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1. Developments in Nuclear Power

Tomoko Murakami, Senior Economist, Manager
Nuclear Energy Group
Strategy Research Unit

On January 25, the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA) released a report titled “The Costs of Decarbonisation.” The report calculates the “system cost,” which consists of the cost of grid optimization as well as power generation, for a power system with CO_2 emissions of 50 gCO_2/kWh or less, with various shares of variable renewable energy (VRE). Under the emission constraint of 50 gCO_2/kWh, the most economically rational generation mix was the base case scenario consisting of roughly 80% nuclear power and the remaining 20% hydropower and gas. The system cost rises with the VRE ratio, reaching USD50/MWh or about ¥5.5/kWh at a VRE of 75%. The purpose of the report was not to deny the expansion of VRE, but to suggest that appropriate assessments of system cost will enable proper investment in decarbonization. The report is worth reading for Japan and other countries which expect VRE to play a role.

The estimates of system cost in the report are based on the premise that nuclear power will remain cost-competitive into the future. On February 12, the Agency for Natural Resources and Energy held an International Symposium on Nuclear Energy Technology Development international symposium on the development and demand for nuclear technology in Tokyo, co-hosted by the Institute of Applied Energy and the IEEJ, to discuss future measures for nuclear technology and the expected challenges. Yuji Matsuo of the IEEJ took the stage as moderator and panelist and expressed the view that, considering the cost of grid stability based on the projected generation mix of the United States, Canada, and other countries, nuclear power is expected to remain cost-competitive in the future. There were also comments that small modular reactors (SMRs), which major countries consider to be a highly promising technology, should be considered not only as a solution for safety issues specific to LWRs but also from a broader perspective, including their possible use for load-following and as a heat source. To promote the use of SMRs and other innovative technologies, it will be important to take appropriate initiatives to improve their predictability for business operators and investors.

In Japan, the situation for nuclear power remains harsh. On February 4, Kansai Electric announced a six- to nine-month postponement of the completion of construction of the safety measures for Takahama Units 1 and 2 and Mihama Unit 3, which had obtained permission to extend its operating life. Consequently, it has become much more likely that no new plants will restart in FY2019.

On February 13, Kyushu Electric announced the decommissioning of Genkai Unit 2, leaving Japan with 37 nuclear power plants, including Fukushima Daini Units 1 through 4. The power company explained the reason for the decommissioning as “a comprehensive judgment based on its own technical constraint of lack of space, the output level, and the number of years of operation after restarting.” The situation is presumably similar not only for the 12 plants yet to apply for safety assessment but also for the 28 plants that are currently shut down including 10 plants undergoing assessment and the six plants that have been licensed to restart. Serious discussions focusing on cost effectiveness in considering safety improvement measures are needed.

2. Recent Developments in the Oil Market

Tetsuo Morikawa, Senior Economist, Manager
Oil Group
Fossil Energies & International Cooperation Unit

Oil prices remain steady. After returning to $60/bbl in January, Brent is hovering in the mid-$60 range as of late February. Oil prices are being propped up by slower Iranian oil exports, rising tensions in Venezuela, production cuts by OPEC Plus, and the recent sluggish growth of US output, in addition to the perceived easing of macroeconomic uncertainty with the expected slower pace of US interest rate increase and mounting hopes for the resolution of the US-China trade war.

Despite the temporary waiver of sanctions, Iranian oil exports have dropped from 1.1-1.2 mb/d in November 2018 to around 0.8 mb/d in December and have crawled back to only around 1.0 mb/d as of February 2019. Japan and other Asian importers are requesting the United States to extend the temporary waiver, but if the US refuses, Iranian oil exports, and in turn its output, are set to decline significantly.

The situation in Venezuela has deteriorated severely since the start of January. On January 28, the United States announced additional sanctions on the country, freezing the assets of state oil company PDVSA in the US and banning the export of diluents, which are vital for Venezuela's oil production, to the country. If Venezuela cannot secure alternative diluent supplies, the country's oil output will fall even faster.

OPEC Plus countries have pledged to collectively cut their output by 1.2 mb/d from October 2018 levels for six months starting January 2019. As of January, OPEC's compliance rate stands at 86%, quite high for the first month, though the compliance rate of Russia and other non-OPEC countries remains low at 25%. Notably, Saudi Arabia has cut as much as 400 kb/d (4%) month-on-month. Output also declined in Libya, which is exempted from production cut obligations, by 100 kb/d (10%) in January as parts of its oil fields have been occupied by militants since December.

US output is also struggling to increase due to the slump in oil prices toward the end of 2018. According to the US Energy Information Administration (EIA), output increased to as much as 11.9 mb/d in November 2018, but remains at the same level as of mid-February 2019. The EIA projects output to grow by 1.45 mb/d from 2018 to 2019, but rig count was 857 as of mid-February, down from 888 in mid-November 2018.

