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“Above-Ground” Issues Affecting Energy Development in the Arctic

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Overview

As opportunities to develop energy resources in the Arctic grow as a result of climate change and technical advances, companies wishing to participate will face not only technical challenges, but political, legal, and regulatory challenges, as well. The five Arctic countries considered in this paper (defined here as the countries that border the Arctic Sea – the United States, Canada, Norway, Denmark/Greenland, and Russia – see Figure 1 on next page for map) will likely see increased interest in the development of their Arctic resources in the coming decades and will have to begin considering how to address these challenges in order to take advantage of this interest. Each Arctic country has different policies, laws, and regulations regarding oil and gas development and transportation, and these differences will affect how and by whom resources are developed, and how and where they are transported.

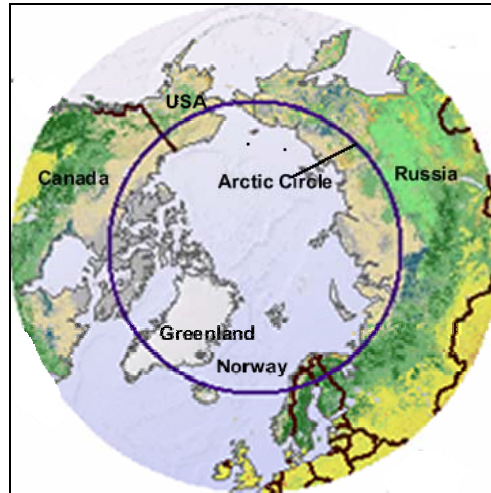
This paper describes 1) the reasons that energy companies will likely focus more of their attention on the Arctic; 2) the current state of knowledge of Arctic oil and gas resources; and 3) issues that will affect the development of Arctic oil and gas resources including boundary issues, access to resources, environmental restrictions, tax and regulatory issues, transportation challenges, and regional issues.

Attractions of the Arctic

The Arctic has not been widely explored by oil and gas companies, due to the severity of weather conditions, the high cost of Arctic operations, inadequate technology, and the fact that oil and gas can be produced with greater ease and at less expense in many other parts of

the world. Recent trends, however, have begun to mitigate these factors, with the result that increased oil and gas production in the Arctic in the coming decades is likely.

Figure 1. Circumpolar Map of the Arctic



UN Environment Programme, Arctic Environmental Atlas, <http://maps.grida.no/arctic/>.

Higher Arctic Temperatures

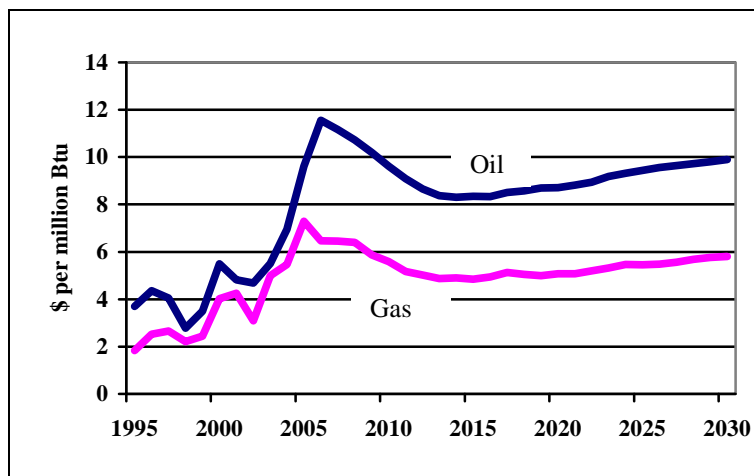
Climate change is expected to continue to affect the Arctic by increasing average temperatures and reducing sea ice coverage. The Arctic Council's 2004 assessment, "Impacts of a Warming Arctic," found that winter temperatures in Alaska and western Canada have already increased 3 to 4° C in the past 50 years. The Arctic Council projects that annual average temperatures in the Arctic will rise 3 to 5° C over land and up to 7° C over the oceans during the next 100 years. The assessment also found that over the past 30 years, the annual average extent of sea ice in the Arctic has declined by 8 percent and projected that there will be additional declines of 10 to 50 percent by 2100. The assessment noted that some climate models project the almost complete disappearance of summer sea ice by that time.¹ Whatever the more serious global implications of these changes are, one consequence is that the Arctic environment may become more hospitable to oil and gas production. (It has been noted that if warming causes icebergs to break free of polar ice, they could present a new danger that would hinder Arctic energy development.)

