

THE ARCTIC: The World's New Economic Frontier and Opportunity for Development, Shipping, and Expansion

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The Arctic (Figure 1) has become the latest and possibly most attractive of development areas on earth and not just because of the immense, largely untapped resources that are becoming increasingly accessible, but also for the opportunities for shorter sea routes and greater accessibility to markets. Although much of the Arctic sea routes are still only accessible part of the year and usually requires special ice-class vessels as well as ice-breaker escort, more and more operators are taking advantage of the huge savings in fuel and travel time between major trading areas such as the Europe/U.S. East and West Coast and East Asia or NW Europe/East Asia trades.

Arctic oil and gas production is growing rapidly and shipping is usually the preferred or only way to deliver the energy products to markets. In 2011, there were 9 tanker voyages across the Russian North Sea route. A number of large ice-class tanker voyages from Arctic production fields to China, South Korea among others were performed in 2011. Though this service requires special vessels and support services, it is attracting a growing number of operators who recognize the long-term opportunities in these trades. Some compare it to a new gold rush (Table 1).

There is also a growing interest in the North West Passage across the north of Canada from Greenland to North Alaska which was actually explored by the Onassis-owned tanker Manhattan over 35 years ago.

The Arctic is warming twice as fast as the rest of the planet, largely because of the Albedo effect which causes darker surfaces such as land and water to absorb more heat than white surfaces such as snow and ice. If some water is exposed, heat absorption will accelerate and cause surrounding snow and ice to melt. This effect is largely responsible not only for the accelerated greening of Greenland, but also the accelerated melting of ice in the Northern Sea route and the North West Passage. ExxonMobil agreed to work with Rosneft on a 500 billion dollar Arctic oil production development over a 25-year period. Arctic air temperatures have increased more rapidly in recent years. As ice becomes thinner, its rate of melting increases, so there is a double acceleration effect which causes extremely rapid melting of sea ice throughout the Arctic. There is also a large increase in soot and other carbon particles in the air which will have a huge effect on surface warming and therefore ice melting. As a result, Arctic sea ice is melting or receding much faster than predicted. Arctic ice melting will continue to accelerate at an even greater rate with losses increasing from 2% per year to over 4% in the next ten years.

Human development and use of the Arctic must be effectively managed to prevent a catastrophe which would not only affect nations bordering the Arctic, but the whole world. At

the same time, we must recognize the huge amount of resources and opportunities which are opening up greater accessibility in the Arctic. Not only will the new shipping routes at the NW Passage and the NSR or Northern Russian Sea route greatly reduce distances and trading costs between Europe, North America, and Asia, but will open up new trading opportunities as well.

It is important to note that unlike other regions, the Arctic has developed into a cooperative region in terms of political and economic cooperation. In fact, the Arctic is a unique example of international relationships which puts the good of mankind first and considers global benefits and costs in a fair and just manner. In fact, the Arctic Council of Arctic nations have become an example of international cooperation.

The great opportunities and challenges of the Arctic have also generated new and effective developments of shipping, resource exploitation, and safety technology, such as new below surface offshore development platforms, dynamic positioning systems for deep water exploration and production, bottom placed tanker loading terminals and more technology particularly suited for ice-infested waters as well as new types of strengthened vessels capable of breaking ice. There is an urgent need for large, new ice-breakers and navigational aids as well as better Arctic support bases which provide both safety and environmental support facilities for unpredictable challenges.

The Arctic truly offers new and immense opportunities for mankind. This not only in terms of ease of access to natural resources and areas of expansion, but also as an opportunity for a more peaceful and just environment which encourages mankind to live a more peaceful cooperative, mutually beneficial life.

There is an Arctic council of representatives of countries bordering the Arctic which cooperates on issues of Arctic development, environment issues and use. This council has shown a high level of successful cooperation but usually found in international relations at this time. It is hoped that this will continue, as the Arctic is both fragile and rich and in a way man's last major development frontier which will affect the world's future state in economic, political, strategic, and environmental terms (Tables 4 and 5). This route cuts the NW Europe or U.S. East Coast, East Asia or U.S. West Coast (China, South Korea, and Japan route) to about half the distance, offering huge potential fuel and time savings. It also eliminates the large costs of transiting the Panama or Suez Canals.

