storage system – Bilciuresti", during the period 2018-2025, with a value of EUR 59 million; "Extension of natural gas underground storage capacity at Ghercesti facility", during the estimated period 2020-2025, with a value of EUR 122 million; "New natural gas underground storage facility in Moldova", during the estimated period 2020-2025, with a value of EUR 80 million.

ii. Projections of network expansion requirements at least until 2040 (including for the year 2030)

Electricity

The national transmission system is made of power lines and substations, most of which were built during the period 1960-1980, with a technological level corresponding to that period.

Due to the maintenance program performed and the implementation of new technology and modernization program, the installations were kept with a proper technical condition until present time.

The next ten years will be dedicated to the completion of the projects for implementation of new technology and modernization of the installations and equipment that are in progress, but other new projects will be also initiated.

CNTEE Transelectrica has communicated the projects for the grid development, which are to be put in practice:

1. Stage 2018:

- CNTEE Transelectrica SA:
  - 400kV LEA d.c. Resita – Pancevo (Serbia).

2. Stage 2022:

- CNTEE Transelectrica SA:
  - 400kV LEA Portile de Fier – Resita (stage I of the conversion to 400kV voltage of Portile de Fier – Resita – Timisoara – Sacalaz – Arad axis);
  - Connection 400kV LEA Stupina – Varna (Bulgaria) input-output in Medgidia 400kV substation through a 400kV LEA d.c.;
  - Connection 400kV LEA Rahman – Dobrudja (Bulgaria) input-output in Medgidia Sud 400kV substation through a 400kV LEA d.c.;
  - Second TR 250MVA, 400/110kV in Sibiu Sud substation;
  - Connection of Ostrovu Mare 220kV substation (CHE Portile de Fier II) input-output in one circuit of 220kV LEA d.c. Portile de Fier – Cetate;
  - Second AT 400MVA, 400/220kV in Iernut substation;
  - Second AT 400MVA, 400/220kV in Brazi Vest substation;
  - 400kV LEA d.c. (1 equipped circuit) Smardan – Gutinas;
  - 400kV LEA d.c. Cernavoda – Gura Ialomitei – Stalpu;
  - Conversion to 400kV voltage of Brazi Vest – Teleajen – Stalpu LEA;
  - 400 kV LEA d.c. (1 equipped circuit) Medgidia Sud – Constanta Nord.

3. Stage 2027:

- CNTEE Transelectrica SA:
  - 400kV LEA d.c. Resita – Timisoara/Sacalaz – Arad (stage II of the conversion to 400kV voltage of Portile de Fier – Resita – Timisoara – Sacalaz – Arad axis);
  - 400kV LEA s.c. Gadalin – Suceava;
  - 400kV LEA s.c. Suceava – Balti;
  - 400kV LEA d.c. Stalpu – Brasov (1 equipped circuit).

The solutions foreseen for the grid development must allow eliminating the congestions on the main directions of power flows between the power generation facilities in the Eastern region of the country and the consumption and storage sites in the Western region.

There are no current projections regarding the development of electricity transmission infrastructure for year 2040.

Natural gas

National Transmission System

National Gas Transmission System (SNT) is operated in Romania by SNTGN Transgaz SA, the technical operator of the transmission system (OST). The natural gas transmission capacity is ensured by the network of supply pipelines and connections, with diameters of 50 to 1,200 mm and with a total length of 13,350 km of main pipelines for transmission and connections for supply of natural gas, out of which 553 km pipelines for international transmission of natural gas.

SNT is connected to the neighboring countries, namely with Ukraine, Hungary, Moldova and Bulgaria, through the following cross-border interconnections:

Interconnection with UKRAINE:

1. Interconnection pipeline Orlovka (UA) – Isaccea (RO) with the following features: DN 1000, Capacity = 8.6 bcm/year and P_{max} = 55 bar;

2. Interconnection pipeline Tekovo (UA) – Mediesu Aurit (RO) with the following features: DN 700, Capacity = 4.0 bcm/year, and P_{max} = 70 bar.

Interconnection with HUNGARY:

3. Interconnection pipeline Szeged (HU) – Arad (RO) - Csanadpalota with the following technical features: DN 700, Capacity = 1.75 bcm/year and P_{max} = 63 bar.

Interconnection with REPUBLIC OF MOLDOVA:

4. Interconnection pipeline Ungheni (MO) – Iasi (RO) with the following technical features: DN 500, Capacity = 1.5 bcm/year and P_{max} = 50 bar.

Interconnection with BULGARIA:

5. Interconnection pipeline Ruse (BG) – Giurgiu (RO) with the following technical features: DN 500, Capacity = 1.5 bcm/year and P_{max} = 40 bar

Plan for the Development of the National Gas Transmission System presents the development directions of Romanian network of natural gas transmission and of the major projects that the operator of the National Gas Transmission System (SNT) intends to implement in the next 10 years. The objective is to reach a maximum degree of transparency as regards the development of SNT in order to offer the actors on the market the possibility to be informed in due time about the existing and planned transmission capacities, so that, by public consultations, the decisions regarding the investments in the natural gas transmission network meet the market requirements.

The Draft Plan for the Development of the National Gas Transmission System (SNT) during the period 2018 - 2027 meets the requirements of the European energy policy regarding:

- Ensure the security of the natural gas supply;
- Increase the interconnection of the national network of natural gas transmission to the European network;
- Increase the flexibility of the national network of natural gas transmission;
- Liberalization of the natural gas market;
- Integration of the natural gas market at European Union level.

Under the Plan for the Development of the National Transport System, the SNT operator suggests major projects for investments in the strategic and sustainable development of natural gas transmission infrastructure in Romania, at the same time aiming at the compliance with the requirements of the European regulations in this field.

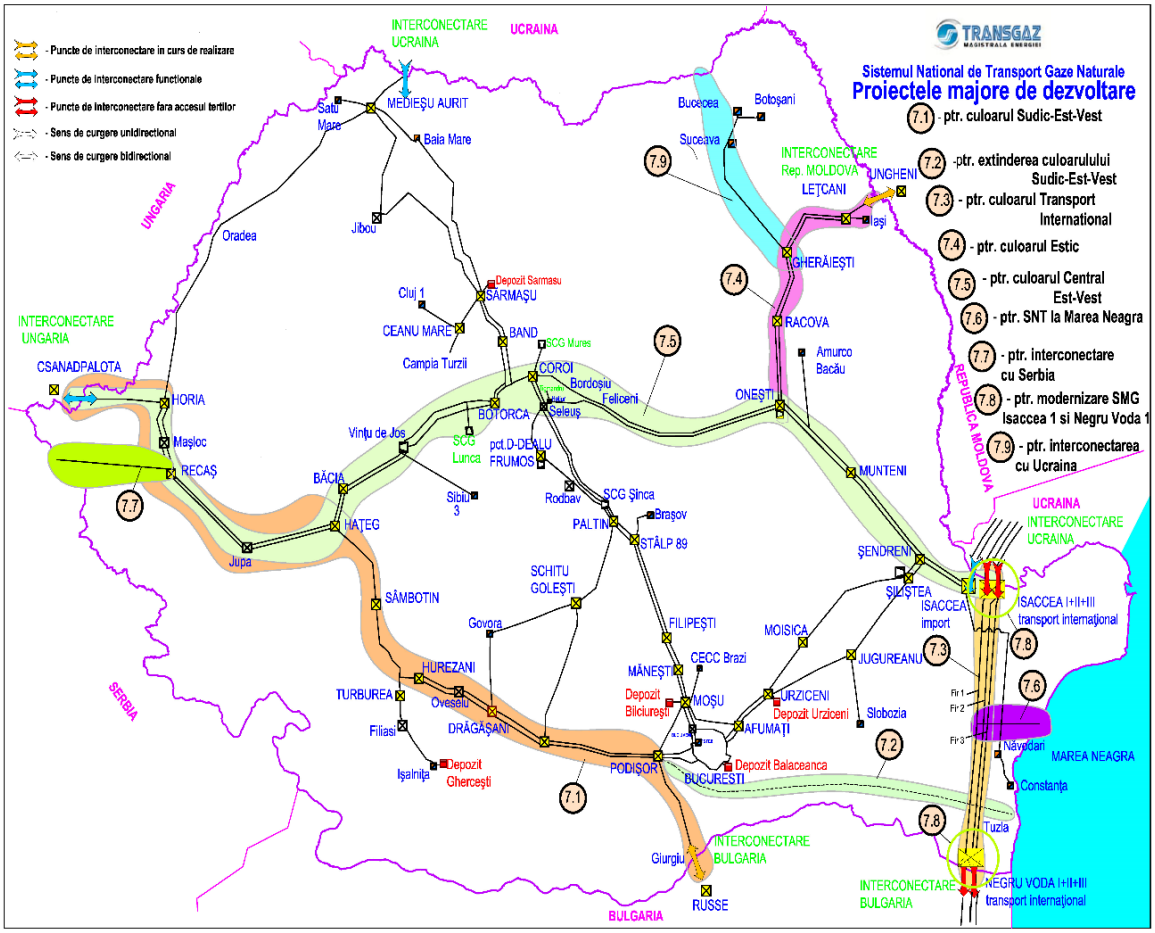
Therefore, the projects suggested under the Draft Plan for the Development of the National Gas Transmission System 2018 – 2027 are[62]:

1. **Development on Romanian territory of the National Gas Transmission System on Bulgaria–Romania–Hungary–Austria Corridor (BRUA phase I and phase II);**
2. **Development on Romanian territory of the Southern Transmission Corridor for taking-over the natural gas from the Black Sea shore;**
3. **Interconnection of the National Gas Transmission System with the international gas transmission pipeline T1;**
4. **Developments of SNT in the North-Eastern region of Romania in order to improve the natural gas supply within the area as well as to provide the capacities for transmission to the Republic of Moldova;**
5. **Enhancement of the bidirectional corridor of natural gas transmission Bulgaria–Romania–Hungary–Austria (BRUA phase 3);**
6. **Project regarding new developments of SNT for taking-over the natural gas from the Black Sea;**
7. **Interconnection of the National Gas Transmission System in Romania with the natural gas transmission system in Serbia;**
8. **Modernization of SMG Isaccea 1 and SMG Negru Voda 1;**

[62] Draft Plan for the Development of the National Gas Transmission System, 2018 - 2027

9. Interconnection of the national gas transmission system with the natural gas transmission system in Ukraine, on Gheraesti-Siret direction.

