

# **The Future of Arctic Marine Navigation in mid-21<sup>st</sup> Century**

## **Interview Highlights**

**A Pre-Read for  
Scenario Creation Workshop Participants**

**Arctic Marine Shipping Assessment  
PAME**

**April 2007**

**Compiled by**

**GBN Global Business Network**  
a member of the Monitor Group

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## **Interview Introduction**

**Conducted by Global Business Network, April 2007**

This document highlights the main points from 14 interviews conducted with participants in the PAME/AMSA project on the Future of Arctic Marine Navigation. Some, but not all, of those interviewed will be present at our scenario creation workshop to be held on April 3<sup>rd</sup> through April 5<sup>th</sup>, 2007 in San Francisco, CA. The statements that follow are taken directly from the interviews, and we have kept, as much as possible, the voice of the interviewees. None of the statements are attributed, and all have been intentionally reviewed to protect the confidentiality of those interviewed by GBN.

The purpose of this document is one of provocative table-setting. It is not meant to be a complete representation of all the issues that could impact the Future of Arctic Marine Navigation. It is, however, meant to show the range and depth of areas that the interviewees see when thinking about the long-term future.

Through these interviews, we aimed to surface major issues, uncertainties, and general points-of-view about the future of the Arctic region, but also informed by global trends. One question supposed an oracle that can clearly see the future—“What three questions would you ask s/he/it about the future?” Another asked, “What are major uncertainties or disruptions that you see in the next 10-15 years?” We also asked, “What are issues might the Arctic community be under-prepared for?” In addition, we asked about trends which may grow in salience at regional, political, and cultural levels, as well as the differences in considering 2020 versus 2050 as timeframes.

The GBN team then reviewed the responses and analyzed the ideas, categorizing the important uncertainties according to the patterns that emerged from the interviews. Although there is some overlap in a few of the categories, and certainly inter-connection between many of them, they formed several areas of uncertainty: the ice and climate change, resource exploration and development, shipping and transportation, and international relations. Responses to other questions expressed a diversity of perspectives about the key framing of issues facing the Arctic community, the impact of global trends on the region, and the resulting implications for regional growth and development.

As you review the following pages in preparation for next week’s workshop, consider what strikes you about these responses: What’s covered well? *What would you add?*

## Uncertainties about...Arctic Sea Ice, Climate Change & Time

*When discussing uncertainties around Ice and Climate Change, interviewees responded with a range of issues. The nature, accuracy, and plausibility of ice models were one recurring theme. Based on those assumptions, the interviews touched on shipping, travel and resource development prospects from those projections. The discussions also included drivers and impacts of global climate change beyond the Arctic region, particularly their portents for increased attention on the Arctic region.*

### Arctic Sea Ice, Climate Change & Time – Changing Arctic Sea Ice

- How accurate are global climate change models? Which ones should we believe? No one disagrees about climate change, but it's more about the rate of climate change. The outcome 30-40 years down the road will define how Arctic shipping will develop. I think it will be very regional and not the Arctic as a whole.
- I think a number of the participants will be aware of the dispersion within the GCMs (global climate models). But I think they're important to have in your mind as you're talking about future impact. It could end up in the middle, or on either end of the spectrum. I think exploring these outcomes as a distinct uncertainty is important to see how the spread of predictions will influence things.
- I think the main thing I learned over the last 40 years is that you really have to be careful about extrapolations. It was in the early part of my career that we were worried about an Ice Age. Now we're worried about the opposite problem. But I leave it to the scientists to make the case for importance. Be thoughtful, take measured, cautious steps.
- What we don't know is what will happen that will be related to climate change, but also looking at the Arctic as an energy province. 25% of known reserves are in the Arctic. How convinced should we be?

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- What will be the long-term change in global climate for ice? Will we really see ice-free summers? Although, even if we did have guaranteed ice-free summers, I'm not sure ships would use the Arctic routes anyway. There are still lots of other issues to work through including: insurance, communication, infrastructure, and comfort with existing routes. Perhaps some ships would do it now and again, but not the same volumes that people would get excited about.
  - There are currently extreme changes in the Alaskan climate that seem to be connected to the ice. In the north of Alaska, the temperature is rising on the land (hotter summers, and an increasing number of fires). Research has pretty well established that the hotter summers on the land are related to the ice moving away.
  - What is the general annual sea ice cycle in 2050? Is the Arctic totally clearing out of ice in the summer time? Is there remnant multi-year ice all year-long? Is the Arctic Ocean freezing over in the winter time?
  - Even 20 years ago in the Russian Arctic up by the North Pole, the internal temperature of the ice was very close to its melting point.

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- By mid-century I believe we'll see at least 6 months of easy passage. Annual ice will be a piece of cake to break – just a meter deep.
  - The ice moving backwards will be steady. I see a fully open sea at mid-century or shortly afterwards.
  - I think we need a better understanding of ocean currents in the Arctic Ocean and how it impacts ice states. We know very little about the Arctic Ocean in general (mineralogy, ice, oceanography, etc.)

- I'm looking at ice conditions while I'm planning new itineraries in 2008. Looking at the charts, I'm seeing the sea ice disappear earlier. That means I need to go in earlier and go further north than I ever have. In the past 40-50 years of data, we've never seen so little ice as we have in the past 4 years.
- Current off-shore drilling is still relatively shallow (200ft is "deep" in the Arctic versus 10,000 in the Gulf of Mexico.) The primary concern, however, is the ice window which is defined by differences in water depths, distances from shore, and seasonal constraints.

