ANALYSIS OF RENEWABLE ENERGY USE IN THE EUROPEAN UNION

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ABSTRACT: *The transition to a zero-emission society and economy is both an urgent challenge and an opportunity to create new jobs and economic development. The green transition is also a necessary step to reduce the EU's energy dependency. Replacing fossil fuels with cleaner forms of energy will reduce the EU's greenhouse gas emissions. A large proportion of greenhouse gases on the Earth's surface are generated by energy production and the burning of fossil fuels. Energy is therefore a key issue in the climate change concerns, with renewable resources being effective ways of reducing dependence on fossil fuels. Accelerating the transition to clean and sustainable energy is the path to a healthier planet for people today and for future generations.*

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JEL Classification: *Q01, Q29*

1. INTRODUCTION

Renewable energy production is an extremely important aspect of the efforts to combat climate change and transition to a more sustainable energy system less dependent on fossil fuels. The use of renewable energy sources can contribute to reducing greenhouse gas emissions, conserve natural resources, and promote sustainable development.

In July 2021, as part of the "Fit for 55" legislative package, the European Commission proposed an amendment to the Renewable Energy Directive to align renewable energy targets with the new climate target. The Commission proposed to increase the mandatory target for renewables in the EU energy mix to 40% by 2030 and promoted the use of renewable fuels such as hydrogen in industry and transport with additional targets.

In May 2022, as part of REPower EU plan following the aggression of Russia against Ukraine, the European Commission proposed a new amendment to accelerate the transition to clean energy, aiming to phase out Russia's dependence on fossil fuels. The Commission proposed installing heat pumps, increasing solar photovoltaic capacity, and importing

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hydrogen and biomethane from renewable sources to increase the 2030 target for renewables to 45%.

On 9 November 2022, the Commission proposed a new amendment to a Council Regulation to accelerate the use of renewable energy. Under the proposal, renewable energy plants will be of major public interest, which will allow the acceleration of the authorization procedures for renewable energy projects and specific exemptions from EU environmental legislation for them. [6]

In March 2023, the Parliament and Council informally agreed to increase the renewable energy target for 2030 to 42.5%, Member States trying to reach 45% and, for the first time, included industry by setting binding targets (42% hydrogen from renewable sources in total hydrogen consumption by 2030) and indicative targets (1.6% annual increase in renewable energy use). In October 2023, was approved the "Renewable Energy Directive aiming to increase the share of renewable energy in total EU energy consumption". [2].

2. USE OF ENERGY FROM RENEWABLE SOURCES IN EU MEMBER STATES

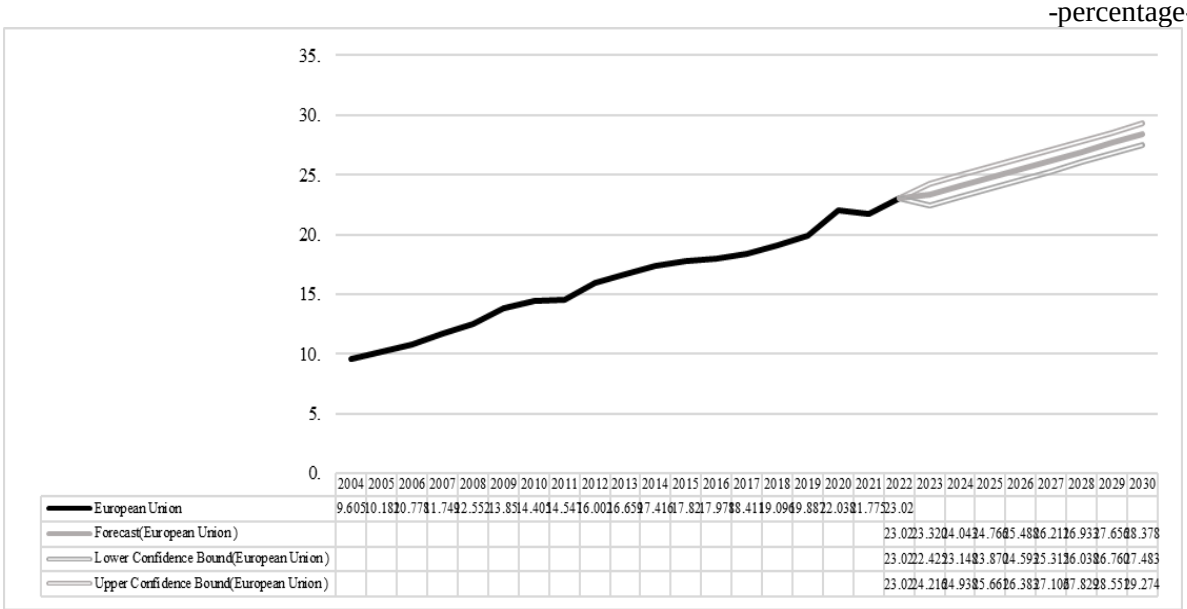
In the following, we analyse the current situation in the European Union regarding the use of renewable energy and whether the ambitious EU targets can be achieved. Thus, we will analyze the data available on the Eurostat website regarding the share of renewable energy production in the period 2004-2022 of EU Member States.

