

ASPECTS CONCERNING THE ENERGY CRISIS IN ROMANIA

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Abstract: The energy crisis and its far-reaching effects have led to a significant change in political priorities in EU. Important countries from EU have turned to coal to increase security of electricity supply. The EU electricity demand is expected to recover slightly from 2023 with an average annual growth rate of 1,4% based on expectations of lower energy prices and a boost to electrification.

Key words: renewable sources, efficiency, mix energetic, balance, security.

1 INTRODUCTION

Energy is a domain of strategic importance for the fact that its provision at reasonable prices influences competitiveness economic, domestic production capacity and political strength of a state. The future of energy sector is settled in decentralized of energy in using the energetical sources mix and also in storage and carbon usage in industry [1].

The energy market goes through profound transformations in order to deliver cleaner energy while ensuring continuity of supply. Nowadays, renewable sources will drive to sharpe decreasing of electrical energy production based on coal and fossil fuel from 2023 [2]. The electricity consumption recovered almost 5% in 2021 in the same time with economic recovery after a substantial decline of 4% year on year in 2021 in the EU. In 2022 when Russia`s invasion of Ukraine triggered an unprecedented energy crisis and the growth reversed in 2022.

2 THE ALTERNATIVES FOR ENERGY THROUGH DECENTRALIZATION

The rapid growth of solar and wind power in recent years has breathed hope into global efforts to reduce greenhouse gas emissions and limit the most dangerous effects of climate change.

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An important place is to concern about energy system decarbonization through promoting renewable sources with zero CO₂ emissions. Due to their unforeseeable character some renewable sources as wind and solar sources could affect the operating safe conditions of energetically system. So, it has to find an equilibrium well justified from technicum and economic point of view, between decarbonization through developing the renewable sources with their unforeseeable evolution and security of energetic system.

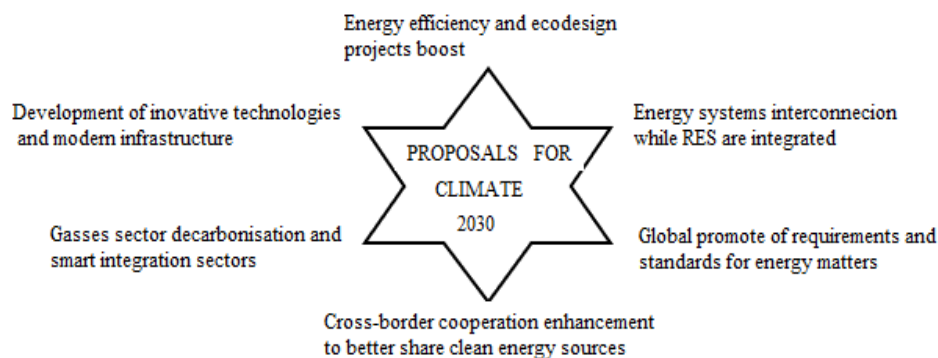


Fig.1. The objectives in the climate field

Taking into account the present conditions it is important to choose the right place of renewable sources installation even of point of view of their inclusion in electrical outlet grid structure to avoid network congestions. Also, the projects that involves renewable sources have important risks for financings determined by energy production dependency with variable phenomenon.

The attention is driven to green hydrogen made from hydrolysis, as energy carrier in energetically purpose. Since hydrogen is not occur freely in nature, it must be produced through the use of energy. Its H₂ energy is about 140MJ/kg at least three times more than a classic fuel, and by burning it does not cause polluting emissions.

Although the production of hydrogen by electrolysis of water is a known and easily accessible process, the reduction of resulting hydrogen costs will be essential in order to increase the share in the energy field. The most efficient way to power feed of electrolyzes is to use the energy produced in excess by unpredictable energy sources as solar and wind.

On the long term, the hydrogen can become competitive as a primary energy source in the same time with reduction of costs in an installation with electrolyzes.

It is considered that in 2050 Romania will allocate around 10TWh with purpose of suppling the electrolysis for the production of hydrogen; the construction of electrolysis about 1500MW will be required as a production of about 0,2Mt H₂/year. Making a comparation between emissions the hydrogen produced by electrolysis of water causes the lowest emissions as: solar 1,0kg CO₂ equivalent/kg H₂; wind 0,5kg CO₂ equivalent/kg H₂; nuclear 0,6 CO₂ equivalent/kg H₂ and 0,115g nuclear waste; hydro 0,3 CO₂ equivalent/kg H₂.

