PART IV

Potential Arctic Oil and Gas Development

5. Potential Arctic Oil and Gas Development: What are Realistic Expectations?[1]

Arild Moe

INTRODUCTION

The Arctic has increasingly come into focus over the last decade. With energy one of the major issues, the Arctic has been presented as a new Middle East and there has been talk of "a race for resources" and potential for conflict because of imminent and massive petroleum activities in the Arctic Ocean. There is widespread concern that increased petroleum exploration and production could have grave environmental consequences.

The purpose of this chapter is to clarify the potential and the challenges of involvement in the Arctic by reviewing resource estimates and discussing the governance of Arctic offshore energy resources. Very often Arctic development is considered primarily in view of the needs of energy consuming countries outside the region. In this chapter, I argue that more attention must be given to the strategies and interests of the owners of the resources who can determine the speed of development. Here special attention is given to Russia and Norway. The chapter is, however, meant to contribute to a discussion of the role Arctic hydrocarbon resources may have for North Pacific countries.

DRIVERS

The attention to the Arctic as an energy province has been spurred by several simultaneous, but unrelated developments. Political uncertainty in the Middle East, the world's dominant oil supply region, has helped direct the focus toward regions regarded as more peaceful and stable. The Arctic, which never has seen armed warfare on a large scale,[2] had during the Cold War been an important deployment area for strategic submarines, and was perceived as heavily militarized. Much of the military infrastructure remains in the region, but, with the Cold war gone, the military interest in the Arctic waned. It is, however, not only the perceived tranquility that has made the Arctic look attractive to the international oil industry. Acreage available for development by international oil companies (IOCs) has shrunk considerably over the last few decades.

In a growing number of oil producing countries, state oil companies are given a dominant or preferential role. Foreign companies must increasingly accept a secondary role, or they are not allowed in at all. Still, the IOCs possess unique experience and technology required in complicated fields or harsh environments. The Arctic is a region where development presumably will require such assets.

These drivers have been augmented by changes in the natural environment. Over some years now the world has witnessed rapid climate change in the Arctic. Events are catching up with model simulations of the ice situation. While this development is indicative of the critical global challenges ahead, it is also offering new opportunities. A smaller ice sheet and less or no summer ice will make larger areas in the Arctic more accessible for exploration. However, due to large annual and seasonal variations, the oil industry will have to be prepared to meet ice limitations similar to today's, for many years. Also, climate change means more extreme weather, complicating operation of equipment, and melting permafrost, making infrastructure development in the coastal zone more difficult.

THE RESOURCE POTENTIAL

The description of the Arctic as peaceful and accessible would have no relevance for the oil industry if there was no expectation of finding resources. The changing perceptions of the resource base in the Arctic are therefore a key element in assessing the situation and outlook.

Even, as argued above, there are new drivers for oil industry engagement in the Arctic, the interest has been there for several decades. Offshore petroleum production in Arctic waters was regarded as a natural development for the oil industry already in the 1970s. By that time exploration as well as production was underway several places in the Arctic onshore, and it was assumed that discovered petroleum accumulations would extend into the adjacent offshore areas. In an overview published by the Central Intelligence Agency in 1978, the Beaufort Sea continental shelf outside Alaska and Canada (where first exploration drilling took place in 1976), offshore areas around the Canadian Arctic islands, Greenland's west coast, the continental shelf northwest of the Norwegian mainland and the areas east of the Svalbard archipelago, Russian Barents and Kara Seas were considered the most promising.[3]

Resource estimates were published on some occasions, and geologists expressed great optimism,[4] but the estimates were very rough and, besides, large parts of the Arctic were considered inaccessible, for technological, climatic and political reasons. It was only after the end of the Cold War that the general image of the Arctic started to change. In

2000 the United States Geological Survey (USGS) released its World Petroleum Assessment. The purpose of the exercise was to "rigorously document the geologic foundation for estimating undiscovered petroleum resources for the world".[5] "Undiscovered resources" are understood as resources which are located in the ground by a certain probability. Geological probabilities are estimated for geological provinces and exploration must be carried out to actually identify accumulations (structures and fields). In the USGS survey the petroleum basins of the world were grouped into eight regions. The Arctic was not defined as one region in the study since the focus of the report was not the Arctic, and it was only somewhat later that analysts started adding data on the various Arctic provinces that had been assessed and termed as Arctic in the report. The estimates from these provinces added up to 25% of the world's undiscovered resources. But much of this referred to onshore areas usually not defined as Arctic, notably the East Siberian basin, representing 11% of the 25%. On the other hand, large parts of the Arctic offshore had not been assessed at all, thus there was also the possibility that undiscovered resources were larger.[6] Anyway, the 25% figure was easy to remember and caught the attention of analysts and policymakers who did not care to acquaint themselves with the geographical delimitation and certainly not with the definition of undiscovered resources. Thus soon many newspaper readers were under the impression that 25% of the world's oil was located in the Arctic offshore. There is no doubt that the report and accompanying misunderstandings served to direct the attention of policymakers and the public towards opportunities in the north. But it also influenced the oil industry, which was able to read the USGS numbers more correctly.[7]

The new USGS report "Circum-Arctic Resource Appraisal" (CARA) from 2008 had an explicit Arctic focus and sought to rectify the omissions and confusion of the World Petroleum Assessment. CARA only included the area north of the Arctic Circle and more sub-regions within the Arctic were more closely assessed. The results were summed up thus: "…about 30% of the world's undiscovered gas and 13% of the world's undiscovered oil may be found there…"[8] Some observers were quick to point out that the estimates had been reduced, compared to the World Petroleum Assessment. But in reality, estimates of undiscovered resources in the "real" Arctic had been increased, taking into account the different geographical scope of CARA. Whereas the estimates are based on the assumption that resources can be extracted with existing technologies, the USGS pointed out the uncertainties in the assessment and its limitations: "…these estimates do not include technological or economic risks, so a substantial fraction of the estimated undiscovered resources might never be produced." Also the accuracy of the

probabilistic methodology applied can be questioned. The resource estimates published are averages from a quite wide range of probabilities. Nevertheless, the publication of percentages and also volume assessments for individual basins gave once more the impression of a huge and fairly certain petroleum potential in the Arctic.

The relative importance of Arctic resources

But how big are these figures, really? They certainly make up significant shares of the world's undiscovered resources (see Tables 5.1 and 5.2),

But in discussion of the Arctic's share of the undiscovered resources it is often overlooked that there are enormous amounts of discovered oil as well as gas resources in the world that for various reasons have not been developed.

Table 5.1. The Arctic's share of global oil resources

OIL	Arctic	World	Arctic share in %
Undiscovered	90	732	12.3 %
Discovered	60	1579	3.8 %
Total	150	2311	6.5 %

Compiled by D.H. Claes, University of Oslo, based on "World Petroleum Assessment", USGS Fact Sheet FS-062-03, "Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of Arctic Circle", USGS Fact Sheet 2008-3049:; A.M. Spencer et al. (eds): Arctic Petroleum Geology. Geological Society, London, Memoirs, Vol. 35, 2011.[9]

Table 5.2. The Arctic's share of global natural gas resources

	Arctic	World	Arctic share in %
Undiscovered	1669	5196	32.1 %
Discovered	1615	8453	19.1 %
Total	3284	13649	24.1 %

Compiled by D.H. Claes, University of Oslo, based on "World Petroleum Assessment", USGS Fact Sheet FS-062-03, "Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of Arctic Circle", USGS Fact Sheet 2008-3049:; A.M. Spencer et al. (eds): Arctic Petroleum Geology. Geological Society, London, Memoirs, Vol. 35, 2011.

In its latest edition, the Statistical Review of World Energy reports that the reserve to production rate for oil is 54.2 years and 63.6 for natural gas.[10] A large share of those reserves are located in the Middle

East in countries with already high production. These countries do not need to increase their output significantly and the discovered but undeveloped resources there must be seen as a long term economic reserve. They also form a crucial part of the world's energy resource base for the longer term and inform assessments of future availability and price of hydrocarbons even if in the short and medium term these resources are not available for the international oil industry. The industry goes where it can make a profit. That brings us back to the Arctic as a prospective petroleum region.

COSTS AND PRICE

Even if resource estimates are big, "undiscovered" does not mean "recoverable." First, the resources must actually be found, after a costly and often lengthy exploration period. Recovery then depends not only on technological solutions but also on the costs versus price: Does it make economic sense to develop Arctic resources? It is understandable that Arctic production must be considerably more expensive than onshore in the Middle East. Nevertheless, there will always be reasons to develop more expensive alternatives, as long as the market price justifies the costs.

The oil price has shown volatility over several years, but the price has been high enough to justify costly Arctic development. Developments in the gas market have been more dramatic. The rapidly increasing estimates of recoverable unconventional gas, particularly shale gas, have introduced a whole new segment of supplies. The volumes becoming available in an increasingly globalized gas market has a dampening effect on prices. Unconventional gas is not necessarily cheap gas and it does not need to signify the end of all Arctic offshore gas projects, but the expectation of growing prices is gone and the need to find cost-effective technical solutions for Arctic projects is more pressing than ever.

There are still many uncertainties about the potential and costs of unconventional gas over the longer term. Also the prospect of exploiting unconventional gas in a variety of countries, including China, will have implications for the attractiveness of Arctic gas resources.

JURISDICTIONAL CONFLICTS?

Seen from afar, the Arctic Ocean may look like a vast no-man's area. But in reality the continental shelf is controlled by the coastal states. Article 76 of the UN Convention on the Law of the Sea (UNCLOS) grants all coastal states a continental shelf of 200 nautical miles if it

does not meet another state's shelf. The continental shelf may also extend further out, to a maximum of 350 nm from baselines, if there is a natural prolongation of the land territory.

Unlike territorial waters the exclusive economic zone and the continental shelf is not sovereign territory. Other states enjoy full rights to shipping activities and shall also as a rule be granted permission for scientific activity. But the coastal state enjoys sovereign (exclusive) rights to the exploitation of resources.

The delimitation of continental shelves and EEZs to bordering shelves and zones, as well as the outer delimitation of continental shelves where it extends beyond 200 nm is a complicated issue. But the number of border disputes in the Arctic is very small, contrary to popular perception. Outstanding bilateral disputes include:

- Maritime boundary between Russia and the United States in the Bering Sea.
- Beaufort Sea between Canada and the United States.
- Lincoln Sea between Canada and Denmark (Greenland).
- Hans Island between Canada and Denmark (Greenland).

In all these disputed seabed-areas potential hydrocarbon resources are involved. The largest—and most complicated dispute—is between the US and Russia. The agreement reached in 1990 has, however, been respected by both sides even if it has not been ratified by Russia.

Perhaps the most prominent bilateral jurisdictional dispute in the Arctic was the area of overlapping claims between Norway and Russia in the Barents Sea. It emerged when developments in the law of the sea granted coastal states continental shelves of minimum 200 nautical miles from shore, without ascribing how delimitation of neighboring shelves should be carried out. The two sides adhered to different principles for delimitation and the resulting disputed area in the Barents Sea and the Polar Ocean amounted to 175,000 square kilometers. Negotiations started formally in 1974. Some seismic surveys were carried out until the mid 1980s. After that both states practiced a moratorium on exploration to avoid activities in contested waters. The limited seismic surveying carried out provided data that were re-analyzed several times, leading to very optimistic statements from the Russian side regarding the resource base. An agreement on delimitation was announced in principle in April 2010. The area was divided fifty/fifty and the agreement prescribed that fields crossing the boundary will have to be developed in cooperation. The agreement entered into force in July 2011.

Both Norwegian and Russian leaders have emphasized that resolving the delimitation of the continental shelf is the culmination of a long,

gradual process and that the line now drawn is based on international law. The legal development and the dynamics of the negotiations are important to understand how the line was drawn, but a willingness to find a political compromise must be added as an explanation as to why a solution was arrived at.[11] I believe that both states see the agreement as a contribution to stability in the Arctic and as a way of proving that the existing international framework with UNCLOS as the major building block is capable of solving disputes peacefully. Thus they signal that attempts to revise this framework are unnecessary.

