



Developing Arctic resources safely and responsibly

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Unanswered Questions

Meet Your Panel

Robert Blaauw

Lead for Shell's Global Arctic Theme

Since joining Shell in 1982, Robert has worked in roles in commercial and general management across the globe and in 2002 moved to Shell's headquarters. He now manages the operational, technical, social and environmental challenges specific to the Arctic Region and holds an MSc degree in Civil Engineering.



Ron Cochrane

Vice President Gas Russia, Caspian and CIS, Shell

Since joining Shell in 2001, Ron has occupied senior management positions in the UK, Netherlands and China. Prior to this he worked for Anglo American in England, South Africa and Australia. He has been in his current position, with responsibility across Russia and the CIS, since 2007.



Peter Slaiby

Vice President Alaska Exploration & Appraisal, Shell

Starting as a field engineer in his native USA, Pete's career has spanned over 30 years and taken him to Syria, Brunei, Europe and Brazil where he met his wife Rejani. In his current role, he manages Shell's exploration and production activities in Alaska, developing relationships across all stakeholders.



Peter Velez

Global Emergency Response Manager, Shell

As Incident Commander for Shell, Peter has responded to major incidents and threats from oil spills, hurricanes and security in countries across the Americas, Europe, Asia and Africa. He sits on many prestigious external committees, including the Board of Directors of the Marine Preservation Association.



Mitchell Winkler

Arctic Technology Lead, Shell

Mitch has been with Shell for 30 years and his Arctic engineering experience goes back to the 1980s where he had in a variety of design, construction, and R&D roles during Shell's initial Alaska Beaufort and Chukchi exploration campaigns.



Joanna Cochrane

Manager Sensitive Areas, Shell

Joanna joined Shell in 2001 following 15 years in consultancy working internationally in environment, social sustainability and international development. She now helps steer Group biodiversity and conservation policy, and create a network that connects subject matter expertise and shares good practice.



Peter Scott

Communications Manager, Shell

Peter is Anchorage based and joined the Alaskan Leadership team in 2010 as the Communications Manager, bringing 16 years of experience in the global energy industry. Prior to moving to this, Peter spent some years in Australia overseeing external affairs for Shell's downstream businesses in the country and developed Shell Australia's Greenhouse Gas Management team.



Smiotti

Q. Compared to developing alternative energy sources, are the costs of developing Arctic resources lower, or are the returns justifiably higher?

Phil Dyer

A. It is not a question of higher or lower costs, we need a mixture of all energy sources to meet growing energy demands. To keep pace, the world will need to invest heavily in all energy sources, from oil and natural gas to renewables and nuclear power. It will take a mixture of solutions to meet the energy demand and fossil fuels will continue to meet these energy needs for decades. Meeting that demand responsibly means developing resources from technically difficult reservoirs and challenging locations, such as the Arctic.

Oceana_nfourrier

Q. Drilling in the Arctic is surely a huge mistake, and a desperate move from an industry racing for profit. Instead of taking the immense risk of destroying a unique and fragile environment -crucial to global climate regulation- why is Shell not massively investing in renewable technologies? We all know that fossil fuel resources are limited, Shell should be leading the way to alternative sources. Future generations will surely appreciate

Phil Dyer

A. We will have to draw on many different sources of energy to meet our future needs. Shell is investing at least \$100 billion from 2011 to 2014 to develop new sources of oil and gas that the world will need. In 2010 we invested more than US\$1 billion in technology research and development - more than any other international oil company. We are producing more natural gas- the cleanest fossil fuel to bridge the gap between hydrocarbons and renewables. Shell is investing in alternative sources and was one of the first energy companies to invest in advanced biofuels that use non-food feedstocks and can offer lower Well to Wheel (WtW) CO2 production. At Shell we believe that in making our contribution, there is no time to waste. We are working on what we can do today to contribute to a sustainable energy future: producing more natural gas for power generation; focusing on sustainable biofuels; helping to develop carbon capture and storage technology; and making our own operations more energy efficient. Our advanced fuels and lubricants are helping our customers save energy.

hugocologic

Q. Hi again, Even if the US Geological Survey's estimates are correct and the Arctic does hold 90 billion barrels of oil, this would only provide three year's worth of global supply. Is risking the Arctic for a three-year hit acceptable? It would be better for a big company like Shell move on to the very profitable sector of Renewable energies like sun energy or windmills instead to put on risk the Arctic ocean and the whole north pole. Warren Buffet considers this sector like the best opportunity to invest nowadays. Thanks.

Phil Dyer

A. We answered this one several times.

Anders79

- Q. Shouldn't Shell explore renewables more, if they put more money and research into it, maybe we didn't need to destroy the Arctic. After all that is the energy and fuel of the future. An UN study has revealed that renewables can power the planet.

Phil Dyer

- A. The world has recognized the need to get to a sustainable energy system for the future. That transition is beginning, but it will take decades. Fossil fuels provide around 80% of the world's energy today and they are expected to remain the cornerstone of the global energy system for many years to come. Even with continued long-term government support, renewables and nuclear power may account for around a third of the global energy mix by mid-century. New technologies can take 30 years to achieve just 1% of the global market – wind power, for instance, is expected to achieve this point in the next few years.

donaaa

- Q. This morning R+D magazine reports that ice caps can recover if temperatures come back down. Environmental concerns will make this the goal. I presume Shell is going into the Arctic because warming temperatures seem to be opening sea lanes. Isn't your investment in this area in direct opposition to recovering from climate change if its not too late already. It will be harder to operate if the ice returns then it already is, will it not? Have you considered this economic risk? Why not invest entirely in fusion and solar and other alternatives which should be ready and able within 30 years and get into that business before the population reaches 9 billion, close to carrying capacity of the earth anyway.

Phil Dyer

- A. Tackling climate change remains urgent and requires action by governments, industry and consumers. The UN climate change conference in Cancun, Mexico, produced a more encouraging outcome than expected. But with so many countries involved, the process of addressing climate change through international agreements is inevitably slow. As stated above and in your question, it will take decades to get to a more sustainable energy system, it is a question of a mixture of solutions to meet the energy demand for now and the future. And Shell is making the contribution towards a more sustainable future- by working on what we can do today : producing more natural gas for power generation; focusing on sustainable biofuels; helping to develop carbon capture and storage technology; and making our own operations more energy efficient and through innovation and technology - helping our customers save energy as well.