¹ Arctic Council, "Impacts of a Warming Arctic," from Arctic Climate Impact Assessment, 2004. <http://www.amap.no/acia>

Higher Energy Prices

Oil and gas prices have been rising steadily since 2000, and few projections predict that they will ever return to previous levels. The U.S. Energy Information Administration (EIA) predicts that oil prices will remain in the \$50 per barrel range until at least 2030, and natural gas prices will remain in the \$5 – 6 per million Btu range. (Figure 2) Just as they have spurred increased development of unconventional resources, such as the Canadian oil sands, higher prices for oil and gas will make remote, technically challenging projects more feasible.

Figure 2. Crude Oil and U.S. Natural Gas Prices, Projections to 2030.



EIA, Annual Energy Outlook 2007, in 2005 dollars. EIA's natural gas price projections to 2030 are much lower than those of most other forecasters, who predict prices to remain in the \$6-7 per million Btu range due to differing assumptions about domestic production and future carbon regulation that could increase gas use in the power sector.²

Host Governments' Restrictions on Access to Conventional Resources

The past few years have seen a trend towards increased government control of the energy sector in resource rich countries and the rise of state-controlled "national" oil companies. At this time, about 77 percent of proven global oil reserves are controlled by national oil companies that do not allow foreign equity participation in their development projects. Partially or fully privatized Russian oil companies control another 6 percent, but the ability of international companies to participate in the development of these resources is declining. In

² Joe Benneche, "Natural Gas Projections from EIA and Six Others." Presentation at EIA Energy Outlook, Modeling and Data Conference, Washington, DC, March 28, 2007.

addition, a significant proportion of the world's gas reserves is controlled by national oil companies (including Russia's Gazprom which controls about one-sixth).³ International energy companies are finding it increasingly difficult to gain access to oil and gas reserves around the world. Four out of the five Arctic countries, however, do not have restrictions on foreign equity participation in their oil and gas sectors (the United States, Canada, Denmark/Greenland, and Norway), meaning that international oil companies will almost inevitably turn their attention to the Arctic as their options in other parts of the world are limited.

There are already signs of rising interest in the Arctic among oil companies. Although BP was the only oil company working in the U.S. portion of the Beaufort Sea for years, Shell recently won a number of licenses from the U.S. Department of the Interior's Minerals Management Service (MMS) and will soon join them there. And MMS included new areas in the Chukchi Sea and Beaufort Sea in its proposed 5-year plan for 2007-2012 because of expressions of interest by industry (even though no infrastructure exists to transport gas from the Chukchi Sea to markets.) MMS has proposed holding the first Chukchi Sea lease sale in February 2008. In recent years, oil and gas companies have also been obtaining licenses in Canada's Beaufort Sea-Mackenzie Delta regions. Just recently, in July 2007, U.S. majors ExxonMobil (through its ownership of most of Imperial Oil), Chevron, and ConocoPhillips won licenses in these regions. Energy companies also expressed interest in licenses Norway offered in the Barents Sea in 2005, the first licenses granted there in ten years.

Although in years past, there was not a great deal of interest in licensing rounds for Greenland's offshore fields (there have only been six wells drilled in Greenland, all in the 1970s), the licensing round Greenland held in late 2006 attracted interest from a number of companies, including ExxonMobil (Husky Energy of Canada won the licenses). Prior to that licensing round, only Canada's EnCana was working in Greenland and had only conducted seismic surveys. Greenland will hold a second phase of the licensing round for other fields this year.

³ *The Changing Role of National Oil Companies in International Energy Markets*, James A. Baker III Institute for Public Policy of Rice University, April 2007.