OUTER DELIMITATION

UNCLOS describes in some detail geological requirements for including a seabed area in the "extended" continental shelf, beyond 200 nm. A special commission (The Commission on the Limits of the Continental Shelf) composed of technical specialists has been set up by the UN to review submissions of such documentation. If the commission finds the documentation sufficient, it gives its endorsement, which means international recognition of the outer limit.

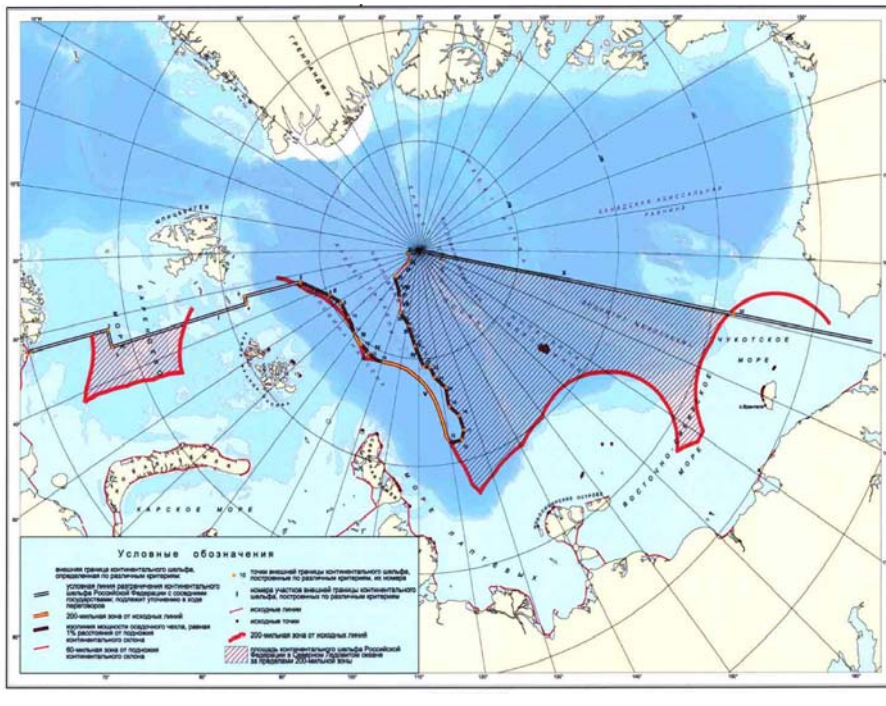
Norway submitted its documentation in 2006 and the commission delivered its final recommendation on the Norwegian submission in March 2009. This was the first submission to be finally processed and meant that Norway now had an internationally recognized delimitation of its extended continental shelf. Only one other state has so far submitted documentation of an extended continental shelf in the Arctic, namely Russia, in 2001. In effect, Russia claimed sovereign rights over resources on the seabed area of some 1.2 million km^2 outside the 200-nautical mile line (see Figure 5.1).

Russia's geological argument was based on the linkage between the claimed areas' ridges on the seabed and the Russian mainland. All the four of the other Arctic coastal states as well as Japan questioned elements in the Russian submission.[12] The commission found the substantiation of the Arctic claim insufficient and asked for more information.[13] Since then a revised submission has been under preparation, reportedly to be finalized by 2014.[14]

The risk that the Russian claim will overlap with claims of Denmark and Canada or that Russia will not respect another negative conclusion from the Commission have led some observers to regard the outer delimitation of continental shelves in the Arctic as an explosive issue. I will argue though that even if a dispute is highly possible, it does not necessarily mean open conflict. First we may see postponement. There is the possibility of several rounds with the commission. That could take decades. However, even if, at the end of the day, it is clear that claims

in the Arctic cannot be reconciled or substantiated, all the Arctic states may see it in their interest to leave it like that, i.e., agree on disagreements and go on with their business. They all have a very strong interest in preserving peace and stability. Open conflict between Arctic states would undermine UNCLOS as the legal basis in the region. And, with extensive resource right granted by this convention, protecting its application in the region is in the strongest interest of all the Arctic coastal states. Furthermore, a realistic assessment of economic interests should also imply that a conflict over outer delimitation of continental shelves is not worthwhile. The seabed areas, which may be contested, are very deep down. It seems unlikely that industrial activity there can become profitable in the foreseeable future, requiring, perhaps, many decades for that outcome. The US Geological Survey maintains that most Arctic offshore resources are likely to be found in relatively shallow waters, within the 200-mile limit. Most of these uncontroversial continental shelves are virtually unexplored. That should logically happen first.

In conclusion, I see little risk of jurisdictional disputes between Arctic states becoming serious inter-state conflicts.



Source: Russia's submission from 2001. Shaded areas are outside 200 nm miles from baselines.

Figure 5.1. Russia's Arctic continental shelf claim

GOVERNANCE

Whereas the coastal state has exclusive rights to the exploitation of minerals in the seabed and can regulate activities there, environmental risks extend beyond areas of national jurisdiction and imply a need for international agreements or at least norms. Oil and gas activities pose direct and immediate threats to biodiversity not only as a result of accidents, but also as a result of regular activities. They include impacts of infrastructure development, the introduction of alien species and pathogens, for example in ships' ballast water, and eutrophication and acidification of Arctic ecosystems as a result of discharges of pollutants from the industry.

Several international conventions are addressing safety of maritime petroleum operations and environmental standards, most of them not-binding. But an important process—development of a "Polar Code" is underway under the auspices of the International Maritime Organisation, (see VanderZwaag's chapter) and more recently the Arctic Council (c.f. Oran Young's chapter) has become involved as a framework for drafting a binding oil spill agreement. The point in this connection is that we are likely to see the emergence of some form of 'international regime' that puts limitations on petroleum activities in the Arctic. This includes concern for the 'climate footprint' of all kinds of energy projects. Major petroleum companies will need a 'license to operate' emanating not only from a formal concession from the resource owner, but also from a broader international understanding that operations are safe and justifiable in environmental terms.[15] Also some voices within the big oil companies call for extreme caution in Arctic operations.[16]

THE SIGNIFICANCE OF NATIONAL POLICIES

Even if resources are economically recoverable and there should be no risk for conflict between states over resources, it is a relevant question when and how much of the resource potential the resource owners, i.e. the coastal states, want to make available for the industry.

The implication of this question is that an evaluation of national strategies, priorities and needs must be added if we want to say something about the opportunities in the Arctic. USGS only singled out the geologically most promising areas for oil and gas discoveries. For oil the Alaskan platform stands out, but sizeable resources are also expected north of Canada, northern part of Russian Barents Sea, north of East Siberia, Greenland offshore. Gas resources are expected to be more concentrated: the Kara Sea and Russian Barents Sea, as well as the Alaskan platform. Altogether the preeminent potential of the Russian

continental shelf is clear.

RUSSIA–THE KEY ACTOR

All the Arctic coastal states have potential for petroleum production on their Arctic continental shelves. And indeed three of them (Norway, Canada and the U.S.) have already started production. But it is Russia that has the largest Arctic continental shelf and where the largest concentrations of hydrocarbons are expected. Understanding Russia's petroleum policy and interests is therefore key to our overall picture of future developments in the Arctic.[17]

Over the last ten years the prominence of offshore development has increased considerably in policy documents and speeches made by Russian top officials. According to Russian estimates, initial hydrocarbon resources on the Russian continental shelf amount to some 70 billion tons oil equivalents of hydrocarbons.[18] And the country's main offshore resources are located in the Arctic, 70% in the Barents and Kara Seas alone. However, only ten per cent are proven resources.[19] According to Gazprom, some 80% of the initial resources are expected to be gas.[20]

In the latest edition of the Russian government's Energy Strategy, the Arctic offshore area is assigned an important role.[21] The increased priority given to offshore areas led to some improvements in the legal framework,[22] but these developments were overshadowed by legislation limiting foreign investment in strategic sectors that was adopted in April 2008. All the resources on the Russian continental shelf were declared to be of 'strategic significance', excluding licenses to foreign companies. Moreover, the continental shelf was reserved for state companies, which, in practice, are only two: Rosneft and Gazprom. This did not preclude joint projects with foreign companies, as long as the license remained with the Russian party. But through this legislation the authorities ceded the initiative to the two companies. An assessment of the outlook for petroleum development in the Russian Arctic offshore must therefore take into consideration the strategies and interests of Gazprom and Rosneft.

Arctic offshore natural gas

Gazprom, which totally dominates Russian gas production and controls the lion's share of Russian gas reserves prepared in 2003 a 'Concept for development of hydrocarbon resources on Russia's continental shelf until 2030'[23] and two years later a more detailed program that sets out an order for development of the various offshore regions. The main driver

for development of Arctic offshore gas was LNG production which could be sold in markets beyond the reach of Russian piped gas, particularly the United States. The first gas project in this program was Shtokman. This gas and condensate field, located 650 km north-east of Murmansk city and 540 km from shore is one of the largest offshore gas fields in the world, with reserves of 3,800 billion cubic meters (bcm). Various options for development were discussed over the years, but only with the establishment in early 2008 of Shtokman Development AG (SDAG) with Gazprom (51%), Total (25%) and Statoil (24%) as partners did a concrete plan materialize. Whereas the full development of Shtokman is envisaged in three stages, each producing up to 23.7 bcm (corresponding to 15 mt of LNG) per year, SDAG would only be responsible for the first one. Different schemes have been considered: an exclusive LNG (liquefied natural gas) development, or dividing the output 50/50 between LNG and gas transported by pipeline to the Baltic Sea and further via the NordStream pipeline to Germany. Final investment decision for the project was postponed several times and uncertainties increased due to changes in the gas market.

By 2012 it was evident that Shtokman would be too expensive with existing and expected market conditions and that the project would have to be seriously revised, possibly with new partners, to become viable. Thus the project has not been officially abandoned, but it may take many years before a new and viable development scheme can be implemented. It also seems likely that the organizational and contractual set up will be affected by changes in the market situation. Shtokman AG was established in 2007-2008 when the gas market looked very different, with concerns over a looming supply constraint. The two foreign companies were ready to enter a structure where they did not have ownership in the license and would not sell the gas. That would be left to Gazprom. But they would together finance, develop and operate the field for 25 years. Thus the role of the foreign companies was akin to that of 'technical assistant'—a role usually seen as unattractive by oil majors. The "Shtokman model" was then heralded as the preferred or only model for foreign companies wanting to be involved in large scale energy projects in Russia. The question now is, however, whether this model which so clearly reflects the strength of the resource owner is sustainable in today's market situation.

In parallel with Shtokman a new Russian LNG project emerged, somewhat surprisingly. The Yamal LNG project is based on gas from the South Tambey field on the eastern side of the Yamal peninsula and is led by the independent Russian gas company Novatek. Since 2010 Total is a major participant. The Russian government has promised to assist with developing crucial port infrastructure amounting to some $30

billion USD, something which has drawn criticism for being a subsidy.[24] Production is envisaged to start in 2016 and increase to 16 million tons per year. Final investment decision is expected by the end of 2013. Part of the business plan for Yamal LNG is to ship gas both westwards and eastwards by way of the Northern Sea Route, seeking the market with most favourable conditions. But the economics of transportation on the Northern Sea Route to the Pacific remains uncertain.

Also Gazprom has contemplated LNG from the gas rich Yamal peninsula, but plans are very preliminary. Meanwhile Gazprom, after a controversial process, had become majority owner of the Sakhalin 2 project in the Far East. The project which was developed by Shell and two Japanese companies is now giving Gazprom direct experience in the LNG market.[25]

Offshore oil–Rosneft

Rosneft, which is 75% owned by the state, for long did not have a public Arctic strategy, but due to the privileged position it earned as a state dominated company it was granted a series of promising offshore licenses, with which it initially did very little. A Heads of Agreement with ExxonMobil in 2011 on exploration and possible development of a large area in the northern part of the Kara Sea represented a significant change in this respect. A final agreement was reached in April 2012.

