Chapter 2

Arctic Circle Energy Resources and Japan’s Role

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Introduction

On November 7, 2012, the Ice-Class LNG tanker “Ob River”, with 135,000 m^3 of LNG loaded onboard, cleared the port of Hammerfest in Northern Norway, headed east on the Northern Sea Route, passed the Bering Strait and, on December 5, entered into the LNG receiving terminal of Kyushu Electric Power Co., in Tobata, the City of Kitakyushu. This voyage, which took place at the end of the navigable season of the Arctic Ocean just before the winter set in there, required 29 days at sea, which was about one week longer than normal. The LNG thus shipped came from gas extracted from the Snohvit gas field, whose operators include Statoil of Norway, and was purchased by Gazprom Marketing and Trading - a trading arm of Russia's state-owned Gazprom – which then transported it to Japan as just described, marking the first-ever such export. This also provided Japan with a moment where, all of a sudden, it felt the Arctic Ocean to be so close (see Figure 1).

In order to transit the Arctic Ocean, an application needs to be filed with the Russian government half a year in advance. While the LNG that arrived this time as cargo was purchased on the spot market, the voyage itself was thus a carefully prepared action. With gas prices hovering high in the Asian region, the Japanese gas market is even more attractive in Russia's eye than European markets. As exporting more LNG to this market is therefore a business endeavor of high policy priority, LNG exports to Japan that take advantage of the Northern Sea Route are likely to expand beyond 2013 as well.

Commercial transportation from the Arctic Sea bound for Asia began in the summer of 2010. Novatek, an independently-owned gas company in Russia, performed a trial shipment involving the transportation of 70,000 tons of condensate from Murmansk to Ningbo in China's Zhejiang Province by navigating the Northern Sea Route, using a tanker owned by Sovcomflot of Russia. It took 22 days to complete the voyage, thus achieving a 45% reduction in the number of navigation days, but the total transportation cost-saving was just 15% because of the obligation to have two icebreakers escort the ship.

Novatek did this to explore a shipping route for delivering LNG to Asian markets from the Yamal Peninsula, in accordance with its development aim for the future, as it looks at the potential of such commercial shipments of LNG. Given the fact that the LNG is brought to European markets in the wintertime but demand in the European markets falls in the summertime, the company is turning to Asian markets, where there is substantial demand for electricity in the summertime. By the same token, ten tankers with condensate onboard headed for China in 2011 in preparation for LNG shipments to come.

In the meantime, the Northern Sea Route is also utilized on return trips from Asia to Europe. On its way back from a trip to ship gas condensate, Novatek's tanker loaded jet fuel in Korea to bring home to Russia. A technical service ship that had ended its service for Sakhalin 1 also chose the Northern Sea Route as its return route. Going forward, the Northern Sea Route may possibly see logistics activities bustle in both directions.

Figure 1: The shipping route of the LNG carrier transporting LNG to be exported to Japan via the Arctic Ocean in the late fall of 2012 (Line ①). Other solid and dotted lines indicate natural gas pipelines that run on land (developed by the Japan Oil, Gas and Metals National Corporation (JOGMEC) based on information from press reports).

1. State of oil and gas exploration in the Arctic Ocean

(1) Resource study by the US Geological Survey: "CARA"

In July 2008, the US Geological Survey made public the results of its study on resources in the Arctic Circle, called the Circum-Arctic Resource Appraisal (CARA).[1] This study covers the area north of 66.56 degrees north latitude, which also includes land areas on the Yamal Peninsula, the Taymyr Peninsula, etc., and is therefore not strictly limited to the Arctic Ocean, but can provide the audience with geographical evidence that countries have extended the reach of their exploration activities into the polar zone.

According to the study, the area houses 90 billion barrels of undiscovered oil resource, making up 13% of the world's total, and 1670 trillion cubic feet of undiscovered natural gas resource, or 30% of the world's total. Oil from the area extending from the Alaska North Slope to the Chukchi Sea, as well as natural gas from that area and also from the Russian side of the Barents Sea and the Kara Sea, is given a conspicuously high rating.

