

OUT IN THE COLD: INVESTOR RISK IN SHELL'S ARCTIC EXPLORATION



An aerial photograph showing a vast expanse of fragmented sea ice. The ice consists of numerous large, flat, white floes of varying sizes, interspersed with smaller, more irregular ice chunks. The dark blue water of the sea is visible between the ice floes, creating a complex, textured pattern. The overall scene is a high-angle view of a cold, icy environment.

'Oil spill risks, high extraction costs, doubts over the amount of commercially recoverable reserves, and a precedent of cost overruns and delays combine to raise questions about the commercial viability of some proposed Arctic projects.'

Introduction

International oil companies (IOCs) are facing a dual threat from both the end of easily accessible oil from conventional sources, and the rise of resource sovereignty in the Middle East, Russia and Latin America, whereby governments are increasingly asserting control over the natural resources located in their territories. This is driving the IOCs to ever more extreme forms of oil and gas extraction, from Canada's tar sands to ultra-deepwater sites, to the Arctic and other ice-covered waters¹.

The Arctic Ocean is the last frontier for the IOCs, with rapid reductions in ice cover (due to climate change from the combustion of fossil fuels) making the exploitation of newly discovered offshore resources possible, at least theoretically. The region's resources are estimated at 22% of the world's undiscovered oil, according to the latest US Geological Survey (USGS) estimates,¹ although commercially recoverable reserves may be much smaller (see Section 1).

In the aftermath of the Deepwater Horizon disaster in the Gulf of Mexico, the potential environmental and financial impact of an oil spill in the Arctic has received much scrutiny, although to date IOCs admit they have not calculated the financial impact of a worst-case scenario.²

Apart from oil spill risks, high extraction costs, doubts over the amount of commercially recoverable reserves,

and a precedent of cost overruns and delays combine to raise questions about the commercial viability of some proposed Arctic projects.

Accordingly, it is necessary to analyse specific projects and specific territories to understand the precise risks of Arctic projects for a particular company. In Russia, for example, political risk and a lack of transparency should be of concern to IOCs and their shareholders. This report therefore, firstly, examines the risks that are generally applicable to offshore Arctic extraction projects (as separate from onshore operations, as offshore work involves different technological challenges and is subject to different regulatory regimes). Secondly, we assess the environmental, safety, political, funding and other risks associated with particular offshore Arctic-conditions projects for a specific oil company, in this case Royal Dutch Shell ('Shell'). Shell's Russian (Section 4) and Alaskan (Section 3) offshore operations are used as case studies to illustrate the spectrum of risks.

This report focuses on Royal Dutch Shell's operations as its proposed drilling programme in Alaska this year is seen to lead the charge into Arctic waters for major IOCs.

Finally, we propose questions that shareholders should ask of Shell to clarify how such risks are being mitigated and managed.

i. The Arctic region is conventionally understood as land and ocean north of the Arctic Circle (currently 66° 33' 44" north) and includes the following countries and/or their waters: Greenland (autonomous province of Denmark), Iceland, Norway, Sweden (no Arctic Ocean access), Finland (no Arctic Ocean access), Russia, the US (Alaska) and Canada. For the purposes of discussing oil extraction, it makes sense also to talk of 'Arctic conditions', that is, waters where ice cover demands specialised technological solutions. The waters off Sakhalin Island, discussed in Section 4, are an example of an Arctic-conditions province south of the Arctic Circle.

Executive summary

Arctic offshore exploration is a priority for Shell: its Alaskan project alone accounted for about one-seventh of Shell's total exploration spending in 2011 (see Section 3), while further lease purchases were made in Greenland and Canada in 2010-11, and negotiations continued for a strategic Arctic partnership with Russian state-controlled major Gazprom. More bidding is expected soon for concessions in Arctic Norway, Greenland and the US.

This push for reserves is due in part to the decline in Shell's production over the last 10 years (with the exception of a 5% rise in 2010). Sakhalin-2, Shell's first Arctic-conditions offshore extraction project, decided upon around the time of Shell's reserves scandal, has a history of cost overruns and delays that sets a worrying precedent for investment decisions made during periods when Shell feels pressure to book new reserves (see Section 4).

International oil companies (IOCs) face pressure from investors to achieve a positive reserves replacement ratio (RRR), which measures the amount of proven reserves added to a company's reserve base during the year relative to the oil and gas extracted.³ It is important, however, that investors and IOCs appropriately balance any focus on their RRR with the potential financial impact of the short- and long-term risks inherent in any project.

ARCTIC OIL AND GAS PROJECTS – THE RISKS FOR SHELL AND ITS SHAREHOLDERS

High costs

High extraction costs raise questions about the feasibility of Arctic extraction projects in the medium-term, with one analyst noting that *"development costs will be at*

*the high side of the industry range" and "development times are likely to disappoint".*⁴ Shell has previously experienced significant cost overruns at its Sakhalin-2 project, where estimated costs rose from \$10bn to \$22bn in one go (see Section 4).