After the delimitation agreement with Norway in the Barents Sea went into force, Rosneft was granted exploration and development licenses for most of the Russian part of the previously disputed area. In April 2012 the company signed an agreement with the Italian company ENI to explore and subsequently develop resources in the southern part of the area, and a few weeks later a similar agreement was made with Norway's Statoil for the northern part, as well as three blocks in the Okhotsk Sea.

According to Rosneft the Arctic areas to be jointly explored with the foreign companies contain vast resources:[26]

- With ExxonMobil : 6.268 billion tons (46 billion barrels) of oil and 14.58 trillion cubic meters "estimated recoverable resources";[27]
- With Eni: 3.5 billion tons (25.7 billion barrels) "recoverable resources";
- With Statoil : 2 billion tons (17.7 billion barrels) of oil 1.8 trillion cubic meters of gas "prognosticated resources".[28]

Such numbers must, however, be treated with great caution. There

has not been any drilling in these areas and assessments are based on fairly superficial geological information. It will take time before the resource picture becomes more certain. More specifically the agreement with ExxonMobil stipulates seismic surveys in the period 2012 to 2016 and drilling of the first exploration well in 2014 or 2015. The agreement with ENI stipulates first exploration drilling before 2020,[29] the same with the deal with Statoil.[30]

Rosneft's deals with the three foreign companies involve the same scheme. Joint ventures for exploration of and eventual production from the assigned blocks will be established. The foreign companies will hold a third of the shares in each JV and Rosneft two thirds. The foreign companies will cover all the costs in the geological prospecting phase (seismics) and a certain number of exploration wells and also compensate Rosneft for 'historical costs'—initial prospecting—and a third of the price for acquiring the licenses. At present it seems improbable that the JVs will be allowed to take over the licenses. They will remain with Rosneft. Thus there are some similarities with the Shtokman model. However, the joint ventures will probably, if exploration is successful, not only develop the fields, but also sell the oil, since oil exports unlike gas exports are not monopolized. This is a crucial incentive to foreign investors.

Evidently, the foreign companies take all the risk in the initial exploration phase at the same time as they are minority partners in the JVs. But reportedly important decisions in the JVs will have to be made unanimously. Nevertheless, the foreign partners demonstrate considerable faith in their Russian partner as well as in the framework conditions. These conditions, especially tax rules, have been a matter of concern for foreign companies—and also the Russian companies—interested in Arctic ventures. And the signing of contracts in April 2012 was clearly released by the declaration of a new taxation policy. New offshore projects would be exempted from the export tax (which was USD 460 per ton as of April 2012), and the minerals extraction tax—NDPI—can be lowered to 5% for the most complicated projects. Property tax and value added tax on imported equipment that Russia does not produce would be lifted. It was promised that the tax conditions will not change for a period of 15 years after start-up of production.[31]

Russian policy outlook

The deals concluded by Rosneft over less than one year marks a significant shift in Russia's Arctic offshore policy, and help realign realities with the ambitious rhetoric which has been heard over the last ten years. Russian authorities acknowledge that Russian companies are not

in the position financially and especially technologically to play a dominant role in such development and that partnerships with international companies are required. Moreover, they understand that terms must be adjusted if the foreign companies shall commit large funds for investment. But Russia is not ceding control over developments on its continental shelf.

Despite the major breakthroughs in 2012, it is too early to tell whether Arctic offshore resources will emerge as a major factor in Russia's energy production as early as expected by some and it is still unjustified to say without reservation that the Russian Arctic continental shelf will become a major arena for the international oil industry in the next ten years. According to Rosneft's president Igor Sechin production from the blocks developed with ExxonMobil may start in 2020 if all goes well.[32] This sounds very optimistic. In addition to the geological uncertainty, the speed of development in other complicated offshore projects internationally suggests a later start-up. Questions must also be raised regarding Rosneft's capacity to handle all the projects it now will be involved in, if it is going to sit in the driver's seat, as presupposed in Russian policy.

Rosneft, as well as Gazprom, has earlier been heavily criticized by the Ministry of Natural Resources for passivity offshore. That is obviously changing. But the ministry still harbours ideas of opening up the continental shelf for other Russian companies—especially Lukoil—who could then also form alliances with foreign companies. This line of policy has support from other liberals in the government and seems to be in conflict the priorities of President Putin.[33]

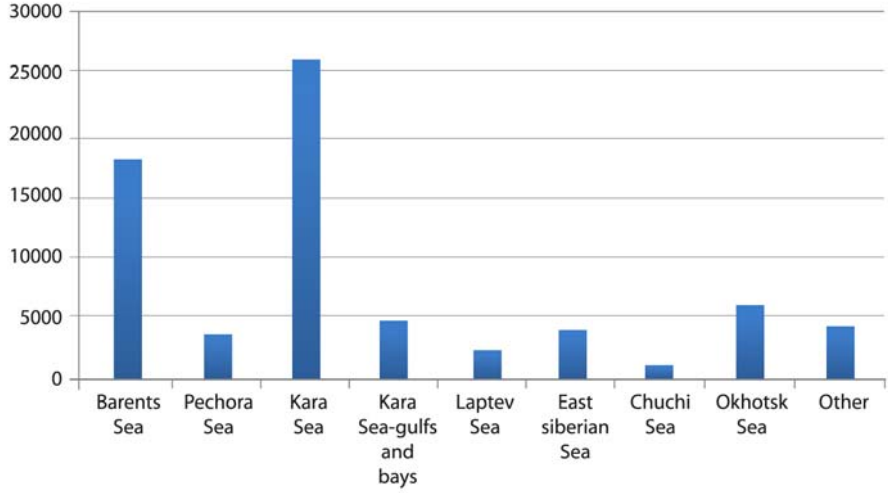
As noted above, the general expectation is that the highest concentrations of hydrocarbons will be found in the Barents and Kara Seas, but there are expectations of deposits further east, both in the Laptev Sea and the East Siberian Sea (see Figure 5.2). In these areas, which are even more remote from infrastructure, the geological mapping has been very limited though.

It is repeatedly stressed that the Arctic offshore resources are the country's strategic reserve for the twenty-first century. This is used as an argument to go offshore, but the implication of this realisation could also be the opposite. Is it really rational to spend this reserve now, if there are other options? A major driver for Arctic expansion has been problems in the development of Russian onshore resources. Russia possesses vast onshore oil and gas resources. But exploration has been insufficient over many years, which means that resources have not been developed to a stage where they can be put into production.

There is also no doubt that future onshore production will have to come from smaller, more complicated fields in more remote areas.[34] An important argument for the Arctic offshore is not only the expected vol-

ume of resources there, but also that those concentrations are expected to be high, that is, that the fields will be big. The present Russian industry structure with emphasis on very big companies has a much better fit with large fields than with small, heterogeneous deposits.

But if a more diversified oil industry was allowed to develop, the potential of the diverse onshore resource base could be tapped more effectively. Likewise, serious economic reforms would make it possible to tap into the vast energy efficiency potential, particularly in the consumption of natural gas. There is also a policy line strongly arguing for the need to reduce the country's dependence on the hydrocarbon sector, as expressed by former president Medvedev. Such developments in the Russian economy could hold back the need for rapid Arctic offshore development. The government must also consider how big a share of the resource rent it keeps if it is necessary to offer wide-ranging tax concessions to open offshore areas. Both the gas and the oil industry are increasingly calling for tax concessions in "complicated regions," including the continental shelf. In addition, there are serious concerns about the environmental risks associated with Arctic offshore operations. A major accident could delay development and help bring other alternatives higher on the agenda.



Source: Calculated on the basis of distribution of resources reported by Vladimir Pavlenko. 2012 "Call of the Arctic", Oil of Russia, 3, 2011, p. 46, and total continental shelf resources 70 bill. toe (100 bill tons standard fuel equivalents) reported by e.g. Deputy Natural Resources Minister D. Khramov in interview with "Golos Rossii", 26 March 2012. http://www.mnr.gov.ru/press-service/publications/detail.php?ID=128451&sphrase_id=128623

Figure 5.2. Initial hydrocarbon resources on the Russian continental shelf

Despite the reservations presented above, it seems clear that the Russian government policy is to expand Arctic offshore activities rapidly. The recent concessions given to new offshore projects show this. It should also be stressed that the petroleum companies Rosneft and Gazprom are supporting this policy as long as they continue to enjoy monopoly privileges. There is very little likelihood that the offshore offensive will be called off, but the speed of development in coming years may be affected by changes in overall economic policy.

Oil from the Russian Arctic will presumably be sold freely on the international market. If transportation of oil from the Kara Sea along the Northern Sea Route makes sense it is likely to emerge as a new supply corridor to the North Pacific, already in the last few years several voyages with tankers carrying condensate have gone through the NSR from ports in the west. But, as indicated above, sizable offshore oil production is still probably more than ten years off. Russian Arctic onshore production is another matter. Some 12-15 million tons are annually shipped westwards from the terminal near Varandey in the north-eastern part of European Russia. These volumes can go eastwards if that is more profitable. Output from the huge Vankor field in the far north of East Siberia was originally intended for shipment by sea, but was connected to the trunk pipeline system instead. This field is the primary source of Russian oil exports to China and will contribute to filling up the Eastern Siberia-Pacific Oil Pipeline (ESPO). The pipeline is in itself a reflection of the growing importance of production in East Siberia and a determination to reach Asian markets. Development of the resource base takes longer than first anticipated however.

The foreign policy component is stronger for gas than for oil. The need for diversification of gas exports has been noted on several occasions and has become more important as the traditional market in Europe is stagnating. Export diversification has both commercial and political components. Schemes that can bring Russian gas to new customers are clearly welcomed by the Russian government. The question is how important the Arctic is for Russia in this regard. Projects in Eastern Russia also have this potential. Already in 2007 the Russian government launched a program for an integrated gas production, transportation and supply system in Eastern Siberia and the Far East, with a view to potential gas exports to North Pacific markets. The major resource base in the Far East is onshore. According to Gazprom, initial gas resources in Eastern Siberia and Russia's Far East are some 52.4 trillion cubic meters (tcm) onshore and 14.9 tcm offshore (Sakhalin and the Okhotsk Sea).[35] The importance attributed to development of Russia's Far East was underscored by the establishment in 2012 of a special federal government ministry to coordinate government programs there.[36]

Also, projects in the Russian Arctic enjoy political support for similar reasons. Sustaining and developing the Northern Sea Route has high priority. Hydrocarbon projects that can provide traffic and help finance infrastructure are important in this regard. One might expect goodwill and perhaps preferential treatment in policy processes. This is one interpretation of the seemingly very positive treatment of the plans for the Yamal LNG project which aims at using the Northern Sea Route both westwards and eastwards. And as noted above, the Russian government seems intent to undertake substantial infrastructure investment which will help the economics of the project. Nevertheless, the authorities can only help a project become profitable if it is marginally unprofitable. Subsidization is unlikely beyond the infrastructure construction mentioned. Commercial terms remain decisive. This has been witnessed in the negotiations with China where Russia has not wanted to sign an export agreement at the price proposed by the Chinese side (and which is considerably lower than the price paid in Europe) despite the fact that the gas in question has no alternative takers. The fate of the Shtokman project suggests that LNG projects in the Russian Arctic at present are very uncertain.

It is evident that Asia-Pacific is becoming more and more important in Russia's energy strategy, both to diversify exports, but also to support domestic regional development. Major development projects in the Russian Far East are underway and will help meet both goals. The additional value for Russia of exports from the Arctic in terms of diversification will be marginal, since Arctic energy will serve the same Asian-Pacific markets as the Far East can do. The goal of maintaining and developing the Northern Sea Route remains, however, an argument in favor of Arctic projects.

NORWAY

Activities are also picking up in the Norwegian High North. Norway started exploration in the southwestern part of the Barents Sea in 1980. Over the next thirty years several minor discoveries were made, and three substantial—the gas field Snøhvit ('Snow White'), discovered by Statoil in 1984, the Goliat oil field, discovered in 2000 by Agip and a third major oil discovery, Skrugard, was made by Statoil in 2011. The last few years have seen new optimism about the resource potential in the region (see Figure 5.3). By 2011 remaining reserves in discovered fields amounted to 193 mill tons oil equivalent (mtoe).[37] 70% of this was natural gas. Exploration activity in the Norwegian Barents Sea has not been very intensive, however, with only some 75 exploration wells drilled as of 2011, and there are expectations of sizable new discoveries.