Russia has an area of 2,700,000 km^2, or approximately 60 percent of the continental shelf of the Arctic Ocean, which is the largest among the five Arctic coastal nations. Also notable is the fact that the Barents Sea and the Kara Sea are located in the northward extensions of the established onshore oil and gas producing areas, namely, the Timan-Pechora Basin and the West Siberian Basin respectively, implying a very high level of oil and natural gas resource potential. Further still, the Barents Sea, where the Gulf Stream flows in, does not freeze even in the wintertime and thus presents the best operational conditions. Although the Kara Sea does freeze in winter, the ice is thin and operations are therefore possible except in the midwinter season. Russia's Barents Sea is endowed with the most favorable environment on three counts – a vast continental-shelf area, resource potential and ice conditions – followed by the Kara Sea.

(2) Russia's Arctic Circle (See Figure 2)

(a) Barents Sea: Shtokman gas field

The Shtokman gas field is the world's eighth largest gas field, discovered in 1988, located almost right in the middle of the Barents Sea. There is 133 trillion m^3 of gas in reserves. It is the second largest gas field in the Arctic Ocean after the Bovanenkov gas field, which is situated roughly in the central part of the Yamal Peninsula. As, however, it is far – 565 km in offshore distance - from Teriberka, a village near Murmansk where an LNG hub is located, natural gas and condensate would be carried to the land in a multiphase system, for which technology development is challenging. The original plan envisaged a final investment decision (FID) to be made at the end of 2011 and the production start timing to be 2016, but more than one year has passed without an FID being made yet. It is believed that production cannot begin before 2019. Diminishing demand for natural gas in Europe has been a factor behind this.

Another point is that while the total cost to be incurred, from the Shtokman project to LNG shipments, would, given the current state of affairs, amount to approximately \$500 per 1,000 m^3, an average spot price in European markets in 2011 was merely around \$300 per 1,000 m^3, providing grim prospects in terms of profitability. On top of that, there is another issue that has been pointed out: gas sourced from the Shtokman project might result in cannibalistic competition in markets against a new Yamal LNG project or conventional natural gas projects in the northern part of West Siberia.[2]

Statoil of Norway, a project partner, transferred 24% of its owned stake to the 51% owner Gazprom at the end of July 2012. The remaining 25% is held by Total S.A. of France. Gazprom is requesting that preferential tax treatment be applied to the gas production tax for the Shtokman gas field.

This is an indication of just how difficult it is to make the development of an offshore gas field in the Arctic Ocean commercially viable when it involves a great offshore distance, even in the case of a giant gas field in terms of reserves.

(b) Pechora Sea: Prirazlomnoye gas field

The Pechora Sea is the area of waters that makes up the southern part of the Barents Sea and borders on the Nenets Autonomous Okrug; as the Gulf Stream does not flow in sufficiently southwards, its tendency to freeze in the wintertime is higher than in the central part of the Barents Sea. It was in 1989 when the Prirazlomnoye gas field was discovered in the southeastern part of the Pechora Sea and finally, in 2011, a seafloor-grounded platform was installed there. This is the same type of platform as the Vityaz platform for Sakhalin 2, one designed to avoid impacts of drift ice by having the sides of the structure angled. Work of drilling a production well is currently underway, with the aim of beginning production in mid-2013. It is operated by Gazprom's subsidiary called Sevmorneftegaz, CJSC. The field has 610 million barrels in reserves and is characterized by an average temperature of – 4℃, the offshore distance of 60 km and a water depth of 19 to 20 m.

In the summer of 2012, Greenpeace and the WWF lodged fierce protests, arguing that steps against crude oil spillages had not been put in place, and industry also agrees that these environmental organizations have a point in that argument. Protection against crude oil spills in ice-bound seas still remains a major research topic for the purpose of safe operations.

(c) Western Barents Sea: exploration blocks along the Russia-Norway border

After a 40-year-long dispute, an agreement on the delimitation of the Russia-Norway border in the Barents Sea was reached in April 2010, setting the border along the middle line between what they had respectively been claiming. Norway's claim relied on the normal median line, while Russia's claim was founded on what is called the "sector principle," which considers that due to the proximity to the polar zone, the border should be the line that extends from the overland border point and runs parallel to the meridian in the direction of the North Pole. Factors that can be cited as contributing to the agreement being reached by the two countries include the increased feasibility of resource development in the Arctic Ocean and the progress of their cooperation in the Shtokman gas field development project, etc., which worked to foster trust in each other.