## **Arctic Sea Ice, Climate Change & Time – Climate Change**

- Today, it's a new golden age for the Arctic due to climate change and more politically stable energy resources.
- Is the climate going to change? I believe that we will be able to change the effect that we are having on the climate.
- What about abrupt climate change? If the ice barrier would experience some sort of a reversal, then we might have to revisit the question about whether the Arctic Ocean is navigable.
- What is the impact of global warming? What is going to happen? Have we reached trigger points? Do we only have a few years before we reach an irreversible tipping point? Or will things re-adjust given the knowledge that things always eventually adjust.
- India and China are going to keep pumping out gasses in the near term.
- Related to climate change, I think we're not paying attention to how we'll adapt to it. What do you do with a warming Arctic? How do you deal with that? For example, if you're building new structures today, you probably don't want to build them near the shoreline.
- The level of shipping and global commerce is going to be correlated to the level of war, destruction and displacement of peoples – levels that could be substantial higher in the future. For example, if half of Bangladesh is underwater by that point, that will have a significant ripple effect around the world as its displaced population migrates to other places.
- A real wildcard would be if we collectively decided that reducing carbon emissions really was important and decided to do something about it. It would clearly change resource consumption and the long-term development of the energy industry.
- I think the bigger changes will happen in the second half of the century. People won't want to retrofit for sequestration right now.
- Climate change and increased accessibility will be the driving factor for energy development.

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- We should also consider how climate change will make the Arctic more accessible and the rate at which companies enter the area to look for oil there. One company sold off all their deepwater land in the Gulf of Mexico so they could focus their push in the Arctic.
  - I can see the impact of climate change in my own work. I compared the last decade to analysis I did in 1970. In 1970, summer was roughly 13 weeks. Today summer in the region is 17-18 weeks. The rate of ice loss within 30-40 years is frightening. It amazes me to think that in September the whole of Arctic Ocean could be open water.
  - I think many companies are attracted to the Arctic because of climate change. I think the whole concept of the Arctic without ice is very attractive to some investors, although I find it very frightening given the ramifications for species, climate, etc. The outcome is uncertain – perhaps better for some and bad for others. I don't think anyone can say that unpredictability and a shift in the world climate are good

things. But I think for the oil companies, it's difficult not to see climate change and a reduction in local ice as a selling point.

- We need to think about localized weather patterns in the region.
- Historically it would seem the last time the sea rose it was significantly warmer, and very similar to the ACIA models for the future. The interesting thing about it is that after the sea-levels were 10 meters higher, we went to the last glacial maximum and the sea was 300 feet lower than where it was today.

## **Arctic Sea Ice, Climate Change & Time – Towards the 2020 Timeframe**

- In my view, 2020 is so close that conditions in the Arctic won't be significantly different from what they are today. One of the points I've always focused on is that there is tremendous variability from one year to the next. If we're looking in 2020, I'm confident that there still will be lots of ice around, and we will see many years where some of the ice melts away and it's open shipping, but then we will get the occasional year where there is not melting. So I believe that ice would be generally less predictable.
- I don't see the world's carbon use changing significantly in the next 20 years.
- 2020 will be a litmus test as to whether we are heading in the direction we think are heading in relation to the ice. We will have years to see if climate change patterns will continue.
- Near-term 2020 will primarily have to do with all the activity that is on-going in Northwest Russia and Norway. A great deal of activity and investment is going on as we speak in those regions.
- For developing drilling projects, 20 year time frames can be handled, but beyond that it's too difficult. We generally work to 20-25 years based on field life. We generally work toward the life of the asset rather than standardized time-frames.
- I think in the next 10 years new concepts and research will be initiated and within 20 years we will have new initiatives. 2020 will be the period when many of the projects will be coming to fruition and transition from exploration to production. That transition will introduce a whole new level of infrastructure to the region. There will be a huge infusion of capital, resources, and people into the region. I think that will be difference if you're looking between 20 and 50 years. So in a certain sense the most amount of change will happen in the next 20 years rather than the next 50 years. The current explorations are 5-7 year projects with production projects taking 3-5 years after that. By 2015-2025 I think you'll see serious production and new facilities coming on-line.
- Industry is very myopic. When you talk 2020 and 2050, most companies will have different views. It's difficult enough for companies to look 5 years into the future. Even trying to predict markets for oil, gas, and minerals next year is difficult enough. However, industry can respond very quickly to market conditions. A ship can go from request for design to embarking from a shipyard in 2 years.
- Whatever action that needs to be taken to resolve these issues we've discussed, the sooner the better. That will establish the framework for dealing with subsequent issues in the next 40 years. Within the next 20 years, you need to put the policy mechanisms (regulatory, political, security) in place.
- I think the political and economic issues are the critical thing to develop in the next 10-20 years prior to feeling the impact of ice-free summer.