The Arctic is also expected to offer huge new sources for energy and mineral resources which, though more expensive to access, produce, and mine, would be strategically attractive as they are under ownership and control of the major industrial nations and their development would greatly reduce dependence on OPEC and, most importantly, the Middle East and North Africa for oil and gas.

Russia's fleet of nuclear-powered ice-breakers, largely based on Murmansk is expected to increasingly engage in supporting commercial trades in the Arctic region. The regulatory

framework for the Arctic is also changing in line with both environmental and physical changes and new safety requirements. The SOLAS Convention rules of the IMO¹ applying to the Arctic region are being updated in line with changes in activities, the polar environment, and new activities in the polar region.

While the emphasis is on safety, increasing concern is also with environmental impact. Both the SOLAS and MARPOL conventions are being updated to respond to the challenges of newly active polar shipping. In particular, aids to navigation need to be updated and new technology based largely on satellite navigational guidance is being applied.

Five nations share control of the polar region (Canada, Russia, Norway, U.S., and Greenland/Denmark). The latter's nationality has yet to be finalized. Though 146 (oil and gas) fields have been discovered in the Greenland area, only 23 are currently producing. The remaining 110 fields will probably only be activated when reliable transportation and economic productivity becomes available. Greenland, twice the size of Germany, has a population of just 57,000, yet is nearly ice free now.

Developments of the polar (Arctic) region are now speeding up and many new resource discoveries are expected. However, the high cost and difficulty of access will make this a very slow process. There are high expectations that in addition to oil, gas, and other resources such as dry minerals and other commodities will soon be discovered and mined which will probably accelerate developments. The polar region may become a most important economic region. Although seaborne traffic and oil and gas production are now driving the interest, other economic benefits will soon be discovered and drive persistent economic development and access to this new development region.

Once more intense shipping and other economic activity develop in the polar region, urban and other economic developments will take place. As an example, Greenland, while ice-covered until a few years ago, is now largely green and fertile. Roads, housing, airports, and infrastructure are now being developed. The same applies to Baffin islands and many parts of Siberia, Alaska, and Northern Canada. It is expected that all these developments will move economic activity increasingly northwards. The polar region may yet trigger a new gold rush in human and economic terms and that time is not far away.

Postscript: The author is indebted to Ms. Mey Lee Soh, Chief of Planning for AET Tankers in Kuala Lumpur for permission to use the graphics and data presented in the accompanying figures.

¹ IMO, International Maritime Organization, a UN body responsible for ocean and coastal issues such as safety, environment, and access.

Conclusions: Arctic Region, Here We Come!
<ul style="list-style-type: none"> • Land or region of opportunity
<ul style="list-style-type: none"> • Hard and difficult here we come now that we have a longer season and greater opportunity
<ul style="list-style-type: none"> • Increased opportunities for the extraction of oil, gas, and minerals
<ul style="list-style-type: none"> • New transportation routes and reduced shipping distances
<ul style="list-style-type: none"> • New habitable land such as Greenland and more
<ul style="list-style-type: none"> • New fishing grounds

Conclusion: Overall Arctic Outlook and Opportunity
<ul style="list-style-type: none"> • The Arctic Region could be the last major unexplored frontier of global oil and gas reserves. Estimated 115 Bboe of gas reserves; 17 billion bbl of oil reserves and; condensates, under 3 billion bbl while 71% of it is believed to be offshore.
<ul style="list-style-type: none"> • Currently, offshore production north of the Arctic Circle is not substantial but there is significant interest in exploration in Beaufort Sea (U.S. and Canada), Greenland, and Norway.
<ul style="list-style-type: none"> • In the short-mid term, we expect majority of Arctic offshore exploration and development to be focused on Russia with estimated 3415 mmbbl of oil reserves, activity in U.S./Canada will be dependent on outcome of review of industry regulations.
<ul style="list-style-type: none"> • In the meantime, Norway and Greenland remain optimistic that substantial reserves can be found and developed in their respective Arctic offshore regions.
<ul style="list-style-type: none"> • In Russia, the key Arctic offshore basin for oil reserves are estimated to be in the Pechora Sea (3097 mmbbl) and Barents Sea (296 mmbbl) which are waiting to be discovered.
<ul style="list-style-type: none"> • In Norway, the liquid production is expected to be on a declining trend while revolving to be a gas province.
<ul style="list-style-type: none"> • In Greenland, estimated large oil reserve of 16.2 bn boe with Baffin Bay reserve comparable in size to the North Sea. However, no commercial production volume is discovered.
<ul style="list-style-type: none"> • In Canada, offshore production and exploration is confined by numerous regulatory and legal impediments. However, oil majors, i.e., Imperial Oil, ExxonMobil Canada, BP, and Chevron have invested significantly to secure acreage in the Beaufort Sea.
<ul style="list-style-type: none"> • In Alaska, the drilling focus is in the Chukchi and Beaufort seas which have 35% of active exploration licenses.
<ul style="list-style-type: none"> • Given the increasing global requirements for energy, operators will still seek to explore and develop the Arctic region although O&G activity comes with significant environmental and technical challenge.