Figure 4 - Projects for the development of the national gas transmission infrastructure during the period 2018-2027



Source: Plan for the Development of the National Transmission System 2018-2027- draft

1. Development on Romanian territory of the National Gas Transmission System on Bulgaria–Romania–Hungary–Austria Corridor

The project aims at the creation of a natural gas transmission capacity among the existing interconnections between the Romanian natural gas transmission system and the Hungarian and the Bulgarian ones. To this effect, it is necessary to build a pipeline with an approximate length of 529 km on the route Podisor–Hateg–Horia of 3 new compressor stations, in Jupa, Bibesti and Podisor.

The implementation in phases of BRUA project implies:

- Phase I which consists in achieving the following objectives:
  - ✓ Podisor – Recas pipeline 32'' x 63 bar in length of 479 km;
  - ✓ Three gas compressor stations (CS Podisor, CS Bibesti and CS Jupa), each station being equipped with two compressing units (one in operation and one in reserve), with the possibility on ensuring bidirectional gas flow.
- Phase II which consists in achieving the following objectives:
  - ✓ Recas – Horia pipeline 32'' x 63 bar in length of approximatively 50 km;

- ✓ Amplification of the three compressing stations (CS Prodisor, CS Bibesti and CS Jupa) by installing an additional compressing unit in each station;

Amplification of the gas measuring station GMS Horia. Estimated completion date: year 2019 for Phase I, respectively year 2022 for Phase II.

2. Development on Romanian territory of the Southern Transmission Corridor for taking-over the natural gas from the Black Sea shore

The main objective of this investment is the construction of a telescopic pipeline for natural gas transmission Tuzla – Podisor, with a length of 308.2 km and DN1200 and DN 1000, to link the natural gas resources available at Black Sea shore with BULGARIA – ROMANIA – HUNGARY – AUSTRIA corridor, thus ensuring the possibility to transport the natural gas to Bulgaria and Hungary by the existing interconnections Giurgiu – Ruse (with Bulgaria) and Nadlac – Szeged (with Hungary). In addition, this pipeline will interconnect with the current international gas transmission pipeline T1.

Estimated completion date: year 2020.

3. Interconnection of the National Gas Transmission System with the international gas transmission pipeline T1

This project is extremely important because:

- by its implementation a transmission corridor is created between the markets in Greece, Bulgaria, Romania and Ukraine, given that a new interconnection is also created between Greece and Bulgaria;
- the transmission contract related to the capacity of Transit 1 pipeline has expired on 1 October 2016; starting with the gas year 2016–2017 the transmission capacity of Transit 1 pipeline is traded based on bidding procedure, according to the European code on capacity allocation mechanisms in gas transmission systems code on mechanisms to allot capacities at cross-border interconnections and to NERA Order no. 34/2016;
- it will be possible to ensure physical bi-directional gas flows at point Negru Voda 1, according to the requirements of Regulation (EU) no. 1938/2017[63];
- the project becomes necessary also given the taking-over in the Romanian transmission system of the natural gas recently discovered in Black Sea, for their exploitation on Romanian market and on regional markets.

The project will consists of:

- Phase I:
  - ✓ Interconnection works between NTS and the international transmission pipeline T1, in the area of Isaccea measuring station;
  - ✓ Repair of Dn 800 mm Costesti – Onesti pipeline (66.0 km).
- Phase II:
  - ✓ Modernization and amplification of Silistea Compression Station;
  - ✓ Modernization and amplification of Onesti Compression Station;

Modifications within TN Silistea, TN Sendreni and TN Onesti. Completion term: year 2018 phase I, respectively year 2019 phase II.

4. Developments of SNT in the North-Eastern region of Romania in order to improve the natural gas supply within the area as well as to provide the capacities for transmission to the Republic of Moldova

[63] SMG Negru Voda 1 is bidirectional, but the reversible flow of gas will be provided when SNT interconnection with the international gas transmission pipeline T1 is completed

Given the need to improve the supply with natural gas of the North-Eastern Romania and taking into account the perspective offered by the new interconnection pipeline between Romania and Republic of Moldova (Iasi–Ungheni), to offer transmission capacities towards/from Republic of Moldova, several developments are required in the Romanian natural gas transmission system so that the technical parameters are ensured according to the consumption requirements within the concerned regions.

Estimated completion date: year 2019.

5. Enhancement of the bidirectional corridor of natural gas transmission Bulgaria–Romania–Hungary–Austria (BRUA phase 3)

In the event that the transmission capacities necessary to exploit the natural gas from the Black Sea on Central and Western Europe markets exceed the potential of transmission of BRUA corridor phase 2, SNTGN Transgaz SA has planned to develop the central corridor which practically follows the path of the current system's pipelines, but which are currently operating at technical parameters that are not proper for a main pipeline.

The project will consist of:

- ✓ Rehabilitation of existing pipelines belonging to NTS;
- ✓ Replacement of existing pipes belonging to NTS with new pipelines or construction of new pipelines, installed in parallel with the existing ones;
- ✓ Development of 4 or 5 new compressing station with total installed power of approx. 66-82.5 MW;
- ✓ Increasing the natural gas transmission capacity to Hungary by 4.4 bn. cm / year.

Estimated completion date: year 2023.

6. Project regarding new developments of SNT for taking-over the natural gas from the Black Sea

Given the natural gas deposits that have been recently discovered in the Black Sea, SNTGN Transgaz SA intends to extend SNT for the purpose of establishing an additional point for taking-over the natural gas generated by the submarine exploitation perimeters of the Black Sea.

This project became necessary as a result of the discussions held/initiated by SNTGN Transgaz SA during 2015 with the holders of licenses for the exploration and exploitation of perimeters in the Black Sea.

Estimated completion term: year 2020, depending on the schedules for the execution of upstream offshore projects.

7. Interconnection of the National Gas Transmission System in Romania with the natural gas transmission system in Serbia

With the existence of the Energy Union Strategy provisions and of the actions for the implementation of this strategy's objectives (competitiveness, sustainability and security of energy supply), Romania pays special attention to provide energy security dimension, to develop the energy infrastructure by diversification of energy sources and transmission paths, to reinforce the solidarity among Member States and to provide efficient operation of energy market.

For the purpose of consolidating the interconnectivity level among the natural gas transmission systems in EU Member States and of increasing the energy security in the region, it was also conceived the project for the interconnection of the National Gas Transmission System in Romania with that in Serbia.

The version under analysis for the natural gas export to Serbia is to take over the natural gas from the future BRUA pipeline (phase I). The nearest point of BRUA pipeline to the border between Romania and Serbia is Mokrin, in Arad area.

The project "Interconnection of the national gas transmission system with the similar gas transmission system in Serbia" consists in the construction of a pipeline for interconnecting the national gas transmission system with the similar gas transmission system in Serbia on the direction Arad Recas–Mokrin with a length of approximately 97 km. According to PDSNT 2018-2027 the pipeline path will be on the Recas-Mokrin corridor, modified compared to PDSNT 2017-2027 on Arad–Mokrin path.

The project will consist of:

- Construction of a new interconnection pipeline of approx. 97 km length, out of which approx. 85 km on Romanian territory and 12 km on Serbian territory, with the following characteristics:
  - ✓ Pressure in BRUA pipeline in Recas area: 50-54 bar (PN BRUA – 63 bar);
  - ✓ Interconnection pipeline diameter: Dn 600 mm;
  - ✓ Transport capacity: 1.6 bn Scm / year (183,000 Scm / h), with increasing possibility up to 2.5 bn. Smc / year (285,000 Smc / h), Morkin pressure: 39-45 bar;
  - ✓ Construction of a natural gas measuring station (located on Romanian territory).

Estimated completion term: year 2020.