Rosneft acquired license in this area of waters and proceeded to reach an agreement in April 2012 with ENI of Italy on a joint exploration venture in the Tsentralno-Barentsyevsky exploration block (Central Barents) in the southern part of the waters, followed by another such agreement with Statoil of Norway for the Perseevsky exploration block in the northern part of the waters in May of the same year, with a foreign investor stake of 33.3% in each deal.

(d) Kara Sea: exploration blocks under a joint venture with ExxonMobil

In August 2011, Rosneft and ExxonMobil Corporation reached a strategic alliance agreement, which included a particularly significant agreement on explorations in the East Prinovozemelsky exploration blocks 1, 2 and 3 in the Kara Sea, among other waters. The deal is formulated so that Rosneft should acquire license and ExxonMobil should acquire a 33.3% stake in that. An exploratory drilling operation is scheduled for 2014.

While the Kara Sea comes with tougher development conditions than those of the Barents Sea as it freezes in the wintertime, the degree of ice development there is still lower than the Laptev Sea or the East Siberian Sea in Eastern Russia. To the south of the exploration blocks, two enormous gas fields lie in the central part of the Kara Sea, namely, Rusanov and Leningrad, an indication of a strong gas tendency in the area. ExxonMobil is aiming for discovering oil in the area closer to Novaya Zemlya.