In Russia, a number of international oil companies were vying, over the past few years, to become a part of Gazprom's giant Shtokman gas project, even as Gazprom continued to delay a decision and finally chose France's Total as a partner in July 2007. Elsewhere in Russia, Rosneft and BP signed an agreement in late 2006 to explore jointly the Arctic Shelf.⁴

“Above-ground” Issues

Although significant exploration and production in the Arctic will probably not take place in the near future, it is worth considering some of the non-technical issues that will affect how Arctic resources will be developed.

Lack of Information

There is not yet a large volume of information available about potential energy resources in the Arctic. When the U.S. Geological Survey (USGS) completed its 2000 World Petroleum Assessment, it estimated that, in the 12 provinces in the study that lay in or near the Arctic, there was 374 billion barrels of oil equivalent, or about 23 percent of the approximately 1.6 trillion undiscovered barrels of oil equivalent that the study estimated for all the geologic provinces around the world that it covered. (Table 1) The Assessment excluded a number of Arctic geologic provinces, however (no U.S. provinces were included, for example). Also, nine of the assessment's twelve Arctic provinces were in Russia – including West Siberia, a basin defined as extending from the Kara Sea to Kazakhstan, which greatly inflated the assessment's estimates of both oil and gas resources.

In 2006, the consulting firm Wood Mackenzie released some of the results of its own assessment of many of the Arctic provinces included in the USGS assessment, as well as additional provinces in the United States, Canada, Greenland, and Norway (but excluding West Siberia). The Wood Mackenzie conclusions contrasted with the optimism of the USGS study. The company estimated that, in the basins it examined, there were 233 billion barrels of oil equivalent, with the potential for another 166 billion. The study also estimated that 85 percent of the discovered resource and 74 percent of the exploration potential was gas. The Wood Mackenzie study also predicted that export and technological constraints would delay

⁴ “BP Cashes Out for Access to the Russian Arctic,” *Barents Observer*, 1 December 2006.

production of the majority of the gas until 2050.⁵

TABLE 1.			
USGS UNDISCOVERED RESOURCE ASSESSMENTS			
Province	Mean undiscovered		
	Oil+gas (mmb)oe)	Oil (mmb)	Gas (bcf)
<u>USGS World Petroleum Assessment 2000</u>			
West Siberia	182,864	55,235	642,934
East Greenland Rift	64,769	47,148	80,709
Vestford-Helgeland	43,062	6,538	165,201
South Barents	30,377	219	160,857
Timan Pechora	16,598	5,732	52,079
North Barents	11,355	135	59,820
Nepa-Botuoba Arch	7,643	1,208	29,971
Ludlov Saddle	5,361	39	28,387
Baykit Arch	4,897	1,213	16,983
Labrador-Newfoundland Shelf	3,792	1,796	8,893
Angara-Lena Terrace	2,526	242	10,705
Cis-Patom Foredeep	1,309	161	5,364
Total "Arctic"	374,553	119,666	1,261,903
Total all assessed provinces	1,627,442		
<u>Other USGS Assessments- US and Canada</u>			
North Slope ANWR (1998)	11,908*	10,360	8,600
North Slope NPRA (2002)	23,700*	10,560	73,000
North Slope Middle (2005)	10,640*	3,980	37,000
Mackenzie Delta** (2004)	26,088*	10,500	86,601

*Author's calculations. **Mackenzie Delta doesn't include deepwater. MMBOE = million barrels of oil equivalent, MMB = millions of barrels, BCF = billions of cubic feet. USGS World Petroleum Assessment 2000, Tables AR-4A, AR-4B, AR-4C; USGS National Assessment of Oil and Gas Resources, December 2006; USGS Assessment of Undiscovered Oil and Gas Resources of the Mackenzie Delta Province, North America, 2004.

USGS is working on a new assessment, the USGS Circum-Arctic Resource Appraisal, which will assess the entire Arctic for undiscovered, conventional oil and gas resources. The new assessment is scheduled for completion in 2008. In addition, the Arctic Council's Arctic

⁵ Sam Fletcher, "WoodMac: Arctic Has Less Oil than Earlier Estimated," *Oil and Gas Journal*, 13 November 2006.

