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Expert Commentary

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30 April 2020

GECF Secretariat
Energy Economics and Forecasting Department

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It is a fact that hydrogen will be one of the most favourable energy carriers for the future of the energy system. Benefitting from a high efficiency in transformation as well as low polluting contents makes this fuel very attention-grabbing. Hydrogen can be consumed in a variety of energy demand sectors such as power, transport, building and energy-intensive industries. The potential to use in long-term storage for electricity where batteries are challenged is a promising role of hydrogen when it comes through the power to gas technologies. The cost of blue hydrogen considering the abundance and availability of natural gas is less than green hydrogen, so anywhere that geological and political conditions are appropriate, this type of production can be promoted. Especially in regions that CCUS can be of high commercial value as in the case of oil-producing countries that can use CO_2 for enhanced oil recovery (EOR) purposes, blue hydrogen can be produced, stored and in the future can be traded in potential markets. Technology will play a significant role in the application of hydrogen in both sides of production and consumption.

Oil and gas resource-rich countries such as GECF Member Countries benefit from having access to storage facilities. As an example, depleted reservoirs or salt cavern reduce the cost of the carbon sequestration and make the carbon-capturing and storage more economical. Through the advancement of technologies such as methane reforming, carbon capture as well as comparatively newly invented technologies such as pyrolysis of methane, natural gas will gain more attention in the context of decarbonisation through hydrogen production and supply in future trade markets.

The recognised role of natural gas and related technologies are also acknowledged in the “Declaration of Malabo” in the “5th Gas Summit of Heads of State and Government of the GECF Member Countries” in November 2019. The strategic role of the development, deployment and transfer of advanced technologies for more effective production to enhance natural gas environmental benefits is also irritated in the Declaration. [1]

HE Dr Yury Sentyurin, Secretary-General of the GECF has also stated the role of blue hydrogen and announced the GECF studies and modelling efforts in several occasions as in the International Business Congress Working Committee «Modern Technologies and Perspective Oil and Gas industry», December 2019, Vienna, Austria [2]. GECF Secretary-General has also participated and addressed many other high-level meetings which discussed the role of hydrogen as in the G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth in June 2019, Karuizawa, Japan. [3]

GECF has developed a dedicated scenario named Hydrogen Scenario and investigated the global role of hydrogen and associated technologies through to 2050. The results of the modelling suggest that around half of the total hydrogen needed annually by 2050 will be sourced from natural gas-based reforming in the form of blue hydrogen. [4]

In a shorter-term and based on the figures known from announced projects, blue hydrogen is assumed to gain higher share compared with its other clean alternative, green hydrogen. S&P Global Platts Analytics through a webinar and an article published on its website reiterated the promising role of blue hydrogen. According to the same source and based on the announced projects, the capacity of the blue hydrogen production is supposed to reach the level of 3.3 million tones per annum by 2028. This outlook corresponds to a significant growth compared to the current level of only 0.6 million ton per annum that mostly installed in North America. Regarding the green hydrogen, only 0.4 million tones are announced to add to the current 0.2 million tones annual capacity of production over the same period. [5]

The implication of blue hydrogen production, by definition, comes from the need for adequate facilities to capture and store the carbon content. Oil and gas producer countries can use the captured CO_2 for the EOR purposes, or they can store it in the depleted fields or salt caverns. But for some regions such as in Japan, the possibility of extended carbon-capturing practices is subject to significant uncertainty.

Methane pyrolysis, developing technology for hydrogen production, is receiving more attention these days due to the benefits that it can offer in the pathways to the decarbonised economy. Pyrolysis is a technology that splits methane molecule to hydrogen and solid carbon. It is known as thermal decarbonisation of natural gas. One of the most advantageous features of the pyrolysis technology is that it eradicates the challenge of carbon content storage as the solid carbon can be easily stored or used in other industrial applications such as in the tire industry, plastic, ink, electronics, etc.

There are different process for methane pyrolysis such as thermal-based, catalytic-based or plasma-based technologies. The heat requirement can be achieved by natural gas, renewables, or even the hydrogen produced in the process. If bio-fuels such as bio-methane is utilised for the heating, a negative level of emission can be obtained through the entire process.

Similar to the GECF Hydrogen Scenario outcome, some other studies also confirmed that the potential of green hydrogen is not adequate to meet the goals for a net zero-carbon economy. For example, a survey presented in a recent webinar held by OIES suggested that blue hydrogen needs to be implemented to pave the way for green hydrogen. The study has considered the potential of wind turbines, off-shore and on-shore, in Germany. It assumes that by 2050 the country will reach 50% electrification in its energy system. The study also assumes that one per cent of final energy consumption can be reduced annually by 2050 though efficiency improvement or any other technological advancement. The initial results showed that the potential of green hydrogen would not be sufficient to accommodate all the demand for renewable non-electric energy demand by 2050. So even with very visionary assumptions, potential volumes of green hydrogen are not adequate, and blue hydrogen is essential. Besides, local pure hydrogen system sourced by methane reforming can maintain the security of supply and absorb the intermittency of the green hydrogen.

Cost-effectiveness is also another advantage for clean natural gas-based hydrogen to take a role in the future hydrogen economy. A study from Pöyry assessed the cost for three different clean technologies to produce hydrogen: natural gas reforming with CCS, electrolysis and pyrolysis. The results of the study suggested that methane reforming with CCS (blue hydrogen) will stay as the least costly clean technology for hydrogen production even by 2050 compared to the rest. The second cost-effective technology, according to the study, will be pyrolysis that also relies on methane as input. [6]

In conclusion, apart from the role of natural gas as the cleanest natural fuel in the future of clean energy economy and sustainable development goals, its role in other particular pathways in the clean energy economy, such as hydrogen economy, is an undeniable fact. Considering several aspects, supply security and cost-effectiveness, natural gas will be one of the essential pillars of sustainable development. Technology advancement, specifically in early-stage technologies such as pyrolysis can also promote this effectiveness. These facts have also been acknowledged in the Declaration of Malabo where the GECF Member Countries acknowledged the indispensable contribution of natural gas and reiterated the role of associated technologies for environmental benefits. Natural gas is needed to pave the way and herald the decarbonisation through the hydrogen economy.

References

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