Source: Various sources and AET's analysis.

Other than environmentally demanding for exploration and potential production, there are also other issues to be considered.

- Problems connected to commercializing remote discoveries.
- One region but five distinct countries, each with their own issues and interests.
- United by technical challenges, cost issues.
- Gas vs. oil-prospect sizes and setting.
- Fishing and Shipping as much an intra-regional issue as who owns the OCE resources.
- Non-Arctic Drivers: Gulf spill, unconventional gas.

Source: IHS CERA.

APPENDIX A: Arctic Crossing and Population Development

As the Arctic becomes more habitable and offers increasing resource developments, population moves into the region will occur. It is important to assure that this is done in a well-coordinated and environmentally safe manner not only because the region is extremely sensitive, in environmental and habitational terms, but also because it will lack human development support infrastructure for a long time.

It is important to prevent large-scale and rapid human intrusion into the Arctic before adequate protective systems are in place and not just to protect humans, but also the Arctic environment which is already undergoing a traumatic environmental change in physical, environmental, and biological terms. In fact, we may need a new code of civilization, different from that which we used in our equatorial developments.

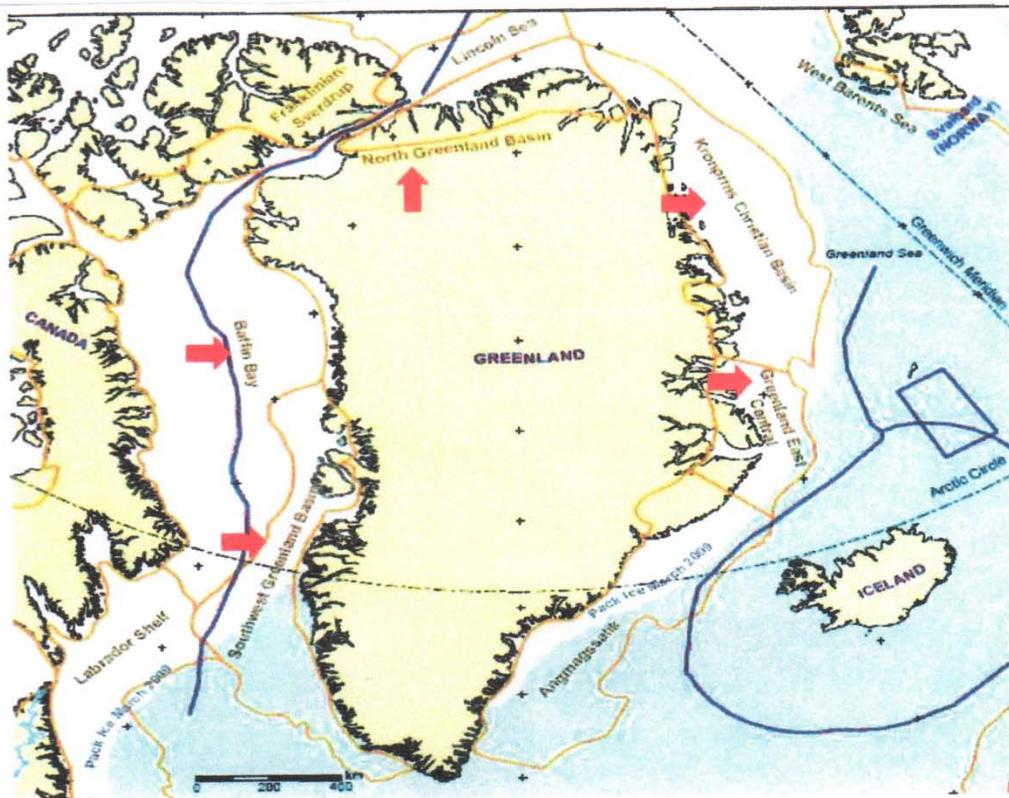
Extensive cruise and similar activities may require a much more stringent set of behavioral rules then applied in less sensitive areas of the world.