Monitoring and Assessment Programme (AMAP) is preparing an assessment of the social, economic, environmental, and health impacts of current and future oil activities in the Arctic. AMAP expects to complete the assessment in fall 2007, but it is uncertain when it will be released, as each Arctic country must review it first.

Boundary Issues

One of the most important issues requiring resolution prior to any significant exploration or production is the determination of national boundaries. Given the high costs and technical difficulty of working in the Arctic, it is unlikely that any major energy company that is capable of doing such work will commit to a project without certainty of what country has jurisdiction over its location.

Two significant boundary disputes exist. The United States and Canada still have not agreed on the boundary between their territories in the Beaufort Sea, and Norway and Russia have a disagreement about the border between their territories in the Barents Sea. The EIA estimates that the disputed portion of the Barents Sea contains oil and natural gas reserves estimated at 12 billion barrels of oil equivalent.⁶ In July, however, Russia and Norway signed an agreement that resolves one small border dispute over the outer Varangerfjord portion of the Arctic, raising hopes that there will be more discussions on the Barents Sea issue.⁷ Another high profile, though less serious, boundary dispute is between Canada and Denmark, regarding the control of Hans Island, an uninhabited island located between Canada and Greenland.

Each Arctic country that has ratified the United Nations Convention on the Law of the Sea has the opportunity to claim jurisdiction over a larger area of the Arctic by demonstrating that its continental shelf extends further than 200 miles from its shores. The United Nations Convention on the Law of the Sea came into effect in 1994 after many years of discussion and negotiation. As of this writing, 152 countries have ratified it, including four of the five countries with Arctic borders, namely Russia, Canada, Denmark, and Norway. The Law of the Sea gives countries an “exclusive economic zone” 200 miles from their shorelines (or until

⁶ *Norway Country Analysis Brief*, U.S. Energy Information Administration. <http://www.eia.doe.gov>

⁷ “Norwegian Border Deal Reached,” *Reuters*, 12 July 2007.

they reach another country's boundary) and allows signatories to claim further an "extended continental shelf," if they can prove that their country's continental shelf extends farther than 200 miles.

To make a claim, a country must submit bathymetric, seismic, and geophysical data to the United Nations Commission on the Limits of the Continental Shelf (UNCLCS). This body consists of 21 scientists whose members are elected by parties to the Convention. A few non-Arctic countries have made claims of extended continental shelves (in different oceans) already, and Russia made a claim of an extended continental shelf in the Arctic in 2001. The Commission did not accept Russia's claim, but asked for more data. Russia expects to complete a new submission this year. In June, Russian geologists from an institute in St. Petersburg announced that after their research expedition, Russia had enough data to support claiming about 460,000 square miles of extended continental shelf, an area the size of France, Italy, and Germany combined.⁸ Canada and Denmark are working together to gather scientific data to support their claims, with submission expected within the next few years (Denmark's submission will cover Greenland). Norway submitted its claim in late 2006 and is awaiting a decision from UNCLCS as of this writing.

The United States has not ratified the Law of the Sea, despite the support of the current Administration. An attempt in the Senate to ratify it failed in 2004, due to intense opposition by a small minority.⁹ As of this writing, there were plans to re-introduce it in the Senate this year. The National Oceanic and Atmospheric Administration (NOAA) has already undertaken mapping cruises in 2003 and 2004 to support a potential claim if the treaty is ratified. As of this writing, NOAA had announced that it would begin a third expedition in August 2007, this one to map the floor of the northern Chukchi Cap.

Arctic Governments' Restrictions on Access to Resources

The fact that many resources in the Arctic lie in countries without restrictions on foreign investment could increase their attractiveness. But, although four of the five Arctic countries

⁸ "Russia Eyes Vast Arctic Territory," *BBC News*, 26 June 2007.