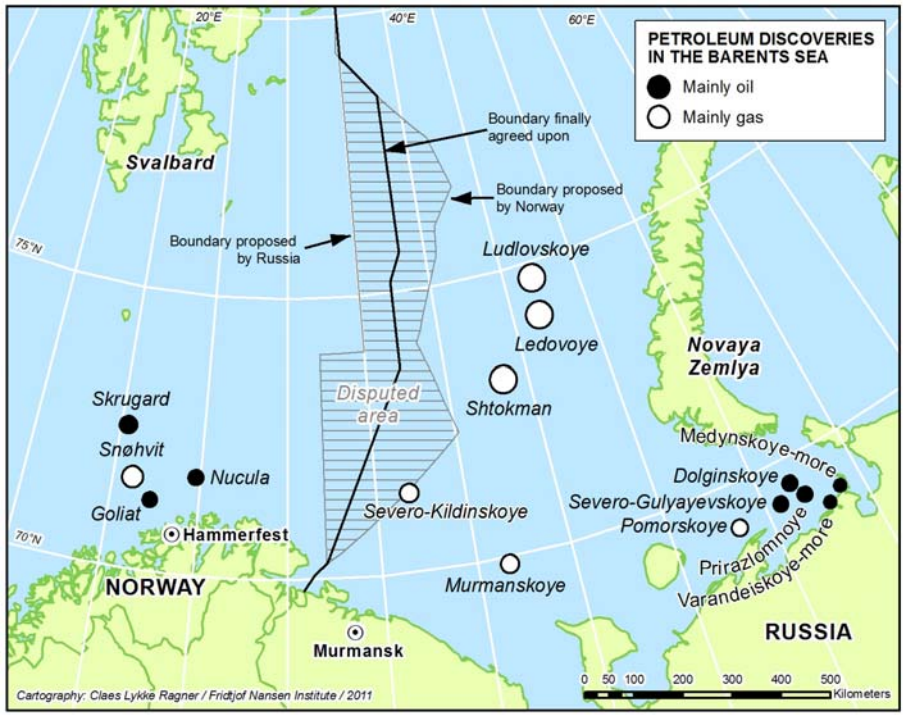


Figure 5.3. Petroleum discoveries and delimitation line in the Barents Sea

Official estimates put undiscovered resources at 735 mtoe.[38]

Production is only taking place at the Snøhvit field, starting in 2007. This is the first large liquefied natural gas (LNG) project in Europe. The field is located 140 km from shore north-west of Hammerfest. The development of the project was stopped several times as the market outlook was not deemed promising. Only after 2000, with positive expectations in the US market, and only after tax concessions did it go ahead. It was still a difficult birth involving commercial uncertainty and cost overruns. After its start it experienced serious technical problems. The field, with recoverable reserves of 173 billion standard cubic meters (scm) natural gas and 22 million scm condensate, has been developed with sub-sea installations at water depths of about 300 m. The gas is piped to shore, where a liquefaction plant has been built at Melkøya. From there the gas is shipped as LNG in special carriers to market. The field is slated to produce approximately 6 bn scm annually. Of this, 2.6 billion scm has been contracted by Statoil for the US market and 1.6 for Spain, whereas 1.7 billion scm is sold by the other main partners, Total and GDF Suez. Plans call for doubling the production ca-

pacity, but it has not been decided whether the new volumes should be liquefied or brought to the European market by way of a new pipeline which would have to be built along the Norwegian coast.

Asia-Pacific has also been seen as a possible market for Snøhvit gas and there have been plans for an experimental voyage with an LNG tanker taking gas to the Pacific via the Northern Sea Route.[39] If the transportation solution is deemed satisfactory this could become an option. Unlike the Russian projects which are starting from scratch in an unfavourable market situation, the bulk of investments at Snøhvit have already been made and extensions involve relative low unit costs. Thus, the commercial calculations can be different.

The next field to come on stream in the Norwegian Barents Sea will be the oil field Goliat, with production start in late 2013, operated by ENI. The field is estimated to contain 23.2 million tons of recoverable oil. After the delimitation agreement with Russia was reached a large acreage that had been closed for exploration became available. Norway immediately started 2D seismic surveys which were completed in 2012. Licensing rounds can be expected in a few years. But also in the "old" part of the Norwegian Barents Sea there is increased optimism following the recent discoveries. In June 2012 a licensing round including 76 blocks in the Barents Sea was announced by the Norwegian Ministry of Petroleum and Energy.

All in all developments on the Norwegian continental shelf indicate that Norwegian oil and gas can become relevant for Asian importing countries, and projects are more mature than on the Russian side. However, as with Russian hydrocarbons, a key uncertainty is transportation and the development of stable and safe conditions for shipping along the Northern Sea Route.

ARCTIC ENERGY AND NORTH PACIFIC MARKETS

Japan and Korea are the world's two largest importers of liquefied natural gas. Japan's imports are expected to be around 85-90 million tons annually in the coming years (depending on how much nuclear capacity is re-started)[40] whereas Korea takes about 35 million tons. China has recently also become a significant importer, but unlike Korea and Japan it has pipeline supplies as an option.[41] Understandably, Asian importers would like to have a diversified supply base for such an essential commodity. Large volumes have come from outside the region, like Qatar, presently the biggest LNG producer in the world. However, in the North Pacific there is a perceived need to diversify not only sources of supply, but also supply routes—the channel problem. Shipments from the Middle East have to pass through relatively narrow straits that could

become choke points in a tense international situation. In this context the emergence of Australia as a major LNG exporter has been a relief. A multitude of projects have been developed there and a series of new projects have been presented in recent years. In fact, Australia has been set to overtake Qatar's leading role. A production volume of 100 million tons by 2020 has until recently been seen as realistic.[42]

Australia's aspirations have become more uncertain as the economics of several of the new developments projects are questioned. The reason is high construction and labor costs combined with lower price expectations. The latter is caused by the emergence of new LNG projects in several countries, leading to an expected "glut" of LNG. This may in turn be seen as positive from the point of view of importers, but the market is volatile, with many uncertainties surrounding the various new LNG sources. At the moment, the outlook is such that investors are reluctant to start the proposed new projects in Australia, but there is a chance that supplies from other sources at the end of the day will not be as cheap as expected.

New supply sources include Alaska's North Slope, East Africa and the Caribbean, especially as the Panama Canal is being widened. As of now, the price of LNG in the North Pacific is higher than in the US, partly because the pricing formulas are different. In the Pacific, as well as Europe, the gas price is pegged to oil, whereas in the US the price is set separately from oil. Due to fierce competition and oversupply in the US the price there is significantly lower than in the Pacific. Suppliers traditionally serving the Atlantic markets (and Europe is saturated) may find it more lucrative to ship their gas to the Pacific, when that is physically possible.

LNG from Russia will also play a very important role in import policies of North Pacific countries. But clearly expansion of capacity in the Russian Far East is first in line. At present, it is about 10 million tons per year. Increase will depend on new liquefaction capacities as well as field development. But as noted above this has high priority in the Russian government.

The biggest and most unexpected change from a few years back is the changing role of the United States market. From being a significant importer of LNG the shale gas revolution has turned the US into a potentially significant exporter. Estimates vary, and there are many uncertainties surrounding the establishment of export infrastructure. But the more optimistic market actors maintain that the US could boost an export potential up to around 100 million tons by 2020, making the US the world's biggest exporter![43] Most of this would be sold in the Asian markets.

Many of the new supply options not only increase diversification,

they also reduce the channel problem since they involve supplies shipped across open seas. So where do these developments leave Arctic LNG? First, it seems safe to say that the supply outlook, even if bright today, is volatile. All the new supply options require specific and thorough scrutiny. But the Arctic now looks more like one of several options and not one major option. However, in addition to the diversification and channel issue, the Arctic could possibly also offer another advantage: large volumes and long term commitments. Importers could in principle be willing to pay a premium for long term safe supplies. Such willingness is, however, unlikely to be expressed in a higher price per unit of energy from a given source. It is more likely that it will take the form of preferential (subsidized) credits, tax concessions or other state support in connection with development of new supplies. This brings us back to the production outlook and the conditions for developing Arctic resources, especially in Russia. As argued above, Russian authorities seem to be increasingly willing to show flexibility with regard to taxation to get projects underway. But as it looks now Arctic offshore gas still has a cost problem. Whether importers' interest is high enough to bridge the gap between price and costs remains to be seen. For energy planners the very long lead times is a complicating factor. To explore and then develop new fields and build infrastructure may take decades. There may be a need to develop new technologies. In the meantime the market may have undergone drastic changes. The fate of the Yamal LNG project will probably have much influence on commercial actors' willingness to participate in long term exploration and development program, but even if that project is aborted, governments may find it in their interest to support such activities. But for it to actually happen their priorities must be realigned with the resource owners' interests, i.e. in particular Russia's.

There are some similarities in the supply situation for oil to China, Japan, Korea. Diversification and the desire to avoid the straits point to Arctic oil as an interesting option. But unlike gas, the general expectation is that oil projects will be commercially viable. Only in some years will it become clearer what the volume potential is, however. At that stage oil from the Barents and Kara Seas may become an option for buyers in the North Pacific. But reliable and safe transportation along the Northern Sea Route will—as for LNG—be a decisive factor for this trade to develop into a significant supply source.

SUMMING UP

There is little disagreement that the Arctic contains very large hydrocarbon resources, but sometimes the impression of the region's potential

role in world energy supplies is exaggerated. Most of the resources are undiscovered. Extensive exploration is needed before major production can get underway. Thus, timing is essential to keep in mind when supply possibilities are discussed. The resources are located on the continental shelves of the Arctic coastal states and are firmly under national jurisdiction. There is little risk for inter-state conflict among Arctic states over resource rights. More international attention to how resources are developed should be expected though.

Whereas just a few years ago major Arctic offshore gas projects were seen as a natural next step for the international petroleum industry, the global gas supply and accompanying price expectations have changed the outlook dramatically. There are now serious concerns over the profitability of such project and tax concessions from resource owners are necessary, but perhaps still not sufficient to get them underway. The other side of this coin is that gas importers are getting more supply options elsewhere.

Production from oil fields already licensed or expected to be licensed in Russia as well as Norway will probably increase significantly from the mid-2020s. Projects will be export oriented and volumes will be available to buyers willing to pay the price. In the case of gas, prices in e.g. the North Pacific may hold back demand from Arctic sources, unless specific incentives are offered by the producers. In the case of oil the price is determined in the world market.

Both for oil and gas a crucial issue is transportation. For Arctic energy to be a viable option of significance for the North Pacific a stable framework for shipping and investments in infrastructure as well as ships is required.

Notes

1. Research for this article has been financed by the Geopolitics in the High North project supported by the Research Council of Norway.
2. Admittedly, there were serious battles during World War Two in the Barents Sea.
3. Polar Regions Atlas, Central Intelligence Agency, May 1978, pp. 24-25.
4. See e.g. Arctic Energy Resources, Amsterdam: Elsevier, 1983.
5. USGS Fact Sheet FS-062-03, June 2003.
6. “USGS: 25% Arctic oil, gas estimate a reporter’s mistake”, Petroleum News, Vol.12, No.42, October 21, 2007.
7. But also in company presentations important qualifications can be omitted. Thus on a Shell web-site it was stated that “An estimated

25 per cent of the world's remaining oil and gas lies under the Arctic". http://www.shell.com/home/content/innovation/meeting_demand/finding_new/frontiers/arctic/arctic.html. The site is no longer accessible.

