SUSTAINABLE DEVELOPMENT AND ENERGY SECURITY

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Abstract: *This paper makes a presentation of the energy system in the context of energy security and the positioning of Romania, in the current conditions, when the international energy markets are in a continuous and complex change. Romania has the advantage of having its own sources of primary energy, being able to achieve a balanced energy mix, in electricity production, between the existing energy resources. The current priorities of the energy sector are correlated with those of the European Union, with the effort to limit the consequences of climate change, and to carry out activities in the sense of the sustainable development of society.*

Key words: energy system, energy security, energy mix, electricity, energy.

1. Introduction

Sustainable development is that development process that meets current needs without jeopardizing the ability of future generations to meet their own needs. In order for the desired sustainable development to be achieved, environmental protection will be an integrated part of the development process and cannot be approached independently of it. [1]

The concept of sustainable development (or sustainability) is widely used and almost all activities are carried out in the sense of sustainable development: society, education, industry, agriculture, etc. Energy security affects the functioning of countries politically, economically, and socially. Energy is an important factor in sustainable development efforts.

Hence, countries are assessing their energy systems for compatibility with sustainable development goals by creating new concepts for energy development. [2]

Energy played an important role in the early days of the European Union, when the six founding member states created the European Coal and Steel Community in 1952, and measures to combat climate change came later.

Energy and climate change are now closely linked, therefore effective actions in the field of energy production and use are essential to combat climate change. Energy and climate change raise many issues that can best be addressed through cooperation between states. [3]

2. Sustainable development of the energy sector

The sustainable development of the energy sector does not only involve the reduction of emissions, the production of clean energy and the increase of energy security, but also takes into account the jobs secured or affected, the increase in the standard of living and the need to support the development of all economic sectors. [3] The demand for energy is

constantly increasing globally and only by making it more efficient and promoting renewable energy can we meet the needs of current and future generations.

The energy sector contributes to Romania's development through its influence on the competitiveness of the economy, the quality of life and the environment.

Romania is positioned quite well in the regional and European context, having the advantage of having its own sources of primary energy, which is also reflected in a balanced energy mix, in electricity production, between coal, nuclear, natural gas, renewable sources: hydro, wind, photovoltaic and biomass. [4, 21] The current international context of energy markets is dynamic, and the evolution of technologies can have unpredictable effects on energy markets. The policies in the field of energy and climate change, at the European level, centered on the reduction of greenhouse gas emissions, the increase in the share of renewable energy sources and the orientation towards "clean energies", will influence the investment behavior in the energy field and energy consumption.

The current priorities in the energy sector are the following: expanding the connectivity of the transport networks for electricity and natural gas on a regional and European level, the progressive decarbonization and electrification of the final energy consumption in all sectors of the economy, including the residential environment, the replacement of physically and morally obsolete technological installations , the integrated approach of energy policies and other sectors with the obligations to respect the environment and with the effort to limit the consequences of climate change. [5, 22]

The energy sector is the most important source of greenhouse gas emissions [6], 66% of emissions belonging to this sector and under the conditions of the current energy mix.

One of the major challenges of the National Energy System, in the case of the scenario according to PNIESC of increasing the share of energy from renewable sources to 30.7% in 2030 (insufficiently ambitious compared to what would be economically feasible, proposing to increase the level of energy from renewable sources to 34% in 2030), would be the lack of the current possibility of ensuring sufficient reserves and balancing for additional capacities from renewable sources. The PNRR proposes the reform of the electricity market, by replacing coal in the energy mix and supporting a stimulating legislative and regulatory framework for private investments in the production of electricity from renewable sources, expanding the capacity of energy from renewable sources until 2030, correlated with the removal from operating coal-based capacities, tipping the balance of the energy mix towards green energy are corroborated with other measures in the sustainable transport sector, urban mobility and green and smart cities, biodiversity, circular economy, all leading to the reduction of greenhouse gas emissions [7].

Romania has a competitive advantage regarding energy from renewable sources, and by promoting these energy sources, the degree of environmental pollution is limited.

Thus, among the available renewable sources, the hydropower potential [4] represents an important non-polluting, predictable and useful source for the balancing and security of the national energy system; the implementation of the hydropower planning program at the national level can increase the amount of electricity from renewable sources, a value that will stabilize at around 42% by the year 2038. Another renewable source is biomass, also insufficiently and inefficiently used, but which can represented the solution for ensuring energy needs (e.g. for heating) and for environmental protection (e.g. waste recovery).