⁹ Michael J. Mattler, "The Law of the Sea Convention: A View from the U.S. Senate" in *International Energy Policy, the Arctic, and the Law of the Sea*, Myron H. Nordquist, John Norton Moore, and Alexander Skaridov, editors. Boston: Martinus Nijhoff Publishers, 2004.

do not have restrictions on foreign investment in the oil and gas sector, Russia does. Russia could extend its control over a considerably larger portion of the Arctic, if its claim to extend its territory under the Convention on the Law of the Sea is successful. Over the past few years, the Russian government has moved to increase its control over the oil and gas sector by returning oil majors Yukos and Sibneft to state company ownership, and forcing foreign companies operating major projects, such as BP and Shell, to renegotiate terms and accept state-owned partners. A proposed amendment to the Subsoil Law would require that the development of “strategic” large fields (statements of what “large” would be have ranged from 500 million to 1 billion barrels of oil, and 500 billion to 1 trillion cubic feet of gas) be controlled by a Russian partner, with any foreign investor limited to less than 50 percent of the project. The government has also decided that all offshore oil and gas development must be controlled by state companies Gazprom and Rosneft and has taken steps to revoke the licenses for several fields in the Barents Sea from the Russian company Sintez.

If Russian policies do not change direction, they will likely have the effect of limiting the development of oil and gas resources in Russia’s Arctic territories, especially those offshore. Russian state companies may not be able to raise the level of investment needed for such remote, technically difficult projects. In fact, the International Energy Agency is concerned that Russia’s energy industry will be unable to raise the estimated \$900 billion it will need over the next 25 years just to maintain current oil and gas production levels.¹⁰ The technical expertise in offshore projects that international energy companies have developed over many years will be unavailable to Russian companies, unless they can convince the international companies to participate under unattractive terms. And according to a recent study by the Baker Institute, national oil companies are only 35 percent as technically efficient as private companies, which could also result in slower development of Russia’s Arctic resources.¹¹

Each Arctic country is also likely to have its own environmental restrictions that will affect oil and gas development. For example, although Norway granted oil production licenses in the Barents Sea for the first time in 2005, it has placed the northern part of the Barents off limits

¹⁰ NJ Watson, “The Money Gap.” *Petroleum Economist*, January 2006.

¹¹ *The Changing Role of National Oil Companies in International Energy Markets*, James A. Baker III Institute for Public Policy of Rice University, April 2007.

for the time being, and there is a moratorium on production in the Lofoten and Vesteraalen areas until 2010 due to environmental concerns. New environmental restrictions could come into effect as well. In late 2006, the U.S. Fish and Wildlife Service proposed designating polar bears a threatened species under the Endangered Species Act because of their loss of habitat due to climate change. U.S. officials have assured energy companies that such a designation would not be used as a reason to limit oil and gas development in Alaska.¹²

Transportation

It is likely that most of the hydrocarbon resources in the Arctic will be natural gas rather than oil, adding complexity to the matter of transportation to world markets. Lengthy gas pipelines are expensive and often require years of negotiation with transit countries over tariffs and other issues. There have already been years of negotiations over the two proposed gas pipelines that would transport gas from the North Slope and Beaufort Sea to consumers in the United States and Canada, and future gas development in the U.S. and Canadian Arctic depends on the success of at least one. As negotiations continue, the cost estimates for each project increase, due to rising equipment, steel, labor, and energy costs. Imperial Energy, the project operator for the proposed McKenzie pipeline system, that would carry 1.2 bcf/day 1200 miles from the Beaufort Sea to the Alberta border, recently increased its cost estimate to \$15 billion (\$16 billion Canadian) and said production would not commence before 2014.¹³ The Alaska government estimates that the proposed Alaska gas pipeline, which would extend 2140 miles from the North Slope to Alberta, will cost \$23 billion – and ExxonMobil estimates that it will cost at least \$30 billion.¹⁴

In 2006, the Alaska government nearly reached agreement with the large producing companies on the terms of an Alaska gas pipeline. However, the new Alaska administration's Alaska Gasline Inducement Act (AGIA), which passed this year, includes terms that are less agreeable to the large producers. For example, there is a 10-year limit on an exemption from the oil production tax. This disagreement underscores the importance that energy companies attach to ensuring that they have just the right fiscal terms under which they can operate.