Burdie

- Q. Why are you continuing to drill for oil when we have passed 'peak oil'? Why are you not investing in renewable energy? The only reason you can actually attempt to drill for oil in the Arctic Ocean is because climate change has made the ice so thin that it disappears during the summer months. All you are doing is contributing to more anthropogenic climate change.

Phil Dyer

- A. Please see other answers; we think we have answered your question.

JP Isham

- Q. Thanks to the panel for sharing this time and giving participants an opportunity to voice questions, concerns and to open up the dialogue on this subject. If a significant find is located and commercialized, what amount of the "find" profits will be allocated to the community and local people to enhance quality of life?

Phil Dyer

- A. It's extremely important to us to ensure local community support in our projects. We aim to be operating in areas for decades, and we have several examples where we have celebrated over 100 years of operations. We would not have been able to accomplish those achievements without the support of the local communities in which we work. Being part of a community means sharing a range of benefits with those around us. They include local jobs and training, contracts for goods and services, and the investments we make in community programmes. Whereas revenue sharing is a matter for State and Federal Governments we have publically supported revenue sharing for the local communities in Alaska for example.

radamson

- Q. The Inuit Circumpolar Conference has set forth their development policies that cover their territories comprising most of the Arctic. Can you explain what steps you have taken to provide assurance and compliance with the development terms and aspirations of the ICC? If the shell assessments address this please be specific in exactly how they address it.

Phil Dyer

- A. We believe that the ICC's declaration is commendable and have demonstrated in various projects and operations in the Arctic our adherence with such standards and principles- Developing the regions' resources will mean meeting and balancing economic, environmental and social challenges. More than 50 years of safely delivering projects in Alaska, Canada, Norway and Russia has given us valuable experience in how to work responsibly in Arctic and subarctic conditions. We work with indigenous peoples, governments, NGOs, industry bodies, universities and environmental organisations to share knowledge and improve our approach to working in the Arctic. For example, the relationships we have built with Inupiat, Inuit, Dene, Komi and other native peoples have enabled us to gather traditional ecological knowledge which has helped our projects and ensured communities have an input into how our operations are conducted. We can use this to operate responsibly and invest more effectively in community projects.

SP

- Q. A federal court recently found that BP was not liable to third parties for breaking a contractual promise to act prudently in its oil field operations. *Reese v. BP*, <http://www.ca9.uscourts.gov/datastore/opinions/2010210-35128.pdf> How then can Shell be held to its promises?

Peter Slaiby

- A. First point I would make is that the link did not work and that after consultation, we are unfamiliar with the case. Shell in Alaska is ready to stand behind any claims that it makes and in general can't sensibly comment on compliance of others.

Vickytizer

Q. Chevron's spill plan says that dispersants will be ineffective in the Arctic to help clean up a spill - do you agree with this assessment?

Phil Dyer

A. To put it simply, we don't. There is growing evidence from testing that dispersants can play a major role in Arctic oil spill response. Laboratory and field tests have demonstrated oil spilled in ice-covered waters is dispersible. We believe they are an essential element of the response toolkit. Recent field trials has shown that for chemical dispersion of oil, a larger window of opportunity for dispersant application exists due to slower weathering of oil, and dispersal remains effective in ice-covered water. A newly-developed spray unit enables new strategies for use of dispersants in high ice coverage (80-90%).

cleutwiler

Q. Hi Peter. Would you please clarify what you mean by "world class response tools" and how they differ from those used in the Gulf of Mexico during BP's oil disaster?

Phil Dyer

A. For our Alaska operations Shell will have pre-staged boats, booms, skimmers, helicopters, barges and other assets ready to begin oil recovery within an hour. Ice-capable vessels and equipment can be activated immediately and operate for extended periods in open water and broken-ice conditions to mechanically contain and recover spilled oil or eliminate oil using controlled burning. The assets are designed for use in Arctic conditions, with things like reinforced hulls, storage capacity to account for the remote location, and materials appropriate for cold temperatures. The main difference is that the assets have been chosen for their Arctic capabilities and are dedicated and on-site and ready to respond within an hour- this was not the case during the GOM incident.

Stromsnas

Q. Do you actually have a fleet of your own for the spill response or do you rely on contracting various government icebreakers? As far as I know there aren't all that many commercial vessels with the ice class Polar 10.

Phil Dyer

A. See above answer

charitat

Q. Which companies are the drilling contractors. Do they have exemplary safety records?

Phil Dyer

A. Shell operates a contractor safety management system that ensures a contractors safety record and performance is taken into account before any award and managed effectively throughout the contract.

Heini Mikkelsen

Q. Are there any plans for cooperation between oil companies in connection with stopping an oil leakage if it occurs in the arctic area?

Phil Dyer

A. When more oil and gas companies enter the area then there will be cooperation between them for response to any incident.

Kim – Greenpeace

Q. Dear Shell, before you start explaining how much care you take to prevent on oil spill, I would like to ask you why are doing this at all? The Arctic is one of planets last pristine natural areas. Why don't you leave it like that? And why don't you stop investing in oil, that brought our planet already so much misery and start investing in efficient transport and renewable energy sources? We want a clean future!

Phil Dyer

A. I think we have answered the question before.

Victor Luijtjes

Q. In order to prevent climate change and not going over the 2 degrees 80% of the remaining fossils should be left underground. Isn't it better to exploit the easier places and leave the rest?

Phil Dyer

A. Unfortunately the easy to find oil and gas is no more. To keep pace with growing energy demand the world will need to invest heavily in all energy sources, from oil and natural gas to renewables and nuclear power. New energy sources, like renewables, will grow. But it will take a long time before they will meet a significant portion of global energy demand. Meeting demand responsibly means developing resources from technically difficult reservoirs and challenging locations, such as the Arctic.

Green Tree

Q. In the last 30 years, the world economy burned 700 billion barrels of oil (not including the economies of Asia). Is Shell going to provide this for the next 30 years?

Phil Dyer

A. The argument for a more sustained energy mix is well founded and Shell is making the contribution towards a more sustainable future- by working on what we can do today: producing more natural gas for power generation; focusing on sustainable biofuels; helping to develop carbon capture and storage technology; and making our own operations more energy efficient. It is not reasonable to hold Shell accountable for the world's energy needs.

Julie

Q. Is there any ecosystem which Shell would consider too fragile to explore for oil in? Bearing in mind that there has not been an exploited region where oil spill have not occurred at some time during oil extraction processes.