8. Gautier, Donald et al. (2009) Assessment of Undiscovered Oil and Gas in the Arctic, Science, (324) May 2009.
9. Percentages vary slightly from USGS numbers quoted in the text, since more updated assessments of world resource have been used in the table.
10. Statistical Review of World Energy 2012, http://www.bp.com
11. For an analysis of factors explaining the agreement see Arild Moe, Daniel Fjærtoft and Indra Øverland: 'Space and Timing: 'Why was the Barents Sea Delimitation Dispute Resolved in 2010?', Polar Geography, No 3, Vol 34, 2011, pp. 145-162
12. Statement by the Chairman of the Commission on the Limits of the Continental Shelf on the progress of work in the Commission, Commission on the Limits of the Continental Shelf, Tenth session, New York, 25 March-12 April 2002, CLCS/32, http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N02/327/68/PDF/N0232768.pdf?OpenElement.
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14. Deputy Natural Resources Minister D. Khramov in interview with "Golos Rossii", 26 March 2012. http://www.mnr.gov.ru/press-service/publications/detail. php?ID=128451&sphrase_id=128623
15. "Arctic Resource Development: Risks and Responsible Management" Report prepared for ONS SUMMIT 2012—The Geopolitics of Energy by the Fridtjof Nansen Institute and Det Norske Veritas. http://www.fni.no/doc&pdf/ONS-Arctic.pdf
16. See e.g. "Total warns rivals that risks of oil drilling in the Arctic are too high", Financial Times, 26 September 2012.
17. Canadian and Alaskan resources will be analysed in an upcoming North Pacific Arctic Conference.
18. This is a widely reported figure, see e.g. "Russian continental shelf", Gazprom web-site http://www.gazprom.com/about/production/projects/deposits/shelf/. Russian reserves and resources are reported in standard fuel equivalents (coal equivalents). 1 ton standard fuel = 0.7 ton oil equivalent.
19. Deputy Natural Resources Minister D. Khramov in interview with "Golos Rossii", 26 March 2012. http://www.mnr.gov.ru/press-service/publications/detail. php?ID=128451&sphrase_id=128623
20. "Russian continental shelf", op.cit.

21. Energeticheskaya strategiya Rossii na period do 2030 goda, Order of the Government of the Russian Federation, No 1715-r, 13 November 2009.
22. Moe, Arild and Elana Wilson Rowe, 'Northern Offshore Oil and Gas Resources: Policy Challenges and Approaches'. In Wilson Rowe, Elana (ed), Russia and the North. Ottawa, University of Ottawa Press, 2009, pp. 107-128.
23. Gazprom press release, November 27, 2003.
24. "Pravitel'stvo pomozhet Novateku na Yamale" (The government helps Novatek on Yamal, kommersant.ru, 19 July, 2012.)
25. Michael Bradshaw; "A New Energy Age in Pacific Russia: Lessons from the Sakhalin Oil and Gas Projects", Eurasian Geography and Economics, Volume 51, Number 3 / May-June 2010, pp. 330-359
26. http://www.rosneft.ru/
27. When BP entered into a deal with Rosneft over the same blocks in early 2011 it was announced that they were estimated to contain 5 billion. tons of oil and 10 TCM of natural gas. http://www.zerich.ru /news/prime-tass/fr/99126/
28. Includes north Barents Sea and Okhotsk Sea blocks.
29. http://www.rosneft.ru
30. http://www.statoil.com/no/NewsAndMedia/News/2012/Pages/StatoilRosneftMay2012.aspx
31. 12 April 2012. 'Prime Minister Vladimir Putin holds a meeting on promoting the development of the continental shelf'. http://www.premier.gov.ru/events/news/18680/print/
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34. V. Kryukov and A. Moe: 'Oil Exploration in Russia: Prospects for Reforming a Crucial Sector'. Eurasian Geography and Economics, Vol. 51, No 3, 2010, pp. 312-329.
35. Eastern Gas Program. http://www.gazprom.com/about/production/projects/east-program/
36. Resolution of the government of the Russian Federation 30 June 2012 No. 664. On the discussion of various schemes to promote development in Eastern Siberia and the Far East, see Simoniya's commentary to the present chapter.
37. Facts – the Norwegian Petroleum Sector 2011, Ministry of Petroleum and Energy and Norwegian Petroleum Directorate, 2012. Converted from mill. tons standard cubic meters oil equivalents.
38. Ibid.
39. http://www.lngworldnews.com/knutsen-gets-approval-to-ship-norwegian-lng-via-northern-sea-route/

40. For a discussion of Japan's options, see Takagi's commentary to the present chapter.
41. For a presentation of demand outlook in China, see Kang Wu's commentary to the present chapter.
42. "LNG boom or bust for Australia," Petroleum Economist, January 17, 2012
43. "US shale derails Australian LNG plans," Petroleum Economist, March 15, 2012.

Comments on Chapter 5: Scientific perspective

Nodari A. Simoniya

The potential role of Arctic hydrocarbons in provision of Northeast Asia with energy resources is very great. Since the first oil shock that followed the well-known historic events of 1973, northeast Asian countries have been trying to solve the problem of hydrocarbon dependence on the Middle East. The problem is still unsettled satisfactorily, while the Middle East has hardly become a more stable region. Moreover, old intraregional contradictions there have been aggravated, while intervention in recent years of outside forces under the motto of "Democratization of the Middle East" quite increased the instability level to an unprecedented height (in Iraq, Libya, Yemen, Syria, Bahrain, etc.). Under these circumstances, some energy resource-consuming countries are trying to resolve the energy security problem at the expense of development of African resources. However, this activity in the upstream sphere in certain African states led to reanimation of many primordial (tribal, religious, ethnical) conflicts (in Nigeria, Sudan, etc.). Against this background, the increasing interest in the Arctic potential in Northeast Asia is no wonder. How do matters stand with use of this potential in five Arctic countries?

Table 5.3 demonstrates that the US is the world's largest oil consumer and imported 577.1 million tons in 2010. Moreover, they absorb practically the whole oil export of another Arctic neighbor-country—Canada (consuming 125 out of 128.2 million tons the same year), and also around 37 million tons of export oil of one more Arctic state—Russia. Additionally, in 2010 the US received a bit less oil—34 million tons—from Europe, mainly from Norway. The US, in their turn, export almost exclusively oil products (101.7 million tons) and those go mainly to their

Table 5.3. Proven Reserves, Production, Consumption of oil in Five Arctic States, 2010.

	Proved reserves (thousand million tons)	Production (million tons)	Consumption (million tons)
US	3.7	339.1	850.0
Canada	5.0	162.8	102.3
Norway	0.8	98.6	10.7
Denmark	0.1	12.2	8.7
Russia	10.6	505.1	147.6

Source: BP Statistical Review of World Energy, June 2011.

neighbors—Mexico and Canada, and also to the countries of South and Central America. All the Asia-Pacific countries get only 14.8 million tons out of the total volume of these oil products. Europe (primarily such Arctic states as Norway and Denmark) delivers even less oil to Asia-Pacific - only 12.6 million tons. Hence, in the nearest future north-east Asian countries should not particularly rely on western Arctic states. So, only Russia remains an option for procuring oil resources.

Traditionally, Russian oil export balance was in favor of the West. It was the same with other former Soviet republics (like Kazakhstan and Azerbaijan). So, already in 2010 out of the total oil export from former Soviet republics amounting to 421 million tons, Europe and North America received on the whole 333.7 million tons, while Asia-Pacific countries got 73.6 million tons. It is important, however, to point out that in recent years a new tendency has begun to accumulate strength. In 2005 Asia-Pacific countries received only 25.4 million tons from former USSR republics. Today, however, a new part of the Eastern Siberia-Pacific Ocean (ESPO) main pipeline has begun to function with an offset to China, and, according to the agreement on 25 billion dollar credit among China, Rosneft, and Transneft, 15 million tons of oil are annually delivered along this pipeline to China. The second part of ESPO will be completed by the end of 2012. Then the pipe's capacity will already amount to 80 million tons. By the way, after transfer by the railway oil from Skovorodino is already delivered to the terminal in Kozmino Bay, which has already had a considerable impact on oil import in Japan. In 2006, when Japan began purchasing oil from Sakhalin, the share of these shipments in its oil imports was just 0.7%. One year later it increased five-fold, reaching 3.5%. In 2010, with the start of ESPO shipments from Kozmino, Japanese imports of oil from Russia amounted to 14.5 million tons, or 6.4 per cent of its total oil imports. Simultaneously, for the first time ever the Middle Eastern share went

down below 80%.

Statistics related to dynamics of foreign sales of liquefied natural gas (LNG, in bcm per year) produced by Sakhalin Energy, the operator of Sakhalin-2 project, are telling a similar story (see Table 5.4).

Table 5.4. LNG export from Russia

Exported to	2009	2010	2011
Japan	3.69	8.23	9.8
China	0.25	0.51	0.3
South Korea	1.35	3.90	3.9
Taiwan	0.24	0.67	0.3
India	0.67	–	–
Thailand	–	–	0.2
Kuwait	0.41	0.09	–
Total	6.61	13.40	14.5

Compiled on the basis of: BP Statistical Review…, June 2010, June 2011 and June 2012.

In the very near future, when a number of new LNG lines start to operate in the Russian Far East, it is fair to expect still bigger volumes of LNG supplies for the Asia-Pacific region. At any rate, this is what Putin visualized when he ordered a quick construction of Sakhalin-1-Khabarovsk-Vladivostok gas pipeline and then insisted that the works on Kirin block of Sakhalin-3 project start ahead of the schedule.

In discussing Russia's efforts to redirect some of its energy exports to the East, it is impossible not to mention the Trans-Korean gas pipeline, 1,100 kilometers long and planned as an extension of the Sakhalin 1-Khabarovsk-Vladivostok pipeline. This project is usually discussed in a package with Trans-Korean Railroad (planned as an extension of the Trans-Siberian). Since both the pipeline and the railroad are supposed to go from Russia to South Korea through the North Korean territory, the importance of these schemes cannot be measured just by stable supplies of gas or more dynamic transits of goods. Implementation of the Trans-Korean projects might contribute to a new atmosphere of cooperation on the peninsula and may eventually help to do away with a major geopolitical impediment to economic integration in East Asia.

Both projects had been offered more than once to both the North and the South Korea, and more than once both the North and the South expressed their approval. South Korea demonstrated its no-nonsense attitude towards this offer by building its own section of the rail-

road which now ends near the border with the North and last October Russian Railroads ran a trial train along the upgraded trans-border route between Russia's Khasan and North Korean Rajin.

Until recently, America's negative attitude would not permit the Trans-Korean projects to go beyond the stage of talks. Every time there were signs that the North and the South were coming to terms, the US would invariably do something to provoke a break in their contacts. All this created a pessimistic aura around the projects and a widespread perception that they were doomed.

In a parallel development, since July 2011 Pyongyang and Washington began to talk to each other in earnest. For a while it looked like Secretary of State Hillary Clinton was determined to correct the mistake of her spouse, former-US President Bill Clinton who once postponed an already prepared trip to North Korea hoping to get there later but never making it. But then the death of Kim Jong-Il and the proudly announced but unlucky launch of a North Korean space satellite resulted in new uncertainties about the fate of Trans-Korean projects. Who knows what may happen next, but Russia's stake in both these projects is too high to give up, especially now, when not just top officials but Russian business and academics are focused on Asia as never before.

In connection with the terrible tragedy on Fukusima-1 and the stoppage of all the remaining nuclear power reactors for safety checks in Russia and Japan, there has been a kind of revival of discussion on a forgotten old proposal of building a sea gas pipeline to Hokkaido. In early May 2012 vice president of Gazprom, Alexander Medvedev and the Democratic Party of Japan policy chief Seiji Maehara agreed in Tokyo to study the possibility of laying a gas pipeline linking Hokkaido and the Sakhalin Islands.[1]

Let us now turn attention to LNG deliveries from other Arctic countries to Asia-Pacific. We will begin with a discussion of the general situation with natural gas in these states (see Table 5.5).