Dependence on favourable political conditions

Because of the high costs, securing significant tax breaks or subsidies will be a necessary precondition for the commercial viability of Arctic extraction projects, particularly gas. Bernstein Research notes that *"fiscal takes will be crucial to make any Arctic developments viable".*⁵ This reliance on favourable political decision-making presents particular challenges for projects in Russia. In 2006, following an intervention by the Putin administration, Shell lost its majority stake in the project to Gazprom. It may be a risky strategy for IOCs to rely on fiscal subsidies from governments to offset high extraction costs.

Inadequate oil spill response plans

The US government's Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) estimated a one in five chance of a major spill occurring over the lifetime of activity in just one block of leases in the Beaufort Sea.⁶

Current technology is ill equipped to deal adequately with a large oil spill in Arctic waters. Limited accessibility due to storms, ice cover and lack of daylight will mean oil companies will not have the long months that were available to those tackling the Deepwater Horizon disaster to determine solutions to any catastrophic spill. Industry-funded research has confirmed that the usual techniques of controlling a spill (such as containment

devices and dispersants) are of questionable efficacy in icy waters (see Section 3).

No analysis has been published quantifying the specific oil spill response impediments in Shell's US lease areas in the Chukchi and Beaufort seas. A study of the Canadian Beaufort Sea by WWF,⁷ however, found that it would not be possible to respond to an oil spill for seven to eight months of the year. Even during the most favourable weather conditions (July-August), a response near the shore would only be possible 44-46% of the time, assuming the necessary infrastructure and workforce were readily available. Without such an analysis it is not possible to accurately assess the risk posed to Shell by an oil spill in its Arctic operations.

Shell recently admitted to the Commons Environmental Audit Committee that it had not assessed the potential cost of a worst-case spill in the US Arctic. Peter Velez, head of Shell's emergency response operations in Alaska, confirmed that the company had put no price tag on clean-up operations, saying the chance of a well control problem was *"very, very small".*⁸ The Deepwater Horizon disaster serves as a stark warning of the high financial and environmental impacts of 'low probability' events.

Lack of transparency in Russian operations

The Sakhalin-2 project (where Shell reportedly has effective operational control, with a 27.5% stake) has neither disclosed equivalent oil spill response plans, nor important financial information. The Russian government has begun receiving revenues from Sakhalin-2,⁹ which under the contract terms should happen once all of the investors' costs have been recovered. Yet at the time of ceding the controlling stake to Gazprom, Shell and

its partners reportedly agreed to absorb \$3.6bn of the cost overrun.¹⁰ It appears that Shell has yet to make any disclosure regarding the issue of cost recovery, which highlights the risk of a lack of transparency regarding Shell's Russian projects.

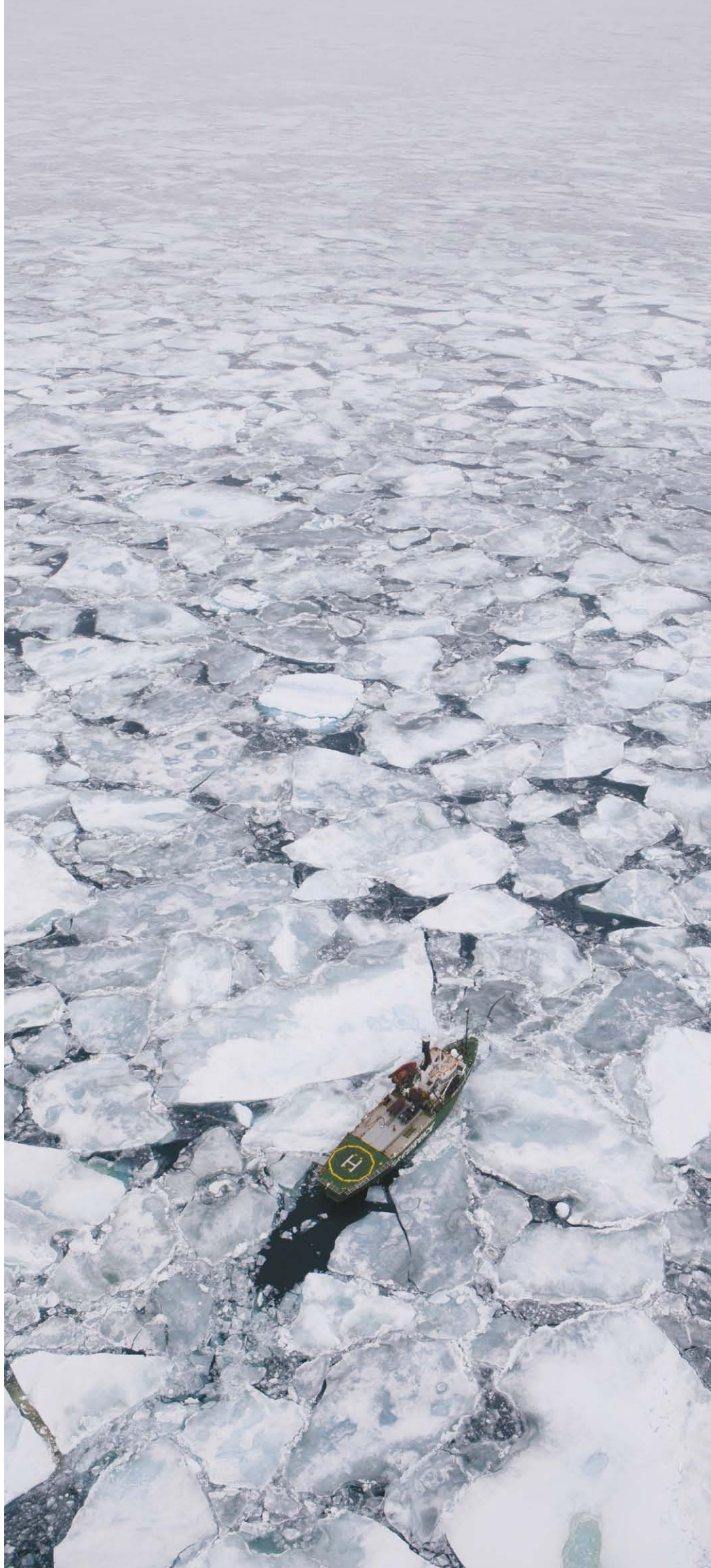
Exposure to poor safety and environmental practices of partners