## **Uncertainties about...Resource Exploration and Development**

*Interviewees emphasized economic and business drivers when discussing resource development in the region. Whether manifested in exploratory drilling, new development projects, or cost benefit analysis vis-à-vis other regions, all Arctic projects must provide a marginal premium over other development opportunities. Beyond simple profits, however, the environmental impact of development in the region, and its influence on public opinion, reinforce the fundamental tenet that the Arctic is a unique region that demands preservation and protection.*

### **Resource Development – The Arctic**

- Any economic activity that occurs in the Arctic will ultimately be decided by the economics and not by people's excitement or hype.
- Oil companies are also fickle, they only go where it's easy, so the source of interest in the Arctic could also dissipate.
- Offshore oil exploration and development, more than shipping, will have a large impact on the Arctic, including considerations about the kind of shipping infrastructure you need to support major oil production activity.
- Ultimately when a good development location is found, it's usually found by a corporation that has invested a lot of money to find it. They usually run into the conflict with people who don't want it developed or want to be compensated more for allowing it to be developed.
- Russia, Alaska, and Canada are the big three countries to consider developing. The big oil and gas players need deep pockets to develop sites, so you need places where you can get good return.
- A 17 vessel fleet will be in the Beaufort Sea this summer. No one has seen this level of activity since they began building the Trans-Alaskan pipeline.
- The immediate alternative is natural gas, and given the concentration of natural gas in Canada, that transition could increase shipping in a significant manner.
- Oil & gas and mineral resources are among the biggest reasons to go into the Canadian Arctic. The resources today are well-known and mapped out (values etc.), but the ice conditions are such that it would require a very expensive fleet of vessels to bring the cargo out. In 2050, have ice conditions gotten thinner? Can you use a cheaper ship to get there? And as a result, have your shipping costs reduced to a point where the value of the minerals you're bringing out is more cost effective?
- I'd like to know about commodity prices going forward because the market for major base minerals and oil is what's going to drive shipping and exploration in the Canadian Arctic. It's not trans-shipping. It is really interesting especially with regard to gas. There is a lot of talk about pipelines for gas in Alaska and the Mackenzie Valley, among others. How should ships compete with pipelines?
- When the North Sea was developed, initially many people from the gulf region tried to apply the same technology and it was very challenging because the environment was so different. Innovation from that starting point was incremental. Now we've been drilling in the North Sea for 30 years, we can reapply that learning to the Arctic. There was a tremendous amount of work in the 1970s to develop the Beaufort Sea. Some of those folks are still around, and they are bringing those ideas out and dusting them off. What you'll see is a bunch of that work will be renewed and new things will also happen.
- Based on my back of the envelope calculation, the level of investment in new Arctic development projects equals about \$50 billion over the next ten years. All the major players are there – internationally. If they're not, they're watching the others to decide when to decide to jump on the bandwagon.

- We have the technology now to explore for oil just about anywhere in the Arctic. But in terms of putting a development rig out there, I don't think we have the requisite technology right now. However, I think it's conceivable in 30-40 years to have the whole region open to production.
- How can we cost-effectively explore in Arctic coastal areas? How to enable year-round drilling technically?
- How do we drill in deeper water? How can we drill faster and short periods of time?
- A lesson to learn from the 1970's is that we didn't need to plan for a decade before we acted. We didn't need everyone to build infrastructure ahead of time because things got designed and built relatively quickly. A brute strength approach can be used successfully.
- There is only one year-round truly off-shore production facility that is in 40 feet of water. The Russians have no year-round off-shore production, they have seasonal production. Right now off-shore year-round is more the exception than the norm. But by 2050 that will be more conventional.

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- What is the economic balance beyond "voyages of opportunity"? What factors will make the Arctic passage an attractive trade route?
  - Who would the potential users of Arctic energy resources be? Depends on the route. I think the first traffic we'll see will be for resource development. For instance, the north of Russia's gas and oil reserves are huge. Brockman and Bering Sea infrastructure development is huge. Similarly, in the Canadian Arctic there are iron ore mines in development. If you drew lines from the major Arctic development sites to the major markets what would that look like?
  - I don't have much time for those who say that the Northwest Passage will be navigable in a few years. However, with climate change progressing at the pace it is, I can't help but think we'll be seeing seasonal ice flows within the foreseeable future.
  - Operations will essentially be the same as now, but there will be more opportunity to do more transportation runs.
  - Will we see the kind of growth continue in the cruise industry generally that we've seen in the past decades? The cruise industry didn't really exist before the late 60's early 70's. This year 90 million people will take a cruise. Of those 90 million people, 90% will be American. For the last 20 years, the industry has grown at a rate of greater than 10% each year. They're basically running out of places to go now, and the Arctic is suitably "exotic."
  - If you look at the Cruise impact on the Alaskan economy, it has been huge – railway lines, lodges, seasonal employment, etc. It's a tremendous change for that area. It's the large ships that tend to drive those changes. There is currently talk about building a deep water port in the Arctic. If you have a deep water port then you have the potential for large cruise ships to go into the Arctic.

## **Resource Development – The World**

- Is there anything that has replaced oil in the world economy? A new energy sources might drive changes in global shipping.
- What is the world's energy infrastructure going to look like 30-40 years from now? If we are still totally committed to being an oil consuming society at that point, then that will have a major impact on the Arctic in terms of shipping and marine development. If we manage to wean ourselves off it, that could drastically shift the pressure away from the Arctic and take away the development pressures.