8. Modernization of SMG Isaccea 1 and SMG Negru Voda 1

In order to increase the degree of energy security in the region, the following Interconnection Agreements were signed:

- Interconnection Agreement for the Interconnection Isaccea 1, entered into with PJSC Ukrtransgaz, Ukraine, on 19.07.2016;
- Interconnection Agreement for the Interconnection Negru Voda 1, entered into with Bulgartransgaz, Bulgaria, on 19.05.2016.

One of the actions mentioned in these Agreements is the modernization of natural gas metering stations at the two interconnections.

The project "Modernization SMG Isaccea 1 and SMG Negru Voda 1" consists in building two new natural gas metering stations within the existing premises of Metering Stations.

Estimated completion term: year 2019.

9. Interconnection of the national gas transmission system with the natural gas transmission system in Ukraine, on Gheraesti-Siret direction

This project provides for the increase of the level of interconnection between the national gas transmission system and the European transmission network. Thus, SNTGN Transgaz SA has identified the opportunity to execute an interconnection of SNT with the natural gas transmission system of Ukraine, of Gheraesti-Siret direction.

The project supposes:

- Construction of a natural gas transmission pipeline and of the related installations, on Gheraesti-Siret direction;
- Construction of a cross-border gas metering stations;
- Enhancement of the compressor stations Onesti and Gheraesti, if necessary.

Estimated completion term: year 2025.

4.5.3. Electricity and gas markets, energy prices

i. Current situation of electricity and gas markets, including energy prices

Electricity market

In Romania, the electricity market is made of:

- The wholesale market, the size of which is determined by all the transactions performed, exceeding the quantity transmitted physically from generation to consumption; all the transactions include the resales for the purpose of adjusting the contractual position and of obtaining financial benefits;
- The retail market, within which transactions take place between suppliers (either competitive or of last resort) and the end customers (supplied under competitive or regulatory conditions – pursuant to Art. 53, para. (2) and to Art. 55, para. (1) of Law no. 123/2012 on electricity and natural gas).

The participants on the electricity market and the related operational structures are:

- Producers;
- Energy transmission and system operator (Transelectrica SA);
- Electricity market operator (OPCOM SA);
- Distribution operators;
- Suppliers;
- Final customers.

The market operator OPCOM SA manages the following electricity markets:

- Day-Ahead Market (PZU);
- Intraday Market (PI);
- Organized framework for trading under competitive conditions of bilateral electricity contracts by extended auction (PCCB-LE), by continuous negotiation (PCCB-NC) and by processing contracts (PCCB-PC);
- Centralized market with double continuous negotiation of electricity bilateral contracts (PC-OTC);
- Electricity market for large final customers (PMC);
- Centralized market for universal service (PCSU)
- Green Certificates Market (PCV).

The developments that influenced the electricity market during the previous year were represented by[64]:

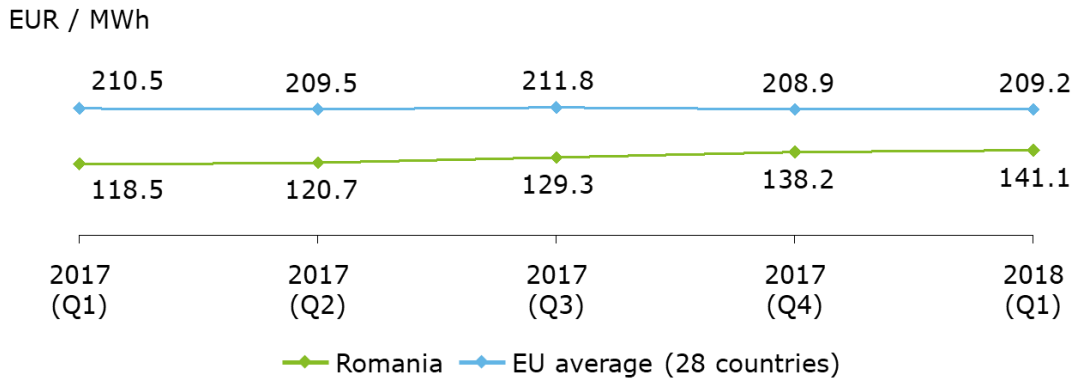
- ✓ The amount of electricity generated inn 2017 was 61.3 TWh, which is a 1% decrease compared to year 2016;
- ✓ As regards the energy mix, an increase occurred in the generation of nuclear and wind energy and carbon, which offset a decrease of hydropower production;
- ✓ The internal consumption of electricity increased by 3% in 2017 compared to 2016;
- ✓ Own technological consumption dropped by 4.68% compared to 2016 due to the favorable distribution of import/export physical flows on the interconnectors in the North-Western part of the country and to the fine weather conditions that caused the reduction of Corona discharges on electrical lines;
- ✓ SAIDI index – planned interruptions has increased from 183.5 min / year (2016) to 193.1 min / year (2017) average interruptions;
- ✓ SAIDI index – unplanned interruptions has decreased from 289.9 min / year (2016) to 283.9 min / year (2017) average interruptions;

[64] According to National Report for 2017, drafted by NERA at 31 July 2018

- ✓ The average durations of the connection procedure have dropped in 2017 compared to 2016 (from 87 days to 83 days for JT, respectively from 255 days to 234 days for MT);
- ✓ There were 774 renewable energy producers, out of which 67 – wind power, 103 – hydropower, 576 – solar power and 28 – biomass;
- ✓ In 2017, most transactions were completed on centralized markets of bilateral electricity contracts organized on OPCOM (PC-OTC, PCCB-LE and PCCB-NC) representing transactions closed on medium and long term, followed by PZU transactions (on short term).

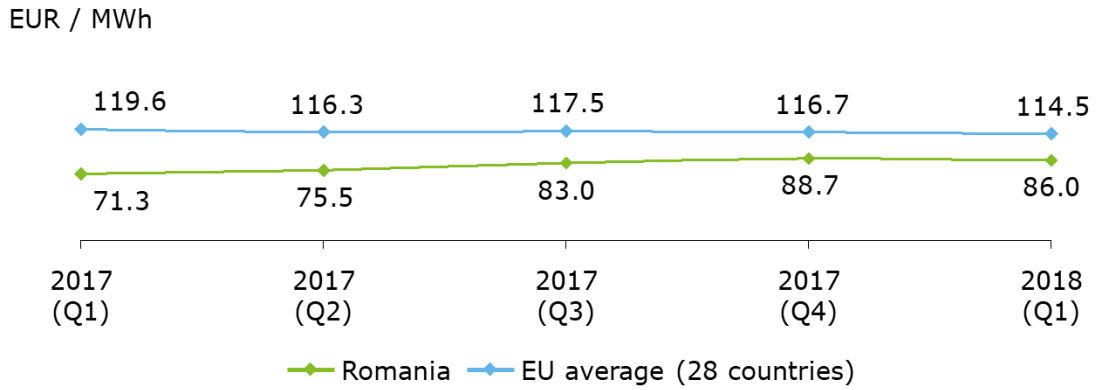
The graphs below present the development of the average quarterly price of natural gas in Romania and the EU average (28 countries) for household consumers, respectively the industrial consumers. Such price includes all applicable fees and excise duties. Thus, it is noticed that in both cases, the price in Romania is lower than the European average, and the highest differences are related to household consumers.

Graph 37 - Development of average quarterly price of electricity for industrial consumers in Romania and EU 28



Source: DG Energy, Quarterly reports on the European electricity market T1 2017 – T1 2018

Graph 38 - Development of average quarterly price of electricity for industrial consumers in Romania and EU 28



Source: DG Energy, Quarterly reports on the European electricity market T1 2017 – T1 2018

Natural gas market

In Romania, the natural gas market is made of[65]:

- Regulated market – which includes the activities of a natural monopoly nature, the activities related thereto and the supply for a regulated price and based on framework contracts, approved by NERA; such market is intended for household consumers, and is going to be entirely liberalized starting from July 2021;
- Competitive market – which includes the marketing of natural gas on wholesale market (between suppliers which are natural or legal persons that perform the activity of natural gas supply, including natural gas producers, between suppliers and distributors, as well as between suppliers and the transmission and system operator) and on retail market (between suppliers, including producers and eligible customers). On the competitive market, the prices are established freely based on demand and offer, as a result of competitive mechanisms through trading on centralized markets, in a transparent, public and non-discriminatory manner and based on negotiated contracts, and on the competitive retail market the prices are established also relying on standard offers.

Depending on the destination of the natural gas, the Romanian market structure is as follows:

- wholesale market - where natural gas generated and imported is marketed/traded between economic operators in the natural gas sector, mainly for covering the contractual obligations/consumptions and for adjusting the portfolios;
- retail market (represents the sales to final customers both on the regulated market, and on the competitive market).

Depending on type of contract, the competitive market operates based on:

- bilateral contracts;
- transactions on centralized markets (where gas is sold to other license holders and to final customers);
- other types of transactions or contracts.

In August 2018 on Romanian market there were:

- 8 natural gas producers;
- 88 suppliers;
- 36 distribution operators;
- 1 transmission operator (SNTGN Transgaz SA);
- 2 storage operators (S.N.G.N. Romgaz Filiala de Inmagazinare gaze naturale DEPOGAZ Ploiesti S.R.L and S.C. Depomures S.A.);
- 2 centralized markets operators (BRM S.A. and OPCOM S.A.).