Due to the energy from renewable sources is more expensive than the obtained from classical sources, could determine competitive advantages for countries that do

not make efforts to decarbonize the energy system Renewable sources could not exceed 30% weight in the total of sources in the system can be expected in the future.

The key to overcome this challenge is to pair the renewable energy sources with energy storage solutions. The energy storage systems assure several features from the point of view of their use in the energy: for frequency adjustment, the storage systems can assure essential services on electric system stability; the large power storage systems can be coupled with less predictable energy supply sources, getting an ensemble of predictable system to fulfil the load demand even when demand exceeds its generating capacity and supplies energy to the grid when the energy production from renewable sources is reduced, this type of aggregate is operating as a controllable source in the electricity market; the large power storage sources can also assure flattening of the load curve when connected to disturbances producing customers; the storage sources can assure the system services by providing necessary energy when the main energetic group is disconnected, as the large power storage sources can assure the optimal power flow in the electrical system

3. EFFICIENCY FOR TRANSITION

The energy efficiency has to preserve the same level of operating, safety and performances for energetical system and some possible measurements could be applied to diminish the energy crisis in Romania:

- the resources allocation by the central and local authorities for professionalisation and increase of the skills of the workers in the energy field and for combating climate change in the context where investments in these sectors are significant;

- updating by training institutions, including those of higher education, of curricula for energy and environment with an emphasis on cooperation and interdisciplinarity;

- significantly more consistent funding for fundamental and applied scientific research for energy efficiency technologies, renewable sources and low emission mobility;

- partnerships between professional associations with tradition and professional associations with an energy profile for information sessions in the field of energy transition towards decarbonize [1], [3].

The causes that set off the energy crisis are shared in external causes and internal causes. The external ones are generated by: the European Committee attitude for facilitating the production from renewable sources and a forced diminution for energy production from classical sources (which generates gas emission and CO₂) without a correlation between those two directions; also, the electrical energy European Unique Market which through the coupling the mechanism determining that the price to be the same in the coupling area without taking into account the purchasing power in Romania is lower than in western countries from Europe; another cause is the increasing the price of natural gasses due to diminution of Russian Federation delivery.

The internal causes which have determined the higher prices in Romania than in the rest of the Europe are: the organizational structure of producers in Romania as

hydro, coal, nuclear, gas renewable sources under conditions of the liberalized electricity market; the lack of investment in the electric power plant with controlled production (as units 3 and 4 from Cernavoda nuclear power plant); the investment deficit in energy storage capacities (as Tarnita hydropower plant; the insufficient stage of transport network for facilitating the developing of wind power plants in favorable areas.

4. MEASUREMENTS TO AVOID THE ENERGY CRISSIS

On the short term, the measurements which can be taken consists in settlement of electrical energy market and increasing the coal production. Only into a regulation system it can be achieved an average price of energy for the final customer in nowadays production structure. The method of imposition of supply price limits determines to increase the acquisition price on the angro market because the suppliers are not longer interested in purchasing energy at the lowest possible price, the state guaranteeing them the return them the difference between the purchase price and limited supply price.

On the average and long term: approaches must be made to the European Commission to give up to establish the setting of reduction targets from classical sources (especially coal) remaining in actuality only renewable sources development targets. The way in which the production of classical sources is reduced remains at the each member state discretion depending on the specific conditions; must be approaches for implementation the mechanism which allow the capacities allocation to be reduced on borders between states; the investments in classical power plants and renewable sources into a balanced percent with maintain the coal production even of reserve of situations in which deficit occurs due to insufficient production of renewable sources; the storage capacities have to increase [4],[5].

The measurements that are required to be adopted for reducing the effects of the energy crisis on the economy, energy and wellbeing are:

- updating the national energy strategy as mandatory foreseeing investments in new capacity of electrical and thermal production as well as new capacities for national and transborder electrical energy transport;

- the development of electricity production from renewable sources to be continued within technical and economic limits allowed by the operation of National Electric Power System and the efficient operation of the electricity market;

- taking into account the domestic energy sources is necessary to achieve a balanced energy mix;

- increasing the energy efficiency as an important component of National Strategy;

- to be applied coherent energy politics and strategies for energy development and protection against geopolitical influences.