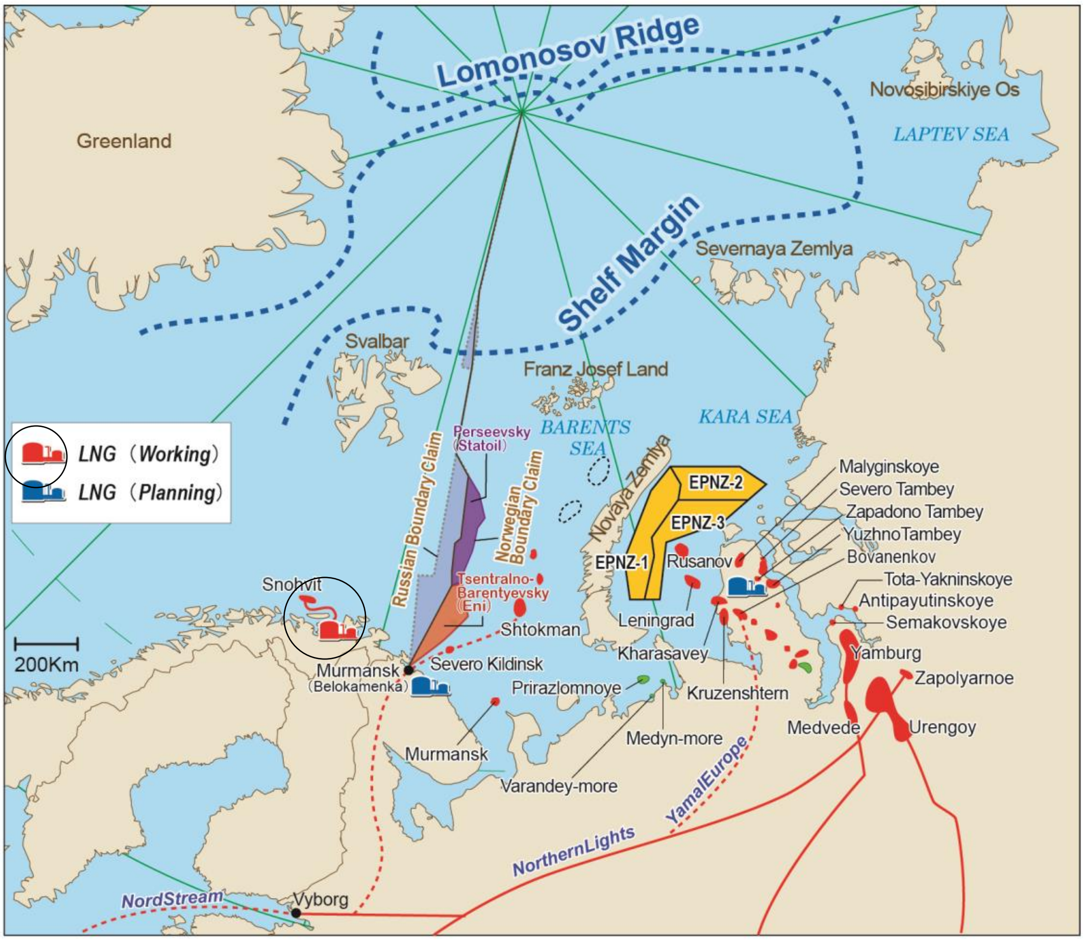

Figure 2: Major oil and gas projects in Russia's Arctic Circle (developed by JOGMEC)

(3) Norway

On the Norwegian side of the Barents Sea, the Snohvit gas field was discovered in 1984, where LNG production finally began in 2006 with an annual output of 4.2 million tons of LNG. Its reserves are small: 6.8 trillion cubic feet.

Bids were announced for exploration blocks located over a vast area of waters in Norway's Barents Sea in December 2012, and more bids are slated to be opened in 2013 for exploration blocks in the Norwegian territory, which resulted from the agreement with Russia on the delimitation on a middle-line basis. The Russian side is also scheduled to take part in a joint bid for this round.

(4) US's Chukchi Sea and Beaufort Sea

Explorations of the US's Beaufort Sea and Chukchi Sea were initiated in the 1980s and resulted in, as a marked example, the Burger gas field being discovered in the Chukchi Sea in 1990 by Royal Dutch Shell, which, with reserves of 5 trillion cubic feet, was insufficient for commercial development purposes and was therefore once given up, together with other areas explored, reflecting the trend of low oil prices that lingered afterwards.

The Burger gas field was reassessed by Royal Dutch Shell in 2000, which led to its reserves soaring to 14 trillion cubic feet; as a result, a licensing round for this section of the sea was announced once again in 2002 and Royal Dutch Shell won the bids for vast exploration blocks including the said gas field (each of the small green squares shown in the Chukchi Sea and the Beaufort Sea in Figure 3 is a single exploration block). This drilling plan, however, had to be postponed for two years because the oil spews in the Gulf of Mexico caused by BP in April 2010 triggered the US Department of the Interior to review its environment and safety standards.

Royal Dutch Shell began its exploratory drilling operations in the Chukchi Sea and the Beaufort Sea in 2012, but the severe ice conditions in that year resulted in major delays in the start of the operations; as a consequence, the workers left the site before winter after performing only a minor amount of drilling. The drilling is scheduled to resume in 2013 by reentering the well that was drilled and left unfinished in 2013. On a related note, the drilling rig used for this operation was involved in a grounding accident in the Pacific Ocean off the Alaskan coast in December 2012 on its way back to the US west coast.

In the US Arctic Ocean, it is compulsory to drill two wells at the same time. The reason for this is to ensure that in the event that a spewing disaster is caused in one well, the other drilling rig could be rushed to the site immediately to drill a relief well (a well drilled anew in the oil stratum that is spewing oil so that oil and gas should be let out in a different direction to have the pressure in the stratum lowered), which is an obligation that constitutes part of the new regulations that the US has established to address environmental issues. It can be viewed as an example of tight environmental regulations applied in the Arctic Ocean.

