

EFFECTS OF HYDROGEN PRODUCTION ON ECONOMIC GROWTH IN THE EUROPEAN UNION

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Abstract: *In this article the author presents some aspects of the hydrogen market, this fuel is essential to support the European Union's commitment to achieving climate neutrality by 2050.*

In 2020, the crisis caused by the Covid-19 pandemic has given a boost by speeding up the global long-term challenge of climate change, with more and more countries committing to achieving "zero net" emissions.

The energy system in the single internal market is responsible for 75% of greenhouse gas emissions. According to the Green Deal Pact. In the context of the crisis caused by the Pandemic Corona, the European Commission issued the Hydrogen Strategy in which it provided for an investment plan in green energy with the aim of economic recovery in Europe. In this sense, green hydrogen can be the fuel that contributes to reducing energy costs at European level.

Decarbonisation leads to a significant increase in the role of electricity, which can cover the demand of over 50% of final energy by 2050, compared to about 20% today.

Hydrogen contributes to the security of energy supply by reducing dependence on the import of fossil energy and natural gas. Thus, the diversification of energy supply takes place by facilitating the implementation of renewable energy sources. This is assessed by the estimation of imported fossil fuels that will be replaced by hydrogen based on domestic renewable sources.

Green hydrogen can be obtained from clean energy where investments in renewable energy, whose prices are falling, and innovation are a viable solution for the green economy. Hydrogen does not emit greenhouse gases and does not pollute the air when used.

In Romania, the potential for renewable energy production is estimated to be almost ten times higher in 2030 than at present, which creates a significant opportunity to use some of this potential in the production of hydrogen that can replace fossil fuels.

Keywords: *Decarbonisation; economic growth; Green Deal Pact; green hydrogen; renewable energy sources; wind farm*

JEL Classification: E23

1. European context

The Member States of the European Union have made a firm commitment to the Paris Agreement and its objectives. The goal of Europeans is to become climate neutral in 2050 (The Paris Agreement).

The energy system in the single internal market is responsible for 75% of greenhouse gas emissions. According to the Green Deal Pact (COM (2019) 640 final), in the context of the crisis caused by the Pandemic Corona, the European

Commission issued the Hydrogen Strategy on 8 July 2020 which set out a green energy investment plan aimed at economic recovery in Europe. In this sense, green hydrogen can be the fuel that contributes to reducing energy costs at European level. Hydrogen is essential to support the European Union's commitment to achieving climate neutrality by 2050 and to the global effort to implement the Paris Agreement.

In line with the European Union's Hydrogen Strategy (COM (2020) 299 final), European countries play a significant long-term role for green hydrogen obtained by electrolysis using renewable electricity.

The European Union's strategic position based on the high potential of offshore energy from the North Sea and the Baltic Sea to the Mediterranean and the Black Sea is essential for Europe to achieve its 2030 carbon reduction targets and become neutral from the point of view of the impact on the climate by 2050 (.COM 2020 741 final).

2. Hydrogen demand in the European Union

In the European Union, offshore wind energy currently produces clean energy that is cheaper than electricity from fossil fuels.

Green hydrogen can be used in those sectors where electrification is difficult, especially heavy transport, the steel and chemical fertilizers industry.

The first offshore wind farm in the world was installed in Denmark and is a successful demonstration project.

The Netherlands is considering the use of blue hydrogen, using natural gas as a raw material, carbon sequestration and storage, as a provisional measure. However, Germany, Spain and Italy are skeptical about "blue hydrogen". France is the only country in Europe that relies on nuclear power generation (although many of its nuclear power plants are nearing the end of their lives), producing hydrogen by electrolysis called "purple hydrogen" using nuclear electricity.

Germany seems to place the most emphasis on the use of hydrogen, although it is not expected to be able to meet all the demand for hydrogen from domestic production, low-carbon hydrogen imports will play a significant role.

At the other extreme, Spain, with a high potential for large amounts of cheap solar energy, is considered to be a significant exporter of hydrogen. Italy is based on imports from North Africa.

Hydrogen is currently used in the European Union, in proportion of 2% with the premises of its use up to about 24% of the European energy mix in 2050.

The current demand for hydrogen is predominant in the chemical refining and ammonia industry, the steel industry, the construction sector and in heavy transport (Figure 1).

