ENERGY TRANSITION AS THE NECESSITY FOR ACHIEVE A CLIMATE-NEUTRAL EUROPE

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Abstract. By 2030, the EU has to be on a clear trajectory towards an energy system decarbonate. In addition to cost benefits, climate and energy security, the energy transition is coming and with new challenges as the system adapts. Reducing carbon emissions represents a difficult task for Romania as well as EU that claims for a diversified mix and strategy.

Key words: climate-neutral, greenhouse gas emissions, energy transition.

1. INTRODUCTION

The energy transition represents a global change in the type that supply and consume energy. A key aspect of the energy transition is the replacement of fossil fuels (coal, oil, gas) with renewable resources.

The energy transition is could consider an element of sustainable energy policy that maximize the wellbeing of the humanity, assuring an equilibrium between competitivity of the energy producers and environmental protection taking into account the energy systems challenges. [1], [2], [3], [17], [21].

The European Green Deal has the goal for a climate-neutral Europe by 2050 and the main objective is to reach net zero by that year, as the amount of carbon dioxide (CO_2) emitted into the atmosphere to be equal to the amount of CO_2 removed from the atmosphere. At the world level, it is estimated that natural absorbers (forests, soil, oceans) remove between 9.5 and 11 gigatons of CO_2 / year. Nowadays, global CO_2 emissions (37.8 gigatons in 2021) exceed natural CO_2 removal capacity. From this reason, measurements to reduce CO_2 emissions and increase capacity are needed simultaneously of CO_2 removal. The European climate law applied from July 2021, sets an intermediate target for the amount of greenhouse gas emissions to be achieved by 2030, 55% lower than in 1990 [2], [4], [18], [23].

The target could become a 57% reduction, if the increase in the absorptive capacity of the land is achieved and forests to 310 million tons of CO_2 by 2030 as stipulated by regulation 839/2023.

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The development of sustainable energy policy in Romania is considering as a rapidly and continuous process for ensuring optimal solutions of long term for customers [20].

All countries in the region have reduced greenhouse gas emissions (GHE) compared to 1990, the below figure shows the evolution of GHE in Romania for the last two decades (fig.1).

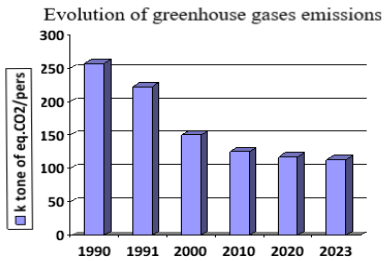
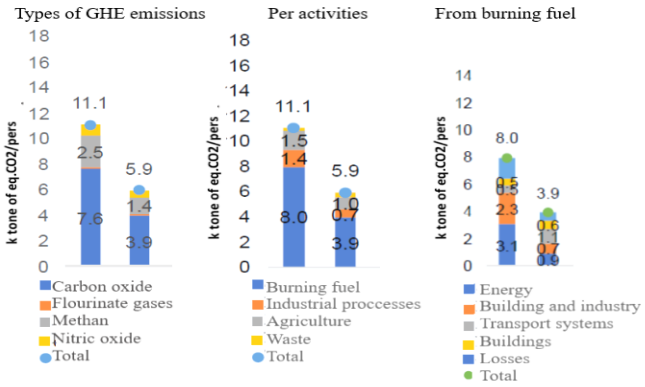


Fig.1. The evolution of GHE in Romania for the last two decades

Based on implementation of clean technologies or de-pollution technologies Romania achieved the largest reduction, from 257 thousand tons of CO_2 equivalent to 110 thousand tons of CO_2 equivalent in 2023.



a) b) c)

Fig.2. Detailed evolution of gase emissions in Romania

Relative to the population, greenhouse gas emissions decreased from 11.1 tons per capita to 5.9 tons/pers. Most of these emissions consisted of emissions of carbon oxides (66%) and methane (23%). [5], [6], [2].

Romania stands out among the countries in the region due to its double weight in greenhouse gas emissions methane, a gas that does not stay in the atmosphere as long as CO_2, but because it absorbs a lot more solar energy has a much higher greenhouse effect (fig.2a). The most polluting activities remained fuel-burning activities, which generated 3.9 tons/pers. of greenhouse gases in 2022 (fig.2b). The rest of the greenhouse gas emissions were due to industrial processes (0.7 tons/ pers.) and agriculture (1 tons/ pers.).

In Romania, agriculture is polluting more than industrial processes. Most of the pollution resulting from the burning of fuels as is generated by the transport sector and energy sector (fig.2c).

Compared to 1990, pollution in the energy sector has decreased (from 3.1 tones/pers. to 0.9 tons/pers.), but in the transport sector it increased (from 0.5 tones/pers to 1.1 tons/ pers). [7], [8], [9], [10].

The other two sources of pollution by burning fuel are representing by construction sector and buildings. Compared to 1990, pollution in the construction sector decreased (from 2.3 tons/pers. To 0.7 tons/pers.), and building pollution increased (from 0.5 tons/ pers. to 0.6 tons/ pers.).

Romania has reduced GHE emissions from 2022 by 56% compared to 1990, above the target of 55% set by the European Commission for 2030. However, efforts to reduce pollution have to be in line to achieve climate neutrality by 2050. Romania emits gases with GHE effect of 133 tons CO_2 equivalent further, which means the need to reduce emissions in parallel to the increase in the CO_2 absorption capacity of land and forests. This capacity will increase to 49.3 tons of CO_2 equivalent, above the target of 26.5 tons of CO_2 equivalent set for 2030 by the European Commission, Romania being the only country in the region with such a performance under the conditions in which the surface forested area increased slightly up to 30% of the country's surface in 2022.