Thus, in spite of the "shale gas revolution" and a considerable increase in natural gas production, which allowed the country to become the leader in gas extraction, , the United States had to import gas from Canada in 2010. Having outpaced Russia, the whole of US gains amounted to 92 bcm, exporting only 20.91 bcm to this country. Naturally, in the given situation, American gas export to Northeast Asian countries could be only symbolic: 0.85 bcm to Japan (from its first terminal on Alaska) and to South Korea (for the very first time)—0.35 bcm. Due to a decreased demand on Canadian gas in the US Japan, wasting no time, made a decision regarding the planned regasification terminal at Kitimmat, intending to turn it into an export terminal and to deliver LNG to Asia. In the meantime, in the US under conditions

Table 5.5. Proven reserves, Production, Consumption in five Arctic countries, 2010

	Proved reserves (trillion cubic meters)	Production (bcm)	Consumption (bcm)	Deficit/Profit (bcm)
USA	7.7	611.0	683.4	− 72.4
Canada	1.7	159.8	93.8	+ 66.0
Norway	2.0	95.7	3.7	+ 92.0
Denmark	0.1	8.2	4.9	+ 3.3
Russia	44.8	588.9	414.1	+ 174.8

Source: BP Statistical Review, June 2011.

of a liberal economic model and tumultuous commotion around shale gas, gas prices began to fall sharply. At the end of January 2012 the price of futures with delivery in February fell down at NYMEX to $2.4 for 1 million BTU, the lowest level since the beginning of 2001. At that time market participants began to talk about a possibility of a further fall to $1 for 1 million BTU. According to the Wall Street Journal, leading energy concerns in the US decreased the volumes of gas well drillings in the first quarter of 2012. ExxonMobil Corporation and ConocoPhillips already declared further decrease of extraction.[2]

Some companies backed by the authorities of the American states involved in gas and oil extraction intend to begin gas export from the US to Asia. Alaska's three producers have formally agreed to study the prospect of exporting LNG from the North Slope to Asian markets. After months of talks, ExxonMobil, ConocoPhillips and the UK's British Petroleum announced on March 29, 2012 that they had reached an agreement to develop natural gas in the North Slope, as well as work with Canadian pipeline operator, TransCanada, in support of the Alaska Pipeline Project from Prudhoe Bay to Valdez, Alaska, for LNG exports to Asia.[3] In another US state of Louisiana, where there happened to be some surplus of shale gas, independent corporation Cheniere Energy has received the final major US government approval that it needed to begin construction of the first facility to export US-sourced shale gas as LNG. At the same time, Cheniere announced that it has signed up a consortium of eight banks (The Bank of Tokyo-Mitsubishi UFJ and seven American and European banks) to help arrange as much as $4 billion in financing for its proposed four-train 18 million tonnes per annum liquefaction facility near Sabine Pass. Another corporation, Sempra Energy, has signed a pair of deals with Japanese liquefied natural gas players firming up its plan to built liquefaction facility at the Cameron LNG import facility in Hackberry.[4] Going through similar problems con-

nected with low gas prices, Canadian business also started cooperation with Asian companies. So, the largest Canadian gas producer, Encana, in February 2012 signed a C$ 2.9 billion ($2.9 billion USD) JV with Mitsubishi to develop its Cutback Ridge assets in British Colombia's Horn River basin. More recently, it closed a deal with Toyota Tsusho to sell one-third of its coal bed methane production from the Horseshoe Canyon fairway in Southern Alberta, and promised to pursue more joint ventures.[5]

It is very important to remember that the US model is in practice not so liberal after all, and the administration always kept a keen focus on oil and gas prices. Recently, the US energy department has signaled that it will not allow LNG exports to Asia to appreciably increase internal gas prices.[6]

Irrespective of what was said above, I want to make one short remark here. In Professor Moe's chapter there is a statement I find a bit too optimistic: "From being a significant importer of LNG the shale gas revolution has turned the US into a potentially significant exporter." I would rather not be so sure about that. Remember that in 2003 expert Daniel Yergin made a prognosis that just in a few years the US will be the biggest LNG market, and that was followed by a real boom in construction of LNG import terminals. Now, Yergin is proud that his CERA invented a new term "Shale gale." Today there is less talk about shale gas and more about shale oil.

As for Norway, in 2010 it exported all in all 100.59 bcm with 95.88 of them—through the pipe to Europe. Out of 4.17 bcm LNG export, only 0.23 bcm were delivered to South Korea (0.16 bcm) and to Taiwan (0.07 bcm), the rest went to North America and a number of European countries. However, in 2011 new oil and gas deposits were discovered in Norway, and for the first time since 1997 the volume of additional reserves exceeded the volume of extraction. The giant North Sea Johan Severdrup field, the world's biggest offshore oil discovery last year, and the Skrugard and Havis fields in the Barents sea have added between 2 billion and 4 billion barrels of oil equivalent to Norway's resources, depending on appraisal results.[7] Bearing in mind the fact that the lion's share in the overall Norwegian energy consumption balance (41.8 million tons in oil equivalent in 2010) is provided by hydro energy (26.7 million tons/oil equivalent), and the fact that natural gas has quite a humble part in this balance (only 3.5 million tons), and finally taking into consideration the small population of the country, we can suppose with confidence that quite soon Norway will be able to considerably increase its oil and gas export chances, including export to AP. It will be also furthered by the outlined stirring up of Norwegian-Russian cooperation within the Arctic shelf framework.

I would like to say a few words about a paragraph of Arild Moe's circumstantial report dealing with the issue of an "Outlook for reform/modernization of the Russian economy". Naturally, I cannot speak about all the economic aspects in a brief comment, though Vladimir Putin on the second day after his election signed eleven decrees regarding first steps aimed at improvement of the business climate in the country, including reorganization in the sphere of customs, construction, and support of export. For that reason, I shall dwell here on two key moments that without any exaggeration might influence the whole Russian energy sector, and, accordingly, the country's economy and cooperation with the rest of the world, especially with Asia-Pacific countries.

Firstly, this moment describes the beginning of the process of realizing state-private partnerships within the framework of the enormous region of East Siberia and the Far East, covering about 60% of Russian territory and embracing sixteen subjects of the Russian Federation. In 2010 Putin, at that time still Prime Minister of Russia, initiated the formation of an entity called the Far East and Baikal Region Development Fund, with the investment capacity of 70 billion rubles in the period up to 2015 coming from the state. Implementation of this project, officially based on the PPP principle, was entrusted to Vladimir Dmitriev, Chairman of the Board of state-owned Vnesheconombank (VEB). After a year or so, nothing much came out of it—primarily because the private sector did not like the idea of investing its money under bureaucratic guidance. Past experience had shown that in the framework of such "joint-ventures" the representatives of ministries and state-owned banks had been only too willing to "dissolve" the money from private sources in all sorts of blurred "territorial development" schemes instead of pointedly investing them in particular projects. This kind of practice was widely seen as wasteful and abusive. When First Deputy Prime Minister Igor Shuvalov called potential private investors to discuss the situation in the government headquarters, all of them openly refused to contribute to the Fund. At the same time they expressed their readiness to interact with the state as equal partners in projects that would represent mutual interest.

Reacting to this turn of events in November 2011, Putin instructed then Minister for Emergency Situations (and now Moscow Region Governor) Sergey Shoigu to prepare a blueprint for an "Autonomous State Corporation" to develop Eastern Siberia and the Far East. With the geographic area of responsibility spanning from the Western border of Krasnoyarsk Province to the Pacific coast, this Corporation was to function under the aegis of a supervisory board nominated by the Russian President and personally chaired by him. In January 2012, Shoigu submitted his draft to Putin. After the document was generally

approved by the government, it was up to the Ministry of Economic Development to polish it. They had done it in about two months.

But, even before that job was completed, some of the spokesmen of the Russian "liberal elite" began to express their disagreement—if not irritation—with Putin's plans. By this time he was not just the Prime Minister, but the President-elect as well. At the forefront of this campaign was ex-Finance Minister Alexey Kudrin. His invectives against Putin's new project were widely spread by Vedomosti—the Russian language daily jointly published in Moscow by the Wall Street Journal and Financial Times, strictly following their party line. Kudrin insisted, for instance, that the proposed corporation could only inhibit the development of the region because other players willing to work there would face an unbeatable competitor.

The real information bomb exploded on April 28, 2012. On that day Finmarket news agency reported that the blueprint for the new corporation literally "outraged" some high-ranking officials who did not bother to hide their feelings, even though they were fully aware of the project's origins. According to the report, the Minister of Finance Anton Siluanov was as rigidly opposed to Putin's initiative as his predecessor Kudrin, and had expressed his views in a special letter, addressed to First Vice-Premier Shuvalov. The Minister's argumentation was based on the claim that the proposed corporation with its "vague objectives and functions" would usurp the prerogatives of federal ministries, resist financial control and severely disrupt the established process of governance.

So what is going on? Why do these people act and speak as they do?

First, the funds of which the future Corporation is supposed to be in charge are really quite substantial. Initially, these may amount to 1.3 trillion rubles, primarily intended for infrastructure projects. That amount is not all, since project financing will be coming as well from private sources, both domestic and foreign. Behind the bureaucracy's opposition to the creation of the Corporation are palpable fears that it will have no real access to these financial flows and therefore no chance for self-enrichment.

Second, the proverbial "interministerial coordination" is now a major stumbling block on the road to Russia's modernization. The suffocating effect of this procedure, cultivated through the years by the "liberals" of Kudrin's school, should be known to Putin all too well. What else if not this inner knowledge is prompting him to assure that his Eastern Corporation will not be subject to formalistic control and will not be crushed by it, unlike some other potentially useful initiatives? If due to Putin's determination the Corporation will start to function as planned, the consequences of its activity—such as accelerated transformation of

Russia's Asian territories and the system of its external partnerships — might someday make the system of bureaucratic capitalism inherited from Yeltsin unsustainable. Are the proponents of the status quo capable of looking that far? Maybe not, but their self-preserving instincts are certainly sharp enough to tell them that the system is challenged and they cannot help but react.

How far are Putin's opponents prepared to go in their resistance to his plan? How tolerant or how firm he will be in this situation? So far, these are open-ended questions. However, judging by what we already know of Putin—and noting how the theme of Siberia and the Far East as development priorities perennially reappears in his post-election statements—one may hope that he will act as befits a real leader who faces a moment of truth.

The second moment lies in determined and radical change of Vladimir Putin's views on the role of foreign corporations in Russian shelf development. Putin's initial illusions about the abilities of Gazprom and Rosneft to resolve this problem alone have completely blown over (and not in the last place it was promoted by Gazprom's impotence to deal with the task of putting Shtokman deposit into operation, which I already dwelt upon in my report a year ago*). He obviously decided to change the main leader (Gazprom) for a new one, more active and resolute (Rosneft), and to create a large holding on the basis of the latter. On May 6, 2011 he appointed Igor Sechin—former chief curator of Russian fuel and energy complex and main initiator of struggle with corruption in energy sphere—as the head of Rosneft. In the course of 2011, Sechin energetically curated adjustment of Rosneft's partnership with foreign business for the development of Arctic deposits on a mutually beneficial basis. They even concluded a framework agreement with British Petroleum, but this corporation's partners in TNK-BP, who had become notorious in the past for their ingenious speculative operations, frustrated that important deal. Sechin, however, instantly agreed with a more reliable partner—ExxonMobil, and in August 2011 signed a framework agreement, which was realized and finally executed by May 2012. Many serious Russian and foreign experts assess it as an epoch-making event. To back this up, on 16 April President-elect Vladimir Putin signed a financial agreement that will eliminate export duties and lower mineral taxes for a minimum of fifteen years after commercial production from the venture is achieved. Both companies pointed to the partnership as the model for its new co-operation agreement.[8] Naturally, other corporations followed suite. Similar agreements were concluded in May 2012 with ENI and Statoil. Putin and Sechin made it clear that on similar terms Rosneft may also conclude agreements with Russian private companies that are ready to share risks connected with works on

the Arctic shelf. At the same time Putin notified those who love to speculate, to obtain assets and then to sell them profitably, without making any contribution into realization of the project. The first company to respond to this proposal was the largest private Russian oil company Lukoil.