Phil Dyer

A. There are instances where Shell has made a decision not to explore. For example, we have agreed not to explore for, or develop, oil or gas in natural or mixed World Heritage Sites. We were the first and currently the only energy company to make this commitment. Considering potential effects on biodiversity has long been part of the environmental, social and health impact assessments we carry out for new major projects or expansions to existing operations. We were the first energy company to adopt standards for how we work in areas rich in biodiversity.

jonathan snell

Q. The decision of if, and when, it would be appropriate to develop Alaska OCS oil resources has enough complicated technical and value-based elements, that it seems appropriate to consider the big picture via use of metaphor. Please describe the rationale for exploitation of Arctic liquid hydrocarbon resources in the context of U.S. former president George W. Bush's acknowledgement that, "We have an addiction to oil."

Phil Dyer

A. I think our previous answers have covered this question

Green Tree

Q. The energy demand is increasing. We all agree, but is it worth it the investment (low temperature equipment etc.). Is it not better to invest in more renewable and sustainable energy to make it more efficient?

Phil Dyer

A. I think our previous answers have covered this question

Erika

Q. To preface, I am not bashing Shell Corp., but you need not print this. Are you, Shell, attempting to convince this forum that you are NOT the longterm cause of global warming (ex: iceberg meltings), negatively affected ecosystems, and negatively affected indigenous human cultures, with your equipment, after glancing at any arctic drilling map?

Phil Dyer

A. The purpose of the Forum was to expand the debate on Arctic development and inform Shell on views and concerns. We think it is recognized that the long term cause of global warming (or climate change) is global energy demand and increase in CO2 emissions, its not down to the oil and gas companies themselves. It is the energy companies that are seeking solutions- and Shell is working on what we can do today to contribute to a sustainable energy future: producing more natural gas for power generation; focusing on sustainable biofuels; helping to develop carbon capture and storage technology; and making our own

operations more energy efficient. Our advanced fuels and lubricants are helping our customers save energy.

Ian Nicolson

Q. A lot of the discussion is around oil spills etc. what are the plans to contain drilling wastes on surface?

Phil Dyer

A. For our Alaska operations we will have specific plans in place depending on the sensitivity of the area we are working in. In the Beaufort Sea for example after extensive consultations with native hunters, we decided the best way forward was to recognize their specific concerns for the Beaufort Sea and agreed to zero discharge of drilling fluids, cuttings after the 20 inch casing, and treated sanitary, gray, ballast and bilge water.

Oceana_nfournier

Q. Hi, what is the % of Shell spending (against turnover [Q4_2010 US\$ 368.056 billion]) exclusively allocated to R&D prevention systems? Thank you.

Phil Dyer

A. In 2010 we invested more than US\$1 billion in technology research and development - more than any other international oil company.

Andrei

Q. Is it comparable, the cost of drilling in very deep waters and in the Arctic?

Phil Dyer

A. Both entail technical, physical and environmental challenges and are in that way comparable.

john

Q. Hi. Are you planning to explore in US, Canadian waters or both?

Phil Dyer

A. Our present plans are for US offshore waters, our Canadian Offshore work remains on hold.

Skytruthamos

Q. Peter - that's a total resource estimate for the Arctic, which as you know is highly misleading. It's only useful to talk about technically recoverable resources - and more to the point, economically recoverable resources under a realistic range of price scenarios. So - what is the economically recoverable resource base for the US Arctic under current prices?

Phil Dyer

A. It's correct to say that finding large Arctic oil and natural gas deposits is difficult and expensive; developing them as commercially profitable ventures is even more challenging. Economic studies involving onshore Alaska North Slope project development costs invoke a capital cost factor ranging from 1.5 to 2.0 relative to similar oil and natural gas projects

undertaken in Texas. The high cost of doing business in the Arctic means that only the world's largest oil companies, most likely as partners in joint venture projects, have the financial, technical, and managerial strength to accomplish the costly, long-lead-time projects dictated by Arctic conditions. In short we believe that economically recoverable resources are attainable at a variety of oil price scenarios. Obviously if the oil price drops significantly then these scenarios would be adjusted. We believe we have economically recoverable reserves in both the Beaufort and Chukchi Seas.

Green Tree

Q. What is the calculated quantity in gallons that Shell expects from this exploration? What is Shell aiming for?

Phil Dyer

A. The current estimate for the Beaufort Sea is 400,000 barrels/day at maximum flow.

MKU

Q. What is your current footprint and planned footprint of exploration in the Arctic?

Phil Dyer

A. We have proposed exploration drilling for Alaska for 2013 with 2 drilling rigs, for Greenland we are carrying our limited seismic operations for the next few years. Future footprint is subject to success in finding commercial quantities of hydrocarbons.

Charitat

Q. Which prospect will be the most difficult to drill and complete wells? The Chukchi Sea or the Beaufort Sea? Has Shell planned accordingly by contracting different class of drilling rigs?

Mitchell Winkler

A. Shell has carried out extensive subsurface studies, well planning, and ice and metocean data gathering in support of our Alaska drilling operations. A risk assessment is done for each drilling location and location specific mitigating controls developed that will allow us to operate in safe manner. The drilling rigs will be using have been carefully selected considering both the environmental operating conditions and drilling conditions.

nicomouss

Q. You stated earlier that "the region can be safely developed with respect for the environment". Could you explain what do you mean by "developed"?

Phil Dyer

A. When we say developed we mean explore and develop resources in commercial quantities for production.

martymlink

Q. I see that this month you were granted conditional approval to drill four wells in the Beaufort Sea - how long do you estimate it will take to gain the additional approvals you require? When could you start drilling in this area? Also what do you see at the key

opportunities for innovation in arctic drilling - technology, logistics (supply chain), infrastructure or something else?

Phil Dyer

A. We are hoping for certainty on our drilling programme for 2012 by October of this year. Some of the permits we will need will be after this date however. We hope to start exploratory drilling by July 2012 in Alaska. Addressing the physical challenge of the Arctic has been the focus of considerable work. But, this is no longer sufficient by itself. Creating a strong license to operate and encouraging greater stakeholder involvement presents a huge, and expanding, technology opportunity. "Expanded Dimensions" in technology development and deployment are now critical for addressing stakeholder concerns, community imperatives and other non-technical challenges with the same kind of rigor we've always applied to traditional drilling and development issues. On top of the extensive science program in place, we are also actively developing specific Arctic-related technologies in our company and in Joint Industry Projects to address these combined technical and non-technical operating challenges.

