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Energy Transition and Future of Fossil Fuels (3)

Ken Koyama, PhD
Chief Economist, Managing Director
The Institute of Energy Economics, Japan

The 464th and 465th issues of "A Japanese Perspective on the International Energy Landscape" discussed energy transition and the future of fossil fuels from the overall or macro viewpoint and from the investment and finance viewpoint. This time, I would like to discuss the matter from the viewpoint of innovative technologies and innovations.

Mainly in Europe, arguments are growing for very ambitious greenhouse gas emission reduction goals including "net zero" GHG emissions. If these goals are to be attained, energy supply and demand would have to be restructured. The world now depends on fossil fuels such as oil, natural gas and coal for 85% of its primary energy supply. If "net zero" GHG emissions are to be realized in the future, the world would have to dramatically expand non-fossil energy such as renewable energy and nuclear, thoroughly decarbonize fossil fuels or combine these measures. Another way to attain the "net zero" GHG emissions would be the direct removal of CO_2 and other GHGs in the atmosphere to offset GHG emissions. If energy supply and demand were changed structurally to attain the goal of "net zero" GHG emissions, however, the world would have to depend on the abovementioned two measures.

As hopes on renewable energy are growing globally and rapidly, with the International Energy Agency pointing to nuclear energy as a key option to address climate change, non-fossil energy sources will likely play greater roles than in the past. Given the fact that fossil fuels account for most of current energy supply, however, how to use fossil fuels as mainstay energy sources in a clean manner to meet climate change goals would also be very important.

As a matter of course, technologies to use fossil fuels cleanly have existed and been developed. Technologies have been developed and diffused to maximize combustion efficiency and reduce CO_2, SO_x, NO_x and other pollutant emissions. They include clean coal technologies. It is important to further sophisticate and diffuse these technologies. To attain high-level goals such as "net zero" GHG emissions, however, innovative technologies and innovations will be required to use fossil fuels.

In this respect, hopes have rapidly grown on innovative hydrogen technologies. Attracting attention particularly in regard to the utilization of fossil fuels and decarbonization is the blue hydrogen technology to produce hydrogen from fossil fuels and use the carbon capture and storage (CCS) technology for containing or cutting subsequent CO_2 emissions. In a manner to meet the trend of calling for raising climate change goals to ambitious levels, various plans are emerging to produce blue hydrogen from coal and natural gas in resource-rich countries and to transport blue hydrogen to consumer countries. They include initiatives in Australia, Brunei and Saudi Arabia. Russia has also grown interested in hydrogen recently. In order to effectively utilize their resources over a long term instead of leaving them to become stranded assets, resource-rich countries have no choice but to

tackle innovative technologies and innovations.

Hopes are growing on innovative technologies and innovations not only among resource-rich countries but also among multinational corporations engaging in fossil fuel business. Believing that the blue hydrogen technology should play a key role in decarbonizing natural gas as planned in Europe, multilateral energy corporations are moving in expectation of utilizing natural gas effectively for producing blue hydrogen.

A key component of the blue hydrogen technology is CCS. CCS technology, which has been expected to become a key climate change countermeasure, will have to be innovated further. In addition to CCS, a wider technology concept of carbon capture, utilization and storage (CCUS) is attracting interest. Although CCS technology captures and stores CO_2 generated through fossil fuel consumption, plans are considered to utilize CO_2 for enhanced oil recovery (EOR) to expand oil and gas production, for dry ice and for carbon recycling initiatives to produce chemical, fuel and concrete products.

These CO_2 utilization plans view CO_2 as a usable resource and seek to utilize CO_2 for the purpose of limiting or reducing CO_2 emissions into the atmosphere. CCUS and carbon recycling have rapidly attracted interest in recent years in line with efforts to explore the effective utilization of fossil fuels and with growing hopes on innovative technologies for the purpose. They were key topics at an annual Group of 20 summit in Japan last year and will be so at this year's G20 summit in Saudi Arabia.

As a matter of course, the abovementioned technologies are innovative and have yet to diffuse commercially in the market. Technologically, economically and socially, they remain in the development stage. Constraints on and hurdles to their commercialization are abundant and difficult to overcome. A key challenge is to advance the technology development to substantially cut relevant costs. This is because laboratory-stage technologies would be meaningless unless they diffuse widely in society.

If very high climate change goals such as "net zero" GHG emissions are pursued, however, the utilization or extension of traditional technologies will not suffice but innovative technologies will have to play a key role. As this point is being shared globally, various countries and companies are seriously enhancing their innovative technology and innovation initiatives while developing technology roadmaps and setting cost reduction goals.

It is important that innovative technologies and innovations have the potential to resolve climate change and other challenges for the whole of mankind. However, attention must be paid to their potential to influence the survival of individual countries and companies. As global races for technology development and supremacy are growing fiercer, countries or companies with technological advantages are likely to have dominant influence and achieve supremacy in the world. In this sense, the world is expected to see fierce geotechnology competition in the future.

Amid the energy transition, the future of fossil fuels will depend on how blue hydrogen, CCUS and other innovative technologies make progress. We will have to closely watch global technology development efforts and competition.

Contact: report@tky.ieej.or.jp
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