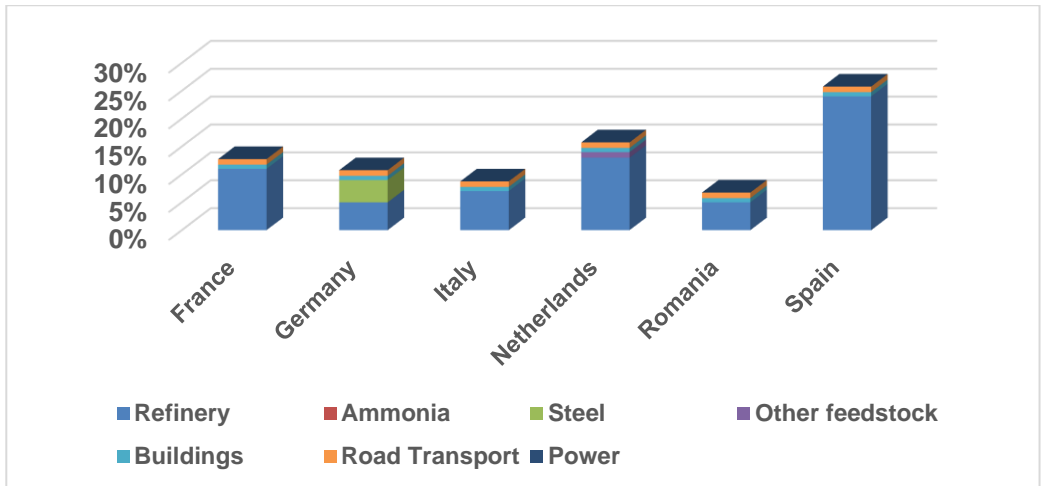


Figure 1: Demand for low-carbon hydrogen by country and sector in 2030. Low scenario

Source: Authors' analysis

The European Commission believes that only hydrogen from renewable energy will be sustainable in the long run. Therefore, only this type of hydrogen is addressed and supported by the European strategy. The European Commission has determined that hydrogen production will be supported by European funds.

The analysis of two scenarios was performed for the energy market in Romania and five markets in the European Union by calculating the penetration of low carbon hydrogen, as a percentage of total energy consumption in each key sector of demand, both the lowest scenario and the highest.

The data presented in Table 1 show that the highest percentage comes from the refinery sector. This is explainable because there is already a hydrogen market in refineries and in the petrochemical sector (along with ammonia production).

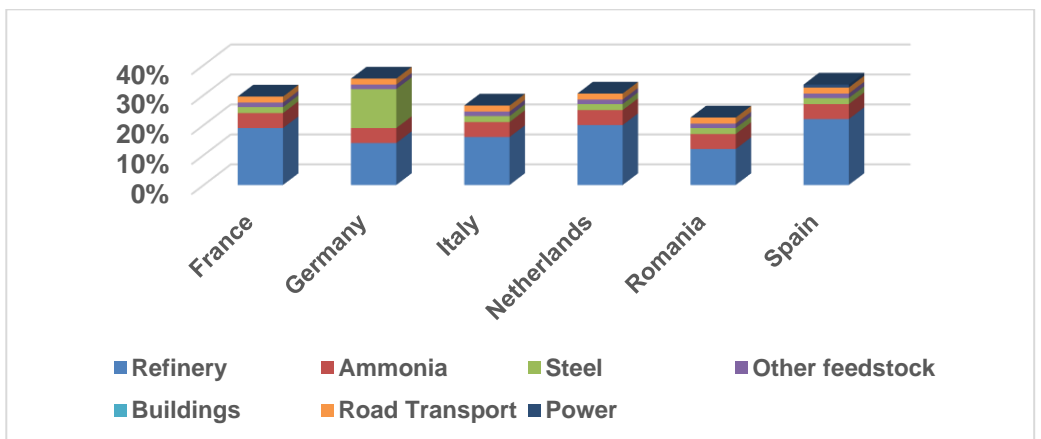


Figure 2: Demand for low-carbon hydrogen by country and sector in 2030. High scenario

Source: Authors' analysis

However, as can be seen from Figure 2, the total energy demand of each sector has a significant impact in forecasting the total hydrogen demand.

Currently, hydrogen obtained from water electrolysis accounts for less than 1% of hydrogen production in the six countries. However, due to the decarbonisation ambitions accompanied by the expansion of renewable energy sources, the future potential for hydrogen production is high.

In general, there are two electricity supply options: the supply of electricity from off-grid installations and the supply of electricity from the national grid.

Currently 96% of the hydrogen consumed comes from burning fossil fuels.

For the production of pure hydrogen that does not release carbon into the atmosphere, it is produced by electrolysis of water using renewable or nuclear energy. Approximately 22 TWh of green electricity is needed to produce 15 TWh of hydrogen.

Even if in the lowest scenario, in the transport sector, the penetration is only 1% or 2% (in the case of the highest scenario) in the 2030 demand forecasts, this translates into a significant proportion (between 25-30%) of total hydrogen demand.

Similarly, in the construction sector, a hypothesis of 0.75% percentage penetration in the low scenario and 7.5% percentage in the highest scenario (with the same value in all countries) leads to significant variations in the estimated demand.

3. Effects of the development of the hydrogen market in Romania

According to estimates on renewable energy, in Romania the potential for electricity production in RES will be almost ten times higher in 2030 than at present, which creates a significant opportunity to use some of this potential in generating renewable energy. to produce hydrogen by electrolysis.