These include:

- Improving the safety of operating in ice and extending capability to harsher conditions.
- Reducing our operating footprint and impacts.
- Advancing oil spill response capability in ice.

Blaker

Q. I understand that final signatures of approval have been given last week for upcoming Arctic drilling. What is the anticipated time scale for this to happen?

Phil Dyer

A. See above.

Sergio

Q. Hello, another question. There has been any proposal to transport the oil from Alaska to the refineries by an oil pipeline? I don't know if that is currently done. Thank you.

Phil Dyer

A. There will be an export route from both the Beaufort and the Chukchi Sea. The export route has not been decided yet, but the preference is for a pipeline.

SP

Q. In follow up to your response to my previous question: You said that Shell "will only employ equipment capable of working in these conditions" [North Sea and Arctic conditions] but there is an uncontrolled leak that is a week old in the North Sea. Something is not working in those conditions. Why shouldn't we look to the North Sea as an example of Shell's inability to successfully respond to a spill as we consider whether to let the company explore in the Arctic?

Phil Dyer

A. The response to the spill in the North Sea was in alignment and agreement with the authorities. There was dispersant standing by for use should it have been needed. The agencies involved decided that natural dispersion due to weather conditions was sufficient.

The spill was monitored at all times. The spill was under control. The well is shut in, the affected part of the flowline is physically shut off from the well, the flowline is depressurised and the relief valve has now been closed from which the residual oil in the line was seeping. Now there will be a phase of monitoring the carrier line to check that it remains sealed.

Note too, that dispersants "on stand by" meant that these materials were actually on the standby vessel permanently in the field. Other stocks of dispersant and equipment on shore permanently on standby were mobilized to be to the right airports and ports for the most rapid deployment to the field should they have been needed.

hugocologic

Q. About the last incident that Shell had involved, your company has received a lot of criticism for its lack of openness in dealing with the recent North Sea spill. Why should people believe anything it says about being prepared to deal with an accident in the Arctic? Thanks.

Phil Dyer

A. On Wednesday 10 August, the UK Department of Energy and Climate Change (DECC) was notified within 4 hours that a leak had been discovered, along with other relevant regulatory bodies. We have been providing daily updates to the media, through a dedicated website which includes background information, photos, videos and explanations of what we are doing.

We remain confident that our exploration activities in Alaska planned for 2012 have an unprecedented level of preparation for prevention of any oil spill incident. The application of a multi-layered well control system is designed to minimise risks and the chance of any spill, so if any one system or device fails it should not lead to a well control incident.

cleutwiler

Q. Do you really think it's appropriate to avoid questions on the North Sea spill during this chat? How is the incident and lack of response irrelevant to Arctic drilling?

Phil Dyer

A. We believe we did not avoid answering questions about the North Sea- we directed all enquiries to the extensive information we had on our web-site . We answered the specific question and then moved on as we wanted to concentrate on our Arctic development. We believe we have been transparent with regular updates given to the media and information broadcast on our dedicated website.

Jennifer

Q. I'd like to ask...The 218 tonne,(700 more tonnes expected to be leaked) oil spill here in Aberdeen, Scotland was from Shell's 20 year old pipeline which passed inspection last October. Shell are blaming the "inspection programme". How can Shell ensure there will be no leaks from the Arctic pipeline when the inspection procedures they have in place failed with the Aberdeen pipeline?

Phil Dyer

A. There is currently an investigation ongoing as to the cause of the oil leak in the North Sea. We are in an exploration phase in Alaska and Greenland, pipelines will not be in place for

decades and when they are installed, they will be buried several meters below the seabed to ensure no impact from ice scour and other marine activities – such as fishing. They will be designed to National, Regional and Local regulations, and Industry codes and standards that exist to specifically address Arctic Pipeline Design. Additionally for Alaska, Federal regulations require liquid pipeline systems to have Computational Pipeline Monitoring (CPM) leak detection, which provides a process and training to operators enabling them to detect differences in the input and output of pipelines to identify leaks.

Roberta

Q. Reports from Scotland this week are that you withheld information from the public for nearly three days about your oil spill in the North Sea, and that you believe the oil will naturally disperse through wave action. Why did you withhold this information? What conditions exist in that region that led you to decide to leave the oil in the water rather than attempting to clean it up? Do you believe spilled oil only causes damage when it hits the coast? If not, what is your rationale for not taking action to clean up the oil and minimize damage?

Phil Dyer

A. The response to the incident was in line and agreement with the agencies involved. For this type of light oil, the response is treatment with dispersants, which were on standby on location throughout. The deployment of dispersant was not considered necessary by the agencies involved. We had a stand-by vessel plus two other vessels on site with dispersants and specialised oil spill response equipment. We also had on standby further oil spill response equipment and materials to fly from Southampton. The sea, wind and other weather conditions, currents and the fact we had almost completely halted the leak was providing effective dispersal and evaporation of the sheen.

BenAyliffe

Q. Shell has received a lot of criticism for its lack of openness in dealing with the recent North Sea spill. Why should people believe anything it says about being prepared to deal with an accident in the Arctic?

Phil Dyer

A. On Wednesday 10 August, the UK Department of Energy and Climate Change (DECC) was notified within 4 hours that a leak had been discovered, along with other relevant regulatory bodies.

skytruthamos

Q. Shell has reported spilling 67,000 gallons so far in the North Sea, with 185,000 gallons remaining in a single failed gathering line. How would you detect such a leak, and effectively clean it up, if a failure like this happened in the Arctic in the dead of winter, under a thick sheet of pack ice?

Phil Dyer

A. Due to the conditions in the Arctic pipelines will be buried several meters below the seabed to ensure no impact from ice scour and other marine activities – such as fishing. They will be designed to National, Regional and Local regulations, and Industry codes and standards that

exist to specifically address Arctic Pipeline Design. Additionally for Alaska, Federal regulations require liquid pipeline systems to have Computational Pipeline Monitoring (CPM) leak detection, which provides a process and training to operators enabling them to detect differences in the input and output of pipelines to identify leaks.

BenAyliffe

Q. You say you have extensive experience in the Arctic and top safety systems to minimise risk. Presumably you have similar systems in place in the North Sea, yet for whatever reason they weren't followed and we are now witnessing the worst spill in the UK for a decade. Despite on paper having very impressive sounding multi-layered safety systems for Alaska, your previous track record suggests that they may not even be adhered to if things go wrong. Is this a fair assessment?