Greenland, a land three times the size of Germany, has a population of just 57,200 in 2012. Similarly, there are few people living permanently in other parts of the Arctic, except scattered settlements of Inuits whose lifestyle and livelihood is increasingly under assault as a result of the receding ice and as a result diminished herds of seals, etc. and in turn other sea animals which for long provided the basis of their livelihood.

While there are increasing numbers of people in the Arctic serving large-scale oil, gas, minerals, and other resource exploitation projects, there are few permanent settlements and infrastructure to support permanent human settlement. There is an urgent need to develop plans for human settlement in the Arctic and it is hoped that the Arctic Council will soon develop plans for the long term and permanent settlement developed of Arctic communities.

Such developments cannot be left solely to the resource development companies and their supporters whose objectives are mostly economic.

Appendix B: Greenland has 5 potential areas for offshore hydrocarbon exploitation: Southwest Greenland Basin, East Central Greenland Basin, Kronprins Christian Basin, Baffin Bay, and North Greenland Basin. Source: IHS CERA



Greenland Eager to Encourage Exploration of Vast Territory

State-owned NUNAOIL is a **minority partner in all Greenlandic** hydrocarbon licenses:

- Founded in 1985 and jointly owned by the Government of Greenland and Denmark's Dong Energy
- Focused on acquisition of seismic data in the 1990s; discontinued seismic activities in 2000 due to increase in private sector interest

Bureau of Minerals and Petroleum (BMP) establishes – one door process to facilitate investment

- No other Greenlandic or Danish organization need be consulted on oil and gas licensing issues
- Issued 13 licenses covering 137,000 square km of coastal acreage to date; additional blocks to be auctioned in 2010 and 2012

Source: IHS CERA

Greenland Infrastructure: Greenland's energy supply currently includes imports from refineries in Denmark and Norway by a 22,500 m3 tanker.

- The products are imported to 4 terminals: Qaqortoq, Polaroil, Nuuk, Sisimiut
- From the terminals, the products are distributed to the towns by a 3,000 m3 tanker. (A secondary distribution system exists between the towns and the settlements.)
- Any considerable liquid discoveries are likely to result in developments, as liquids can be exported with minimal infrastructure.
- Gas exploitation will require the discovery of sufficient resource volumes to support the construction of LNG facilities.