- If the Middle East stabilized I would see interest in the US and Canadian Arctic going to zero because it's too expensive. The Russians would continue, however, and they would continue to develop their resources and shipping out resources by water is the cheapest for them, relatively speaking.
- How will the economic development in Asia (China, India) impact global travel? There is a new money syndrome that people begin to see as the middle class develops. Initially it starts with 5-star resorts and people are not initially interested in going to see nature. I suspect that as the Chinese and Indian economies mature and evolve, however, there will be many people looking for new "scenic" travel experiences. How will these changes affect their society, will there be a middle class with time, money, and education to demand the sorts of trips that would lead them to the Arctic?
- If the Panama Canal gets shut down, it would be a catastrophic event. The world shipping community would find an alternative very quickly and the alternative would likely be north. If you made a \$200 billion investment today, you could double the capacity of the Panama Canal. If that sort of money was spent in the north, that sort of capacity would also be available today. However, without considering the catastrophic/terrorist implications, as a business person you'd invest in Panama because of the existing infrastructure and such.

## **Resource Development – Environmental Impact**

- The word pristine and the Arctic no longer go together, but sustainability still remains a cornerstone of Arctic policy.
- People see the Arctic as pristine, and they hold a higher standard to the protection concerns they want to impose. On the one hand everyone wants economic development, but on the other hand, they want to protect the environment. Ironically, even though they clamor for development, they often will not accept standards that would be easily acceptable in a developed part of the country.
- What is the impact of climate change on the wildlife of the Arctic? Right now we can tell people that we've never operated a cruise where we didn't see polar bears. If we couldn't assure people of that, it would affect our market. There have already been significant changes to the eco-systems in the region already, and it will remain to be seen how those impacts will bear out.
- I think when you've got a region like the Arctic where large marine eco-systems don't respect international boundaries (or shipping routes), that the best way to move forward is to do it internationally and regionally. That's what the IMO and the Law of the Sea accomplish. Large marine ecosystems are very difficult to manage, especially in isolation.
- As living marine resources migrate north and marine ecosystems change with the warming of the waters, the stewardship required to accommodate those changes (protection, commercial fishing regulations, etc.) will grow.

## Uncertainties about...Shipping and Transportation

*Interviewees expressed differing opinions about shipping and transportation prospects within, and across, the Arctic. While some believed that various regions would present viable transport options in the medium-to-long-term, others were critical of the large obstacles, both physical and structural, that challenge the development of highly trafficked trading routes. Of particular concern was the potential for accidents in the region, and the need for formal means of disseminating the expertise required to safely sail in the Arctic. Regulation and oversight also proved a contentious topic as many interviewees felt that it was either crucial to close gaps in existing maritime regulation with regard to the Arctic, or essential to draft regulations unique to the region. Technology, and the prospects for new and innovative means of ice-breaking and shipping, was also a frequently discussed topic.*

### Shipping – Routes and Development

- There is tremendous pressure to make the Arctic routes global trade routes. My colleagues are knowledgeable about the region, but not about the global shipping industry. It is critical to gain knowledge of the maritime community and integrate their views into the assessment. We need it for robustness and plausibility.
- I don't see Trans-Arctic shipping as a significant source of demand because the cost-benefit analysis of saving distance does not justify the expense to modify existing ships for ice worthiness. No one is going to accept the vicissitudes of the ice for just-in-time delivery.
- I think Arctic shipping routes will develop like the first air routes. You usually don't make just one long leg. In early times, when you wanted to go to California from the East, you would fly by segments and pick people up along the way.
- I don't see regular commercial traffic as routine at all. I have a hard time visualizing how the economics would work. For shippers, the way the economics have developed in global logistics, there is not slack in the system to accommodate ice-related delays. It messes up the economics of the entire system. With ice conditions reducing the big question is will there be a winter ice cover? If a significant ice cover still forms in the winter, it will still be an impediment to shipping – no one wants to build out infrastructure for only 6-months of the year. However if the oceanic flows were to change such that the Arctic ocean was ice free all year-round and open to navigation, it would change people's perspectives about investment in the North. But an Ice Free future is really pushing the boundaries and is a real outlier.
- When we came out with the original report, the board of Overseers of Panama Canal analyzed it to find out if their plans to widen the canal were robust or if Arctic will overtake them. They concluded that their timescale was 30 years and that they should go ahead.
- I believe ships would transit from Atlantic to Pacific on an opportunistic basis. Most likely in the form of special purpose voyages of 1-2 ships a month. I think the largest amount of shipping will be for extraction of minerals, oil, and natural gas. I could also see some minor increase in the supply of communities there because of activity. There could also very likely be an increase in shipping activity since fishermen generally follow the ice edge.
- There will be more ships in the Arctic Ocean (perhaps orders of magnitude in the next several decades – tankers around northwest Russia, cruise ships, off-shore development, etc.)
- I think what is more likely is that the Arctic shipping regime will become not unlike the Baltic Sea today – significant wintertime ice cover (6 months give or take a month) that will require the use of ice breakers to escort ships a portion of the route. Perhaps it might even be slightly worse than the Baltic. In the summer time, I think most of the ice will melt out. I think there will still be some multi-year ice that will be hanging around that presents a significant impediment to shipping.