In light of these factors, oil prices are likely to remain steady. However, this trend may be disrupted depending on the outcomes of the US-China trade war and Brexit. The US has postponed the implementation of higher tariffs scheduled for March 1, but whether the two countries can reach a deal on ending the trade war remains uncertain. Furthermore, financial markets are headed for chaos if the UK and the EU fail to agree on the withdrawal conditions or extension of the negotiation deadline at the EU summit on March 21, though this date may also be postponed. If that were to happen, oil prices would inevitably fall, albeit temporarily, even if supply and demand are in balance.

3. Recent Developments in the LNG market

Hiroshi Hashimoto, Senior Analyst
Gas Group
Fossil Energies & International Cooperation Unit

As the author described in the No. 151 issue (January 2019), investment activities in the LNG liquefaction sector currently attract the highest attention in the LNG industry. This year's first final investment decision on a major LNG production project in the world was announced in early February. Two distinctive ways of momentum buildings have been observed between the Golden Pass project in Texas, United States, on which the above-mentioned first FID of the year was made, and the Mozambique Area 1 LNG project in East Africa, where the sponsors are gradually approaching the decision time.

The Golden Pass project is a brownfield development which takes advantage of an existing large-scale LNG import terminal and associated infrastructure and has partners Qatar Petroleum (QP) and ExxonMobil - already long-standing partners at the largest LNG production center in Qatar. No specific long-term sale deals into any gas consuming markets have been announced from the planned production capacity of the project along with the latest investment decision. Variety of marketing activities are expected, including offtake options to optimize positions that the partners have at existing LNG production facilities in other parts of the world.

On the other hand, Mozambique LNG1 Company announced five LNG sale deals in February for substantial volumes, respectively. According to the project operator Anadarko, the project is well in a position to make a sanctioning decision in the first half of 2019 with more than 9.5 million tonnes per year of long-term sales secured including the five deals. As the company is a relatively new comer in the LNG industry, the greenfield project may need firmer long-term offtake commitments from credit-worthy buyers to jumpstart. On the one hand, additional project development by the largest established players with global LNG positions is effective and essential to cope with expected growth of the LNG market. On the other hand, new entrants in LNG supply is also essential for the sake of healthy competition in the LNG market. Hence the contrasty trends of LNG project development are expected to continue for the foreseeable future.

Several factors are suspected to have encouraged the Golden Pass decision this time. As QP has set a goal to increase its global hydrocarbon production and has announced a plan to invest heavily in the gas industry in the United States, the project is a major element of this plan. The project will provide QP with an opportunity to diversify its production capacity, not only to increase it, when the company also has a plan to expand its LNG production plants in its home country. As Qatar has already shipped its LNG to more than 20 countries around the world, by substituting its supply commitment in the United Kingdom and other Atlantic markets with its own LNG supply from the United States, it will be able to direct more Qatari LNG to the Asian markets. As the United States is expected to be a more crowded field of LNG projects in the years to come, earlier mover's advantages are expected in smoother engineering and construction works. ExxonMobil may expect the deal, as well as partnership with QP in multiple locations around the world, may help it have a better chance to participate in the expansion phase in Qatar.

4. Update on Policies Related to Climate Change

Takahiko Tagami, Senior Coordinator, Manager
Climate Change Policy Research Group
Global Environment and Sustainable Development Unit

After a 21-hour meeting, in the early hours of January 26, Germany's Commission on Growth, Structural Change and Employment (the so-called Coal Commission) agreed on a schedule for phasing out coal power and published its final report. The Commission had been examining the impact of the phase-out on Germany's greenhouse gas (GHG) reduction, power prices, and supply security, and the economy of coal regions. The government is expected to implement the recommendations as-is.

According to the Commission's recommendations, Germany's coal power capacity will be reduced from 42.6 GW in 2017 to 30 GW by 2022 and to 17 GW for the period from 2023 to 2030. The coal exit roadmap will be reviewed every three years from 2023 assessing the ramifications of phasing out nuclear power in 2022. The plan is to close all coal-fired plants by 2038, but the deadline will be reviewed by experts in 2026 and 2029. The recommendations state that the issue of compensation for brown coal power plants shall be solved in principle through a mutual agreement between each state government and power plant, and by law if an agreement is not reached by June 2020. All funds will be appropriated from state government budgets and will not be added to power prices.

