Knowledge grows

Leveraging blue hydrogen to rapidly reduce emissions and realize the potential of the hydrogen economy

Introduction

To meet common climate goals and limit global warming, it is crucial to reduce emissions from industry, energy, shipping and food. Hydrogen and hydrogen derivatives, such as low-carbon ammonia, hold great potential to decarbonize these sectors. But this requires vast amounts of hydrogen and hydrogen derivatives.

Bridging the gap to green hydrogen with CCS and imports

The ultimate goal is to fully rely on green energy from renewable sources. But to achieve this, we need to scale up the hydrogen economy to ensure the needed infrastructure is in place.
Low-carbon hydrogen is an effective solution to cut emissions while bridging the gap towards zero-emission renewable production. This is because CCS can be swiftly deployed at large scale. It is also a cost-efficient decarbonization solution as it is compatible with existing European hydrogen production infrastructure. It will make hydrogen available in larger quantities, allowing for the rapid and reliable scaling up of hydrogen applications in industry and transport, which will in turn pave the way for renewable hydrogen.

To meet the hydrogen demand of European industry, imports must complement domestic hydrogen production. Ammonia is one of the most promising hydrogen carriers and enables the long-distance ship-borne transport of hydrogen. Furthermore, ammonia itself can be used as a shipping fuel, which allows for the decarbonization of the maritime transport sector as it does not emit CO_2 when burned.

A robust European and global hydrogen system, supported by multiple hydrogen pipelines, can secure clean energy for European industries. However, completing the required pipeline infrastructure will take time and is not expected to be in place for another decade. When the required cracking infrastructure to convert ammonia back to hydrogen is put in place, hydrogen imports in the form of ammonia can be scaled rapidly.

Matching supply and demand

Given the scale of the decarbonization challenge, all technically feasible and economically viable options must be considered. As infrastructure is developed, it is also vital to create a market for low-carbon products through value chain partnerships and policy tools such as incentive schemes.

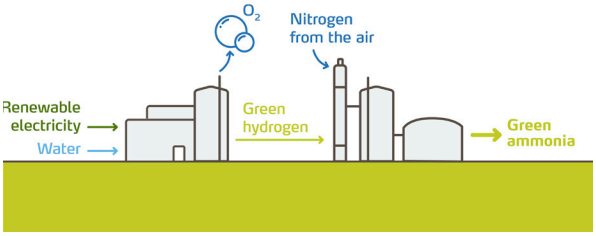
What are the different types of hydrogen and how are they produced?

The conventional production method for producing hydrogen is to use natural gas and steam, which is known as steam methane reforming. This results in "grey" hydrogen with CO_2 as a byproduct.

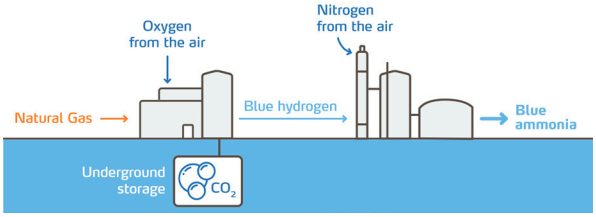
Switching the production method from natural gas to renewable electricity and water electrolysis (splitting water into hydrogen and oxygen) avoids generating CO_2. The result is renewable hydrogen (also known as "green" hydrogen). The EU's regulation on Renewable Fuels of Non-Biological Origin (RFNBO) defines what qualifies as being truly renewable hydrogen.

Nuclear electricity can be used as an alternative energy source for water electrolysis, resulting in so-called "pink" hydrogen. Incorporating carbon capture and storage (CCS) technology to capture and sequester the byproduct CO_2 in the conventional production process results in low-carbon (or "blue") hydrogen. "Blue" and "pink" hydrogen both qualify as low-carbon hydrogen if they meet the same emission threshold as RFNBO.

Green ammonia production



Blue ammonia production



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OUR RECOMMENDATIONS

1. Foster all technologies that allow for large and swift emission reductions.

Low-carbon hydrogen based on CCS can be swiftly deployed and is cost-efficient and compatible with the existing production infrastructure. By supporting the deployment of low-carbon hydrogen from domestic production and imports, European industry can decarbonize its production processes more quickly.

2. Increase the recent policy focus on CCS and develop a comprehensive and supportive framework for low-carbon hydrogen.

The role of CCS in reaching climate neutrality has been increasingly acknowledged over the past years, which led to the publication of the Industrial Carbon Management Strategy by the European Commission in February 2024. For the 2024-2029 mandate, it is crucial that momentum is kept up to ensure that a regulatory framework is put in place in time to optimize the decarbonization potential of CCS.

3. Expand partnerships across the value chain to promote the production and use of products with a reduced carbon footprint.

Yara has already entered into partnerships with companies such as PepsiCo Europe, Reitan in Norway and Lantmännen in Sweden to supply them with lower-carbon footprint fertilizers to help decarbonize food production. Collaboration along the value chain must be significantly accelerated to create a viable market for low-carbon products. Demand measures must also be put in place by both the private and public sectors to ensure the successful transition to the hydrogen economy.

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