Figure 1: The Arctic Region – a region with 5 distinct countries. Source: IEA

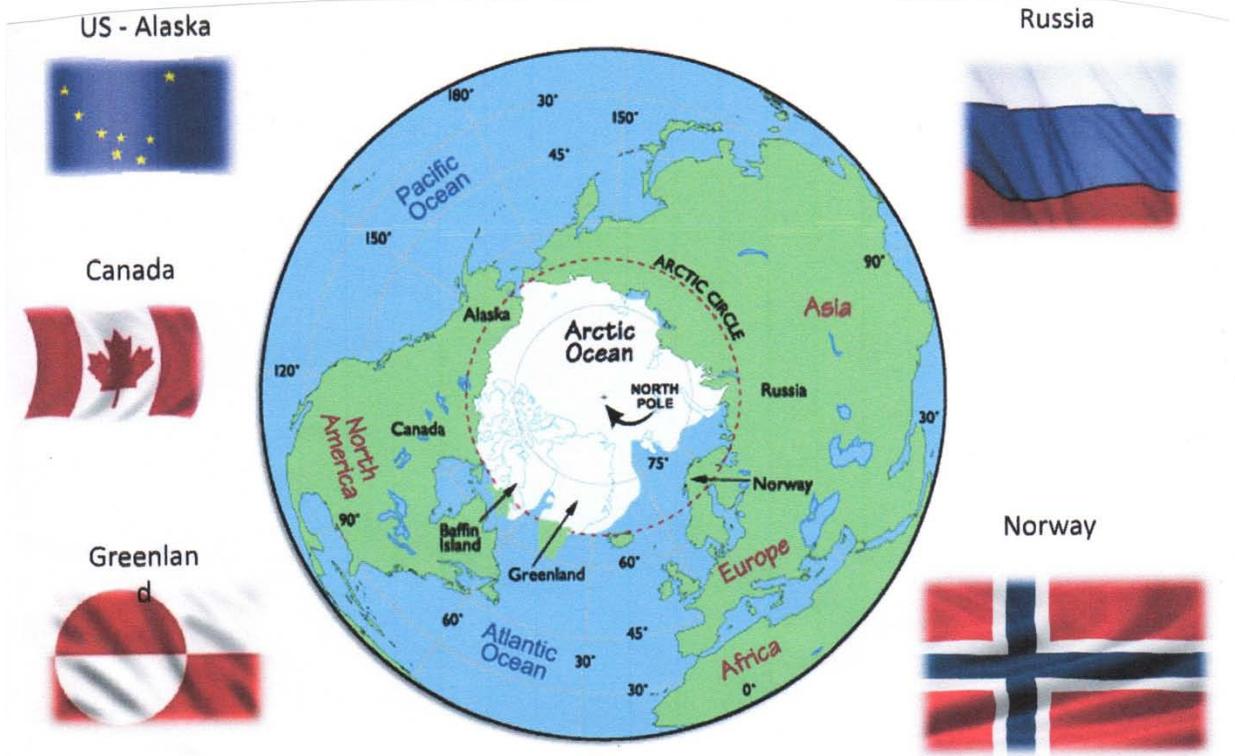
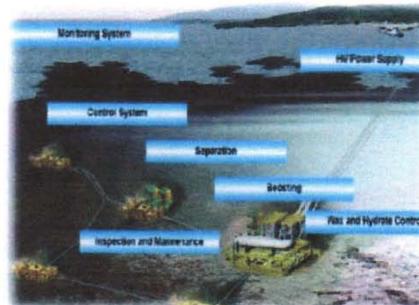


Figure 2: Exploration and production in the Arctic are subject to a broad range of challenges. Therefore, tomorrow's zero footprint oil and gas field developments are required for the pristine environment of Arctic region. (Source: IEA)



- Remote location
- Changing ecology
- Icebergs
- Sea Ice conditions
- Prolonged darkness
- Mobile pack ice
- Severe storms
- Permafrost
- Earthquakes
- Sensitive environment
- Deep water

Table 1: Arctic – The New Economic Frontier
Economic Opportunities
Resource Mining and Production: Oil, Gas, Minerals, Heat
Transportation: North of Russian-Siberian Passage, North West (Canada-U.S.) Passage
Industries – Urban Development: Electric Power Generation, Communication

Table 2: Plenty of interests are seen to plunge the icy depths of the Arctic in search for Oil and Gas
<p>Russia: Russian Government seeks to unlock its Arctic Offshore O&G supplies and has permitted foreign participation with Russian operation.</p> <ul style="list-style-type: none"> • Gazprom being partnered with Total and Statoil for the Shtokman development • BP is to stake a claim in Russia’s Arctic region with Rosneft. Establish an Arctic technology centre: (1) to develop technologies and engineering practices for the safe hydrocarbon resources from the Arctic shelf and (2) to continue joint technical studies in the Russian Arctic to assess hydrocarbon prospectivity in areas beyond the Kara Sea.
<p>Norway and the Greenland: Norway and Greenland self-governing authority are encouraging of their offshore Arctic waters.</p>
<p>U.S. and Canadian Government: Strong interest in exploration of areas, i.e., Beafort Sea by Shell.</p>

Source: Infield Systems White Paper: Offshore Arctic Oil and Gas Market Report

TABLE 3: Much of the Arctic region’s undiscovered oil and gas potential is viewed to be offshore – which comprises more than 71% of total area within the Arctic Circle.	
Arctic offshore region:	Russia Alaska Norway Greenland
Sub-Arctic region:	Sakhalin Island Offshore Eastern Canada Alaska’s Cook Inlet
3 sub-Arctic areas:	Sakhalin Island (offshore Far East Russia) Offshore Newfoundland and Labrador (east coast of Canada) The Cook Inlet (south coast of Alaska)
Only half the basins, i.e., Beaufort Sea and West Barents Sea have been explored.	