The Commission also recommended compensation of 2 billion euros per year from the federal budget for consumers for the increase in power prices caused by phasing out coal. To address concerns over supply security, it also recommends providing incentives for investments in power plants if there are not enough plants under construction (such as gas-fired plants) as of 2023. Regarding the economic prospects of the coal regions, the report states that 60,000 jobs depend directly or indirectly on the brown coal economy and dedicates 148 pages of the 275-page report to the project list for brown coal regions. Media reports state that the affected regions will receive 40 billion euros over 20 years. Germany's efforts to engage with this long-term project deserve close attention.

The two oil majors made moves heading toward the annual general meeting (AGM) in spring. On February 1, BP announced it would support an institutional investor group's call for the company to describe how its strategy is consistent with the goals of the Paris Agreement. The institutional investor group in its shareholder resolution had directed BP to include in its corporate reports a description of its strategy which the board considers to be consistent with the goals of the Paris Agreement, as well as how the company evaluates the consistency of each new material capex investment with the Paris Goals, metrics including the anticipated levels of investment in oil and gas resources and reserves, and the company's targets to promote reductions in its operational GHG emissions. BP also announced that GHG emissions reduction has been included as a factor in the bonuses for employees of the BP group all over the world.

Further, on February 7, Chevron issued an update to its "Climate Change Resilience" report of 2018. In the update, Chevron set two goals, including reducing methane leakage by 20 to 30% per product between 2016 and 2023. These numbers will be measured not only in projects which Chevron operates but also in those that the company holds as equity, and the result will be a factor in deciding employees' compensation.

5. Update on Renewable Energies

Yoshiaki Shibata, Senior Economist, Manager
New and Renewable Energy Group
Electric Power Industry & New and Renewable Energy Unit

On February 1, the Agency for Natural Resources and Energy established a new office named the Carbon Recycling Promotion Office to promote innovations in relevant technologies. On the 14th, the carbon recycling council held its first meeting. The council will formulate a technological road map by June and present it at the G20 energy and environment ministerial meeting. In carbon recycling, CO_2 is separated and captured instead of being released into the atmosphere and is reused as a fuel, raw material for producing materials, and for growing plants, and can be viewed as a type of CCU.

CO_2 is used in materials such as cement aggregate and for curing concrete by fixing CO_2 in the material, thus preventing its release into the atmosphere for a certain period. As CO_2 is released at disposal by decomposition or incineration, it is equivalent to CCS with a time limit.

One method of recycling carbon for fuels is methanation, for which there is an established technology. In methanation, CO_2 is combined with renewables-based hydrogen to produce synthetic methane through chemical reactions. The CO_2 is released when the synthetic methane is used but is cancelled out by the CO_2 captured to be used for methanation. Further, as synthetic methane is produced using renewable energy instead of the usual natural gas or other fossil fuels, less CO_2 is emitted overall. This synthetic methane, also called “carbon-neutral methane”, is positioned as a product of “methanation using CO_2-free hydrogen” in Japan’s Basic Hydrogen Strategy. Methanation was also mentioned as an example of CCU alongside hydrogen as a key technology in a speech by Prime Minister Abe at the World Economic Forum’s Annual Meeting in Davos on January 23, in which he stressed the importance of “discontinuous innovations for addressing climate change.”

Carbon-neutral methane produced from CO_2 and renewable hydrogen is also an option for transporting and using hydrogen. It could also be used as a feedstock for city gas to decarbonize the energy. It plays a key role also in the plan, “Contributing to long-term climate action by utilizing city gas and natural gas” drawn up by the Japan Gas Association at the end of last year. Carbon-neutral methane can also help reduce supply costs as it can be supplied using the existing natural gas network.

NEDO has been carrying out feasibility studies on carbon-neutral methane and developing technologies for effectively using CO_2 since 2016. The Ministry of the Environment has also launched demonstration projects starting this fiscal year. In the private sector, organizations such as the Organization for Carbon Capture & Reuse (CCR) and the Society of Anthropogenic Carbon Cycle Technology (the Institute of Applied Energy is the secretariat) are already in place.

Achieving a zero CO_2 society will take considerable time. Until then, it is rational to produce hydrocarbon fuels by combining renewable hydrogen with the CO_2 emitted from thermal power generation, large-scale industries such as steel and cement, and from biomass generation, thus efficiently decarbonizing the energy system using existing infrastructure. Also, CCU is free from barriers typical of CCS such as suitable sites for storage, social acceptance, and legislation, and CCU can be implemented relatively smoothly in society once the technological and economic challenges are resolved. Developments in carbon recycling must be closely monitored.

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IEEJ e-Newsletter Editor: Yukari Yamashita, Director
IEEJ Newsletter Editor: Ken Koyama, Managing Director
Inui Bldg. Kachidoki, 13-1 Kachidoki 1-chome, Chuo-ku, Tokyo 104-0054
Tel: +81-3-5547-0211 Fax: +81-3-5547-0223