The developments that influenced the natural gas market during the previous year were[66]:

- ✓ The natural gas consumption has continued its upward trend in 2017 too, being by 5% higher than that of year 2016;
- ✓ Approximatively 95% of the internal production of natural gas of 2017 was covered by the two main producers (Romgaz and OMV Petrom);
- ✓ NERA has approved by Decision no. 910/22.06.2017 the plan for the development of the National Gas Transmission System, to ensure a proper level of interconnection with

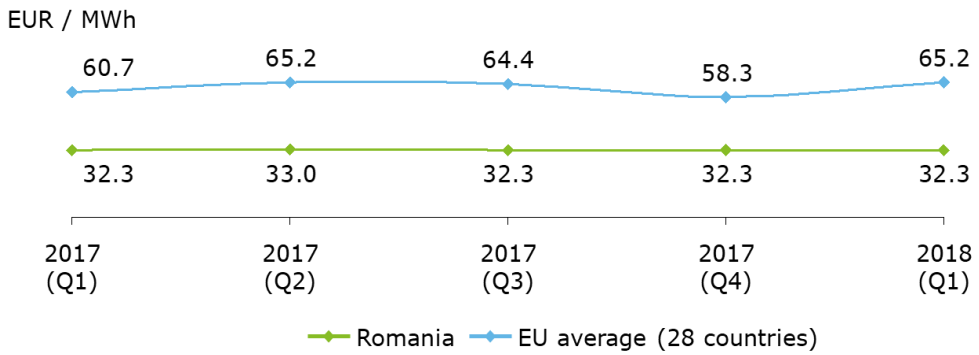
[65] According to the Monthly report for monitoring the natural gas domestic market for 2017 August 2018 2017, drafted by NERA (https://www.NERA.ro/ro/gaze-naturale/rapoarte/rapoarte-piata-gaze-naturale/rapoarte-lunare-de-monitorizare-pentru-piata-interna-de-gaze-naturale-2018)
[66] According National Report for 2017, drafted by NERA at 31 July 2018

the neighboring countries, to ensure the natural gas transmission from the new sources of supply, the extension of transmission infrastructure, etc.;

- ✓ The investments foreseen for 2018 in the transmission network is estimated at RON 687 million (out of which RON 617 million represent works for the modernization and development of SNT), by 36% more than the value of the investments made in 2017;
- ✓ The actual level of market opening has increased by 10% in 2017 compared to 2016, reaching 72% of the total consumption of the final customers;
- ✓ A workgroup was formed upon NERA and SNTGN Transgaz SA initiative, with the participation of ACER, ENTSO-G, NERA, SNTGN Transgaz SA and DG ENERGY in order to ensure the implementation of the harmonized market rules in EU as regards the regime of natural gas input-output into/from SNT, based on transactions in one virtual point (PVT);
- ✓ The "Manual of the open season binding procedure to be conducted jointly by Societatea Nationala de Transport Gaze Naturale "Transgaz" – S.A. Medias and "Földgázszállító Zártkörűen Működő Részvénytársaság" – FGSZ ZRT", for the allotment of incremental capacity at the interconnection of the national gas transmission system in Romania with that in Hungary.

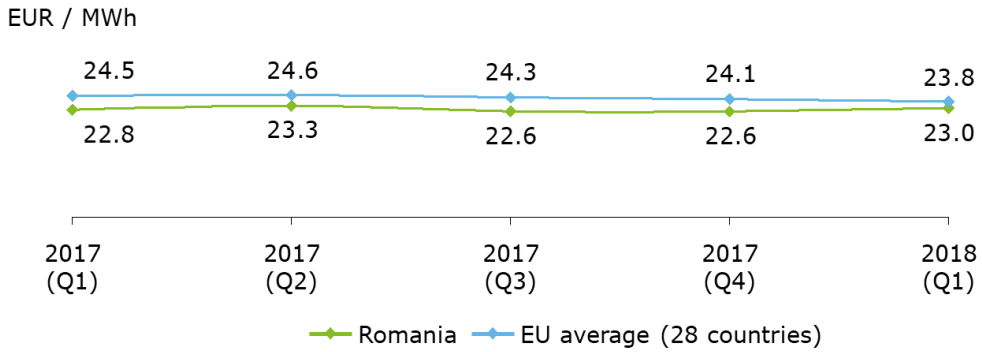
The graphs below present the development of the average quarterly price of natural gas in Romania and the EU average (28 countries) for household consumers, respectively the industrial consumers. Such price includes all applicable fees and excise duties. Thus, it is noticed that in both cases, the price in Romania is lower than the European average, and the highest differences are related to household consumers.

Graph 39 - Development of the average quarterly price of the natural gas, VAT excluded, for the household consumers in Romania and EU 28



Source: DG Energy, Quarterly reports about European market of natural gas, T1 2017 – T1 2018

Graph 40 - Development of the average quarterly price of the natural gas, VAT excluded, for the industrial consumers in Romania and EU 28

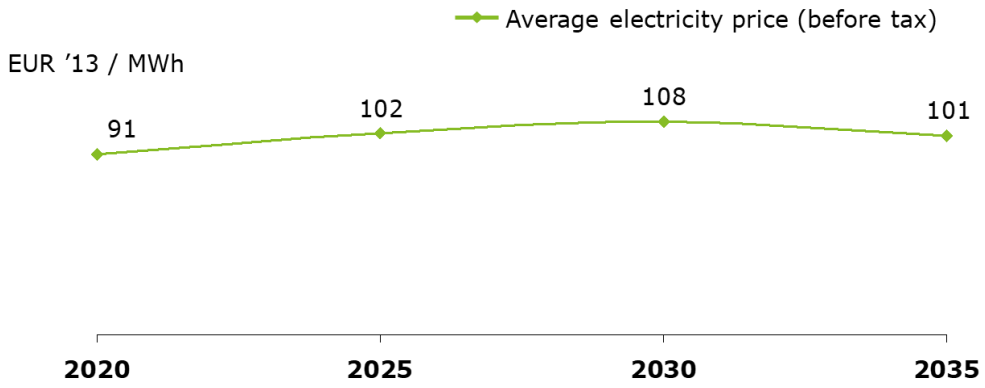


Source: DG Energy, Quarterly reports about European market of natural gas, T1 2017 – T1 2018

ii. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

The graph below presents the development expected for the electricity price under current conditions. This price does not include VAT nor excise duties.

Graph 41 - Expected development for the average price of electricity, VAT excluded, with existing measures and policies



Source: PRIMES 2016 scenario, prepared for the Ministry of Energy

As regards the development of the natural gas price with existing policies and measures, this was presented in section 4.1.iii "Global energy trends, international fossil fuel prices, EU ETS carbon price".

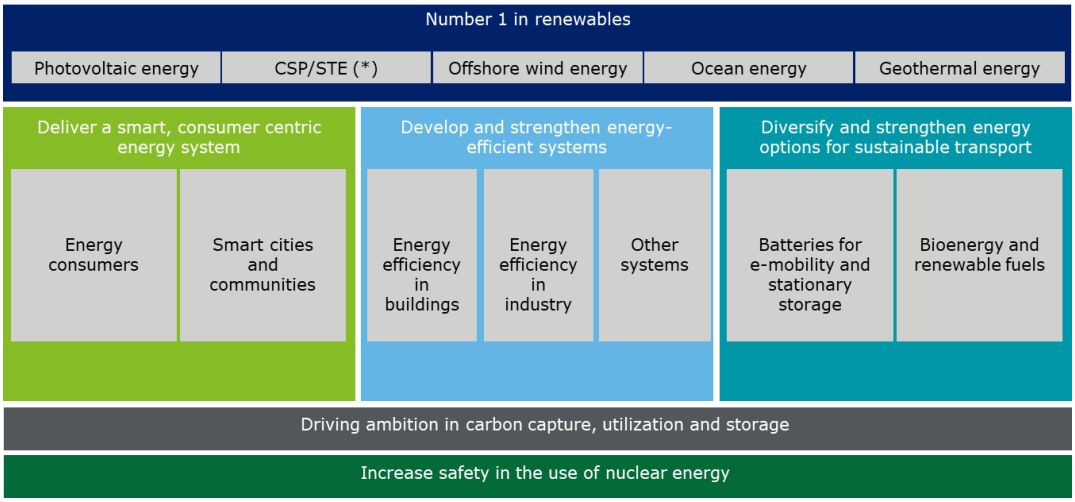
4.6. Dimension research, innovation and competitiveness

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)

By comparison to the 5 strategic directions proposed by the European Commission, the research-innovation pillar present the largest difference between the potential of Romania and the concentration of efforts for performing and augmenting it, a trend that is also reflected at sectoral level. The main challenges are related to the absence of predictability in financing, undersizing the critical mass of human resources, low absorption of European funds and the excessive bureaucracy.

At European level, the main instrument for promoting and mobilizing finance sources in the field of research, innovation and competitiveness in the energy sector is the SET Plan (Strategic Energy Technology). It deals with priorities such as: reinforcement of the leader position in the renewable resources field, participation of the consumers in ecosystem through intelligent systems, energy efficient systems, sustainable transport, sequestration, use and storage of carbon and improvement of the security in the use of nuclear power.