The volatile nature of the energy produced from renewable sources imposes additional

measures and rules for operation under conditions specific to maintaining the balance of the national energy system. [8, 9]. Ensuring the sustainability, competitiveness and modernization of the energy generation sector requires the integration of producers based on different primary energy sources (e.g. coal, natural gas, hydropower, renewable energy sources, etc.).

The role of the state remains important regarding Romania's energy security; there are economic, social (e.g. public service) and national security reasons for the state's ownership of stakes in the power sector, and energy development programs are a government priority.

The state has an essential role in the Romanian energy sector as the developer of energy policies, legislation, regulations, respectively as the owner of assets in the energy sector.

The intervention of the state is essential for attracting funding sources for new projects, for energy production, where the imperative replacement of some capacities is needed.

Depending on the means at its disposal, the state must participate in strategic investments, within the limits of the recommendations of the European Union (competition and state aid); exemplifying, in the medium and long term, major state participations in strategic electricity production assets in the nuclear or hydropower subsector are realistic.

The EU is actively promoting Europe's transition to a low-carbon society and updating its rules to facilitate the private and public investment needed in the clean energy transition. EU countries should draw up risk-preparedness plans for electricity crisis prevention and management on the basis of the identified regional and national scenarios. [10]

Over the past 20 years, global demand for energy has grown by approximately 50%. In that period, the proportion of fossil fuels in the mix has remained relatively stable at about 80%, which means total demand for fossil fuels has increased by roughly 50%, as well.

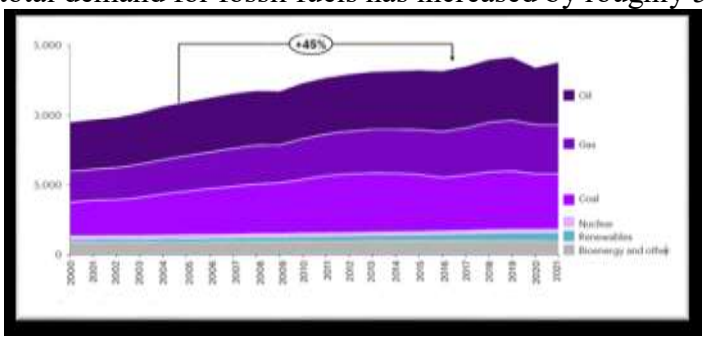

Fig.1. Historical energy demand by source, 2000-21(in mtoe) [11]

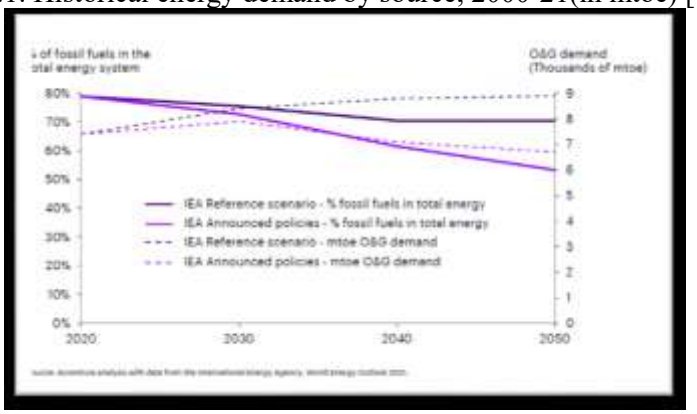

Fig.2. Projected demand of fossil fuels, through 2050 [11]

Secure energy is sustainable energy. Recent Accenture research confirms that oil and gas companies are placing greater importance on both security and sustainability. From an

overall sample of 201 companies, energy security is getting the most attention. [11, 19].

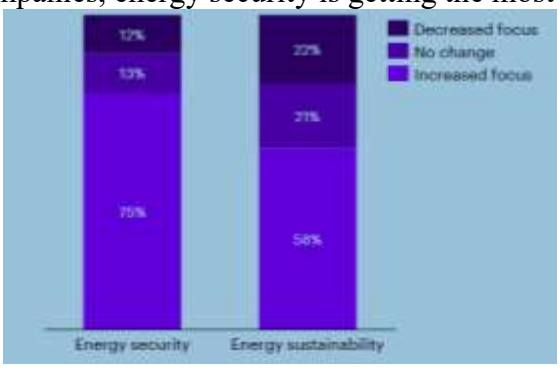

Fig. 3. Among oil and gas companies, both energy security and sustainability are growing in importance [11]