2. DECREASING POLLUTION MEASURES

In the last 6 years, the structure of electrical energy production electrical was strongly influenced by the retreat of coal or hydrocarbon power plants or groups generators from operation.

During the period September 2017 – June 2023 ware retreated from operation capacities totaling an installed capacity of 5508 MW in Romania. So, the capacity installed in the energetic power reached a historic low of 18.254 MW in 2023. In Romania, some capacities were installed as power plants put in operation about 624 MW, most of the power, installed photovoltaic farms – 496 MW, but they did not compensate the decommissioning of two coal-fired units from CE Oltenia, last year. [11], [12], [13], [3].

While wind and solar power were touching production records in Europe, flexibility system becomes vital for accelerating the transition energy, which it still based on fossil sources. Lignite is remaining an important source for electricity production, currently covering almost 18% of total electricity production at the national level.

There is a set of measures that is recommended for reducing pollution, all of them have the same importance and also reinforce each other:

- first, expanding the use of technologies based on renewable energy sources for the generation of electricity is approaching and started many years ago.

The mix of usable of renewable resources depends on existing technologies, availability resources, the climatic conditions determined by the geographical position

of Romania. In Romania, the renewable resources used in order of importance are the waters (35.6%), the wind (16.3%) and the sun (7.7%) [14], [19], [22].

- second, increasing energy efficiency can reduce the amount of energy required. Romania had the third highest energy efficiency in the region last year.
- third, public spending for environmental protection they can finance measures where ecological balances are precarious and natural capacity of CO2 absorption can be improved.

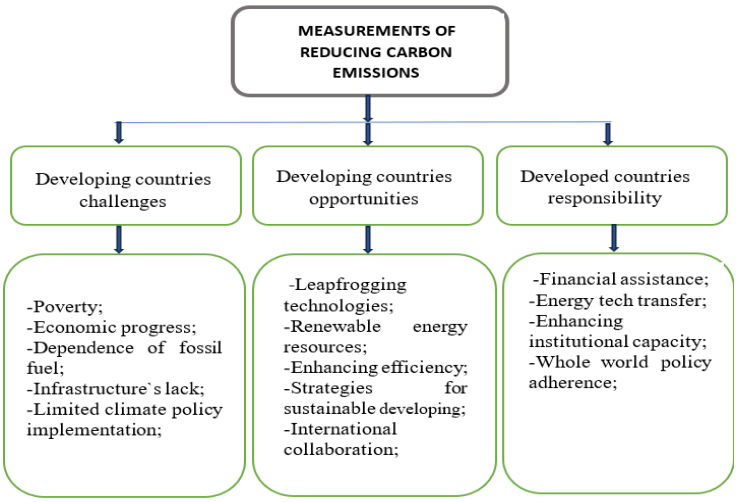


Fig.3. Climate change and build a low-carbon for a sustainable future

Of course, these expenses depend on the fiscal space in the budgets national. In Romania, in the period 2017-2022, the annual public expenses for environmental protection were the lowest.

Reducing carbon emissions represents a difficult task all over the world that claims for a diversified strategy. Each nation, regardless of its present quantity of emissions, has a specific role in this world effort. International collaboration, shared responsibilities, and coordinated efforts can help nations to tackle climate change and build a low-carbon for a sustainable future.

3. ENERGY TRANSITION AT THE MOMENT OF TRUTH

Without sufficient mineral resources, without processing units, without sufficient equipment factories, without mature technologies, Romania and all countries of European Union are engaged in a historic process of economic transformation, with the energy transition at the center. About 85% of a solar panel ,70% of an offshore wind turbine, 41% of the electrolyzes necessary for the development of the hydrogen industry or 71% of electric cars are produced in China, which is the largest global supplier of technology for the projects of green energy. These aspects are hard to be reach or overtake by EU [3], [4], [15]

The energy sector transition in Europe recorded crucial advances in 2023 as the system energetically emerged from a period characterized by high prices and government intervention. But although the EU has strengthened its energy ambitions from renewable sources in response to emerging crises in the last three years.

Improving efficiency in the energy sector is crucial in the clean energy transition process. In addition to reducing greenhouse gas emissions, investments in energy efficiency have the effect of increasing the share of renewable energy and combating energy poverty. Moreover, investments in this objective can create jobs, improve the quality of life and reduce social costs. At the same time, energy efficiency goals must be achieved without affecting productivity. In this transition process, Romania has the advantage of having gas reserves, which will help to have a phased energy transformation, and in addition, but the local market needs storage capacities. [5], [6], [16].

Beyond the moral aspect, of sustainability green transition involves major expenses. The European Commission estimates the costs for the European Union at 700 million euros annually until 2030, or around 5% of the EU's gross domestic product. Probably, each member state of the European Union requires comparable outgoings. The financial sources could be different. In addition to European funds, financing for green transition can be obtained on an internal basis through environmental taxes and green bond issuance. For Romania, between 2017 and 2023, green taxes accounted for 2.1% of GDP annually, representing almost all from energy taxes meanwhile, private sector obligations amounted to USD 0.5 million in 2022 and USD 0.2 million in 2023. For the first time, in February 2024 were issued two million euros of sovereign bonds. [3], [6], [16].

Volumes attained from both funding sources have the potential to be high in the next years. Romania is holding a comparative advantage in green transition relative to other countries, which must be maintained in order to achieve the goal of climate neutrality by the year 2050.

4. CONCLUSIONS

The growth of Romania's electric power sector is essential to the country's overall development since it must guarantee physical availability. continuously to provide power at a cost reachable by customers. The electricity sector's decarbonization reflects a quick and essential step to accomplish the goals that Romania has set for itself in the energy sector and climate change, necessitating an adjustment to sector by boosting electricity safety, promoting social and economic development as component of sustainable development.

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