Figure 5 – Main component of the Energy Transmission System



Source: Strategic Energy Technology Plan (SET Plan), 2017

The research infrastructures and the projects described below, at different stages of development, may be structured within SET as follows.

Consumers' participation in the intelligent energy system

The regulatory framework to encourage the prosumers participation in the energy circuit was improved by Law 184/2018, which provides a clearer definition of the 'prosumer' concept and simplified authorization procedures, tax facilities and options to promote generating energy from renewable sources[67], such as exemption from the obligation to purchase green certificates yearly and quarterly, but also from the payment of all tax duties related to the amount of electricity generated (own consumption / surplus sold to suppliers).

Intelligent cities

The strategy for transforming the country capital city is in progress, and aims at approaching topics in the energy sector, such as energy generation from renewable sources, monitoring the energy grids using computer and communication technologies, control of pollution and monitoring of water/air/soil quality, the use of photovoltaic and solar panels at the buildings, the extension of cogeneration solutions, the use of solution for the storage of energy surplus and the reduction of the time to remedy the flaws and of the maintenance costs.

The city of Alba-Iulia, based on the partnership of the city municipality with various multinational companies in the technological field, as well as local or regional SMEs, has benefited from the implementation of several 'intelligent city' projects, such as[68]:

- Operational projects: intelligent lighting, industrial equipment IoT (Internet of Things) for the public energy management, thermodynamic solar system with a 450% yield, producing hot water continuously, even during the night;
- Projects about to be implemented: intelligent metering kit LED + IoT sensors for 3 buildings within a school, allowing the remote communication of electricity, water and natural gas consumptions, a complete solution for intelligent lighting;
- Project under analysis: Intelligent Electricity Grids and Renewable Energy Systems" is a system of integrated solutions for high-capacity energy storage in the key points connected to sources of electricity generation from renewable sources (photovoltaic system).

[67] Romanian Official Gazette, Parte I, 635/20 July 2018. Law approving Government Emergency Ordinance 24/2017, amending and complementing law 220/2008
[68] https://albaiuliasmartcity.ro/solutii/, accessed on 30.10.2018, at 09:20

Energy efficiency systems

The research infrastructure CCAT (Center for Advanced Research in Propulsion) intends to become a pole of excellence in aeronautic, naval and space propulsion.

In the Smart Grid field, one may notice the participation of the Ministry of Education and Research and of UEFISCDI (Executive Unit for Financing Higher Education, Research, Development and Innovation), a public institution which reports institutionally to the Ministry of National Education, in the European ERANet SmartGridPlus program, which aims at loosening the transfer of knowledge of Smart Grid initiatives at regional and continental level[69].

Also within ERANet, we mention the Romanian participation in the project CERA-SG (efficient collection of data in intelligent networks), coordinated by MINcom Smart Solutions GmbH (Germany), in partnership with a local SME, University of Pitesti and an European company in the energy field, as well as FISMEP (API open source platform, which intends to get results that are applicable in domains such as intelligent buildings, intelligent networks, advanced systems for energy services monitoring), which includes research centers in Romania (Polytechnics University), Germany, Sweden, as well as local and European companies in energy field, being coordinated by RWTH University of Aachen, Germany[70].

RENEWS is a research infrastructure aiming at creating and consolidating a national excellence center in the energy, environment and water field, contributing also to objective ESFRI 1.2, regarding the modernization of the research infrastructure by connecting the national and the international networks[71].

Increase of nuclear security and reduction of radioactive wastes in the Generation IV nuclear reactors

- ALFRED (Advanced Lead Fast Reactor European Demonstrator) is a research project for a lead fast reactor technology demonstrator reactor (LFR, Lead Fast Reactors). LFR technology is supported by European Union by the initiatives SNETP (Sustainable Nuclear Energy Technology Platform) and ESNII (European Sustainable Nuclear Industrial Initiative), for the development of generation IV nuclear systems. These are based on lead fast reactor (LFR), Sodium Fast Reactor and Gas Fast Reactor. The project is in the portfolio of the international consortium FALCON (Fostering ALFRED Construction), established in 2013 in Bucharest by Technologies for Nuclear Energy State Owned Company, Ansaldo Nucleare and ENEA, followed in 2014 by CVR (Centrum Výzkumu Řež, Czech Republic). Currently, FALCON has signed 10 agreements of scientific cooperation with research and development organizations of the European Union countries, which help the development of LFR technology, as well as a memorandum of collaboration with SN Nuclearelectrica, in 2018.

The consortium FALCON has foreseen a period for testing the technologies, as well as the completion of designing and engineering ALFRED until 2020, for the purpose of completing the construction of the demonstrator at Mioveni Pitesti (Romania) before 2030. ALFRED would have thus a total power of 300 MWth, and the related estimated costs would totalize from EUR 1 to EUR 1.4 billion[72].

[69] Source: UEFISCDI, https://uefiscdi.ro/era-net-smart-grids-plus, accessed on 30.10.2018, at 09:55
70 Source: ERA-Learn.eu, https://www.era-learn.eu/network-information/networks/era-net-smartgridplus/era-net-smart-grids-plus-joint-call-for-proposals/cost-efficient-data-collection-for-smart-grid-and-revenue-assurance, accessed on 30.10.2018, at 09:57
71 Report on the research infrastructures in Romania – Roadmap 2017, Romanian Committee for Research Infrastructures
[72] Memorandum ALFRED - 7 January 2014, Report on the research infrastructures in Romania – Roadmap 2017, Romanian Committee for Research Infrastructures

- The Experimental pilot plant for tritium and deuterium separation (PESTD) – ICSI Nuclear, an objective of national interest, has the mission to execute the technology for the detritiation of heavy water used as moderator and cooling agent at CANDU nuclear reactors and to check specific materials and equipment in tritiated environment and at cryogenic temperatures. The experimental pilot plant is included in the list of nuclear plants supervised by the Atomic Energy Agency in Vienna. Some of ICSI partners in the nuclear field are KIT Karlsruhe - Tritium Laboratory and Institute for Trasuranium Elements in Karlsruhe, Germany, Nuclear Energy Center in Belgium and Atomic Energy Commission in France. Also, ICSI is registered in the international databases as member of the research networks within - European Commission - Research Executive Agency - Validation Services - Legal Entity Appointed Representative (LEAR), EU research and innovation program Horizon 2020, EURATOM - International Thermonuclear Experiment Reactor (ITER), European Fusion Development Agreement (EFDA) and Fusion for Energy (F4E)[73].
- As regards the international cooperation in this field, National Institute for Research and Development in Physics and Nuclear Engineering "Horia Hulubei" participates in the infrastructures within CERN Geneva (European Organization for Nuclear Research), FAIR Darmstad (Facility for Antiproton and Ion Research) and collaborates bilaterally with IN2P3 France (National Institute of Nuclear and Particle Physics), INFN Italy (National Institute of Nuclear Physics) and JRC – CE (Joint Research Center EC).

Sustainable transport

National Hydrogen and Fuel Cell Center (CNHPC), part of ICSI Energy Rm. Valcea, coordinates the research activity in the field of generation, storage and use of hydrogen at fuel cells. The main directions aimed at are:

- conversion of hydrogen into energy, gas-to power;
- technologies for the storage of energy to obtain the parameters to create power-to-gas plants;
- hybrid technologies for the storage of energy – Lithium-ion program;
- development of "clean" propellers for mobility – "H-mobility" program.

ICSI collaborates within joint initiatives for hydrogen technologies and fuel cells (Joint Technology Initiative on Hydrogen and Fuel Cells Research Group and N.ERGHY Group)[74].

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 financing options include national funds for investments (included in the instruments for the implementation of the National Strategy for Research, Technological Development and Innovation 2014-2020), European Funds (POC, Horizon Europe), private funds or other funds (for instance, programs budgeted for within the Ministry of Regional Development, Public Administration and European Funds).

The national plan for research, development and innovation for period 2015-2020 (PNCDI III) is a major mechanism major for financing the activities in this field. This sustains priority domains within the national strategy for research, development and innovation 2020:

Intelligent specialization priority fields

- Biobased economy;

[73] Memorandum ALFRED - 7 January 2014, Report on the research infrastructures in Romania – Roadmap 2017, Romanian Committee for Research Infrastructures
[74] Annual activity report, 2017 – National Institute of Research and Development for Cryogenic and Isotopic Technologies – ICSI Rm. Valcea

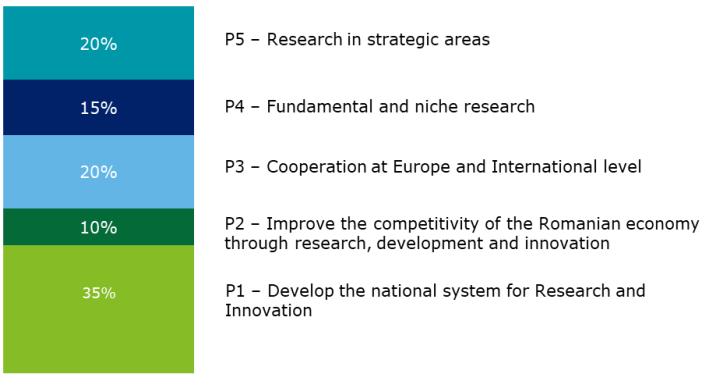
- Information and communication technology, space and Security;
- Energy, environment and climate changes;
- Eco-nanotechnologies and advanced materials.

