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The EU at the Forefront of The Green Hydrogen Revolution

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Introduction

The embrace of hydrogen as a sustainable energy source is on the rise, propelled by the ambitious goals set by the EU in its quest for decarbonizing the energy landscape. The global push for net-zero emissions has fueled interest in "green hydrogen", namely low-carbon hydrogen generated via electricity produced by renewable energy sources. In the context of EU's strategic approach on green hydrogen, the REPowerEU Plan and the Fit for 55 packages are setting the stage for integrating renewables and fostering a robust green hydrogen market.

At the same time, Greece is following the green hydrogen trend by setting ambitious goals for decarbonizing its national economy, even though a comprehensive national framework for the development of green hydrogen projects has not yet been established.

The Promise of Green Hydrogen

The integration of green hydrogen in the European energy ecosystem has the capacity to promote both decarbonization and security of energy supply through the achievement of the following key objectives:

- **Emission Reduction**: Green hydrogen is pivotal in reducing emissions in sectors like heavy manufacturing, aviation, and shipping, where it can replace traditional fossil fuels.
- **Further integration of renewables**: Green hydrogen production via electrolysis performed through intermittent renewables, such as wind and solar, tackles the variability of renewable power generation. Furthermore, in EU member states where renewable energy sources (RES) projects face a bottleneck situation with regards to grid access (Greece is one of them), utilizing RES produced electricity for electrolysis instead of injecting same to the grid may be considered as a viable, alternative business plan for RES producers.
- **Energy Security**: Geopolitical tensions, such as those related to the Russia – Ukraine conflict, have increased interest in low carbon hydrogen within the EU by reducing dependence on fossil fuel imports, especially natural gas.
- **Global Potential**: Hydrogen, while abundant on Earth, is primarily produced from fossil fuels with significant CO2 emissions. Green hydrogen has the potential to create a global market for clean fuel with numerous advantages in storage and long-distance transport.

In summary, green hydrogen is becoming integral to achieving net-zero emissions, addressing challenges in emissions reduction, renewable integration, energy security, and the creation of a global market for clean energy carriers. However,

transitioning from unabated fossil fuel hydrogen to low carbon hydrogen production is a significant global challenge, since the production of green hydrogen presents technical and economic challenges, including the construction the infrastructure necessary to accommodate the manufacturing of electrolyzers, securing a reliable supply of renewable energy, and addressing grid capacity issues. These issues call for a robust industrial policy directed to the creation of a dynamic and competitive green hydrogen market.

EU Policy Initiatives

The European Union (EU) has strategically outlined a framework to promote a low-carbon hydrogen economy, with a strong emphasis on green hydrogen, the EU Hydrogen Strategy. On the supply side, EU aims at the installation of at least 40GW of electrolyzer capacity to produce 10Mt of green hydrogen; on the demand side, promote the integration of green hydrogen technologies across various industrial sectors.

REPowerEU

To support these objectives, the European Commission introduced the *REPowerEU Plan* in May 2022, which received endorsement from the European Parliament and Council in February 2023. The plan establishes ambitious 2030 targets, aiming for 10Mt of domestic green hydrogen production and 10Mt of green hydrogen imports within the REPowerEU segments of recovery and resilience plans. Here are some of the measures included in RePowerEU related to green hydrogen:

- **Increased Targets for Renewable Energy:** RePowerEU proposes an increase in the binding target for renewable energy in the EU's energy mix, which is expected to facilitate a larger role for green hydrogen in sectors such as industry, energy storage, and transportation.
- **Dedicated Hydrogen Accelerator:** To boost the production and use of renewable hydrogen, RePowerEU proposes a "Hydrogen Accelerator" with the goal of doubling the previous target of 40 GW of renewable hydrogen electrolyzers in the EU by 2030, including the development of necessary infrastructure and the fostering of international partnerships.
- **Removal of Regulatory Barriers:** The plan calls for faster permitting processes and improved regulatory frameworks to facilitate the rapid deployment of renewable hydrogen projects.
- **Scaling Up Investment:** RePowerEU looks to mobilize additional investment to support hydrogen through various financial instruments and funding opportunities, including the Recovery and Resilience Facility (RRF), the InvestEU program, and the Innovation Fund.
- **Hydrogen Valleys:** The concept of "Hydrogen Valleys" is promoted, where entire regions develop their green hydrogen economy, covering production, transportation, and end-use applications. This holistic approach is expected to create local ecosystems for hydrogen economy, stimulating demand and integrating hydrogen into various sectors.
- **Strategic Partnerships and Import Initiatives:** Recognizing that domestic production will not be sufficient, RePowerEU seeks to establish strategic partnerships with external suppliers to import green hydrogen or its derivatives. These partnerships will include agreements with countries in North Africa and the Middle East, among others, to create a diversified supply.
- **Infrastructure Development:** The plan also includes the development of a trans-European hydrogen backbone, improving storage capabilities, and retrofitting existing gas infrastructure to be hydrogen-ready.