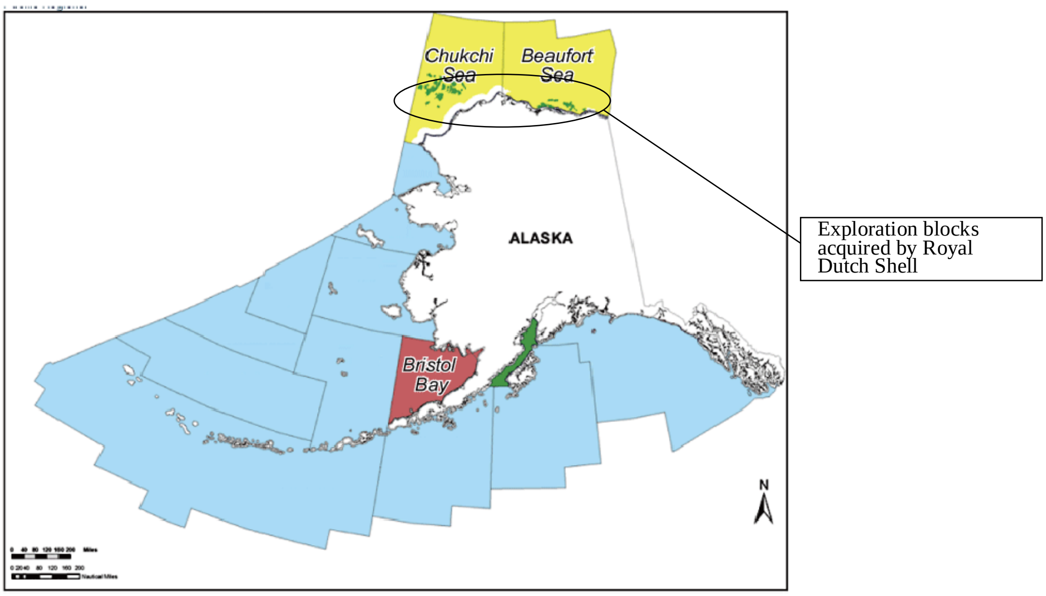

Figure 3: The Chukchi Sea and the Beaufort Sea on the Alaskan Arctic Ocean (the circled area indicates the exploration blocks acquired by Royal Dutch Shell)

(5) Iceland

On January 4, 2013, the National Energy Authority of Iceland (Orkustofnun) granted a medium-sized UK oil company with an exploration block in relation to the exploration of its Northeastern waters. This is a micro-continent on which the Jan Mayan Island in the vicinity lies and is said to potentially contain hydrocarbon reserves. That being the case, Iceland is a volcanic island formed on the Mid-Atlantic Ridge and sediments in its neighboring areas are therefore mainly of volcanic origin, a fact that suggests an extremely low probability that the areas have a distribution of sediments with enough organic materials to generate petroleum. Specialist circles are thus skeptical about the alleged hydrocarbon potential.

(6) Greenland

After a licensing round was announced for Baffin Bay (to the southwest of Greenland), Cairn Energy plc of the UK performed drilling to discover a small quantity of gas in 2010; this, however, did not lead to the discovery of oil in a follow-up well. In 2012 to 2013, a licensing round was announced for exploration blocks in the Northeastern coast of Greenland and its bidding results should come out sooner or later. An exploratory drilling is scheduled for 2014. Although Northeastern Greenland has shown plenty of oil indications on land and its offshore exploration blocks are believed to be promising as well, it is also a place with a concentration of considerable volumes of drift ice, as with the east coast of Sakhalin, and thus poses severe development conditions. It cries out for the application of technologies like a subsea production system.

2. Policy recommendations from Japan's perspective: our role in the Arctic

(1) Promoting Japan's LNG imports from the Arctic Circle and assisting in upstream interest acquisition

The year 2012 saw the first-ever introduction of LNG from the Arctic Ocean to the Japanese market. This works as a good example to show that Japan is a valuable market of LNG in the Arctic Circle.

Demand for gas in Northern Europe is not high, particularly in the summertime. In contrast, electricity demand shoots up in East Asian nations, including Japan, for air-conditioning use. Given these two demand peaks for LNG, the one in the summertime in Asia and the other in the wintertime in Europe, LNG production operations in the Arctic Circle can expect to achieve higher economic efficiency by serving both markets, as they have mutually complementary demand periods.

Currently, there are two LNG projects in progress in the Arctic Circle – Yamal LNG (FID scheduled for mid-2013) and Shtokman LNG (FID scheduled for 2011 but held off) – and the East Asian market, including Japan, is very much in the mind of the operators as potential export markets in the summer and fall seasons. For Japan, becoming an active purchasing market for LNG from those projects will contribute to diversifying the sources of its LNG supply. Moreover, diversifying supply sources can also be expected to have an effect of curtailing LNG prices in Asian markets, which have soared as they are interlocked with oil prices, posing a problem in recent years.