Public priority fields

- Health;
- Patrimony and cultural identity;
- New and emerging technologies.

The total budget of PNCDI III for the entire period of implementation is up to maximum RON 15 billion. Starting from the initial level, the investment model may be subject to adjustments, the initial division being presented in the graph below.

Graph 42 - Division of PNCDI III budget



Source: National Plan for Research, Development and Innovation for the period 2015-2020 (PNCDI III), adopted by Government Decision 583/2015, amended by Government Decision 8/2018

The subprograms directly applicable in the energy sector are found mainly at subpoint P5, and are presented herein below.

Table 16 - Selection of subprograms within Research, Development and Innovation Strategy 2014-2020, applicable in Energy sector

Program	Objectives
Subprogram 5.2 – Participation in international bodies and programs for research and development in atomic and subatomic field	• Increasing the visibility of Romanian research by participating in international research bodies and programs in the nuclear field and of elementary particles; • Strengthening scientific and industrial cooperation, knowledge transfer and leading-edge technologies at European and international level in nuclear field and of elementary particles; • Promoting industrial innovation in the nuclear energy sector; • Obtaining nuclear technologies by strengthening the collaboration between Romania (by the Institute of Atomic Physics - IFA Bucharest) and partner organizations at international level (for instance, CEA - Alternative Energies

Program	Objectives
	and Atomic Energy Commission in France); • Providing an efficient communication platform between Romanian research, educational, industrial and economic institutions and international research bodies in the nuclear field and of elementary particles.
Subprogram 5.5 Program for research, development and innovation of 4th generation reactors – ALFRED	• Developing the research, development and innovation activities, for strengthening competences in correlation with the requirements of the future infrastructure ALFRED; • Preparing the research, development and innovation programs to be carried-out within the future infrastructure ALFRED; • Increasing the Romanian scientific and technological potential through support infrastructures and the infrastructure ALFRED through projects of technological development and support activities carried-out in partnership with support organizations in Romania or international organizations in this field; • Ensuring cooperation among Romanian institutions of research, education, industrial and economic and between these ones and similar international bodies in the field of development of technologies for advanced 4th generation reactors and nuclear security; • Substantiating and maturing the project for the implementation of the research infrastructure – Technological demonstrator ALFRED.

Source: National Plan for Research, Development and Innovation for the period 2015-2020 (PNCDI III), adopted by Government Decision 583/2015, amended by Government Decision 8/2018

Other financing options are included in the Financial mechanisms of European Economic Area EEA - FM EEA 2014-2021 and Norwegian 2014-2021, under the programs coordinated by the Ministry of Regional Development, Public Administration and European Funds, and are described in the table below.

Table 17 - Additional programs for financing energy projects

Program	Objectives
Development of business, innovation and SMEs" (program operator –	• Budget EUR ~22.7 million • For projects in the private environment of investments in innovative products, services and solutions, which, directly or indirectly, lead to more resource efficient technological processes

Program	Objectives
Innovation Norway)	(the budget and indicators related to the objective concerning the energy efficiency are not yet established).
Research	• Budget EUR ~47 million • For research projects also in the field of efficiency of the generation, transmission, smart grids and distribution of energy, environmental technologies for energy generation, diversification/balance of energy sources (the budget for this component has not yet been established)

Source: Answer of Ministry of Regional Development, Public Administration and European Funds, official letter 131291/2017

The staff in the Research and Development structures in the energy industry counts 560 researchers (by adding the data published by the National Institute for Research and Development in Physics and Nuclear Engineering "Horia Hulubei", National Institute for Research and Development in Electrical Engineering-Advanced Research, National Institute for Energy Research and Development, Institute for Nuclear Research Pitesti and National Institute of Research and Development for Cryogenic and Isotopic Technologies)[75].

In addition, within the above-mentioned institutions, there were 33 patents applications and 200 products/solutions resulted from research during 2017.

iii. Breakdown of current price elements that make up the main three price components (energy, network, taxes/levies)

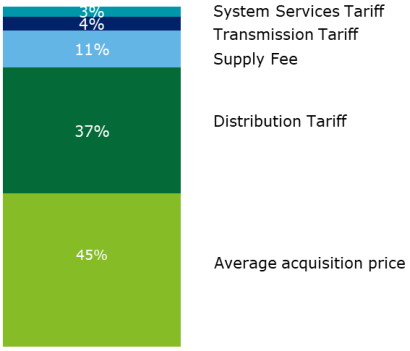
Average costs by unit for the supply of electricity to final customers supplied as universal service, are made of the following elements:

- Purchase net cost;
- Transmission cost;
- System costs;
- Market administration cost;
- Distribution cost;
- Supply cost.

The breakdown of the same, based on their share in the total, is presented below:

[75] According to annual reports 2017 of the institutions mentioned

Graph 43 - Breakdown of the components of the electricity price and their share in the total



Source: NERA quarterly reporting – Results of monitoring the regulatory market of electricity in second quarter 2018

iv. Description of energy subsidies, including for fossil fuels

The system for granting subsidies is configured towards the following directions:

- Aids to decrease energy poverty; these ones consist in social aids, allotted by Ministry of Labor, by means of family allowances and aids for guaranteeing a minimum income. There are also included specific aids for vulnerable consumers, social tariffs for electricity (until 1 January 2018) and aids for heating;
- Subsidies for heat, without making difference of the consumers based on vulnerability criteria, which apply directly to the energy price. More than 60% of such subsidies are allotted to the operator in charge with the capital city area.

According to certain independent studies, there were granted in 2015 total aids in amount of RON 1.1 billion, out of which RON 208 million for the first category, and the remaining RON 900 million for subsidies for heat (for the second category, the study has cumulated the values related to 15 municipalities).

5. Impact assessment of planned policies and measures[76]

The integration of the results of modeling both macroeconomic scenarios that were analyzed (modeling scenario with existing WEM measures and modeling scenario with planned WPM measures) reflects aspects specific for Romanian economy, where the need for an accelerated development at economic, political and social level must be consistent with Romania intention to contribute to European joint effort related to decarbonisation, increase of energy efficiency, enhanced energy security, completion of common energy market and increase of competitiveness by the development of research and innovation. This combination of opinions was taken into consideration in the document concerning Romania energy strategy, according to which "the development and increase of Romanian economy competitiveness, the increase of life quality and care for environment are indissolubly related to the development and modernization of the energy system".

5.1. Impacts of planned policies and measures described in section 3 on energy system and GHG emissions and removals including comparison to projections with existing policies and measures (as described in section 4)

i. Projections of the development of the energy system and GHG emissions and removals as well as, where relevant of emissions of air pollutants in accordance with Directive (EU) 2016/2284 under the planned policies and measures at least until ten years after the period covered by the plan (including for the last year of the period covered by the plan), including relevant Union policies and measures

Gross electricity generation

Given the above-mentioned context, the comparison between the two models as regards the gross electricity generation indicates similar increase trajectories, even if according to WPM scenario the increase is weighted by 2.58% expected for 2030. It is useful to mention here that:

- Nuclear energy generation has a negative correction (operationalization of the 4th nuclear reactor, after 2030);
- Increase of solar power generation has a significant positive correction (56.33%), which partially offsets the nuclear power generation;
- The necessary difference of generation according to the expected level of demand is offset by the positive correction of 19.53% of the solid fuels production.

Energy consumption

The economic growth foreseen for Romania is necessarily reflected in the demand of final energy, having a positive correction of approximately 16.14% under WPM scenario compared to WEM scenario, taking into account the energy efficiency increase measures and the competitiveness based on research and innovation. It should be mentioned here:

[76] Planned policies and measures are options under discussion, with an actual chance to be adopted and put into practice after the date the national plan in presented. Therefore, the forecasts resulted from point 5.1. subpoint (i) include not only policies and measures implemented and adopted (forecasts with existing policies and measures), but also planned policies and measures.

- Increase of energy consumption in transport sector, with a correction of approximately 15.67%;
- Increase of electricity consumption, with a positive correction of 31.07%.

Renewable energy consumption

The above-mentioned generation and consumption trends contain elements and trends of renewable energy generation and consumption. This illustrates Romania contribution to achieving the European targets of decarbonisation, energy efficiency, energy security, domestic market and competitiveness included in the European Union program documents. The comparison between the two models in the specific area of energy from renewable sources and GHG emissions brings to attention remarkable results:

- Overall weight of renewable sources reaches a level of 27.9% in 2030 (compared to 24% in 2020), further to the additional policies and measures as forecast;
- It is relevant the progress of the renewables share used in transport sector, which increases from 11.2% to 17.6%, with the additional policies and measures, while SRE share in heating and cooling has an increase of 2.4% (given the relatively short period of applying the measures – after 2025); as for SRE share in electricity, taking into account the premises of WPM scenario, one may notice a decrease of 5.4%.

