October 3, 2022

Toward Building International CCS Projects

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In August of this year, a series of projects were announced in Europe that may have important implications for Japan's future CCS projects. One is an agreement between Norway's Equinor and Germany's Wintershall Dea on a project to transport 20–40 million tonnes of CO_2 per year by pipeline from Germany to Norway by 2037 and store it in suitable underground locations in Norway. The other, also agreed between Equinor and Norwegian chemical company Yara, involves capturing 800,000 tons of CO_2 per year at Yara's fertilizer production plant in the Netherlands and transporting it to Norway for storage. In particular, the former project with Germany will be a significant decarbonization measure for German industry if implemented, as it will collect, transport, and store very large amounts of CO_2 accounting for 20% of the annual emissions of German industry (about 180 million tons). While Germany has attracted attention mostly for its ambitious renewable energy policies, the country is also considering the use of CCS, which is based on the use of fossil fuels.

These two projects are founded on Equinor's expertise and capabilities in CCS. Since 1996, the company has been conducting a CCS project to capture and store the CO_2 produced alongside natural gas in the Sleipner gas field, and has already stored more than 19 million tonnes of CO_2 underground to date. Since 2008, the company has been conducting a similar CCS project for an LNG project in the Snøhvit gas field, also in Norway. CCS technology is often described as "technically unproven," but the fact that there are actual projects like Sleipner that have been steadily capturing and storing CO_2 for more than a quarter century should be made more widely known. In addition to these current CCS projects that capture and store the CO_2 from gas fields, the company is working on a project called the Northern Light Project to capture the CO_2 emitted from industrial clusters in Norway, transport it by liquefied CO_2 carriers, and store it in a reservoir off the Norwegian coast. The Yara project mentioned above also relies on this Project for the storage of CO_2.

These CCS projects have important implications for Japan because, like Germany and others, Japan may have to conduct CCS using reservoirs outside of Japan. The Japanese government has set a target of storing 120 to 240 million tonnes of CO_2 per year through CCS in 2050. The plan is to meet this goal by securing domestic reservoirs, but if these alone are not sufficient to store the target amount, it will be necessary to secure overseas reservoirs.

Needless to say, there are many challenges for Japan to overcome to implement cross-border CCS projects going forward. The first is securing a sufficient storage capacity in a region as close to Japan as possible. If assuring reliability is the priority, depleted gas fields are the preferred option for storage due to the availability of detailed subsurface geological information, but aquifers have greater future storage potential; storage sites must be secured with both of these in mind. Geographically, many depleted gas fields are located relatively close to Japan in Southeast Asia. For example, in Malaysia and Indonesia, CCS projects utilizing depleted gas fields are already being considered, although primarily to store domestic CO_2 emissions. As for the means of transporting CO_2, the German project plans to use pipelines, while the Yara project plans to use liquefied CO_2 carriers; in the case of Japan, liquefied CO_2 carriers will probably be the primary means of transportation. CO_2 liquefies at minus 56.6°C, so it can be transported using the same technology as existing LPG carriers. However, as transporting the CO_2 will incur significant cost, it will be necessary to develop large CO_2 carriers if full-scale international CCS projects are to be implemented in the future.

Second is the issue of measurement and certification, in other words, how and where the reduction effect of a CO_2 project should be properly recognized. Although CO_2 emissions reduction occurs in the country where the collection takes place, it is the destination country that stores the captured CO_2 emissions underground. This may not be a major issue if both parties are within the same country, but for cross-border CCS projects, there must be an agreed international system on how reductions should be recognized and accounted for. In addition, since performing CCS itself is energy-intensive, there must be an accurate method to measure the net emission reductions throughout the CCS value chain.

In addition, to ensure that such CO_2 capture, transport, and storage projects are lasting and sustainable, sufficient value must be generated in each link of the value chain for the project to continue. It is the companies that actually capture, transport, and store CO_2, and unless they find value in such operations, the value chain will not be sustainable. In simpler terms, cross-border CO_2 transportation and storage will not happen unless the value of reducing emissions at the point of emission exceeds the total cost of transporting and storing it outside the country. And because the value of emission reduction at each emission point varies greatly depending on the emission reduction systems of each country, governments face the difficult task of designing and operating systems for the CCS value chain to be sustainable.

Furthermore, the issue of public acceptance may arise depending on the CO_2 recipient country or location. For the recipient country, accepting and storing CO_2 from overseas could be a new source of revenue, but it could also spur negative reactions from the local community. As the primary recipients of CO_2 are likely to be resource producing countries, such negative reactions may not become a serious constraint. That said, it is still necessary to fully consider the possibility that social as well as economic and geological constraints may occur when conducting international CCS projects.

Thus, in order to promote international CCS projects, it is necessary to deal not only with operational aspects, such as securing storage sites and transportation means, but also with institutional system development and society. Further study is needed to determine what kind of institutional design is desirable in Japan and Asia, taking into account the progress of similar projects in Europe.

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