Shell and Gazprom signed a 'protocol for strategic global cooperation' in 2010. The potential operational involvement of Gazprom or its subsidiaries in Shell's Arctic projects and, particularly, a potential share swap between the companies should be of concern to investors, owing to Gazprom's poor safety, environmental and transparency record. In December 2011, Gazflot, a subsidiary of Gazprom, continued drilling outside of the approved season¹¹ and without carrying out all necessary assessments.¹² The rig in question sank, killing 53 of its 67 crew.¹³

Project funding challenges

The social and environmental responsibility guidelines of international financial institutions (IFIs) and signatories to the Equator Principles – the voluntary set of standards for assessing and managing social and environmental risk – have proven to be a barrier to companies securing project funding for frontier extraction projects.

For example, in 2003-2006 Sakhalin-2 failed to obtain funding from the European Bank for Reconstruction and Development (EBRD) because of serious breaches of EBRD's environmental and sustainability guidelines.¹⁴ The project's current lenders (including BNP Paribas, Credit Suisse and Standard Chartered) are facing public pressure to refuse funding for an additional drilling platform at Sakhalin-2.¹⁵



1. The high cost of Arctic oil and gas

Confronted by the end of easily accessible oil from conventional sources and the simultaneous rise of resource sovereignty in the Middle East, Russia and Latin America, International Oil Companies (IOCs) have sought to maintain their profits by pursuing ever more extreme sources of oil in provinces such as the Arctic, the tar sands in Alberta, and ultra-deepwater sites in Brazil.¹⁶

The swift reduction in ice cover that has attended the onset of climate change has now opened up the theoretical possibility of exploiting newly discovered offshore resources. The US Geological Survey (USGS) estimates the region's resources at 22% of the world's undiscovered oil, or 90 billion barrels of oil, and 1,670 trillion cubic feet of gas,¹⁷ although the price of extraction is not taken into account in these figures.

But any such extraction will be heavily dependent on a variety of market, technical and environmental factors. Extremely harsh climatic conditions, long distances and high technological demands mean extraction costs are likely to be very high. The key requirements are sustained high demand, and the resulting high oil price, as well as ongoing political stability in the region. Neither of these conditions is permanent – and, in fact, high prices can suppress demand.¹⁸ But IOC strategy at the board and management levels appears to assume that these market conditions are in fact permanent. For comparison on oil price, an analysis by McKinsey quoted by the Office of Tony Blair report, *'Technology for a Low Carbon Future'*, estimates that a sustained oil price of \$120 per barrel reduced the incremental cost of additional investment in decarbonisation, and, as a result, alternatives to fossil fuels would become more attractive.¹⁹

High extraction costs challenge the feasibility of Arctic extraction projects in the medium-term. Furthermore, commercially

recoverable reserves may not be as bountiful as the oft-quoted USGS figure suggests, and the feasibility of particular extraction projects will depend to a significant extent on political will and available tax breaks, as well as the oil/gas ratio.

Overestimated recoverable reserves?