Phil Dyer

A. The investigation into the Gannet Oil spill is still ongoing so we cannot speculate on what happened yet or what was the cause of the incident. It will be the subject of a full investigation by Shell and separately by the Health & Safety Executive (HSE) and DECC with other government agencies involved in the response providing input. We carry out a risk-based inspection programme on all our flowlines and pipelines. This allows us to inspect lines on a frequency appropriate to each individual line. The relevant part of this line was last inspected in October 2010.

Rob

Q. Do your Disaster and Oil Spill Contingency Plans take into account a Tsunami? As you probably know the last big Tsunami in Japan did also damaged the Antarctica area. How can you proof that there will be no oil Spill in such scenario?

Phil Dyer

A. Our emergency plans and procedures do take into account the worst case scenarios for weather conditions- including earthquakes.

Liangweiq

Q. I am working in a oilfield specialty chemical company. Do you have any suggestions to the chemical industry on how we can participate and contribute to the subject?

Phil Dyer

A. We would suggest contacting Shell directly through http://www.shell.com/home/content/products_services/solutions_for_businesses/chemicals/

Ian Nicolson

Q. Is it possible to discuss our environmental solutions offline with the Team?

Phil Dyer

A. Of course, please contact phil.dyer@shell.com to arrange any further dialogue

Project & Risk Management Professional

Q. What about is happen other new Exxon Valdez or Prestige, but this time in the middle of the Arctic? How can you response at this possibility? Most of the oil in the planet is carried away for flags of convenience ships, in a very bad state and with illegal crews.

Phil Dyer

A. We are in the exploration phases at the moment that does not include export options- our next phase will be appraisal to see if there are commercial prospects. Export, should it happen is likely to be through pipeline route as that is the preferred option. There are also strict regulations in the US and elsewhere for tankers and we are confident that these will ensure the utmost integrity of the vessels should this option be considered.

Tina@Myelin

Q. What are Shell's plans to equip the Arctic operation with qualified individuals?

Phil Dyer

A. We have standards in place at the moment that deal with certification and competency of all Shell and contract staff working on our installations and support vessels.

LaurensKuiper

Q. Working in the Arctic is also intense for the platform staff. How does Shell plan to deal with this? (For example, development towards unmanned platforms etc.?)

Phil Dyer

A. You are correct, additional stresses are imposed on platform crews in Arctic conditions and this is a big part of our research and development when considering offshore structures for the Arctic. We are actively developing specific Arctic-related technologies in our company and in Joint Industry Projects to address combined technical and non-technical operating challenges such as this. These include improving the safety of operating in ice and extending capability to harsher conditions. Although not a solution for all situations, subsea development can be developed.

JBB123

Q. Has Shell asked any government or regulator to relax safety laws at any time? Or expressed a desire to have them relaxed?

Phil Dyer

A. Ongoing consultation and dialogue with Governments is important to develop performance standards that meet the objectives of operating safely. There is ongoing discussion on safety regulations, but this does not mean we advocate relaxing safety standards.

nickargus

Q. Hi, Shell seems to have a few environmental problems coming together at the moment -- Nigerian lawsuits and the North Sea spill -- what have you learnt from past problems, such as the Brent Spar fiasco, about how to handle negative public perceptions of the oil industry?

Phil Dyer

- A. After Brent Spar, Shell underwent a root and branch review of our communications procedures including public relations and a lot was changed. However, we are constantly learning and trying to improve what we do. There are times when we get it wrong and we ensure we learn from those mistakes.

Julie

- Q. At what economic level does a potential solution to a risk situation become not cost effective? Should extra provision be allocated for safety costs when working in such a challenging environment as the Arctic?

Phil Dyer

- A. We work to reduce the risks of any operation to as low as reasonably practicable. With the Arctic there are unique challenges and risks, we recognize these and build our systems, procedures and hardware to reduce the risk accordingly. However, you are right, this is a risk and reward business if the return on investment is not favourable then decisions are taken not to proceed with any development.

Sergio

- Q. Hello, the O & G industry supports environmental efforts actively in other countries rather than in North America. Why not to commit seriously by being part of the Clean Air Act and Clean water act, and bring to the industry the most clever people to work with risk analysis of this new projects?

Phil Dyer

- A. Shell and Oil and Gas Companies have and continue to commit significant amounts of time and resources toward understanding baseline environmental conditions in Alaska and the US. In the last several decades, the frequency and intensity of these studies has increased in response to concerns related to climate change and efforts to understand potential effects of energy development. Such research funding initiatives as SBI (NSF), RUSALCA (NOAA), OCSEAP and COMIDA (BOEMRE), and Industry Joint Studies Programs have generated large amounts of data on physical oceanography, acoustics, and most tropic groups on both intensive local and broad area scales. We can provide more information if you would like to contact us directly.

Rossjo

- Q. Peter Scott. If the estimated reserves are 400 billion barrels. Is risking the Arctic for a 12 year extension of global supply acceptable?

Phil Dyer

- A. We disagree that resource development of the Arctic is "risking the Arctic". It has to be remembered that extensive oil and gas activity has occurred in the Arctic, with much oil and gas produced and much remaining to be produced. To date Arctic operations have produced some 40 billion barrels of oil and 1,100 trillion cubic feet of gas. Currently, the Arctic produces about 10% of the world's oil and 25% of its gas, altogether some 8 million barrel of oil equivalent per day, of which the majority is produced in the Russian Arctic onshore. The Arctic, like any unique area has to be developed responsibly and we recognise that our license to operate depends on our commitment to to operating safely and with a respect for communities and the environment.

evedarwood

- Q. The US government claimed that there is a one-in-five chance of a spill of more than 1,000 barrels over the lifetime of just one drilling block in the Beaufort Sea. Does Shell think this is an acceptable risk, given the pristine nature of the Alaskan environment?

Phil Dyer

- A. While the figure is based on the estimated resource and a time period for development, it is not based on the history of safe operations in the Arctic. In total, more than 500 exploratory, production, and disposal wells have been drilled in the Arctic waters of Alaska, Canada, Norway, and Russia. More than 150 wells have been drilled offshore in Arctic waters of the US and Canada and more than 50 wells have been drilled in the US Beaufort and Chukchi Seas. Shell has drilled 33 wells in Alaska, 32 of which were offshore. During these 40 years of offshore operations, there has never been an oil spill caused by a well blowout in state or federal waters in the Alaskan and Canadian Arctic. However, we are not complacent and we have used our extensive global wells and offshore experience to create one of the most comprehensive spill prevention and control plans ever developed for an exploration program. It starts with state of the art methods and then is tailored specifically for Arctic conditions based on a thorough investigation of what works and what doesn't.