Greenhouse gas emissions

In the field of greenhouse gas emissions, the results of modeling in WPM system versus WEM tend to be influenced more by the projections of Romania robust economic growth than by specific measures of decarbonization, which levels the GHG emissions decreasing curve. Thus:

- The decrease initially expected compared to the reference year (1990) of 48.8% according to WEM scenario is corrected by an expected decrease of 52% after WPM is applied;
- The effect is the result both of emissions decrease in ETS sectors (-9.09% WPM compared to WEM), and non-ETS with a decrease of 4.88% in WPM compared to WEM.

ii. Assessment of policy interactions (between existing policies and measures and planned policies and measures within a policy dimension and between existing policies and measures and planned policies and measures of different dimensions) at least until the last year of the period covered by the plan, in particular to establish a robust understanding of the impact of energy efficiency / energy savings policies on the sizing of the energy system and to reduce the risk of stranded investment in energy supply

See Annex WEM – WPM Policies.

iii. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures

See Annex WEM – WPM Policies.

5.2. 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

Modeling configured on existing policies and measures (WEM) as well as modeling configured on planned policies and measures (WPM) were based on macroeconomic elements quantified both as input and output variables. The enhancement of the quality of life was and still is a major objective both for the complex of current policies and measures, and for the expected ones.

To this effect, the fundamental objective 3 of the energy strategy, entitled "Protection of vulnerable consumer and reduction of energy poverty" mentions the price accessibility as one of the main challenges of the energy system and a strategic responsibility.

In the same context, the fundamental objective 6 entitled "Enhancement of the quality of education in the energy sector and continuous training of human resource" mentions the need to complement the qualified staff in energy sector. To this effect, it is mentioned the development of specific educational packages at all levels: public high-schools and professional schools and in dual system, continuous training at workplace, faculties, master programs and doctoral schools.[77]

Besides the orientation of these initiatives towards the energy sector, the general macroeconomic elements confirm the favorable effect of implementing the WPM model on some pertinent elements:

- The decreasing trend in Romania population, although still present, it is slightly stopped by the implementation of the planned model (by slowdown factor of almost 2% by reference to WEM);
- The Gross Domestic Product is accelerating significantly its increase, with a relative value of approximately 38% in WPM modeling compared to WEM;
- The gross value added has a major leap (by 41.7%) in 2030 according to WPM scenario compared to WEM. Each of the component sectors are expected to increase, Constructions by 20.8%, Tertiary (Services + Agriculture) by 46.6%, Energy by 19% and Industrial by an impressive 41.4%;
- The social size of the macroeconomic growth is also reflected in the number and size of households, but especially in their available income, which would increase by 34% according to WPM modeling compared to WEM modeling.

Even if these indicators are usually reflected in increases and benefits generated also in other areas of social and economic environment (health, environment, employment, education, level of competences, etc.), there are no sufficient elements at this time to configure an impact assessment.

5.3. Overview of investment needs

i. Existing investment flows and forward investment assumptions with regard to the planned policies and measures

The investment flow pertinent for modeling WEM scenario is subject to a positive correction with the expected measures and policies for WPM scenario. The projections indicate a

[77] Romania energy strategy 2019-2030 with a perspective for 2050

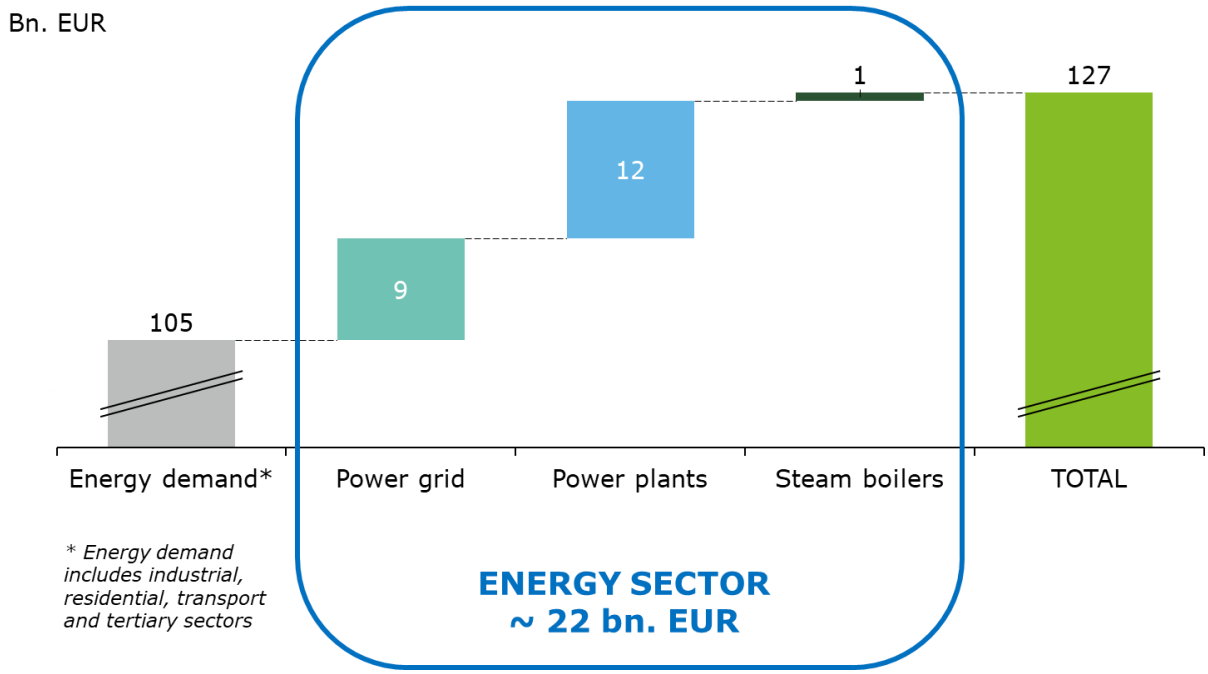
significant increase of investments, by 47.4% during the period 2025-2030 according to WPM scenario, compared to WEM scenario. A closer look at the prognosis categories brings into light relevant particularities:

- The chapter of investments necessary to satisfy the demand is relatively constant (percentage of the total investments) in both scenarios (~82%). It actually reflects the expected level of economic growth, which will encourage the demand of energy in all relevant fields (industry, residential, tertiary, transport, etc.);
- Under such circumstances, the increase of investments necessary to satisfy the demand is very pertinent for the industry (365%) and tertiary (133%) sectors;
- In the offer area, the investments required for electrical grids seem to be significantly high in WPM scenario than in WEM (by 126%).

The characteristics of assessing the investments needs reflect actually the economic growth hypotheses as presented and mentioned in Chapter 5.2, influencing directly the existing projects in the sense of their extension and of new projects that become necessary (as detailed in Chapter 4).

The investments required during the period 2021-2030 (cumulative values) necessary to achieve the proposed objectives with future policies and measures (WPM scenario) are presented in the graph below. Thus, it will be necessary to have total investments of approximately EUR 22 billion in the energy sector during the period 2021-2030.

Graph 44 - Cumulative investments necessary during the period 2021-2030 for achieving the proposed objectives (WPM scenario)



Source: Deloitte analysis, based on Romania Energy Strategy, 2019 – 2030, with perspective for 2050

ii. Sector or market-risk factors or barriers in the national or regional context

An incipient analysis to take into account risk factors with potential impact and probability relevant for the implementation of policies and measures expected, has identified categories of elements classified into strategic risks, market and financial risks, and operational risks. A non-exhaustive list of such risks includes:

Strategic risks

- Macroeconomic category – development of the natural economic cycle, change of the order of merit in investments;
- Governance category – periodical election cycles, stable vs. unstable public policies;
- Reputation category – public opinion, regional and/or EU policies and directions.

Market and financial risks

- Environment category – new national laws and rules, new European laws and rules;
- Financial category – increase of implementation costs, increase of financing costs;
- Supply chain category – local or regional gaps in the supply chain and/or in the outsourced structure.

Operational risks

- Legal lability category – external commitments, internal commitments;
- Nature category – natural disasters, climate changes;
- Human factor category – events caused by humans and having a relevant impact, security (physics, cybernetics, etc.);
- Quality/ operation category – new technology or in development, technological integration at national and/or regional level.

iii. Analysis of additional public finance support or resources to fill identified gaps identified under point ii

The list of risk factors above has not included, at this moment, a detailed, quantitative analysis of the mentioned factors and barriers. Therefore, the options to control the probability and/or the impact are now defined strictly from the point of view of the quality based on the existing good practices:

Strategic risks

- Macroeconomic category – avoiding extremes during modeling and considering the median impact;
- Governance category – promoting political consensus to achieve the agreed targets;

- Reputation category – communication, involvement, negotiation and openness.

Market and financial risks

- Environment category – involvement, diplomacy, commitment;
- Financial category – flexibility, adaptability, innovation;
- Supply chain category – controlled redundancy, involvement.

Operational risks

- Legal lability category – monitoring, early warning, consistency;
- Nature category – monitoring, resilient solutions, plans for continuity;
- Human factor category – robust, resilient solutions, with an optimal level of redundancy;
- Quality/ operation category – pragmatism, flexibility, involvement.