Lastly, I believe that Sechin's real authority within the framework of the Russian fuel and energy complex will be much wider and more considerable than those of the official (but unprofessional in the energy sphere) Vice Premier Arkadii Dvorkovich. It is not by chance that Vladimir Putin included Sechin into Board of Directors of Rosneftegaz holding 100% shares of which belong to the state. A full 75.6% of Rosneft shares as well as 10.74% of Gazprom's shares and 7% of Caspian pipeline consortium are on the balance of this holding just as about eighty gas distribution enterprises all around Russia.[9] Besides, in the second half of last year Sechin prepared an important ally for himself in Rosneftegaz leadership: according to his personal recommendation, Igor Makarov, head of independent gas company Itera, was nominated to the board of directors of this holding. Following in February of 2012 Rosneft and Itera concluded an agreement on cooperation and creation of JV, where 51% of shares belonged to Rosneft.[10] Then, Gazprom (as independent Novatek permanently annoys him with its successes) obtained another powerful rival, which will undoubtedly support the campaign started by Leonid Mikhelson (Novatek's head) for the abolition of Gazprom's monopoly on the export of Russian gas.[11]

So, the process of offensive, real competition on Russian home energy markets is obvious.

Notes

1. Daily Yomiuri Online, May 5, 2012.
2. Vedomosti, January 20 and May 4, 2012.
3. Upstream, April 6, 2012.
4. Upstream, April 20, 2012.
5. Upstream, 4 May 2012.
6. Upstream, 10 August 2012.
7. Upstream, 27 April 2012.
8. Petroleum Economist, May 2012, p. 30.
9. Izvestia, May 23, 2012; MK (Moskovsky Komsomolets), May 25, 2012.
10. Neft i Kapital, No.4, April 2012, pp. 14-15.
11. Kommersant, May 10, 2012.

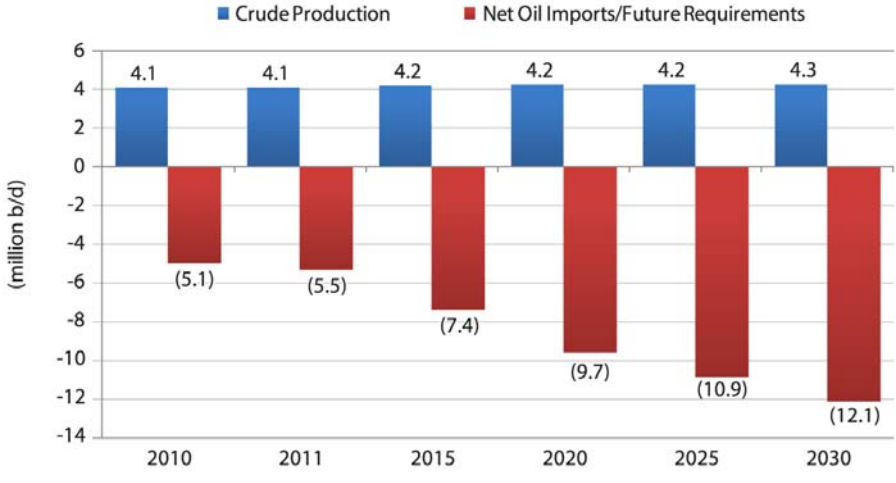
Comments on Chapter 5: Chinese perspective

Kang Wu

OUTLOOK FOR OIL AND GAS DEMAND AND SUPPLY IN CHINA

China is currently the largest energy consuming country in the world. China became a net oil importer in 1993, a net natural gas importer in 2007, and finally a net coal importer in 2009. In other words, China is currently a net importer of all three types of fossil energy. As the second largest oil consuming country and second largest oil importer in the world, China's need for imported oil has been growing very fast since 1993. In 2011, China had a net oil (crude oil and refined products combined) imports of 5.5 million barrels per day (b/d), up from 205 thousand b/d in 1993, 1.5 million b/d in 2000, and 2.9 million b/d in 2005. In the meantime, domestic oil production has stagnated (Figure 5.4). China imports oil from all over the world where major suppliers are from the Middle East, Africa, Russia and Central Asia, and Latin America (Figure 5.5).

In 2011, net oil imports of China accounted for 53% of country's total oil consumption (up from 45% in 2008), as compared to 58% for



Note: 2012~2030 data are projections.

Figure 5.4. China's Crude Oil Production and Overall Oil (Crude and Products) Imports, 2010-2030

- Structure of the imports:
  - Middle East: 51%
  - Africa: 24%
  - Asia Pacific: 3%
  - Elsewhere: 22%

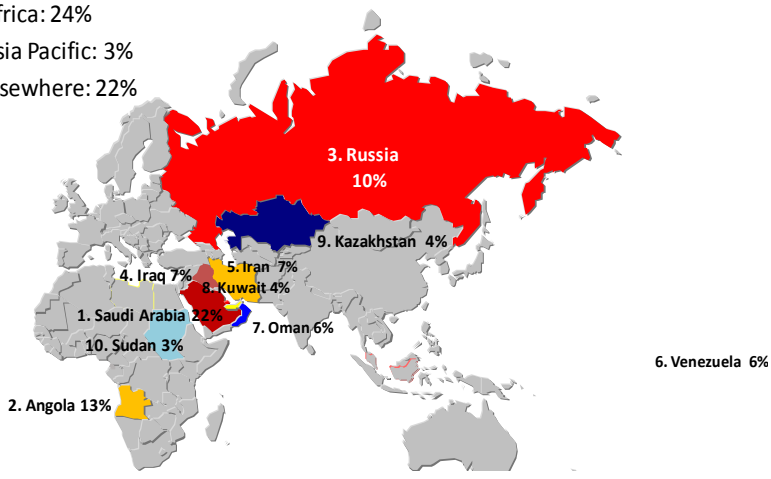


Figure 5.5. China's Crude Oil Imports by Source, 2011

the US (down from 65% in 2008)—the world's largest oil consuming country (FGE 2012 and BP 2012). The difference between China and the US is that US demand went down during the past five years and will be flat or will decline over the coming decades while the Chinese demand increased rapidly since the middle of last decade and will continue to grow. We expect that the share of net oil imports in China's total oil consumption will go up to 68% in 2020 and 70% in 2030 (Figure 5.4), thanks to rising demand and flat domestic oil production.

When it comes to natural gas, the size of the market for demand and supply is much smaller. However, China has recently surpassed Japan to become the largest natural gas consuming country in Asia. China started importing liquefied natural gas (LNG) in 2006. By 2007, the volume of imports exceeded that of exports to Hong Kong. China also started importing natural gas by pipeline from Turkmenistan via Kazakhstan at the end of 2009. In 2011, China's net imports of natural gas (LNG and pipeline gas combined) accounted for 21% of China's total natural gas use. This share is expected to go up to nearly 40% by 2020.

Under these circumstances, securing future oil and gas supply to meet China's growing demand has become vital for the country. Since the beginning of the millennium, the Chinese have increasingly given energy security a high priority in its five-year program and long-term energy planning. Among many measures taken and planned by the Chinese government, diversification of energy supply sources (particularly oil and

gas) and increasing overseas energy (again with focus on oil and gas) investments are two of the key strategies. Both of them point to the Arctic as one of the new frontiers for China to ensure its energy security through trade and investment.

CHINA'S POLICIES TOWARD AND INTEREST IN THE ARCTIC

China neither owns Arctic coasts nor has sovereign claims over the region, with no claims to either continental shelves or the natural resources that lie beneath them. However, China intends to expand its role as a global power and shows increasing interest in the Arctic. In general, China wishes to be involved in its management by obtaining a permanent observer status in the Arctic Council if the terms are right. The Council is comprised of Canada, Finland, Iceland, Norway, Russia, Sweden, the US, and Denmark and is an intergovernmental forum promoting cooperation among eight states bordering the region. For the Arctic's energy and natural resources, China seeks to participate in the exploration, development, and eventually production as a major investor. In addition, China is a potential market for any oil and gas from the Arctic.

China has acquired its ice breaking capability but currently has only one ship, named *Xue Long* ("Snow Dragon"), in operation (Campbell 2012). Still, *Xue Long* is the world's largest conventional ship equipped with ice breaking capability with a displacement capacity of 21,000 metric tons (tonnes). The ship was purchased from Ukraine in 1993 and upgraded as scientific research vessel, and is capable of breaking ice to the depth of 1.2 meters. This icebreaker scientific research vessel *Xue Long* operates mainly in Antarctic waters but has been to the Arctic five times as well in 1999, 2003, 2008, 2010, and 2012. The latest mission of *Xue Long* to the Artic started in July and ended in late September 2012, where the ice breaker ship sailed on the Northeast Route and entered the Arctic Ocean from the Pacific Ocean for the first time (XinhuaNet 2012). China's own ice breaker ship with a displacement capacity of 8 thousand tonnes with a cruise speed of 15 knots and ice-breaking depth of 1.5 meters is under construction and will be put to use in 2014.

China has had a presence in the Arctic since 2004 when it established a research station-Huang He Zhan-in Svalbard, Norway, which is well inside the Arctic Ocean in the Barents Sea. Also, China already has the largest foreign embassy in Reykjavik, Iceland in expectation of Iceland becoming a major shipping hub (Makki 2012). Although China claims no Arctic territories, it has an appetite for its natural resources. More importantly, China is interested in utilizing shortened routes

through the Northern Sea Route as Arctic ice melts (Hong 2012), although actual distances depend on the originations and destinations of different journeys. Overall, China has not come up with a clear policy toward the Arctic. However, public statements from various ministries of the Chinese government suggest that China is becoming increasingly active in the Arctic affairs.

OVERSEAS INVESTMENTS OF CHINESE NOCS CONCERNING THE ARCTIC

As mentioned earlier, overseas energy (oil and gas in particular) investments are one of the leading strategies for China to address the issue of energy security. The effort has been led by several Chinese national oil companies (NOCs): CNPC/PetroChina, Sinopec, CNOOC, and Sinochem, as well as other Chinese companies, sovereign wealth funds, and financial institutions. Since the late 1990s, the cumulative actual and intended investments by Chinese NOCs and other players have exceeded $100 billion USD, with the largest one being CNOOC's proposed $15.1 billion USD takeover of the independent Canadian oil and gas producer Nexen at present (Reuters 2012). In 2011, China's equity oil production from overseas operations reached an all-time high of 1.5 million b/d. That amount was more than one-third of China's domestic oil production. As Chinese companies continue to expand their overseas investments, they turn to areas such as shale gas, deep-water drilling, Canadian oil sands, and now perhaps oil and gas potential in the Arctic. In the areas of energy trade and investments, China has developed relationships with all Arctic Council member nations to various degrees. These relationships will help China gain footage in the Arctic business.

For the Arctic in particular, Russia's Rosneft has been working with various Chinese NOCs. The Russian company has reached agreements with a number of foreign companies, including all three Chinese NOCs (CNPC/PetroChina, CNOOC, and Sinopec) to begin exploration in the Arctic area. In late 2010, CNPC signed a long-term cooperation agreement with Russia's state-owned tanker shipping company Sovcomflot (SCF) on shipping oil and gas through the Arctic.

Chinese President Hu Jintao paid a state visit to Demark in June 2012. Among many bilateral issues discussed, Sino-Demark cooperation in new energy and gaining Denmark's support for China's application to gain the permanent observer status in the Arctic Council were also on the agenda. China struck an Arctic oil agreement with Iceland on the oil-rich Arctic region after Chinese Premier Wen Jiabao flew to Reykjavik in April 2012 on the first stage of a four-nation European tour.

Separately, Iceland's Orka Energy signed a deal with China Petrochemical Corporation of the Sinopec Group on using geothermal energy in China for heating homes and generating electricity. Although China's relationship with Norway has been strained due the award of the Nobel Peace Prize to the Chinese dissident Liu Xiaobo, energy cooperation between CNOOC and Statoil and the two countries continues. China will need Norway's support for getting involved in Arctic business ventures.

IMPLICATIONS OF THE ARCTIC OIL AND GAS DEVELOPMENTS ON CHINA

The Moe chapter (see Moe 2012) indicates that oil and gas resource potential is huge in the Arctic. For proven reserves, the Arctic accounts for 4% of the world's total for oil and 19% for gas. If the unproven, estimated portion is added to these calculations, the share of the Arctic is 7% for oil and 24% for gas. The implications of this are huge for China for both trade and investments.