- Even though the mileage is shorter, if you have to go slower (making only 4 or 5 knot), it may take you twice as long.
- I see Arctic shipping as more of a constant movement of ships over a discreet area. Think moving people, goods, and equipment back and forth – very localized marine activity. That stands in contrast to point to point transport, such as a Yokohama to Hamburg shipping route via the Arctic.
- The opening of ships to the North Pole is something I never would have imagined either. Every year, 2-3 ice breakers full of Russian tourists go to the pole.
- The Northern Sea Route in Russia is also likely to open up (more so than the Canadian Arctic), and if that happens it will significant shorten (by 4,000 miles) international transportation routes.
- The Northern Sea Route is a more likely candidate for shipping than the Northwest Passage. Why does everyone focus their attention on the Northwest Passage?
- Many shippers are not really all that excited about using the Northwest Passage as a marine route. The islands in the Canadian Archipelago have thicker ice and act as choke points in that area.
- This whole thing about the Northwest Passage has just generated so much hype that people are missing the science now. There is an expectation in the media that may not play out. I don't believe that commercial shipping is lined up to charge into the Northwest Passage at the first lead. They want more assurance. They need a 12-month-a-year system, not a one-month or three-month system. There's a need for infrastructure. The north is a destination, not a transit route. There are minerals there that people want; it's not about saving distances going from Europe to Asia.
- Many people believe that the region that stands to benefit from a dramatic shift is off the Russian coast. Within Canada, people talk about the Northwest Passage, although the changes in that region won't be dramatic enough to draw a stampede of ship-owners through there. I see the Northwest Passage pretty much being business as usual through that area. There are areas other areas such as the Russian Northern Sea Route, and the coast of Greenland that may change more dramatically.
- I think the obvious two countries that are interested, or have done some of this navigation already, are Russia and Canada. Russia already has extensive experience running along its coast. I don't see any explicit issues, but there could be. The Canadians are fiercely defensive of the inside passages within the islands. Those are regional issues, but if you cut either of those countries out, you can't circumnavigate the Arctic.
- Given ice recession factors under a moderate global emission scenario, it is highly plausible that there could be less ice. What is the plausibility of additional pipelines from Russia to Europe or across Eurasia? How would those pipelines affect the marine transportation system?
- There are arguments about whether or not pipelines are better than shipping. These are actually international issues because pipelines are multi-national in terms of routes.
- Take the northern part of Russia for example. They have an extensive program for development in the Arctic. They looked at the cheapest transport costs: pipelines over land versus shipping over water and I believe shipping won out in many places. In addition, there are some structural issues with pipelines as permafrost diminishes.

## **Shipping – Infrastructure and Support Services**

- What sort of infrastructure is available to support navigation in the Arctic? One of the big impediments to the Northwest Passage is that there aren't any facilities there. There are no docks, fuel depots, or infrastructure to support shipping. It's a big risk for commercial shipping.
- I think people aren't thinking enough about the environment and the isolation. It has all the same sorts of hazards for shipping in temperate waters compounded by the long duration of darkness and cold. In

addition, once you get far north communication is almost non-existent. Communication is something that today's ship rely upon. In the Arctic, satellite coverage gets spotty at 75 degree north latitude and at 82 degrees is practically non-existent. Furthermore, weather forecasts are spotty, and navigation charts are not nearly as available. This is not top-of-mind within the shipping community.

- Even if you had less sea-ice, it wouldn't make a difference in the short-term because it's still far away, dark, and cold and tough to get up there. Right now there is no good technology to drill in pack-ice, and if it was free of pack-ice, then you're dealing with deep-water drilling, which is not currently adaptable to Arctic conditions.
- There will be more ports and harbors in the Arctic, as well as related infrastructure.
- How do the Arctic states go about filling that infrastructure void (providing weather forecasts, navigation charts, etc.) to promote safety of navigation? When do you solve the chicken and egg scenario?
- I think we will actually need more ice breakers. This ice is going to sloshing all over the sea, because of the wind. It will take an ice breaker to get you through there, or less capable vessels will get locked in.
- As multi-year ice begins to break-up, it becomes more subject to wind, external forces, and conditions can change drastically. We will need to see that vessels can transit safely. We also need to define that if there was an incident, that there is sufficient response infrastructure. Right now it's not such an issue, but if development increases, it will be a significant issue.
- The problem facing the US in particular is that with all this increased activity in a harsher, distant environment it needs to set up infrastructure to assure adequate response time. It becomes very difficult, particularly if your ice-breaker fleet is in a state of decay.
- There will be some level of maritime accidents in the Arctic. From an intuitive basis, I believe it is a relative certainty there will be a spill in the region within the next 10 years. Given the 2004 data we have collected, the highest traffic in the ice-free waters will be in Norway. There is huge projected traffic growth in tankers from Russia.
- When something goes wrong where there is a gap, how do we deal with it? That is uncertainty. The risk of something happening up in the middle of the Arctic is different. We have a significant gap in emergency resources. The regulations and protocols are same all around the world, but a pump that will work in the Pacific will not work when you try to use it in the Arctic.
- There is some concern because the Canadian ice-breaker fleet is pretty much on its last legs, but a good cruise operator would plan to not require those services. If you plan on needing those services, you're usually in big trouble.
- Spill response and search and rescue are serious issues. There are currently no such services available. Especially in relation to spill response issues. The whole environmental and safety issue is really lagging behind. That's most likely because the industry people don't see it happening in the next ten years. What we heard in Cambridge was that if it's not happening in next ten years, then they won't worry about it.
- There is tremendous negative feeling for taking risks in the Arctic because we don't have highly evolved safety measures (etc. no established techniques for taking care of an oil spill), environmental clean up, and impacts on local ecosystems (whaling, etc.).
- My biggest fear is someone who got involved with Arctic shipping without knowing what they were doing – who then causes some disaster.