The use of renewable energy sources is seen as a key element in energy policy, reducing dependence on imported fuel from non-EU countries, reducing emissions from fossil fuel sources, and decoupling energy costs from oil prices. Directive 2009/28/EC on the promotion of the use of energy from renewable sources set accounting criteria for renewable energy targets.

The Renewable Energy Indicator focuses on the harmonized calculation of the share of renewable energy. The main benefit derived from this is that Member States are committed to following the same method to calculate the desired values. Its application prevents any irregularities from varying the parameters and rules used in different calculation methods. [4]

Figure 1. Share of energy from renewable sources forecast in the European Union

-percentage-



Source: Author owns processing based on Eurostat data (2024)

As it can be seen in Figure 1, in 2022 the share of renewable energy in total energy production slightly increased. In 2022 the share of renewable energy sources in gross final energy production at the EU level was 23,02%.

The forecast showed that in 2030 the share of renewable energy production in the European Union will be, with a 95% probability, in the range 27,48% - 29,27%. Through the natural evolution of the indicator, the forecasted value is 28,37%, European Union falling short of the proposed target of 42,5% renewable energy consumption.

The situation of the share of renewable energy production in 2022 in each of the EU Member States is shown in Table no.1.

Table no.1. The share of energy from renewable sources in the EU member states in 2022

States	Share of energy from renewable sources (%)
Sweden	66,00
Finland	47,88
Latvia	43,31
Denmark	41,60
Estonia	38,47
Portugal	34,67
Austria	33,75
Lithuania	29,59
Croatia	29,35
Romania	24,14
European Union	**23,02**
Slovenia	22,93
Greece	22,67
Spain	22,11
Germany	20,79
France	20,25
Cyprus	19,42
Bulgaria	19,09
Italy	19,00
Czechia	18,19
Slovakia	17,50
Poland	16,87
Hungary	15,19
Netherlands	14,97
Luxembourg	14,35
Belgium	13,75
Malta	13,40
Ireland	13,10

Source: Eurostat (2024)

From the data presented in Table no.1 we can see that, in terms of share in production of the renewable energy sources, in 2022 ten EU Member States are above the EU average. This group of 10 countries includes Romania with a production of 24,14% of energy from

renewable sources compared to the EU average of 23,02%. The country with the highest production of energy from renewable sources is Sweden with a percentage of 66,00% and the country with the lowest production of energy from renewable sources is Ireland with a percentage of 13,10%.

As mentioned above, each EU Member State has set a target of 45% renewable energy production in total energy by 2030. In the following, we will forecast the evolution of the Share of energy from renewable sources for the 10 countries that are above the EU average in 2022.

Table no.2. The share of energy from renewable sources in the first 10 EU member states in 2022 and 2030 forecast

States	Share of energy from renewable sources 2022 (%)	Share of energy from renewable sources forecast 2030 through the natural evolution of the indicator (%)
Sweden	66,00	72,15
Finland	47,88	52,76
Latvia	43,31	48,79
Denmark	41,60	47,72
Estonia	38,47	46,93
Portugal	34,67	40,72
Austria	33,75	42,49
Lithuania	29,59	34,61
Croatia	29,35	35,91
Romania	24,14	30,13

Source: Author owns processing based on Eurostat data (2024)