As far as trade is concerned, China's oil import requirements are forecast to go up from 5.5 million b/d in 2011 to 9.7 million b/d in 2020 and 12.1 million b/d in 2030. China is likely to overtake the US to be the largest oil importer between 2015 and 2020. For natural gas, China's import requirements–a combination of LNG and pipeline gas–are forecast to increase from 3.0 billion standard cubic feet per day (bscf/d)—equivalent to 23 million tonnes (mmt) of LNG–in 2011 to 11.9 bscf/d (equivalent to 93 mmt of LNG) in 2020 and 18.0 bscf/d (equivalent to 138 mmt of LNG) in 2030. Obviously, this is not only a huge, but also a fast growing market for oil and gas from the Arctic.

On the investment front, the Chinese NOCs and other players are still at the forefront in investing everywhere in the world aggressively. As mentioned earlier, these Chinese have recently moved to more difficult and challenging projects and areas, including potentially the Arctic. As exploration, development, and production of Arctic oil and gas resources are expensive, the Chinese investments may be appreciated and needed to get the work off the ground. Once again, China has no territorial claims over the Arctic Ocean and shores, which may eventually give them an advantage as a third-party investor in the region as long as the sovereign nations craft regulations governing foreign investments carefully. As such, after some initial resistance and particularly if China can overcome the geopolitical and diplomatic changes with certain Arctic Council member nations, China will eventually become a permanent observer of the Council and their investments will be welcomed in the region in the long run.

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Comments on Chapter 5: Japanese perspective

Yuji Takagi

JAPAN'S INNOVATION CHALLENGE AFTER MARCH 11, 2011

After the disaster of March 11, 2011 Japan's energy challenge is continuing to attract the greatest national concern. The Great East Japan Earthquake and tsunami and the resulting Fukushima Nuclear Power Plant accident have had unprecedented impacts and Japan is now facing the serious problem of power shortages. In order to overcome these

shortages, the challenges are focused on increasing power supply capacity, enhancing energy savings, and securing fuel procurement. Long-term energy policy and strategy are now occupying a central space on the agendas of government, industry and local communities.

As for long-term energy implications, the biggest national concern is the probable scenario of a "sharp decrease in nuclear production" for this year and beyond. Out of a total of 54 nuclear power reactors that existed prior to March 11, 2011 all were shut down for two months beginning in early May 2012, while only two reactors at one plant resumed operations in July of 2012 in order to overcome the summer peak demand. Under such circumstances, the government's "Basic Energy Plan" will inevitably be revised. The revision shall include such factors as the future of nuclear energy, the further promotion of renewable energy, enhancement of energy efficiency, and the re-establishment of a best energy-mix and strategy to address the balance of energy security and climate change.

Japan's numerical energy targets, as guidelines for a long-term approach toward 2030, were centered on five points. First, energy efficiency was to improve 30% in terms of GDP intensity; second, oil dependency was to decrease to lower than 40%; third, oil dependency in the transportation sector was to decrease about 80%; fourth, nuclear energy was to maintain a 30-40% share or more in the electricity generation mix; finally, overseas resource development was to increase 40%. However, the entire design of this long-term energy policy is now under drastic review, in order to properly incorporate the effects of the Fukushima nuclear power plant accident. In particular, now under study is the possibility of limiting dependence on nuclear power generation to between 0% and 25% of total generation, while it had occupied roughly 30% before the Fukushima accident.

JAPAN'S FUTURE HOPES FOR MARINE RESOURCES

In Japan, a new hope for future potential energy resources has arisen, in that large reserves of methane hydrates under the deep sea off Japan's coast of Tokai-Kumano. These reserves are estimated to contain the equivalent of 100 years of domestic gas consumption, and their target commercial production is projected for 2018.

Especially after March 11, 2011 driving forces in Japan for the development of new energy resources to replace nuclear energy have geared up dramatically, both in the government and the private sector, as well as many research institutions and universities. This development scenario includes not only methane hydrates, but also research and development into innovative power generation utilizing marine resources, including sea

waves, sea tides, ocean currents, and osmotic pressure. This is Japan's special approach both as a "Big Ocean State," possessing the sixth largest ocean surface area in the world, and also as a technology oriented country.

Japan suffers from an enormous handicap of scarce natural resources, represented by the fact that Japan's energy self-sufficiency rate is only 4%, the lowest among the major industrialized countries. This handicap in fact led to Japan's achieving its reputation the best energy efficiency in the world. Although Japan ranks as the fifth largest energy consumer, the third largest oil consumer, the third largest oil importer, and the largest LNG importer in the world, its energy intensity is by far the smallest among top energy consuming countries.

HIGH DEPENDENCE ON MIDDLE EAST OIL AND GAS

The Persian Gulf countries (the Gulf) of the Middle East are especially crucial for Japan's energy security because nearly 90% of its crude oil supply is imported from the Gulf. The import ratio from the Gulf compared to the entire world was 87% in 2011, and has been at almost the same level for the last 15 years. Therefore, strengthening the relationship with the Gulf is of utmost importance and an urgent issue for Japan's sustainable oil and gas procurements, considering that Japan's government policy on nuclear energy will certainly be revised because of the events of March 11, 2011.

That earthquake and the recent yen exchange rate appreciation against the major currencies have had a large impact on the economy, leading to Japan's recording a trade deficit in 2011 for the first time since 1980, as Japan imported a historically record high quantity of LNG, mostly from the Gulf, to make up for the reduction in nuclear energy. In this way, the Gulf is a critically important trade counterpart for Japan for energy security, and therefore Japan has been contributing in the Gulf as an industrial goods exporter and also is engaged in direct investment, mainly for Gulf infrastructure projects.

RESOURCE DIVERSIFICATION AND COMPETITION AMONG NEW RESOURCES

However, at the same time, Japan must diversify its energy import sources. In fact, Australia and Sakhalin in Russia have been added as stable supply sources. How and whether Arctic oil and gas will become one of the import resources for the Japanese market in the future is totally a matter of competition among newly developed resources by origin

and by resource type, as well as by speed of their development. The allure of the Arctic is strong at a time when Asian powers are eager to diversify their energy resources and enhance supply security. Chinese, Korean and Japanese involvement in the Arctic would add a new dimension to the region's geopolitical and sovereignty debates.

The best energy mix for Japan in terms of power generation as an ideal case toward 2030 is, in my personal opinion, a good balance combining all possibilities without excluding any: oil and coal together could be reduced to 10%, LNG increased up to 35%, nuclear energy cut in half to 15% (from 30% before the Fukushima accident), renewable energy ramped up to 30%, with the remaining 10% accounted for through new approaches such as "wise-saving" or a new lifestyle achieved through a new national campaign utilizing IT technology in the fields of smart city, smart grid, and smart life.

Arctic oil and gas for the Japanese market will be subject to competition from many other resource candidates, such as U.S.-origin shale gas LNG or East Siberia-origin LNG or newly developed Australia, African, and Asia-Pacific LNG in the future, as well as renewable energy or unconventional resources or ocean-origin power. All these energy resources might well take significant time to become commercially available. From a commercial and geopolitical viewpoint, Arctic oil and gas has plenty of hurdles to overcome in order to compete with all these other new candidate sources, from a long-term viewpoint. Still, the key to these competitions shall always lie in the realm of innovative technology: how technology has been developed and utilized in a commercially feasible way is at the heart of what the history of energy has been teaching us for decades.

Comments on Chapter 5: Korean perspective

Yoon Hyung Kim

Most of Korea's energy supply and demand is dependent on hydrocarbons such as coal, oil, and gas. To improve the energy use structure, the Korean government embarked on an ambitious nuclear and renewable energy source development. However, according to the Korea Energy Economics Institute, the share of renewable energy sources are projected to be no more than 20% of the total energy supply/demand in 2035. This implies that the era of hydrocarbon as a dominant energy source will continue for the time being. Accordingly, the procurement strategy

of oil and gas resources is an urgent national task for Korea. As of 2011, Korea is the sixth largest oil importer in the world and the nineth largest oil consumer. Worse yet, more than 86% of oil imports are sourced exclusively from the Middle East. To secure the needed oil and gas resources and to overcome the uncertainty regarding the future energy supply and to diversify the supply base for oil and gas, Korea regards the Arctic oil and gas as mid-term strategic resources and plans to expand its participation in the Arctic oil and gas development projects.

Korea has a huge deficit in gas and is the world's second largest importer of liquefied natural gas (LNG). Net imports have reached unprecedented levels. Korea's LNG imports are around 35 million tons annually. On the other hand, the world gas market has changed within the last four years because of the shale gas revolution and this has tended to devalue the prospect for Arctic gas supplies. The Arctic may become a source of natural gas for consumers in Asia. One project on the Yamal Peninsula already includes shipment eastward as part of its business plan. China, Japan, and Korea are all potential consumers of Arctic hydrocarbons. What is important in this connection, however, is not only the size of resource base but also market accessibility and the attractiveness of alternative sources. The prospects for shipping oil and LNG through the Northern Sea Route will be an important consideration. The shale gas revolution is another important factor affecting the economic attractiveness of Arctic hydrocarbons. The US shale gas revolution has been transforming the world and the Korean energy outlook. The life of hydrocarbon will be extended. The global security of energy supplies will be improved. The shale gas revolution makes nuclear and renewable electricity uncompetitive. A technological breakthrough, the combined-cycle gas turbine, replaces coal with gas in power generation, thereby cutting greenhouse-gas emissions.

The Korean government perceives that sequencing of the development and production of unconventional gas is as follows: shale gas first, followed by coal-bed gas, tight gas and Arctic gas. The Korea Gas Corporation (Kogas), the world's largest corporate buyer of LNG, has procured a long-term LNG supply of 3.5 MTPA starting from 2017 by signing a twenty-year LNG Sale and Purchase Agreement with Cheniere Energy on January 30, 2012. On December 17, 2010, Kogas signed the heads of agreement with Santos Australia for the purchase of 3.5 MTPA of coal-seam gas LNG for a period of 20 years from 2015.

The Arctic gas now looks more like one of several options and not one major option. However, in addition to the diversification issue, the Arctic could possibly also offer another advantage: large volumes and long term commitments. Furthermore, in considering that a take-or-pay supply contract for the LNG business is over twenty years, the Arctic

gas will become one of the most important strategic resource base for Korea. President Lee Myung-bak and Russian President Dmitry Medvedev agreed to work closely together to push a pipeline project to send Russian gas to South Korea via North Korea in November 2011. Subsequently, a tentative agreement reached between Kogas and Russia's Gazprom called for starting the construction of a pipeline through North Korea in 2013 in order to begin pipelined natural gas (PNG) supplies of 7.5 MTPA to South Korea in 2017. According to the recent South Korean government source, talks have dragged on because North Korea is demanding a transit fee that is two to three times higher than international rates.

Other technological advances might reduce the cost to produce Arctic gas. Korea has been actively involved in the Arctic for this reason. The Korea Polar Research Institute (KOPRI) opened the DASAN station in Ny-Ålesund in 2002. Research activities have been increasing since, focusing mainly on environmental research, glacial and periglacial geomorphology, hydrology, and atmospheric chemistry. Starting with the DASAN science station, Korea obtained the ad hoc observer status in the Arctic Council in 2008 and constructed Korea's first icebreaker Araon in 2009. While Korea has embarked on the Arctic development activity, it has not yet shown any concrete Arctic development activities. Korea's first icebreaker explored Canada's Arctic Ocean to check the sea-floor for gas hydrate reserve in May 2012. For the first time, the Korean government included polar resource development in the nation's fourth oversea resource development basic plan in December 2010. In February 2011, Kogas acquired a 20% stake in the Canadian Umiak gas reserve owned by Calgary-based MGM Energy. This investment by Kogas is significant as it is the first resource development in the North Pole by a Korean firm, which will establish a bridgehead to enter a promising frontier.