## Shipping – Regimes and Regulations

- What sort of regulatory regime would there be? Is it favorable to shipping? Who controls it? For example, the Russian sea route is currently under-utilized because there isn't a clear regulatory framework.
- The most important elements in considering the future of the Arctic involve government regulation. Infrastructure is not as important when you're looking farther out. Ultimately anyone who wants to do something will want infrastructure customized to what they want done. If you try to predict what people will need, most times it ends up being a white elephant and ends up being unused.
- I'm not sure we have thought enough about the gaps that are currently unaddressed with existing political and regulatory requirements. The middle of the North Pole, the middle of the Atlantic, and the middle of the Pacific are treated exactly the same. The question becomes: should they be treated the same? Should regions like the Arctic get extra protection?
- What if the Arctic states decide to go their own way and develop their own collective navigation policy, independent from IMO policy?
- It is relatively certain that some of the Arctic states will have some consistency of freedom of navigation.
- I'm not a big proponent of the Arctic treaty, even for only environmental protection. We have to resolve Article 76 of the Law of the Sea, and that will take 10 years at least. But it doesn't mean the Arctic states shouldn't proceed under the IMO as the umbrella organization taking the lead for what is already on-going.
- I think it's essential to initiate some sort of control to dictate the quality of the ships, navigation guidelines for national waters, control of crew quality, etc. I think Canada's Arctic Waters Pollution Prevention Act is a solid document in this arena and I think other Arctic states will copy that model. But that's perhaps 10-years away with loads of negotiation.
- The big problem is that the different Arctic states will all come up with different sets of rules. Ideally the states would come up with a set of harmonized polar rules for designing Arctic ships. I think the biggest hindrance would be different countries coming up with different sets of rules. Right now, if you want to design an Arctic ship there are 15 different sets of rules you could use. Similarly, some countries rules are extremely lax. In the US right now, if you can get insurance you can take any ship you want up in the Arctic.
- There also may be people who don't want to accelerate Arctic navigation as well.
- There is a great risk of oil & gas tankers coming out of Country A and coming past Country B, thereby increasing the Country B's risk of spills and environmental damage.
- Who controls the shipping and who decides under what conditions the shipping will occur? For example, if you have an oil spill in the Arctic, who enforces the regulations?
- Besides the general guidelines from the IMO, the only other thing is a voluntary set of guidelines developed by the IMO for shipping in ice-covered waters. There isn't an enormous amount of regulatory expertise for moving a ship through ice-covered waters.
- Another issue will be the training of ship personnel in Arctic navigation. The shipping community is often naïve about what the Arctic is like. There have been international efforts to adopt an Arctic code for operation. It works very well for machinery, but very poorly for training ships' crews. I know major shipping companies already have trouble crewing capable people as it is. When you introduce Arctic navigation training, it will become an even larger issue.
- There is an utter lack of unified safety and environmental standards mandatory for all ships. Development of those standards will be important going forward

## **Shipping – Technology**

- The capabilities of new ice-going cargo ships will be quite different than in the past. Whereas ships were formerly escorted by ice-breakers, today I think the Finnish are developing new nickel ships operating independently without ice breakers. Russian escorts only worked because they operated in a not-for-profit economy. I think the economics and the technology are going to drive it away from escort ice-breaking services.
- If the shipping technology improves sooner, we will have the same conditions we are thinking about for when the ice diminishes, but we wouldn't have to wait for the ice to melt.
- Will there be widespread nuclear propulsion for ships? Our biggest problem today is fuel supply and environmental emissions.
- R&D development for these technologies is generally driven by the resource potential of the location, so we allocate and develop as needed.
- I think generally speaking that the technology from 1967 to 1997 has not changed a great deal. Ship structures, for example. Then as now, you rely upon the massive ice breaker support, especially from Russia. Russia built out a huge ice breaker fleet. Given enough money, you could keep the North Sea route going all year. Ship design construction and economics all revolved around breakers. With more single year ice, as opposed to multi-year, combined with the new shipping tech like the Murmansk, you have a new paradigm: ships that do not have to rely on the ice breakers. But there will be very little change until that point.
- I think the technology of the new ice-breakers and what they are capable of is a significant game changer. I didn't imagine that ice-breakers could become that much more efficient with the new ways they could break the ice. The new ship technology from the Finnish ships is astounding.

## **Uncertainties about...International Relations**

*International relations were a central topic in all of the interviews. Whether discussing the relations between neighboring Arctic states, the needs and expectations of local indigenous populations, or the importance of uni-lateral or multi-lateral agreements, the urgent need for Arctic representation was always top of mind. As attention returns to the region, disputes over borders, jurisdictions, and rights will likely arise. At the same time, the voice and opinions of the numerous local communities will need to be incorporated in future plans. International treaties and governing bodies will be required to insure that intra-regional agreements are honored in the global arena. Finally, the Future of Russia will play a prominent role in future international relations, not only because of its wealth of natural resources and geographic position, but also because of the level of uncertainty that accompanies current (and many historic) Russian political regimes.*