Mr. P.

- Q. I have a question regarding the safety culture of working in the Arctic. In light of the often repeated industry accusations that Shells safety culture is inadequate and that systemic management failure is key to this (e.g. the '05 explosion in the Netherlands where two contractors died and management admitted to 'systematic faults', or the forced shutdown of the Brent Charlie platform after an employee tragically died June this year) I wonder how you can guarantee that this lack of real safety culture will not take place in your Arctic operations where errors caused by collective blindness can have serious effects to the surrounding environment. How do you plan the safety culture in Shell.

Phil Dyer

- A. Our safety performance is critically important – not only to the safety of our staff, but to the environment and our surrounding neighbours. Our approach to operating in the Arctic is no different and has never been. Even before the blowout at Macondo last April, we had planned for a low probability, high impact event. We can, do and will raise the bar on safety in the Arctic and our operational and safety performance proves it. In 2010 for instance, there were no recordable incidents in our Alaska operations, adding to more than 1100 days without a lost time incident.

hugocologic

- Q. As well, I'd like to say that Shell has claimed it has a fully functioning, state-of-the-art oil spill response system in place for Alaska. Could the company confirm that these plans have been tested successfully during the Arctic autumn and winter months? Thanks.

Peter Velez

- A. Shell has secured oil spill response equipment that is capable of responding to spills during our exploratory drilling season which is mid-July to end of October. This equipment can also

operate beyond October as it is positioned on ice classed vessels and we have ice management vessels as part of our fleet. There have been many large scale tests going back decades on recovery of oil in ice in the autumn and winter months in the Arctic and through this research and development the Industry has developed the equipment to respond in Arctic conditions.

Lynn Calder

Q. As we know, leaks and spills can happen not just during drilling. How does your oil spill response plan address a leak from a well or pipeline under operating conditions in the depth of winter when the sea is ice-covered?

Phil Dyer

A. The oil spill response plan does not address this scenario as it covers the exploration activities only. Pipeline construction is over 10 years away should we be successful. The oil spill response plan will address this scenario and will be scrutinised by the authorities and local communities when it is in place. For our joint operations in Sakhalin there is an extensive oil spill response plan in place which deals with such a scenario and this can be found on www.sakhalinenergy.com.

Rossjo

Q. Firstly: Who is responsible for the Non Shell operated Ecological science data gathering (offshore and onshore)? Who are the advisors in the coastal villages of North Slope? Secondly: Shell have no response if a spill continues into November or when the ice freezes over and would simply leave the spill till next spring when the ice thaws. Is this A: Acceptable and B: Is there simply nothing that Shell could develop to work under the ice in these conditions?

Phil Dyer

A. There are many organizations apart from Shell involved in research funding initiatives such as SBI (NSF), RUSALCA (NOAA), OCSEAP and COMIDA (BOEMRE), and Industry Joint Studies Programs all of whom have generated large amounts of data on physical oceanography, acoustics, and most tropic groups on both intensive local and broad area scales. Our ecological studies include consulting and including traditional hunters from the coastal communities to ensure they are robust. The answers to the spill in November we believe have been covered elsewhere.

nickargus

Q. I've understood that drilling will only take place up to the end of October, but what if a major leak was to continue from then into the months of winter?

Phil Dyer

A. That is correct. However our equipment can also operate beyond October as it is positioned on ice classed vessels and we have ice management vessels as part of our fleet.

Tim Woody

Q. Mr. Cochrane describes summer conditions in the Arctic Ocean as "generally benign." Could you give a brief description of the weather and sea conditions you expect to encounter over the course of a week in the Beaufort Sea in mid-October?

Phil Dyer

A. This varies of course but generally temperatures are around freezing or lower, low clouds, ne wind 15 - 18, 3 - 4 ft waves with slight seas with ice forming. We constantly monitor weather conditions and to augment forecasting services and build Metocean knowledge, Shell has deployed meteorological buoys that report data via satellite and seafloor wave and current sensors in areas of marine operations. 2011 will see an expansion of the program with at least 3 met buoys and we have deployed a network of weather stations along the Chukchi and Beaufort coasts in 2008.

BenAyliffe

Q. Peter, many thanks for your response re the spill response system, but I'm not sure you answered the question I posed. I understand that you have equipment in place, but can you confirm that they have been tested successfully, on a large scale, during the Arctic autumn and winter months?

Phil Dyer

A. This has been answered above.

Burdie

Q. I would like to respond if I may to the response from Peter Velez when he said that your oil spill contingency plan for the Alaska exploratory wells is available from BOEMRE website. Alaska is not the same as the Arctic Ocean. One is land the other is ocean that is covered with ice for over half of the year. I really do hope that you are not just using the same spill response you used on land for a spill in the Arctic Ocean. Please tell me you do realise the difference between land and sea and you have factored this into any oil spill contingency plan.

Phil Dyer

A. The oil spill response plan is for our offshore operations in the Beaufort and Chukchi seas- this is site specific and is not a spill response plan used on land.

lizvandenzen

Q. In this video of the last spill response test in sea ice conditions off the North Slope an official can be heard calling the test a failure. MMS stated there is no technology available to clean up a spill in Arctic Ocean conditions. The Canadian govt. recently reported it would be "impossible 1 day out of 5." How can you prove that you will be able to recover 95% of oil spilled? How would this impact walrus, polar bear, beluga and bowhead whales?

Phil Dyer

A. We can't comment on the video mentioned in the question as we are not aware of which one is being referred to. There have been decades of research and field tests, the most recent large scale tests were conducted in 2009 in Arctic conditions. During a number of controlled spills, several cleanup techniques, including collection of the oil with skimmers, burning of oil surrounded by fireproof booms and oil released in the field (in-situ burning),

as well as dispersion of the oil in broken ice by use of chemical dispersants, were tested. The laboratory and field tests demonstrated that ice can act as a natural boom and reduce further spreading of the released oil. Availability of different response options is the key to a successful oil spill response operation. The findings revealed that oil spill contingency in Arctic and ice covered waters should be based on a complete toolbox including all available techniques. Laboratory and field experiments showed that in-situ burning can be an effective response method for removing oil in ice, with a burn-efficiency above 90% and also that dispersion of oil can be an effective response method to clean up oil in ice. We are aware of the Canadian Government report. It has to be remembered that conditions in the Canadian Beaufort are significantly different than further west in the Camden Bay region. Break-up occurs earlier, freeze-up occurs earlier and ice concentration in between is much higher. Currents are stronger, water is much deeper (affecting surface water temperature) and due to the land-mass weather is also different. Bottom line is although the name of the Sea is the same, conditions are far different, and cannot be compared one-for-one.

