

## ROMANIA'S ELECTRICITY MIX - ONE OF THE MOST BALANCED IN THE EUROPEAN UNION

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**Abstract:** In nowadays the Romanian production structure keeps all kinds of energy production to coal, nuclear, hydro, and thermal from renewable. The objectives of the energy sector in Romania in accordance with the sustainable development are: providing the security of electricity and power supply for all consumers to an appropriate quality level, through diversification of generation sources, increasing the economic competitiveness and reduction of environmental impact.

**Keywords:** sustainable development, primary energy security of supply.

### 1. INTRODUCTION

For develop a sustainable economic growth, the main measurements that can be taken are in the National Energy System that can support the increasing security in energy supply through reducing the import dependence of energy. Energy and natural resources are the keys for launching the economy. Romanian energy evolution is in dependence with economy development but it is influenced by the evolution of energy and European Union economy [2].

The Romanian and European Union energy and geopolitical realities require the development of a new strategy till 2035 for enabling the provision for energy supplies needed a more efficient and secure operation of the National Power System, a more efficient electricity market in regional and European market and decreasing the dependence of imports [4].

### 2. ENERGY OBJECTIVES – FACTORS FOR SUSTAINING ECONOMY

Safe operation of power system is a priority even in the functioning of the electricity market, whether national, regional or European. An important problem of the European Union is the development of the single market for electricity and gas.

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The objectives of the energy sector in Romania in accordance with the sustainable development are: providing the security of electricity and power supply for all consumers to an appropriate quality level, through diversification of generation sources, increasing the economic competitiveness and reduction of environmental impact. [3] More important is the sustainable development in assuring the energy needs nowadays on long term at the lowest price, suitable for a decent life and a modern economy taking into account the quality and safety supply. The sustainable development is based on:

- efficient using of primary energy sources;
- decreasing the negative impact of the energy on the environment through reducing of greenhouse gas;
- increasing the energy efficiency;
- promotion of electricity and heat in high efficiency cogeneration plants.[9]

The energetically intensity shows the energy PIB in relationship with national economy. The primary energy intensity is an indicator which characterizes economical efficiency of using the energy to a national level and is in dependence with the national economy results. That indicator has to turn to account with care when the energetically efficiency of technical problems are debated. The energetically intensity value is fundamental dependence by the calculation mode of PIB in Romania, typical for emerging economies. For developed countries the differences are insignificant. One of the main objectives for Romania is to reach an appropriate value of energetically intensity of developed countries, unconcerned of chosen measurement unit. This desideratum it is possible in condition as the Romanian economical results are almost like in developed countries.[4]

## **2.1. Forecast for the future**

Romania's electricity mix is one of the most balanced in the European Union, with coal, hydropower, natural gas, nuclear energy and wind power having comparable shares of capacity and power generation (tab.1). With the exception of wind and solar, almost all units are fairly old. As of 2018, units over 50 MW have an average age of 39 years: 40 years for coal, 47 years for gas (some previously ran on coal), 31 years for hydropower and 18.5 years for nuclear. Although, the average capacity used to deliver to the system is around 7 GW, [1], [5].

Romania's energy sector has gone through several inflexion points in the past 20 years, marked by a wave of privatizations and attempts by the state to start new investment projects that have yet to materialize. In the gas sector, the eyes of investors are fixed on the Black Sea, where discovered deposits could help the country maintain its energy sufficiency for decades to come. Meanwhile, the sector requires an estimated EUR 10 billion in fresh investments on the long term to replace aging infrastructure. In the past decade, the country has fully liberalized the prices on the electricity market and on the gas market for consumers [6]. Through to 2021, gas prices for households should also be fully liberalized, according to the latest government targets.