In Romania, in the first phase, the development of hydrogen production capacities of 1500 MW is foreseen, the financing of which is supported by the Modernization Fund (Table 1).

With regard to the transport of hydrogen, it can be transported in a mixture with methane gas using the natural gas transmission infrastructure built under BRUA.

Given that the European Commission gives a significant long-term role to green hydrogen obtained by electrolysis using renewable electricity, Romania is forced, if necessary, to speed up the abandonment of the exploitation and use of fossil fuels for hydrogen production.

From the scenarios presented by the Romanian authorities regarding the exploitation of fossil fuels, more precisely regarding the Decarbonization Plan of the Oltenia Energy Complex, we found that this plan, with a total value of over 1.3 billion euros, does not comply with the principles of European funding. the company's total CO₂ emissions will increase by about 28% by 2030 compared to 2020. The restructuring and decarbonisation plan is not sustainable given the plans to use coal in 2030 without setting a deadline for its elimination. fuel from energy production.

Table 1. Estimated investments in the hydrogen market in the next period

| | Electrolysis capacities for hydrogen production (MW) | Estimated investments (Mil. Euro) |
|--------------------|---|--|
| France | 1164 | 674 |
| Germany | 1843 | 1160 |
| Italy | 779 | 418 |
| Netherlands | 5969 | 3285 |
| Romania | 1500 | 775 |
| Spain | 2820 | 1598 |

Source: Hydrogen Europe, 2020

Romania's intention to continue using coal is contrary to the European decarbonisation targets set by the European Green Pact, regarding the accelerated rise in the price of carbon emissions and the negative effects on air quality.

This delay in eliminating the use of coal has endangered the energy company and its employees in the medium and long term. The protests of the miners in the Jiu Valley in February 2021 reflect the results of the disastrous restructuring of the '90s and recent years.

The resources allocated from the Fair Transition Fund for economic diversification and for the requalification and active inclusion of miners in the Jiu Valley will be accessible if Gorj and Hunedoara counties aim to significantly reduce greenhouse gas emissions.

4. Conclusions

The European Commission adopted, at the end of 2019, the European Green Pact "Green Deal", in which the European Union aims to become a world leader in combating the effects of climate change and the first continent with zero net greenhouse gas emissions in 2050. The European Green Pact leads us to a profound technological transformation. This plan has a significant impact on the European economy and society. Achieving the target will be a major challenge given that, under current energy and climate forecasts, emissions can only be reduced by 60% by 2050. Basically, a sustainable and sustainable transformation of the economy is desired, by removing fossil fuels, promoting clean, renewable energy and developing a circular economy.

Hydrogen is essential to support the European Union's commitment to achieving climate neutrality by 2050 and to the global effort to implement the Paris Agreement.

Making these changes requires a huge need for investment. The European Commission intends to mobilize one trillion euros in this over the next decade. But in order to truly feel the benefits of such a change and to put the European Union's ambitions into practice, a significant part of the investment will need to be directed towards creating a strong and independent European industry that can deliver solutions to the challenges. , generating added value in the economy.

Rising carbon prices have led to the collapse of coal production, so that fifteen EU countries have adopted national plans for the total elimination of coal by 2050. Coal replacement plans provide for the use of clean energy from renewable sources and natural gas. . But the states of the European Union are dependent on natural gas imports, which has led to a focus on increasing energy from renewable sources. In this context, the funds supported by the European Union are provided for hydrogen obtained from energy produced from renewable sources.

Since 2012, Romania is going through a process of modernization of the energy sector in accordance with the objectives of the "Green Deal Pact" of 2019, so, in parallel with the liberalization processes of electricity and natural gas markets, the aim was to attract investors in section.

In terms of investments in clean energy, in Romania was built the largest wind farm located on a continent, in the wind farm located in the Dobrogea area where over 3,500 MW of clean wind energy are installed but also 1,350 MW installed in forovoltaic panels. Thus, the mandatory target that Romania had to meet by 2020, of 24%, was reached in 2011. According to the provisions of the European Energy Strategy, hydrogen is currently used in the European Union, in proportion of 2% with the premises its use up to about 24% of the European energy mix by 2050.

In these conditions, it is imperative that, in Romania, the plan of the Oltenia Energy Complex be in accordance with the provisions of the European Green Pact, Gorj and Hunedoara counties be helped to access European funds to create new jobs in the area, jobs that can , through requalification, to be also oriented towards the energy sector based on new technologies.

In order to achieve the objectives of implementing the development of hydrogen production technologies, a more efficient bureaucratic system is needed, reducing the time from approval to commissioning of the plant from 10 years to 2-3 years.

So far, forced by European targets, Romania has taken small steps to decarbonize the energy system, but the race for 2030 has not yet begun. However, we have the opportunity to adapt to the requirements of the Green Deal Pact and at the same time become a major player in the energy market. energy in the region.

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