Presumably, over the longer term, Japan should aim for participating as an operator with upstream interest. To that end, JOGMEC has already set in place a system of exploration equity financing, etc. to provide the means for businesses to proactively pursue such a course.

(2) Supplying Japan's satellite information to carriers navigating Arctic shipping routes

In order to support logistics using Arctic navigation routes, it is necessary to develop a structure for actively providing the ships with information on drift ice and meteorological conditions through Japan's weather observation satellite. In particular, Japan needs to augment its presence in the waters where shipping routes extend from the East Siberian Sea, the Chukchi Sea and past the Bering Strait to reach Japan's neighboring seas, by providing detailed information on those waters.

(3) Promoting basic research on steps against crude oil spillages in ice-covered seas on the assumption of accidents involving oil development in the Arctic Circle

The basic step against crude oil spill accidents is to isolate crude oil on the ocean with fences, etc. to prevent it from approaching land. Due to the properties of crude oil, its light, volatile portions evaporate first, which gradually increases its gravity, eventually resulting in oil shaping into a ball-like form and falling downward to reach the seabed. There, it will be decomposed by bacteria and go back to nature. If crude oil hits a shore, it causes tremendous damage and requires more convoluted treatment and steps – therefore, such an occurrence must be avoided at all costs.

Polar seas are quite different from normal seas in two respects: due to low temperatures, the speed of biodegradation there is slow and; due to an extensive distribution of multiyear ice in the vicinity, crude oil, if it sticks to such ice, will remain untreatable for a long period of time. Therefore, steps against crude oil spillages in ice-bound seas still remain underdeveloped in the domain of technology.

Although oil companies from various nations are working on developing steps in this area, there is presumably enormous room for Japan to make international contributions by launching some distinctive initiative. The wintertime Sea of Okhotsk can serve as a site to accumulate basic experiments in. By thus accumulating research results there and performing demonstrative experiments in the Arctic Ocean as appropriate, Japan needs to further the presence of

Japan-originated environmental technologies in the polar region.

That can go a long way if Japanese companies have a part in resource development in the Arctic Ocean in the future, as they will be able to deliver a broad range of capabilities by, for instance, providing technologies as part of HSE (Health, Safety and Environment) operations.

Conclusion: Japan's action: what is the significance of resource development in the Arctic Ocean?

As a conclusion, the significance for Japan to participate in the energy resource development in the Arctic Circle will be discussed.

As a general rule, energy resource development is carried out as a commercial project. This is simply because the primary purpose of resource development lies in the pursuit of profits. As an industry, it also involves very high margins. Resource development is an area that any country with capital and technology engages in as a natural course of action. On top of that, it is quite significant to continue working on such activities for the purpose of cultivating technological strengths and establishing them as an industry.

The next point relates to the importance of acting as a principal in development from a perspective of energy security as well. Even in the event of emergency leading to an embargo that shuts a country off from the world's regular trade structure as means to obtain oil and gas, it retains the right to bring them securely into its territory if they are from oil or gas fields that it has its own interest in, and that would remain possible as long as there is no physical obstacle.

The significance of resource development does not stop there, however. Developing an oil or gas field in a given region means making a large amount of investment, creating infrastructure, generating jobs, establishing rules to conserve the environment and defining long-term profit-sharing with the country that has sovereignty over the oil or gas field. This is precisely a process of civilization that encompasses not the oil or gas field alone but also extends to markets via transportation infrastructure from neighboring areas. The activities in that process represent none other than the establishment of an "order" in the region that covers all of those elements. Resource development is something to be carried out not in the form of a "resource plunder" in that locality but the "development of a regional order," with consensus from all participants, in pursuit of plus-sum interactions.

As a venue of resource development, the Arctic Circle is a frontier that allows for more room for new entrants in comparison to other regions and, hence, presents the opportunity for a first-mover advantage; further, in a sense that a player with advanced technology could have a leg up, it should naturally be considered as a destination of Japan's resource development efforts. As, over and above that, taking part in the development of a regional order in the Arctic Circle represents an act of having a part in the international order, it will most likely lead to the achievement of a higher value as well.

- Notes –

[1]USGS(2008), Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle. http://pubs.usgs.gov/fs/2008/3049/fs2008-3049.pdf

[2] Interfax, 2012/10/17