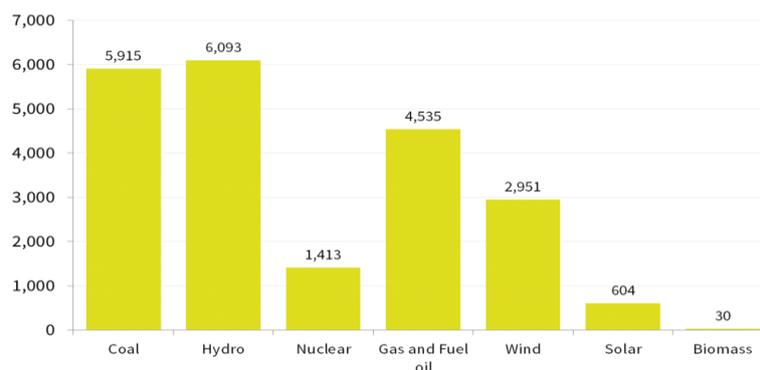
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In the electricity production sector, in close to two decades Romania has seen the gradual transition of the economy to cleaner production capacities. In 2004, coal had a share of 40 percent in Romania's electricity output, followed by hydrocarbons with 25,8% and hydro power with 24% . Nuclear energy had a share of 9% in the production mix, according to energy regulator ANRE. Overall electricity production has touched 56.91 TWh [7].

*Table 1. Power generating capacity*

Net generating capacity GW		2018	2019	2020
<b>Fossil Fuels</b>				
	Lignite	2676	2626	3217
	Hard coal	0,428	0,428	0,428
	Gas	1831	1955	1845
	Mix fuels	1625	1625	1583
Total		<b>6559</b>	<b>6634</b>	<b>7072</b>
<b>Renewable Energy Sources</b>				
	Wind Power	3000	3150	3200
	Solar Power	1350	1420	1480
	Biomass Power	0,150	0,160	0,180
	Hydro	6436	6490	6505
Total		<b>10936</b>	<b>11220</b>	<b>11365</b>
	<b>Nuclear Power</b>	<b>1300</b>	<b>1300</b>	<b>1300</b>
<b>TOTAL</b>		<b>18795</b>	<b>19154</b>	<b>19737</b>

Fast forward to 2017 and close to 35% of Romania's electricity production came from renewable sources, mainly hydro power and wind capacities with shares of 23.42% and 11.64%, respectively (fig.1). The share of coal in the production mix has felt to 26.56%, while nuclear and natural gas capacities generated 18.11% and 15.22% of Romania's electricity respectively [8]. The country's electricity output has richened 61.3 TWh. Starting from 2011 the country has started to involve a massive influx of investments in the renewable sector. More than seven billion of euro went into green power production facilities. Capacities in the wind sector increased in six years from 826 MW to 3.1 GW at the end of 2017.[7]



**Fig.1** Installed capacity in MW

### 3. EXHAUSTIBLE COAL ENERGY RESOURCES

According to the expert, Romania could wean off coal dependency by relying increasingly on a mix of gas and nuclear to ensure the base load supply. Over the last two decades, coal mines have been shutting down in Romania every couple of years, as coal ran out or was becoming too expensive to dig out. None of the coal power plants are fully compliant with the Industrial Emissions Directive (two power plants benefited from derogation for NO<sub>x</sub> emissions under the Accession Treaty, which expired on January 1st 2018), some are operating without an environmental (IPPC) permit and some of the hard coal units have emissions 10-15 times more than the allowed threshold for SO<sub>x</sub>. There are also plans for a new 600 MW unit at Rovinari, being pursued more actively by Chinese government officials than by the Romanian authorities. There are two main coal companies, managing both power plants and mines: Oltenia Energy Complex manages 4 plants and 10 mines, all lignite-based, and it normally delivers 80% of the country's coal-based electricity. The main hard coal processing company, located in the neighboring county, is Hunedoara Energy Complex. Both companies are over-staffed, involved in corruption cases, and their finances depend on the success of other companies. 2017 was a bad year for hydropower and wind energy, therefore Oltenia Energy Complex made a hefty profit, while Hunedoara Energy Complex decreased its losses.[6]

### 4. CONCLUSIONS

Improvement of energy efficiency has an important role in achievement of security of supply; to sustainability and competitiveness and decreases the greenhouse gas emissions. Taking in consideration the effects of the commitments made for 2020 stage, Romania cannot afford to support a mandatory national target for energy efficiency and renewable sources for 2030 stage. Romania respects the EU objective of reducing greenhouse gas emissions.

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