- **Innovation and Research:** Investments in research and innovation to reduce the costs of hydrogen production, improve electrolyzer performance, and explore new technologies for the transportation and storage of hydrogen.

Fit for 55

The *Fit for 55* package is a set of policy proposals presented by the European Commission to enable the European Union to reach its climate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. This set of proposals is aimed at revising and updating EU legislation to fit with the European Green Deal objectives. Regarding green hydrogen, several measures within the "Fit for 55" package specifically aim to promote its development and use:

- **Revision of the Renewable Energy Directive (RED II):** This proposal aims to increase the overall binding target for renewable energy sources in the EU's energy mix, which includes setting specific targets for the use of renewable fuels, such as green hydrogen, in certain sectors. The European Parliament released on 20 September 2023 its proposal for a revised Renewable Energy Directive which includes specific goals with regards to the contribution of renewable fuels for final energy and non-energy purposes, as well as legislative amendments pertaining to the promotion of green hydrogen projects, such as the expansion of guarantees of origin scheme to renewable fuels.
- **Introduction of a Hydrogen and Gas Market Decarbonization Package:** This includes a proposal for the revision of EU gas market rules that aims to create a market for hydrogen, particularly green hydrogen, and ensures that the gas market is fit for the integration of hydrogen and renewable gases. This package has been approved on the ministerial level and is yet to be reviewed by the European Parliament.
- **Carbon Border Adjustment Mechanism (CBAM) reform:** The CBAM entered into force by virtue of Regulation (EU) 2023/956. Although not exclusively aimed at hydrogen, the CBAM is a tool designed to prevent carbon leakage by putting a carbon price on imports of certain goods from outside the EU, within the limits set by applicable WTO rules. This could indirectly benefit green hydrogen production within the EU by making it more competitive compared to non-EU production with higher carbon footprints. The application of the transitional phase of CBAM entered into force on 1 October 2023.
- **Emissions Trading System (ETS) reform:** The ETS reform was effected with the introduction of Directive (EU) 2023/959. The aim of this reform is primarily to increase the carbon price signal, thus potentially making green hydrogen more economically viable in comparison to fossil fuels, which would be more heavily taxed under a stronger ETS.
- **Promotion of infrastructure for alternative fuels:** The European Parliament's Alternative Fuels Infrastructure Regulation (AFIR) aims to revise legislation to promote the deployment of refueling and recharging stations for alternative fuels, which would include hydrogen refueling stations. This is key for creating the necessary infrastructure to support hydrogen-powered vehicles.

These measures are designed to work in concert to create a favorable environment for the production, distribution, and consumption of green hydrogen, thus making it a viable and competitive alternative to fossil fuels.

Green Hydrogen Policy in Greece

Greece has set an ambitious target for 2030 and beyond, within the framework of the new National Plan for Energy and Climate (NPEC), while many Greek and foreign companies are considering their options in relation to potential investment opportunities. The NECP aims at the installation of 1.7 GW of electrolyzers by 2030, which translates to 135,000 tons of green hydrogen production.

On the infrastructure front, both the Ministry of Environment and Energy and the National Natural Gas System Operator (DESFA) argue that the existing gas infrastructure needs to undergo only minor upgrades to become “hydrogen-ready”, while all new pipelines constructed by DESFA are capable of supporting hydrogen transmission. Furthermore, major international pipelines, such as the Trans Adriatic Pipeline (TAP) and the Greece-Bulgaria Interconnector (IGB) are already capable of handling hydrogen quantities.

Despite the ambitions of the Greek government, a comprehensive regulatory roadmap for the licensing of green hydrogen projects as well as of a set of policies for the financial support of said projects is yet to be established, even though the undergoing normative debate on the pertinent framework between government officials, regulators, grid operators and market players is very dynamic.

Conclusion

The European Union is at the forefront of integrating green hydrogen into its energy paradigm, underscored by rigorous policy frameworks and strategic initiatives such as the "Fit for 55" package and the REPowerEU plan. These policies underscore the EU's commitment to reducing emissions through clean energy technologies, with green hydrogen playing a pivotal role. By targeting both supply and demand, the EU aims to ramp up electrolyzer capacity and foster the use of green hydrogen across various sectors, reinforcing energy security and catalyzing the transition to a low-carbon economy. Greece is following the green hydrogen trend, however without any tangible legislative proposals so far for regulating and promoting the industry. Realizing the green hydrogen vision requires overcoming significant technical and economic hurdles, necessitating a strong industrial policy to spearhead the development of a dynamic and competitive market.

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