### **International Relations – Within the Arctic Community**

- National oil companies are exercising greater and greater influence. They have an active seat at the table very early on and an active voice in every project decision.
- I'm not sure the maritime world is aware of the strength of conviction of the Arctic states to protect the region.
- The key issues are geopolitical. Both Russia and Canada believe in the "pie theory": that the boundary extends from their land all the way to the pole.
- You have little spats about borders now, but I can't see that growing into a major conflict. But if it turns into an oil rush then friends quickly become enemies if there are trillions at stake.
- Article 76 of the Law of the Sea is a big question. Claims of territory out beyond 200 nautical miles are big issues that require resolution. What is the US going to do? What are other countries going to do?
- The receding ice could also impact the security issues that come into place for domestic US security (esp. for the Coast Guard). For example, there are risks from increasing transport in the Arctic region, fishing and fishing enforcement, major homeland security implications, as well as jurisdictional disputes, etc. From that perspective there is a definite need for US presence in the Arctic.
- To put it in context, it's probably fair to say that the Arctic states that have resources are going to want to encourage shipping to realize the economic benefit of having those resources. However, the Arctic states that don't have the resources but are in the shipping path will have complaints. For example, Norway has an issue with Russian ships coming out of Russian fields due to increased potential for accidents. They bear the downside risk, but have no upside potential. Northern Scotland, Iceland, etc., who will be impacted by Arctic shipping without benefiting from it? They have very little legal recourse, but they can be persuasive. For example, the Norwegians recently lobbied to have the Russians move their shipping lines further off shore.

### **International Relations – Local Populations**

- Politically, territorial governments and the indigenous people should decide what they want from development. This is an industry that fundamentally encourages responsible and sustainable development because that is what people come to see.
- Culturally, there are issues in the north centering the region's indigenous people. For instance there are the Inuit in Canada and the Inupiat. They use sea ice as land transportation because it's smoother than

land. However as the ice begins to get thinner, and ships can go through using ice breakers, you get a clash of cultures with the people who want to use the ice as a road.

- If sea ice predictions are correct, it will also affect subsistence of people and species (Polar Bears, whales, walrus, etc.) as well. I believe right now the US is being sued in the UN or world court for loss of lifestyles by the ICC. It's an issue. It's a big issue. Oil and gas projects will either stop or be highly modified by local concerns.
- There will be socio-economic impacts of infrastructure build-out. Not only jobs and construction, but new social elements, health issues, etc., introduced into those communities.
- Another issue to consider is the social and economic condition of the inhabitants of the north (aboriginal and other). Any off-shore developments are highly visible and affect the subsistent lifestyle of the people in the area. This is true of not only the actual impact, but also the perception of impacts. It might even be right up there with inter-country political issues.
- Because of the work I do on the oil & gas regulation, I see how powerful the local constituency is. They have to be consulted or included. People can no longer simply do what they want to do in the Arctic. The people of the region are becoming a powerful lobbying force.
- As the ice retreats, the foundation of local indigenous culture—to hunt seals and whales—will evaporate.
- From the local perspective, the uncertainty is the political consultation process. The whale hunters are not against development. They simply don't want to abandon what they are doing. They want to make sure the development accommodates the routes that they need and access to pastures and lakes.
- People aren't paying enough attention to soft issues associated with developing the north – native issues, environmental issues. People know there are problems, but never quite realize how MUCH of a problem they can be.
- Full involvement of local peoples is important (not just government but down to the villagers). Continuing familiarity of local issues is important as well.
- For most of the last year, I've been doing missionary work with the indigenous people. I think it's a tough question to answer. They will have some moral sway over the states/corporations, and they have avenues of legal recourse, but for this issue we need to have engagement and cooperation. But I would say for regional navigation, etc. we have potential conflict of uses (whaling versus noise from ships, drilling, etc.). If a conflict arose, I could see (for example) Alaskan politicians bringing great pressure to bear in the event of such disruption.
- I'm not sure the residents/native groups are prepared for the rate of change that will occur. I'm not sure they will be able to adjust to the level of new development – not without a lot of stress. You're already seeing that in Alaska with the Beaufort Sea project. The local people haven't come to grips with what they say it will do to their culture.
- In a sense, if you look at the way the Canadian Arctic has gone, the political control of the region has filtered down to the native leaders over the last couple decades. That has happened through most of the Arctic states. But that is still a relatively immature system given the amount of experience these individuals have. They act like new governments in a way – just learning how our governmental systems operate. In many ways they are very sophisticated in the ways they approach things, but they are also still students in a certain way. Government contract negotiation could evolve in a novel way. They will view development, environmental issues, etc, very differently. They have a very different set of expectations in terms of values and profits.
- I think it's already expected by native populations that the benefits will come as a result of projects (schools, infrastructure, etc.). I think it's more a matter of a clash of cultures for the natives. The companies will always say the native demands will sink the project economically, but the native cultures

will always insist there is always more give. I don't think it will be the same as in Africa because the standards of living and unity are very different. They already have the new schools, etc. and it's more about how those projects fit itself into the cultural space.

- In the 25 years I've been doing this, the environment and the social concerns of the indigenous peoples have had a hard time stacking up against economic interest. Negotiating dynamics always tend to favor the money making side.
- The nature of multi-lateral negotiation is between countries, the Arctic Council is an experiment with it's permanent recognition of indigenous peoples. However these groups have no voting rights. They only have the ability to voice their dissent. The outcome is that things change by taking into account the opinions of non-voting parties. Changing that would rely on more national recognition and representation. I'm not naïve to the influence they would like to attain, but the fundamental tenet of multi-lateral negotiation is that it's between countries.
- Eco-tourism is also a big factor to consider. The cruise ships have come into the region a lot. In the last few years there have been at least a dozen cruise ships operating in the Canadian Arctic – 500-600 passengers. From a safety point of view it's a little scary.