With more than half of its energy from renewable sources in its final gross energy production, Sweden (66,00%), relying mainly on a mix of biomass, hydropower, wind power, heat pumps and liquid biofuels, has by far the highest share among the EU Member States in 2022 and already exceeds the 2030 EU target of 45% renewable energy production. According to the forecast, through the natural evolution of the indicator, in 2030 the share of renewable energy production in Sweden will be 72,15%. Sweden has steadily increased its wind energy production and as the cost becomes lower, wind energy will replace nuclear energy in the country's energy system. We can mention that, since 2016 Sweden set a target of running entirely on renewable energy from 2040. [3]

Wind turbines have mainly provided power consumption in the Nordic countries (Finland, Estonia, Latvia, Denmark), even at peak demand. Renewable energy sources are proving their efficiency in Finland. Thanks to wind generators, electricity in Finland is free for consumers, 17 February 2020 made history in the state of electricity, as electricity became free for the first time in Finland's history. [1]

Currently, Finland ranks second in the EU in terms of share of renewable energy production, with 47,88%, using mainly biomass, hydropower, wind power, and already exceeds the EU target of 45% renewable energy production by 2030. According to the forecast, the share of renewable energy production in Finland in 2030 will be 52,76%, through the natural evolution of the indicator.

The third largest share of renewable energy production in the EU is in Latvia with 43,31%, mainly using biomass and hydropower. According to the forecast, in 2030 the share

of renewable energy production in Latvia will be 48,79%, through the natural evolution of the indicator, and thus, Latvia will exceed the 2030 EU target.

Denmark (41,60%, using mainly biomass and wind energy) occupies the next position in the ranking. According to the forecast, the share of renewable energy production in Denmark in 2030 will be 47,72%, through the natural evolution of the indicator and it will thus exceed the 2030 target.

In Estonia the share of renewable energy consumption is 38,47%, mainly based on biomass and wind energy. According to the forecast, in 2030 the share of renewable energy production in Estonia will be 46,93%, through the natural evolution of the indicator, and will exceed the 2030 EU target.

In Portugal, the share of renewable energy production is 34,67%. According to the forecast, in 2030 the share of renewable energy production in Portugal will be 40,72%, through the natural evolution of the indicator. Thus, Portugal will fail to reach the 2030 target.

Austria (33,75%, using mainly hydropower and biomass) is currently in the next position after Portugal, but due to the different growth rates, Austria will overtake Portugal by 2030. According to the forecast, in 2030 the share of renewable energy production in Austria will be 42,49%, through the natural evolution of the indicator. This will bring Austria closer to the 2030 target. We believe that a series of investments in renewable energy production in Austria can lead to the target achieving of 45% renewable energy consumption. In 2021, more than 700 river hydropower plants and around 3100 small hydropower plants were in operation in Austria, supplying around 60% of the generated electricity. Austria is number one in Europe in the use of hydropower and offers innovative companies' know-how and a dynamic environment. By the end of 2020, 1307 wind turbines with a total output of 3120 MW have generated clean and environmentally friendly electricity for around 2 million households, or about 50% of all Austrian households.

The forecast showed that the share of renewable energy production in Lithuania, Croatia, and Romania in 2030 will be 34,61, 35,91 and 30,13 respectively. Thus, these countries will fail to reach the target of 45% renewable energy consumption in 2030.

3. CONCLUSIONS

By the nature of its uniform distribution, renewable energy overturns the traditional model of energy supply. Electricity no longer flows in one direction from the utility provider that generates it to those who consume it. The new energy ecosystem comprises a complex network of 'prosumers': individual consumers and businesses who produce their own energy locally, use what they need and, in many cases, want to feed excess energy back into the grid. Electrification of transport, residential systems and industrial processes will also lead to significant increases in electricity demand in the coming decades. Data centers, offices, factories and similar locations can participate in this transition, through battery-powered systems, thermal energy storage, and uninterruptible power systems that interact with the grid.

This process will give rise to large two-way electricity flows, which will require a grid that has the flexibility to cope with volatility and increasing demand.

Experts estimate that by 2026, global renewable electricity capacity will increase by more than 80% from 2020 levels (to more than 5022 gigawatts). Of this increase, two-thirds will come from wind and solar, an increase of 150% (3404 gigawatts). By 2035, renewables will generate 60% of the world's electricity. [5]

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