The results of an unpublished USGS review of the reserves of the East Greenland Rift Basin, obtained by Der Spiegel,²⁰ show that commercially recoverable hydrocarbon reserves in the Arctic are likely to be far less than the purely technical estimates suggest.

The estimate for reserves in this region suggested a yield of 7.5 billion barrels of oil equivalent. According to the USGS findings, however, the amount of oil that can actually be extracted at an exploitation cost of \$100 per barrel is only 2.5 billion barrels, with a 50% probability. That is, the oil produced would need to sell at significantly higher than \$100 a barrel, allowing for transport costs and tax. Even at a more unlikely exploitation cost of \$300 per barrel, only 4.1 billion barrels could be extracted at 50% probability.²¹

No comparable estimates are available for the areas of Shell's established interest (Chukchi Sea, Beaufort Sea, West Greenland). Their depth, ice and weather conditions differ from the East Greenland Rift Basin so the exact correspondence of resources to commercially recoverable reserves will be different, but the USGS data serves as a reminder of the possible discrepancy between these values.

Cost overruns and delays

Bernstein Research excludes any Arctic oil and gas production from its supply predictions for the next decade, noting that *"development costs will be at the high side of the industry range"* and *"development times are likely to disappoint"*.²²

Shtokman, one of Russia's flagship Arctic extraction projects, is a case in point. It is one of the world's largest gas fields (with 138 trillion cubic feet of gas and around 505 million barrels of gas condensate),²³ located in the Barents Sea, and currently operated by a consortium of Gazprom, Total and Statoil. Since its discovery in 1988, the planned start of commercial drilling has been delayed many times. At the formation of the operating consortium in October 2009, the final investment decision had been expected before the end of that year.²⁴ Most recently it was expected in December 2011 and then March 2012,²⁵ but instead a further delay until July 2012 was announced, with analysts citing the lack of tax breaks as a significant factor.²⁶ In the course of this difficult history, cost estimates for the project have shot up, from \$6bn in 1994 to \$20bn in 2007 to around \$40bn in 2011, according to Bernstein Research.²⁷

Gas less commercially attractive than oil

Due to both market conditions and the high costs of transportation, gas fields are likely to be more difficult to make profitable than oil. According to Andrew Latham, vice-president of energy consulting at Wood Mackenzie, *"remote gas is often much harder to transport to markets. In addition, export and technology constraints are expected to delay production of a large portion of [Arctic] commercial gas until 2050."*²⁸

Wood MacKenzie and Fugro Robertson's 2006 assessment of Arctic hydrocarbon reserves concluded that the region was *"a gas province, with 85 per cent of the discovered resource and 74 per cent of the exploration potential as gas"*. Statistics Norway researchers Lars Lindholt and Solveig Glomsrød meanwhile report that *"the relative importance of the Arctic as a world gas supplier will decline"*.²⁹ Shell itself recently announced a decision to sell its stake in Arctic Canada's Mackenzie Delta onshore gas pipeline, with analysts

citing the disappearance of a market for this gas because of the presence of cheaper shale gas in the US.³⁰

Fiscal and political risks

Under these conditions, as Bernstein Research points out, “fiscal takes will be crucial to make any Arctic developments viable”³¹ – that is, securing significant tax breaks or subsidies will be a necessary precondition for any extraction in the Arctic, particularly of gas.

This highlights the particular vulnerability of Arctic extraction to political risk, something not factored in by market analysts such as Bernstein: with the risks and costs at the high end, extraction depends on the support of host governments. Russia is particularly challenging here, as Section 5 will illustrate. However, while US politicians emphasise the role of Arctic oil in providing cheap fuel and reducing dependency on foreign markets, extraction costs may prove too large for this to happen. Indeed, a statistical analysis of 36 years of monthly, inflation-adjusted gasoline prices and US domestic oil production by the Associated Press showed that there was no correlation between extraction volumes and the price of petrol.³² Although there is a strong history of subsidies for domestic oil extraction in the US, this might provide a reason for a government to reconsider subsidies. The future of oil and gas subsidies in the US will in large part be dependent on the outcome of the November 2012 congressional and presidential elections.

The following section presents a brief overview of available information on Shell’s Arctic-conditions offshore projects (both those in operation and those in the early stages) and highlights their particular exposure to the risks outlined above.

‘Development costs [in the Arctic] will be at the high side of the industry range. Development times are likely to disappoint.’

Bernstein Research





2. Shell's Arctic exposure

Shell's production has been decreasing for the past 10 years – with the exception of a 5% increase in 2010³³ – so booking new reserves is a priority for the company. Exploration expenditure is growing, increasing by 30% to \$3.5bn in 2011, with a projected further increase to \$5bn in 2012.³⁴ Since Shell's 2005 purchases in the US Beaufort Sea, the Arctic has been a priority direction in the company's

exploration programme: in 2011, the flagship Alaskan offshore exploration project accounted for at least \$0.5bn of the total \$3.5bn exploration budget.³⁵ This section provides an overview of Shell's ongoing offshore Arctic extraction and exploration activities, as well as the company's plans for further acreage acquisitions in the region, to set in context the two case studies (sections 4 and 5).