SP

Q. In yesterday's Washington Post by Steven Mufson reported that, " a Canadian government study found that bad weather would prevent any spill response one out of five days in June, the mildest month, and two out of three days in October, the end of the open-water season." Why do you think that the Kulluk ship and the small boats and booms you have stocked to respond to spill will not be impacted by these weather interruptions? In addition can you explain why any containment dome and ship-based storage of spilled oil would not be impeded (or prevented outright) by the 20 foot swells common to the area.

Peter Velez

A. The Canadian Study answer is above.

evedarwood

Q. Is it not the case that these claims have not yet satisfied these rigorous review processes, and that in fact BOEMRE has requested that Shell document how it would respond to the "potential presence of sea ice" during its containment efforts?

Peter Velez

A. BOEMRE is still in the process of completing their review of the Beaufort Sea Oil Spill Contingency Plan. The plan submitted is very comprehensive and addresses all scenarios that can be encountered and it meets the requirements of the regulations regarding its contents. Shell will address any comments and questions that BOEMRE has regarding the plan based on their review.

Petercoville

Q. Oil spill clean ups in icebound conditions have never occurred. Surely you couldn't possibly get everything right first-time and significant risks are therefore involved? How are these evaluated and weighed in decisions to operate in the Arctic?

Phil Dyer

A. Shell has worked with Alaskan Native communities, government agencies, and industry to ensure our plans and designs are appropriate for the conditions in the Arctic. We have augmented robust oil spill prevention systems, created an unprecedented oil spill

prevention and response plan, and put in place environmental protections and arrangements with local communities that go beyond what is required to minimize impacts and ensure safety. Equipment has been tested in similar conditions to those expected and we also helped lead the SINTEF JIP completed in 2010. As a reminder, our exploratory drilling season is from mid-July to the end of October that coincides with the open water season. Our planning and safety measures meet or exceed regulatory requirements for operating in the Arctic. Shell would not consider moving ahead with anything less.

Rossjo

Q. Peter Velez, 'Shell's dedicated oil spill response equipment is located within an hour of the drilling location and is fully staffed to respond to any spill in less than one hour.' How many staff? How many vessels? Are you saying, one standby vessel throughout the drilling season even into October? Please can you explain what 'the dedicated response equipment' would be at the end of October in freezing sea ice and in the typical thick fog? I've looked through your documents, but it's good for all to try and move away from rhetoric and be more specific about specific scenarios. Thank you.

Phil Dyer

A. Of course we welcome the opportunity to be more specific on our response fleet and resources. Shell will have pre-staged boats, booms, skimmers, helicopters, barges and other assets ready to begin oil recovery within an hour. Ice-capable vessels and equipment can be activated immediately and operate for extended periods in open water and broken-ice conditions to mechanically contain and recover spilled oil or eliminate oil using controlled burning. The assets are designed for use in Arctic conditions, with things like reinforced hulls, storage capacity to account for the remote location, and materials appropriate for cold temperatures. Examples of selected Arctic capable equipment include the following:

- The Nanuq is a 300-foot purpose-built ice class oil skimmer with 15,000 barrels storage capacity;
- An ice-strengthened Arctic tanker is staged onsite for oil recovery, with 513,000 barrels storage capacity;
- Ice management vessels;
- High-volume-throughput skimmers, boom and small vessels. Shell will have pre-staged additional oil spill response vessels between the drilling rig and the Alaskan coast in the event any oil is not fully contained by the on-site assets. This includes a purpose-built, ice-reinforced processing barge for use with the containment dome to process recovered oil and gas directly from the wellhead. If any oil does move close to the shore, Shell will employ aircraft and wind/current models to predict where the oil could potentially make landfall. In the event landfall is likely, Shell will have pre-staged trained personnel, oil containment booms, boats and skimmers to intercept the oil before it reaches the coastline.

Cholley

A. Peter, Thanks for your answer regarding oil spill cleanup. It however doesn't get to the real issue that even without ice, it is considered a successful cleanup if you recover 5-10% of the oil spilled. Are you saying that Shell can do better than that? Also, the SINTEF Oil in Ice Project was in controlled conditions and illustrated the problems with mechanical skimmers in ice becoming clogged and there were various other issues that cannot be addressed in the limited character count.

Phil Dyer

- A. The effectiveness of options in the spill response toolkit under Arctic conditions has been tested, including three years of field trials conducted by the Joint Industry Program (JIP) on Oil Spill Contingency for Arctic and Ice Covered Waters as you quite rightly point out. Challenges associated with remoteness, low temperatures, seasonal darkness, and the presence of ice were studied.

Matthias Beer

- Q. Regarding Peter Velez' response on dealing with worst case spill scenarios: Could you outline what the current technology gaps are for dealing effectively with a large spill under sea ice conditions? Is there are worst case scenario when response techniques (skimming, in situ burning, dispersants, etc.) become ineffective to the point where operations would need to be abandoned until the next open water season. If that is the case, has Shell conducted impact assessments for oil that needs to be left untreated in sea ice over winter. What are the risks/responses to such a scenario. Thank you.

Peter Velez

- A. Shell will be drilling exploratory wells from mid-July to end of October during the open water season. We have done work regarding response options throughout the year as part of the SINTEF JIP, the new OGP JIP for Oil Spill Response in Ice, and other projects that are underway by Shell and the industry. For example even in ice conditions, tools such as mechanical equipment, in-situ burn and dispersants can be effective by using different tactics such as cutting an opening in the ice or working in between ice floes.

Bharat

- Q. The effectiveness of spill response countermeasures are reduced in Arctic conditions. What information does Shell have to offer that would demonstrate that its proposed response actions would be effective, particularly in the onerous Arctic offshore conditions?