## **International Relations – Policy and International Regulation**

- The Arctic is becoming more of a political football. There are a number of political marine conventions that, by extension, apply in the Arctic. At the end of the day for this project, can we identify the gaps in the international regimes that we may need to amend because of the potential for increased shipping in the Arctic? It's an issue some what ancillary to politics but can not be divorced from politics.
- Today, we have an international port and security protocol because of 9/11. It was put in place in a hurry and on the basis of political demand. The politics and the regulations are not far behind in these issues and they are tied into the global economy. The oil companies working in Sakhalin are pushing for an international standard setting organization because the Russians are constantly changing rules. This is all brought about by demand for energy.
- In a way you can say the Arctic is already influencing policy directions because of the resources in the Arctic which are driving claims for jurisdiction of the continental shelf. Russia has been very strong in submitting these claims. The US recently established a working group to quantify the data.
- 140 nations have ratified the Law of the Sea, but the US not among the signatories. Initially it was because the treaty was not meeting our concerns in the 1980's but those concerns were amended in the 1990's. It's important in an Arctic context is because the commission resolving jurisdictional disputes on the continental shelf is all under the Law of the Sea. If you didn't ratify the Law of the Sea, then you can't participate.
- I think the main thing that would impede development is the extended continental shelf issue. A country is less likely to enter into a multi-lateral agreement if the agreement calls into question that country's own jurisdiction. It's always "this is mine" until the interests shift to having multi-lateral negotiations. In Antarctica, 7 countries hold claims and wars began breaking out until the US stepped in as mediator.
- Most countries won't want to ruin their relationship with Russia. They think it's easier to negotiate bilaterally, no matter what the country is. Choices will tend to be made bilaterally, not multi-laterally.
- The US Congress doesn't really understand Arctic issues. The more powerful that the data can be, and the more plausible the scenarios, the better. The range of outcomes may not be all that wide.
- The US and Russian governments need to take this topic very seriously and they aren't. Russia is diverted by Putin and the US is diverted by Iraq. We need to bring some political influence to bear to get people to think strategically about it. Greenland, Finland, Canada, and Iceland have more serious interest and motivation.

- You need to begin by asking within national jurisdiction or beyond national jurisdiction. If it's intra-national you need to look at who would regulate what, and which government bureau would have jurisdiction. Similarly, internationally you would have a jurisdictional issue. I don't think there is a regime that covers in-depth development of deep-water resources.
- In a big oil war, Beaufort Sea oil and high-Arctic natural gas could be very valuable.

## **International Relations – The Future of Russia**

- Since the end of the cold war, Russians are our commercial partners. Oil is generally found in the continental margins and shelves, Russians controls 80-90% of the shelves.
- Russia is finding its feet through energy.
- Half of the Arctic is along the Russian federation. You have massive unrest and uncertainty in Russia. That plays a huge role in this. Can they invest in the infrastructure? What if the ice breaking becomes automated? Will they want to promote a shipping regime that doesn't rely on ice breakers?
- The northern sea route is a serious business. The expertise, Arctic navigation, nuclear ice-breakers, brought great opportunity for Russia, but challenges for other countries
- The Northern Sea Route Commission in Russia is a wildcard. We can't predict them. Putin doesn't have much influence over them. They are going to think about transit fees. This past summer, we had some coastal work planned for 5 or 6 years. Half if was going through Canadian Archipelago and half through Russia. The Russian authority that has the right to charge fees was asking for \$4mn, so we ended up not working on the shelf of Russia. Russia will see transit as a major economic opportunity and want to exploit it financially.
- In the Russian region, I am not sure the pullback of the ice will make much of a difference because they are working on a significant ice breaker fleet and ice-proof hulls. They are preparing to do this in the current conditions. They're not going to let a little sea ice stop them.
- Given their oil and gas supplies, will Russia continue to be a stable player? Having Russia as a stable LNG producer is important.
- Russian transport is difficult because of unpredictable fees and regulatory structure. Putin is reorganizing the shipping regulator and putting the ice-breakers under the command of the government through the northern sea route and west to Europe.
- Political uncertainty in the region will also be a big uncertainty. How will Russia deal with Arctic development? In the case of Sakhalin Island, I don't think they dealt with it cooperatively. How the Russians deal with oil exploration and development on their continental shelf will be a huge issue.
- I fear Russia will be very restrictive in the future, and that may become a major consideration. In fact, they may take it on themselves by imposing tariffs and restrictions, etc. If we truly get an ice free summer it might become less of a problem.
- The Russian indigenous people want to have a say in policy. That is politically difficult in the current environment. These groups don't have the same clout as the indigenous people in Alaska.
- They [the Russians] are squeezing out the private companies and making themselves a state-controlled entity again. They don't have shareholders who can tell them to do things. The Russian political situation is unknown—it could be seismic shift or gradual shift in attitude.
- But for resource development you need to have viable operations year-round – not just in the summer. You'll have transition zones, etc. IT will be worse for us rather than better. Whereas the Russians will have an easier time of it. I think there is a well established view that western and eastern Russia are currently being developed and will continue to be.