Given high extraction costs, is the company wise to spend this much on exploration acreage? As the story of Sakhalin (Section 4) will show, rushed decisions taken to replace dwindling reserves elsewhere may lead not only to going into riskier frontier areas but also bad cost management.

Key:³⁶

-  Exploration or Production projects currently underway
-  Area of Interest

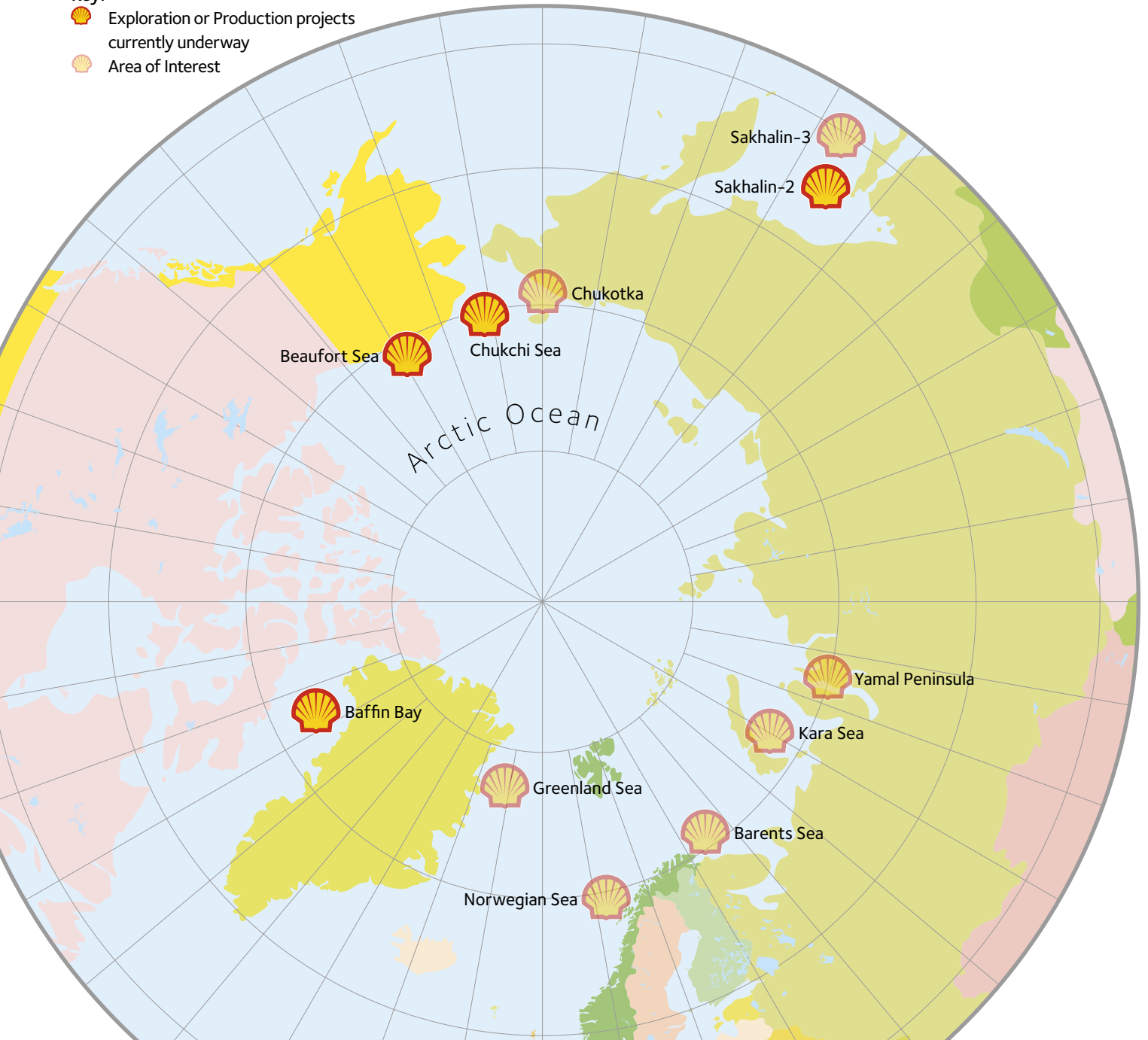


Table 1 – Shell's Arctic Assetsⁱⁱ

Region	Alaska (see Section 5)	Canada	Greenland	Russia (see Section 4)
Holdings	155 leases in Beaufort sea ^{37,38} and 275 in Chukchi Sea ³⁹	One block in Beaufort Sea (since 2007), ⁴⁰	Two blocks off West Greenland	Sakhalin-2: two fields off Sakhalin Island
Stake	Sole leaseholder	Sole leaseholder	Operator, consortium leaseholder (41% for Block five and 46% for Block eight) ⁴¹	Consortium member under production sharing agreement (27.5% stake, down from 50% stake in 2006) with operational control
Partner companies	-	-	Statoil, GDF Suez, E&P Greenland and Nunaoil	Gazprom (controlling stake), Mitsui & Mitsubishi
Stage	Exploration (drilling planned for 2012)	Not yet commenced exploration	Exploration (seismic testing)	Extraction (full cost recovery officially achieved, though likely not factually – see Section 4)
Reserves (oil/gas) (see also Section 1 on the difference between technically and economically recoverable reserves)	Estimates for all of US Beaufort Sea: 8 billion barrels of oil (bbl) / 30 trillion cubic feet (tcf) ⁴² Estimates for all of Chukchi Sea: 12bbl/76tcf ⁴³	Estimates for all of Canadian Beaufort sea, including deepwater: 16.8bbl ⁴⁴	Estimates for all of West Greenland: 31bbl of oil equivalent ⁴⁵	1bbl/25tcf ⁴⁶
Investment to date	\$4bn (including at least \$2.2bn on leases) ⁴⁷	\$600m (Beaufort Sea lease), ⁴⁸	Undisclosed. Seismic survey ongoing in 2012 ⁴⁹	On consortium level: \$24.5bn, including absorbing at least \$3.6bn of \$12bn cost overrun
Future investment	Undisclosed. For comparison, the abortive 2011 exploration programme cost approx. \$0.5bn	Undisclosed. For comparison, \$970m committed to invest in Nova Scotia exploration over six years. ⁵⁰	Unknown. For comparison, Cairn's exploratory drilling in nearby blocks cost \$150m/year ⁵¹	Undisclosed. New (3 rd) LNG processing train and an extra drilling rig are proposed
Key project-specific risks	Inadequate accident-preparedness; regulatory and litigation delays; lease expiry costs			Political control, cost mismanagement, bad track record of partner company (Gazprom), funding