Phil Dyer

- A. In developing our response actions we have worked with Alaskan Native communities, government agencies, and industry to ensure our plans and designs are appropriate for the conditions in the Arctic. We have augmented robust oil spill prevention systems, created an unprecedented oil spill prevention and response plan, and put in place environmental protections and arrangements with local communities that go beyond what is required to minimize impacts and ensure safety. Our planning and safety measures meet or exceed regulatory requirements for operating in the Arctic. As a reminder, our exploratory well drilling season runs from mid-July to end of October which is also the open water season. The spill response equipment that we selected is very capable to operate in that timeframe and beyond if needed.

Project & Risk Management Professional

- Q. We have seen and witnessed the severity of Oil spills in swampy and coastal areas (from the Gulf of Mexico to Ogoniland in the Niger Delta of Nigeria), wherein clean up is daunting, despite occurring in land, calm seas and ice-free conditions. What is the confidence level for effective response strategies in the very challenging geography, weather and sensitive ecosystem presented by the Arctic region?

Phil Dyer

A. See above

Aditya

Q. What according to is the biggest unsolved challenge in cleaning up a spill in the arctic?

Mitchell Winkler

A. As discussed earlier in this forum Shell believes that we have the necessary tools in the tool kit to respond to an oil spill in the Arctic. This has been confirmed via the regulatory approval process that our Alaska operations have been subject. Nevertheless, we do see opportunity to advance existing capability such that the respective tools can be applied over a greater range of environmental conditions.

ManLu

Q. Hello, my questions are related for the first phase in the arctic, meaning field development and then later to maintain them (i.e. IMR activities). How do you feel about the technical/operation development/progress made when it comes to subsea operation?. Given that the main link to operate underwater in the arctic and under quickly changing weather conditions are underwater robots, how do you assess the level of precision and the relative low speed they are operated? What is Shell doing to progress in this area or what improvements you are focussing?

Mitchell Winkler

A. Subsea development is a potentially very attractive solution for the Arctic, but would need to be considered in light of the site specific operating conditions. A challenge for Arctic subsea as you note is Inspection, Maintenance, and Repair (IMR) given the challenge in access during the ice season. The use of robots is just one solution for providing IMR during the periods that access from marine vessels is difficult. The tasks asked of the robot remain to be optimized. Inspection could also be performed using fixed optical or acoustic sensors, fiber optics, etc... Nonetheless, process safety equipment and controls would be designed for automatic / remote accusation, designed to be fail-closed, and or contain redundancy.

Mark Burnett

Q. A report commissioned by the WWF International Arctic Programme that was published in 2008, "Oil Spill Response Challenges in Arctic Waters," found that Arctic marine conditions and lack of proven technology contribute to an oil spill "response gap" that effectively limits the ability to clean up after an oil spill. Does Shell believe there are existing technologies that are field-proven and market-ready to safely develop offshore oil in the Arctic at this time?

Phil Dyer

A. Yes we do. Shell has used its extensive global offshore experience to create one of the most comprehensive spill prevention and control plans ever developed for an exploration program. It starts with state of the art methods and then is tailored specifically for Arctic conditions based on a thorough investigation of what works and what doesn't?

Charitat

Q. Are all of the exploratory drill holes directional? How does Shell plan to conduct VSP surveys of these well bores in harsh Arctic conditions? Will Shell use ocean bottom hydrophones for these surveys?

Mitchell Winkler

A. Your question pertains to operational details some of which will depend upon drilling outcomes and cannot be answered with certainty at this time.

JP Isham

Q. Are there new technologies and opportunities to commercialize them based on the Arctic Exploration? If there are new technologies which have surfaced from this type of arctic exploration, could you share the success and failures of those technologies and what potential impact they would have on energy exploration.

Mitchell Winkler

A. Your question can best be answered by taking the challenges of the Arctic, ice, footprint and oil spill response in order. Solutions needed to respond the specialized challenged of operating in ice have little applicability outside of the Arctic and therefore commercialization opportunities are nil. In the case of footprint, however, solutions driven by the Arctic operating environment and push for unmanned operations and reduced environmental emissions do have opportunity for implementation elsewhere into he business. An example here might be the use of unmanned aircraft for remote monitoring. Likewise in the case of oil spill response the Arctic is a catalyst for new product development and testing; and this equipment will have broader applicability. In terms of energy exploration, the Arctic is largely conventional oil and gas in an unconventional environment, so not so much of a breeding ground for enhanced exploration techniques.

JP Isham

Q. How safe are the technologies (like SAR) you are using to locate oil and then to determine the safeness of the potential well? Do these technologies have an impact on the wildlife or arctic ecosystems - my concern stems from the U.S. Naval testing of Sonar in 2003 which killed an abundance of sea faring creatures and impacted the seas ecosystem.#

Mitchell Winkler

A. To answer the first part of your question SAR, or Synthetic Aperture Radar, is a remote sensing technique uniquely suited to the Arctic because of its ability to see through clouds and darkness. As discussed earlier in this forum, SAR imagery is oft used to develop ice charts - that are then used to support operational decision making - and keep operations safe. Marine sound, moving to the second part of your question, is of concern and something that we actively work to understand and mitigate. For our seismic operations we rely on sound source tests to understand the profile of the emitted sound and marine mammal observers, to verify that marine mammals in the area are outside agreed limits to avoid harmful impacts.

Charitat

Q. How will Shell handle and contain formation fluids (oil, gas, saltwater) that are generated at extremely high pressures during well testing and completions?

Peter Slaiby

- A. This question is a bit beyond what we are proposing to do in our near-term exploration program, where we do not have flow tests planned. Further, although pressure and temperatures will be higher than ambient they will not be in the region that industry normally defines as high. We will comply with EPA discharge requirements as defined in our NPDES permit.

ggood2

- Q. One of my concepts about drilling in an environmentally sensitive area is to use a slant drilling method where a single shaft can be used to send drills in multiple directions. Is this consistent with your procedures?

Peter Slaiby

- A. We do not have definite plans for all of our exploration wells. Those ten (10) that we have submitted however are very simple vertical wells that will be permanently abandoned after they are drilled and evaluated. Should we have exploration and appraisal commercial success, directional wells will clearly be employed in a development concept.

Bharat

- Q. The reply to BenAyliffe, the response states "ice management vessels are classed as Polar Class 10". What is the interpretation of this type of vessel, and which vessel(s) meet these requirements?

Phil Dyer

- A. DNV Polar class 10' or equivalent, this is the Class Notation which aligns with our requirements to operate up to the end November. Both the Nordica and Fennica are this Class.