¹² Yereth Rosen, "US weighs listing polar bear as threatened species," *Reuters*, 27 December 2006.

¹³ "MacKenzie Valley Line Cost Estimates Updated," *Oil and Gas Journal*, 19 March 2007.

¹⁴ Wesley Loy, "Exxon Frets Over Arctic Gas Pipeline Cost," *Anchorage Daily News*, 31 May 2007.

Proposals under AGIA are due in October, but several major Alaska producers have said that they do not plan to submit any.

If there is to be gas development in other regions, additional transportation infrastructure will be needed. In Russia's case, the extension of Gazprom's monopoly on exporting gas, first by the government's enshrining of that monopoly into law, and lately by taking over gas projects such as Sakhalin-2 and Kovykta, and pushing ExxonMobil to sell Gazprom all of its gas from Sakhalin-1, could hinder gas pipeline development from Russian Arctic territories.

If physical conditions permit tanker traffic, transforming Arctic gas into liquefied natural gas (LNG) may be more feasible than building pipelines. There are already numerous existing and planned LNG regasification terminals around the world, and LNG producers have benefited from an increasingly tight market as LNG consumers compete for shipments. LNG liquefaction plants in cold climates have one advantage because the water used for cooling is already cold, thereby improving the efficiency of the liquefaction process.¹⁵ However, higher costs for constructing and operating LNG plants in cold, remote areas may offset any such gains. A decisive factor for whether LNG would be feasible, though, will be the amount of gas available to transport from any particular location, whether it is developed nearby or transported to the liquefaction terminal by pipeline from elsewhere. Nevertheless, at least one model, the Baker Institute World Gas Trade Model, envisions LNG exports from Greenland and the Barents Sea in the next few decades.¹⁶

A glimpse into the feasibility of future Arctic LNG will be provided when Norway's Snohvit project, which will include the first LNG liquefaction plant within the Arctic Circle, begins shipments from its first LNG train of up to 4.3 million tons per year in December 2007. The project's start-up has been delayed for years and has suffered cost overruns and technical difficulties. Statoil plans to build a second LNG train if the company discovers enough new reserves to make a second train feasible.

¹⁵ Odd Arild Mosbergvik, "Statoil to Begin Snovit LNG Operations by Yearend 2007." *Oil and Gas Journal*, 9 April 2007.

¹⁶ Peter Hartley and Kenneth B. Medlock, "The Baker Institute World Gas Trade Model," in *Natural Gas and Geopolitics from 1970 to 2040*, David G. Victor, Amy M. Jaffe, and Mark H. Hayes, editors. Cambridge: Cambridge University Press, 2006. Also personal communication with Peter Hartley, July 2007.

Fiscal Issues

The high costs of oil and gas production and transportation in the Arctic heighten the importance of the fiscal terms offered by the host governments. Each Arctic country has different fiscal regimes for its oil and gas projects, and the total government take (defined as the percentage of the value of the oil and gas produced that is received by government resource owners) varies widely. (Table 2)

US Alaska	56 – 68 %
US Outer Continental Shelf & Gulf of Mexico	37 – 51 %
Canada Arctic	58 %
Norway	73 – 77 %
Russia	90 %
Greenland	46 – 65 %

Figures for the United States, Canada, and Norway are from a May 2007 study by the U.S. Government Accountability Office, which relied on several different private studies.¹⁷ The Russia figure is based on an OECD study (see note 16). The Greenland figure is based on a communication from consultant Daniel Johnston and Co., June 2007, but is not based on any recent research.

Norway and Russia, in particular, stand out as having higher levels of government take than the other Arctic countries. In Russia, new laws were adopted in 2004 that effectively charge companies 90 percent of marginal revenues for all oil sold at above \$25 per barrel. Russia's high level of government take is based on its mineral extraction tax and export tax, neither of which differentiate on the basis of the difficulty involved in developing a field and could have the effect of deterring greenfield investment.¹⁸ Recently, the Russian government decided to create some exemptions for specific greenfield projects in certain areas, and changes in

¹⁷ *Oil and Gas Royalties: A Comparison of the Share of Revenue Received from Oil and Gas Production by the Federal Government and Other Resource Owners*, United States Government Accountability Office, May 2007. GAO-07-676R.