Developments to watch out for	2012 US Department of Interior approval of Shell well containment technology, 2012 drilling season, 2015, 2017 and 2018 lease expiry dates	Exploration plans not yet announced. Beaufort Sea 2012 lease sale.	2012 and 2013 lease sales, 2012 results of seismic testing	Pending decisions on extra drilling platform, 3 rd train on LNG plant. Ongoing negotiations on strategic partnership with Gazprom

ii. Here and elsewhere in the report, amounts of oil and gas are shown in barrels and cubic feet respectively. Where our sources used a different metric, this was converted using the Santos Conversion Calculator (www.santos.com/conversion-calculator.aspx). The conversions of tons of oil to barrels are therefore approximate as the real exact conversion rate depends on the density of the particular oil.



Apart from the projects outlined in the table, further lease sales in Arctic areas is expected in Norway in 2012⁵² and Greenland in 2012-13⁵³ and Shell has indicated its interest in bidding.⁵⁴

Shell also owns Niglintgak, a major onshore gas discovery in Arctic Canada, and operates the Salym oil fields in partnership with Gazprom in north-west Siberia. *Shell in the Arctic*,⁵⁵ a promotional booklet, additionally cites Shell's operations at the Ormen Lange deepwater field in Norway, and its Kashagan offshore field in Kazakhstan. Although aspects of their technological design will be relevant in Arctic extraction, these projects are not included in this report as none of them

presents the same combination of harsh weather conditions and moving seasonal ice that is the challenge of offshore Arctic conditions. Additionally, although Shell is currently the operator of Ormen Lange, the exploration and seafloor installations were carried out by Hydro as operator.⁵⁶ The Gro field just above the Arctic Circle in the Norwegian Sea cited by the booklet proved to be a "disappointment".⁵⁷

Questions for Shell

- ❑ What is the company's overall spending on Arctic exploration compared with its total exploration budget?
- ❑ When does Shell expect any of its new Arctic investments to start extraction?

The following two sections present in detail Shell's ongoing projects and plans in offshore Alaska and Russia and the risks pertinent to each. Oil spill risk is being examined in the context of the US operations, given that the company's most recent spill response plans are publicly available, whereas the pertinence of such risk to Sakhalin-2 and the company's preparedness there is harder to assess.

3. Case study 1: Alaska

As of April 2012, Shell is set to go ahead with a drilling programme in the Beaufort and Chukchi seas, north of Alaska. Shell's plans for offshore exploration in the US Arctic have become an industry test case⁵⁸ on drilling in the Arctic in terms of both technology and the ability to achieve the necessary regulatory approvals and secure the social licence to operate.