The energy efficiency has to preserve the same level of operating, safety and performances for equipment into a technological line, the efficiency standard IEC 60364-8-1 recommends the implementation of integrated management system or energy efficiency based on (fig.2) [4], [6]:

- user setting of main parameters, including of non-electrical parameters;
- suitable selection of the available energy sources, to assure customers supply at lowest costs;
- acquisition of available energy at hourly rates;
- acquisition of data related to energy quality;
- acquisition of data from the various sensors of installations (temperature, pressure, humidity)
- communication with user about information details related to energy consumption.

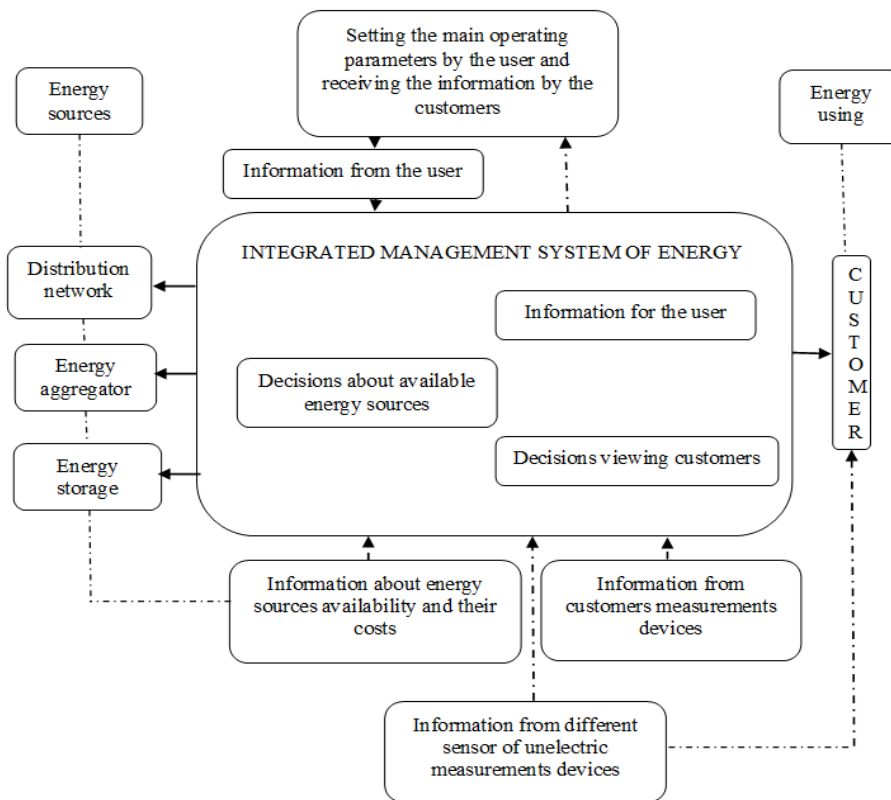


Fig.2. Implementation of integrated management system for energy efficiency

In the last years, almost of 3000MW were put out of operating another 1475MW till 2025 and 2300 MW will put out of operating till 2030 in Romania. It has to take account the tie between geography and existed resources of every state or region isolated. Poland and Germany have coal, Denmark, Finland and Romania have access and gas resources off-shore, states from the Carpathian and the Alps have hydroelectric potential as well as the states from North Sea have wind potential or the states from south of Europe have solar potential, so, not all states could have the same energetical mix.

The regulation applies from first December 2022 to 31 March 2023 adjusts the existing EU initiatives and legislation, to secure the EU's energy supplies, such as a gas storage regulation, a gas demand reduction regulation, the creation of an EU energy platform and outreach initiatives for the diversification of supply sources [7].

Romania is ready to meet tight deadlines for European funding, increasing energy independence from Russia, decrease the effects of the European energy crisis and decarbonize its economy. In Arad in Romania's west, will be installed the largest photovoltaic plant in Europe as it joined a 1.04 GW project developed by Monsson [8].

It is important that assuring a flexible equilibrium between renewable sources and classical sources in the same time with optimization of sustainability and stational system efficiency on the liberalized energy market conditions.

5. CONCLUSIONS

The energy system has to responsibly rethink for assuring the energy independence. The renewable sources alone will not be able to ensure a constant and sufficient level of electricity supply and a flexible balance with classical sources will be ensured, avoiding their elimination before securing a replacement.

In the context of the drastic reduction of oil and natural gas reserved, with consequences on the prices of petroleum production and delays in finding solutions for storage electricity, obtained from renewable sources or the emergence of geopolitical events with major economic implications for national without immediate solutions to equilibrate the balance, coal remains a bridge in the medium term, during which adopting the problems of adapting the new types of resources must be gradually resolved.

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