¹⁸ Rudiger Ahrend and William Thompson, *Realising the Oil Supply Potential of the CIS: The impact of institutions and policies*. Paris: OECD, June 2006.

export tax are being discussed.¹⁹ As for Norway, its high level of government take is based on a 50 percent petroleum tax combined with a 28 percent corporate tax.

Companies developing oil and gas in the Arctic will also be particularly concerned about the stability of the fiscal and legal terms under which they operate. Although this concern is particularly relevant to countries such as Russia, stability will be an issue in every Arctic country. For example, just last year, Alaska changed its system for oil and gas taxation, but it is possible that the legislature and government will reconsider the changes now that it has been revealed that considerable bribery and corruption were involved in the process of making those changes. Whether or not the changes are justified, they still introduce an extra degree of instability into companies' plans. ConocoPhillips, for example, has already said that it may have to delay the production of heavy oil from one deposit in Alaska's North Slope due to this uncertainty.²⁰

Relations Among Jurisdictions and with Native Populations

The relatively small scale of Arctic energy development thus far has allowed some governments to defer settlements with native populations regarding the sharing of energy revenues. Canada, for example, has a settlement with native Canadians in the Nunavut Province, but the Northwest Territories and other provinces have yet to reach any agreements with their native populations.²¹ Increased interest in a region's energy resources can also prompt regional officials to attempt to revise agreements that they have with their central governments on energy project regulation and revenue sharing. Just recently, in July 2007, the Greenland-Danish Autonomy Commission recommended that Greenland be granted the sole right to manage and sell potential oil reserves now that major oil companies are showing increased interest.²² Furthermore, officials from Canada's Nunavut region have blamed the federal government for slowing the development of its resources by failing to issue licenses properly, and have proposed a devolution agreement under which they would have more

¹⁹ Vladimir Milov, "Economic Policy and the Future of Russian Oil Production," Presentation 19 May 2006. Available at <http://www.energypolicy.ru>

²⁰ Tim Bradner, "Producers Roll Up Their Sleeves to Tackle Heavy Oil," *Alaska Journal of Commerce*, 17 June 2007.

²¹ Judy Clark, "The Road to Nunavut," *Oil and Gas Journal*, 21 March 2002.

²² "Greenland Wants the \$\$," *Siku News*, 19 July 2007.

control over energy development.²³ There may be more such attempts to revise central-regional agreements if the Arctic countries are able to extend their continental shelves under the Law of the Sea, and there are new territories and resources to distribute. Energy companies will seek a measure of stability regarding who their regulators and tax collectors will be, particularly in light of the capital-intensive nature of Arctic development.

Conclusion

These “above-ground,” non-technical challenges that will face energy companies seeking to develop oil and gas resources in the Arctic may prove as difficult to resolve as the technical challenges.

Table 3. Summary of “Above-Ground” Issues	
Boundaries	<ul style="list-style-type: none"> • Disputes between Arctic countries still exist • U.S. ratification of Law of the Sea uncertain
Access to Resources	<ul style="list-style-type: none"> • Russia limits ability of international energy companies to develop oil and gas • Arctic countries could impose new restrictions on development
Transportation	<ul style="list-style-type: none"> • Likely predominance of gas in Arctic hydrocarbon deposits complicates transportation options
Fiscal Issues	<ul style="list-style-type: none"> • Fiscal terms will be critical in attracting development • Norway and Russia have highest levels of government take.
Relations Among Jurisdictions	<ul style="list-style-type: none"> • Some countries have not resolved issues of center-regional jurisdiction • More jurisdictional conflicts may arise as more resources are discovered

As extensive Arctic energy development is still well in the future, there is time to address these challenges, if energy companies and the governments of the Arctic countries begin looking at them seriously now. With the right frameworks in place, it should be possible for companies to develop Arctic oil and gas resources efficiently and responsibly.

²³ John Thompson, “Nunavut Blames Ottawa for Stalled Energy Development,” *Nunatsiaq News*, 27 April 2007.

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