The project's safety and environmental safeguards, in particular its preparedness to deal with spills, have seen a number of challenges, exposing both the project's internal weaknesses and a significant regulatory/litigation risk. Despite recent regulatory clearances, a number of facts suggest that **Shell's exploration project lacks key technological capabilities, infrastructure and information to be able to deal with the risk of oil spills.**

The conditions in the region are different from Sakhalin: ice cover is significantly more challenging, with thicker multi-year iceⁱⁱⁱ present,⁵⁹ and drilling (at the exploration stage at least) will be performed by floating rigs rather than stationary concrete-reinforced structures. Politically, the project operates in the

clearer regulatory environment of the US. In terms of management and technology, Shell has little track record of operating in the Beaufort and Chukchi seas (except for test wells in the late 1980s), so this case study focuses on analysing the known unknowns: **the probability of discovering commercially recoverable reserves in the time allotted by the company's leases, and the risks associated with inadequate accident preparedness.**

Background

As of 2010, according to a company presentation⁶⁰, Shell held **137 Beaufort Sea leases worth \$84m** (purchasing began in 2005) and **275 Chukchi Sea leases worth \$2.1bn** (purchased 2008), the company's largest investment in its Arctic programme so far. In December 2011, Shell won rights to an additional 18⁶¹ tracts in Harrison Bay, north of the Alaska National Petroleum Reserve. In 2012, the company plans to drill:

☒ in the Chukchi Sea, the Burger prospect (Posey Area) Blocks 6714, 6762, 6764, 6812, 6912,⁶² and

☒ in the Beaufort Sea (Camden Bay), Flaxman Island Blocks 6559, 6610 & 6658.⁶³

Underestimating oil spill risks

Despite the US Department's Bureau of Safety and Environmental Enforcement approval for Shell's Beaufort and Chukchi seas oil spill response plans,⁶⁵ there are strong reasons to believe the company is inadequately prepared for the risk of a large oil spill.

How much of a risk are oil spills?

Shell's 2009 environmental impact assessment discounted the chances of a large spill or a well blowout as improbable.⁶⁶ But major spills have occurred during exploration drilling (including BP's Deepwater Horizon blowout in 2010 and Petronas' spill north of Australia in 2009), and well blowouts have occurred in shallow water (including Total's recent Elgin gas leak).⁶⁷

The US Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) estimated a one in five chance of a major spill occurring over the lifetime of activity in just one block of leases in the Beaufort Sea.⁶⁸ The probability of small spills is close to 100 per cent⁶⁹ – as elsewhere, such spills are an accepted fact of oil companies' operations, but in the Arctic

iii. Multi-year ice is sea ice that has survived at least one summer's melt season. It contains less brine and more air pockets than first-year ice. This means 'stiffer' ice that is more difficult for icebreakers to navigate and clear.

Shell's lease areas in the US Chukchi and Beaufort Seas as per 2010 company presentation⁶⁴



they will be associated with more significant technical challenges and, therefore, higher costs.

What technology and infrastructure is Shell relying on?

The US Geological Survey concludes that "there is no comprehensive method for clean-up of spilled oil in sea ice."⁷⁰ Shell has acknowledged publicly that the usual techniques for controlling a spill (booms, dispersants, etc.) are of questionable efficacy in Arctic waters: "As these [ice] conditions develop, the efficiency of physical containment and recovery tactics will be reduced."⁷¹ Joint Industry Programme research, funded by Shell, showed that oil weathered for more than six days in field conditions was un-ignitable and unrecoverable with mechanical devices, that in-situ burning was only a viable option for approximately 5 days after oil is spilled and that it is not effective at all in 30–70% ice conditions, reporting that "after six days the oil was so mixed with slush that both mechanical recovery and in-situ burning were evaluated as not effective."⁷²

Not only are there significant technological limitations to the ability of oil companies to clean up a spill, the infrastructure to mount a large-scale response simply isn't in place. The US coastguard has admitted that almost no infrastructure exists in the region. Admiral Robert Papp Jr, a senior coastguard official, said: "There is nothing up there to operate from at present... no way we could deploy several thousand people as we did in the Deepwater Horizon spill."⁷³ Making a more general point, Lloyd's of London in their most recent report, *Arctic Risk*, concluded: "In many areas infrastructure is currently insufficient to meet the expected demands of economic development."⁷⁴

How seriously is the company taking the risk?

Although Shell's 2012 oil spill response plans for both the Beaufort Sea and Chukchi Sea⁷⁵ acknowledge certain risks much better than previous versions of the documents (for example, the Chukchi plan discusses procedure in case of a well blowout, whereas the previous document simply discounted such a prospect as unlikely), a number of details suggest that crucial issues have only been given casual consideration.