Source: Infield...

Table 4: Arctic/Polar Developments – Important Issues
• Prevention of spills or waste discharge
• Navigation guidance in close waters
• Safety of life and rescue techniques
• Strength of hulls and structures
• Reliable cooling systems and cooling intake/discharge
• Dynamic positioning
• Satellite navigation and controls
• Shorter sea lanes between major trading areas
• New fishing grounds

TABLE 5: Arctic Political Environment
• The Arctic Council is amongst the most mutually cooperative international transportation organizations.
• It meets regularly and maintains a relatively open cooperative environment.
• International cooperation in the Arctic may become a beacon of international relation developments around the world.

TABLE 6: Impact of Arctic Polar Developments
• Polar developments may generate another Gold Rush type of movement.
• Polar developments will have a major impact on traditional trade (shipping) routes and trades.
• They will impact on major commodity, particularly oil and gas trades as well as container trades.
• They will impact on the use of the Panama and Suez Canals.
• They will cause major population shifts northwards.
• Though extraction/production costs for major commodities mined/produced in the Polar region will be higher, the difference will be more than offset by lower transport and security of delivery costs.
• Reduced dependence on OPEC and traditional trade/shipping routes will reduce strategic and security costs and will make the world more harmonious.
• Waste energy and energy waste will be used to heat cities and provide energy to or for all the production activities. All of these activities will contribute to enhanced warming of the atmosphere and melting of the ice cap.
• Housing and industrial facilities will be more and more located on floating/floatable ice-strengthened artificial islands.
• Go north and find your gold!!

TABLE 7: Arctic Issues to be Resolved
• Development of Arctic types of offshore platforms and anchoring, positioning systems.
• Mapping of Arctic Ocean floor to determine territorial boundaries.
• Increase in construction of ice-breakers and ice-class vessels.
• Development of effective search and rescue systems in Arctic.
• Development of traffic control systems in narrow passages (Bering Straits, etc.).
• 100 ships in summer 2010 versus only a few in 2007.
• Development of bottom loading tankers and sea bottom platforms.
• Protection and support of Inuit whale hunting and other activities.
• Development of efficient, reliable and satellite communication and positioning systems.

TABLE 8: Few Arctic ports are planned to support growing interest in tanker export, i.e., Pechenga, Vidyaevo, and Teriberka in the Murmansk region and around the White Sea. Several ports along the Arctic shores of West and East Siberia and major river estuaries are candidates for exporting oil. There are small ports along the Ob and Yenisei and estuaries, some of which have been used.
• Arkhangelsk Port: owned and operated by Rosneft . It has an 80,000 b/d capacity for crude and products . A second berth was commissioned in mid-2004 and there are plans to increase capacity to 120,000 b/d. Most cargoes are reloaded onto large vessels at Murmansk.
• Small volumes of oil are exported from Kolguyev Island by Arcticneft (Urals Energy).
• Small shuttle tankers are used to load larger vessels offshore Murmansk. Capacity could be significantly expanded if any of a number of planned pipelines are implemented from Timan-Pechora to ship larger volumes to USA . Current capacity of around 240,000 b/d is also limited by rail delivery capacity. Reloading of crude and condensate from Arkhangelsk also takes place.
• LUKoil constructed a new terminal at Varandei capable of handling tankers with a deadweight of up to 150,000 tonnes in 2008. The port has a capacity of 240,000 b/d .
• At Vitino (White Seal) , small shuttle tankers are used to transfer oil to Aframax at offshore loading points . NovaTEK launched the terminal in 2005 to export products from its Siberian gas condensate plant. In 2009, it exported 45,000 b/d, although there are plans to upgrade the facilities to allow bigger tankers to load there. There are no pipeline links to Vitino and oil is supplied by rail.

Source: Infield System