5.4. Impacts of planned policies and measures described in section 3 on other Member States and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

i. Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

The interconnection level of the national electricity transmission grid is expected to increase in an accelerated manner (see Chapter 4.5.1). This factor implies both internal investments for capacity extension, as well as investments specific for transmission interconnections. As a logical consequence, such desiderata become national projects with a regional impact, which further convert them into Projects of common interest. These are supported by EU and become clusters (Chapter 4.5.1) with an operational impact of energy security and a commercial impact related to the single energy market. An updated list of these projects is made of:

- Black Sea Corridor Cluster with a direct impact on the Romanian and Bulgarian energy systems;
- Mid Continental East Corridor Cluster with a direct impact on the energy systems in Romania, Serbia, Montenegro, Italy.

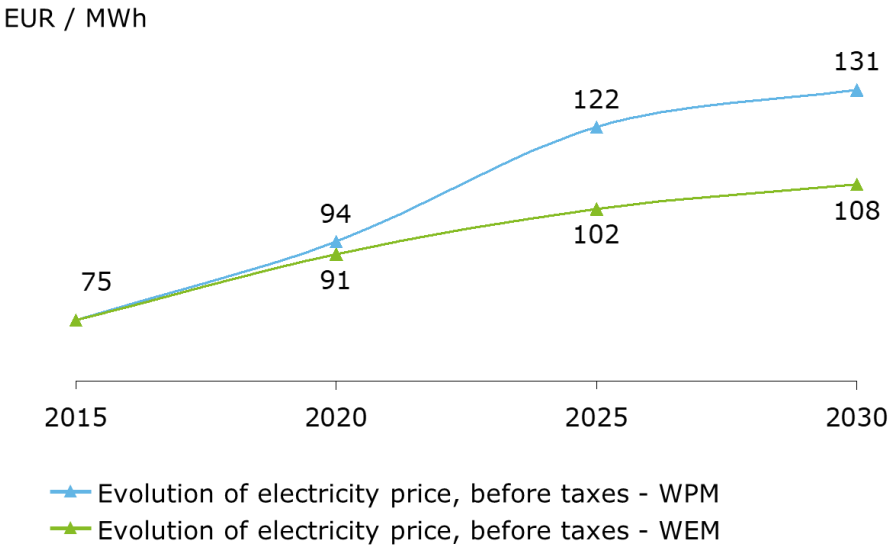
The energy transmission corridors include also the regional initiatives for natural gas transmission. These main pipelines have also an operational, commercial and especially strategic impact, providing a high level of energy security for Romania and other neighboring countries:

- BRUA corridors transits Bulgaria, Romania, Hungary and Austria with a direct impact on the energy systems of these Member States;
- Southern Transmission Corridor for which the transmission operator intends to access European funds and which would brought the gas extracted from the Black Sea into BRUA main pipeline with an impact on the above-mentioned countries;
- The project "SNT developments in the North-Eastern region of Romania" that is part of the priority axis 8 and intends to provide the transmission capacity from / towards Republic of Moldova;
- The project "Interconnection of the national gas transmission system with the international gas transmission pipeline T1 and reverse flow Isaccea" included as part of priority corridor NSI East with an impact on the energy systems of Romania and Ukraine.

ii. Impacts on energy prices, utilities and energy market integration

Given the characteristics of modeling related to WPM scenario (sustained economic growth, increase of electricity consumption and implicitly of the necessary production of electricity), the investments flow related to power plants and grids will be significantly higher than the one estimated in WEM scenario, resulting an average electricity price (before taxes) of 131 EUR/MWh, compared to 108 EUR/MWh (in WEM scenario).

Graph 45 - Impact of expected additional measures on the average electricity price, before taxes



Source: WEM - PRIMES 2016 scenario, prepared for the Ministry of Energy, WPM - Deloitte Calculations, based on Romania Energy Strategy, 2019 – 2030, with perspective for 2050

iii. Where relevant, impacts on regional cooperation

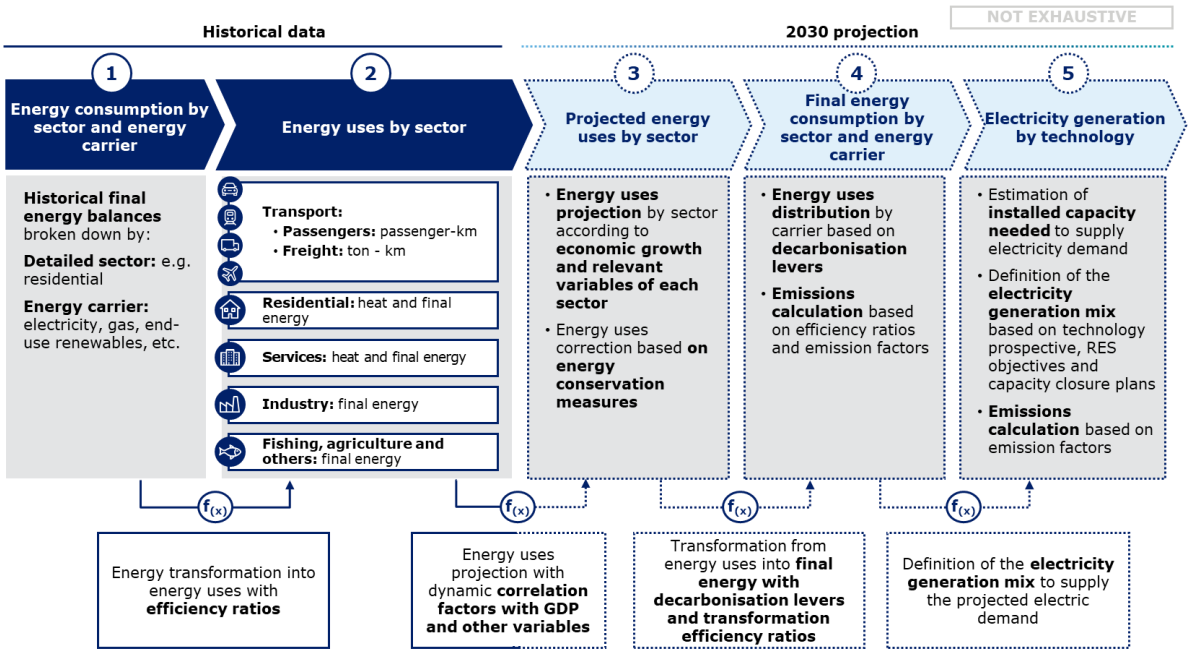
To fill-in after completion of regional consulting phase.

Methodology (overview)

Modeling of Romania energy system was based on expected developments of policies and measures, in compliance with various other technical and economic factors and indicators. To this effect, the proposed policies have resulted in a series of input data and hypotheses, as well as output data of modeling. The model is complex, and analyses the relations between different energy and non-energy parameters and their impact on the indicators that were calculated.

A schematic presentation of the model methodology is found in the figure below:

Figure 6 - Schematic presentation of the model methodology



Source: Deloitte

The purpose of the modeling was to achieve the strategic objectives proposed at institutional level, as well as to adapt the energy system and the related ones to the objectives of the five dimensions of the European policy in the field of energy and climate changes, so that the achievement of these objectives is ensured with an efficient and reasonable cost, and which are technically feasible.

To this effect, the input data / the data on which the output data relied on, were mainly the following:

- ✓ Strategic objectives for each institution, with influence on the energy system and the climate changes;
- ✓ Measures proposed by those institution for achieving such objectives;
- ✓ Macroeconomic forecasts (such as gross domestic product, gross value added, population, which at their turn are influenced by the policies established to encourage economic growth);
- ✓ Expected costs of various technologies;
- ✓ EU ETS carbon price;
- ✓ International prices of fossil fuels (natural gas, carbon and crude oil);
- ✓ Expected number of days of heating and of cooling during the period under analysis; etc.

The output data include, but are not limited to:

- ✓ Primary energy consumption at national level;

- ✓ Final energy consumption at national level, by sources of consumption and by fuel;
- ✓ Gross final energy consumption (for calculating the share of the energy consumption from renewable sources);
- ✓ Gross final renewable energy consumption (for calculating the share of the consumption of energy from renewable sources);
- ✓ Electricity generation by sources;
- ✓ Investments needed to ensure the development framework for economy and for the energy system so that the strategic objectives are achieved;
- ✓ Electricity price;
- ✓ GHG emissions (by ETS and non-ETS sectors).

The modeling was performed in compliance with the following principles:

- ✓ Considering the technical, financial and economic possibilities to generate energy from various sources;
- ✓ Covering the necessary amount of energy consumption from internal sources and, should not sufficient resources exist, covering the shortage from import sources;
- ✓ Making adjacent investments necessary to achieve such objectives, depending on the established projections and on the current status of the national energy system (for instance, investments were made in the electrical grids in order to ensure the transmission and distribution of electricity designed to be generated under conditions of safety and economic feasibility);
- ✓ Estimating the energy consumption based on the economic growth and depending on relevant variables in each sector;
- ✓ Calculating the emissions according to the efficiency coefficients and to the emission factors;
- ✓ Establishing the installed capacity necessary to satisfy the demand of electricity from internal production.