Romania must anticipate and position itself against the trends on the international markets, as well as against the geopolitical resettlements that influence strategic partnerships. The interconnections under construction of Central and Eastern Europe contribute to the development of energy markets and regional energy security mechanisms that will operate according to common EU rules. Regional cooperation is an effective solution to energy supply crises. [12] The electrical installations found in these areas have been specially designed with characteristics to operate in such atmospheres. [13]

When electrical equipment is installed in areas in the atmosphere of which flammable gases, vapors or mist can be present in dangerous concentrations and quantities, protective measures to reduce the probability of an explosion due to initiate ignitions, electric arcs, or incandescent surfaces within the normal or specified time failure, must be applied. [14]

Electrical equipment intended for use in potentially explosive atmospheres must meet certain safety conditions provided in the safety standards for this specific field, that is, their design must be different from that of equipment operating under normal conditions.

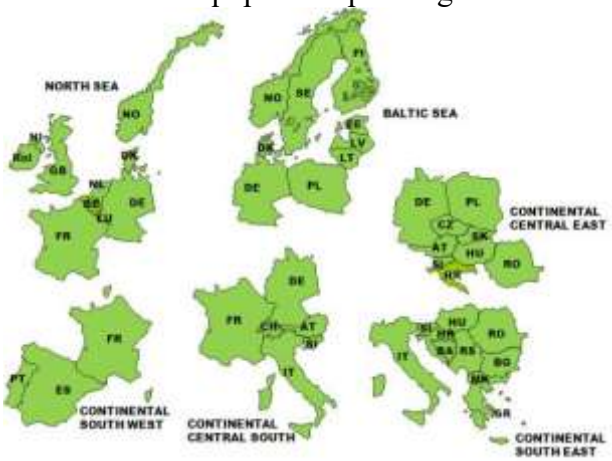

Fig.4. Regions ENTSO-E (source: ENTSO-E)

Electrical equipment located in a hazardous area may be adversely affected by the environmental conditions in which it is used. [15] In the context of today's economic instability, investing in renewable energy technologies is a scenario with multiple gains: for energy security, economy, environment.[20] Nanotechnologies can be used to increase the amount of electricity generated by wind turbines. pave the way for many new forms of light bulbs [16,17].

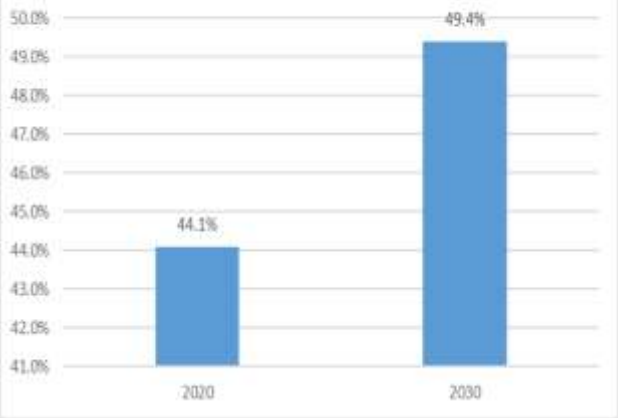

Fig.5. Share of SRE-E (Source: Ministry of Energy)

The use of nanoparticles in the production of solar cells is beneficial. Due to the unique electronic and optical properties of nanostructures, they can reduce production costs and should reach global levels of efficiency, higher than conventional ones. [18]

The promotion of renewable energy sources is an important objective for Romania at the level of 2030 in the context of the transition to green, clean energy. At the level of 2030, Romania aims to achieve a share of energy from renewable sources in the gross final consumption of electricity (SRE – E) of 49.4%, from 41% in 2020. The evolution of this indicator will determine the measure the total SRE share in 2030. [12]

3. Conclusions

The energy sector and energy security represent one of the major challenges for the climate objectives and for ensuring the green transition, influenced by the policies in the field at the European level, which will influence investment behavior in the energy field and energy consumption. The sustainable development of the energy sector involves reducing emissions, producing clean energy and increasing energy security, taking into account jobs, living standards and supporting the development of all economic sectors.

The essential role in the Romanian energy sector, as the developer of energy policies, legislation, regulations, is held by the state, and its intervention is essential for attracting sources of financing for new projects, namely energy production.

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