☒ Shell's worst-case discharge estimate more than quadrupled from 5,500 barrels a day in the 2009 Chukchi Sea plan, to 25,000 barrels a day in the 2011 plan, yet there hasn't been a

comparable increase in resources – only two additional vessel of opportunity skimming systems (VOSSs) staged 42 hours away were added to the response fleet, alongside two other skimmers.⁷⁶

☒ Shell also models its worst-case scenarios in best-case conditions. For example, Shell's 'worst case' discharge scenario models a spill between August 7 and September 6,⁷⁷ which is only relevant to a summer spill scenario. Shell provides no oil spill modelling for a spill on or around October 31 (at the end of the drilling season) nor estimates the movement of oil trapped under ice subject to subsea currents.

☒ Shell's spill plan for the Alaskan Beaufort Sea claims that oil would only "be released to a relatively small area on the water", even though US regulators have estimated some of the wells it wants to drill in 2012 could gush at a rate of more than 60,000 barrels a day.⁷⁸ Worryingly, in a recent evidence session to a UK parliamentary inquiry, Shell admitted that it has not calculated how much a large spill would cost to clean up, despite the serious financial repercussions a large-scale spill is likely to have.⁷⁹

☒ A spill would be most damaging if it occurred at the end of the drilling season, when any response would be further impeded by ice. While drilling in the Chukchi Sea is barred after September 24, the Beaufort Sea plan would allow exploration through to October 31. According to a report by University of Alaska Fairbanks professor Andy Mahoney (commissioned by Pew Environment Group), ice moves into Alaska's Beaufort Sea earlier than it does in the Chukchi region. Ice formed during the winter in the Beaufort Sea is "thicker and stronger" than the ice flows in the Chukchi Sea and could create a major hazard for oil clean-up.⁸⁰

☒ The Interior Department's approval of Shell's oil spill response plan is conditional on the company's well containment plans in the event of a well blowout. In the company's plans for 2009 and 2010, Shell declared that the use of a capping and containment system would be unfeasible.⁸¹ By 2011, the company had changed its mind and the system has become a key part of its planned spill response. However, Shell has released few details about the system. As of March the company has not tested its well containment equipment, leaving


only two months to thoroughly test the equipment before drilling begins. More worryingly, in written evidence to a UK parliamentary inquiry Shell admitted that it has no intention of testing the capping system in icy conditions.⁸² This is a particular concern given that Shell's Chukchi oil spill response plan admits that "the range of open water is variable from year to year and ice could be present at the drill site".⁸³ A recent US government Accountability Office report concluded: "Even with Shell's plans to have dedicated capping stack [a well containment device] and well containment capabilities in the region to provide rapid response in the event of a blowout, these dedicated capabilities do not completely mitigate some of the environmental and logistical risks associated with the remoteness and environment of the region," including surface ice, ice scouring, limited infrastructure and available vessels.⁸⁴

☒ Finally, Shell's Chukchi Sea response plan states that the company intends to use a single drillship during the Chukchi Sea drilling programme: "In the event of a blowout, the drillship would immediately cease its then current operations and relocate to a safe location to initiate a relief well and intersect the blowout well". As the Pew Trust notes, there is no evidence of any case in history where a rig involved in a catastrophic well blowout was able to drill its own relief well.⁸⁵

Key uncertainty: quantifying the threats. So far, no analyses have been published quantifying the specific oil spill response impediments in Shell's lease areas in the Chukchi and Beaufort seas. But a study commissioned by WWF found that it would not be possible to respond to an oil spill in the Canadian Beaufort Sea for seven to eight months of the year.⁸⁶ During the most favourable weather conditions (July–August), a response would only be possible 44–46% of the time, assuming that the infrastructure and workforce were readily available. Such a 'response gap' analysis needs to be carried out and published to be able to accurately assess the threat that spills pose to Shell's operations.

Lease expiry dates

Part of the reason for pushing ahead with the exploration programme despite these gaps in spill response expertise and despite the public opposition may be that Shell is worried about its Alaska leases expiring, as suggested by a 2010 internal company document circulated

A large, white, crumpled piece of plastic or debris is the central focus, floating in the dark blue water of the Arctic. The plastic is heavily wrinkled and folded, suggesting it has been carried by currents or wind. The surrounding water is a deep, dark blue, and there are numerous smaller, white ice floes scattered throughout the scene. The lighting is bright, highlighting the texture of the plastic and the edges of the ice.

The US Geological Survey concludes that 'there is no comprehensive method for clean-up of spilled oil in sea ice'.

to employees and ex-employees: *"With only four years remaining on some of the 10-year leases, Shell is concerned that the leases will expire before commerciality is proven unless the current moratorium and regulatory uncertainty is resolved."*⁸⁷

As follows from Section 1, and considering there is so far none of the infrastructure required to get oil from offshore North Alaska prospects to market, any hydrocarbon discoveries made in the Chukchi and Beaufort seas may not be immediately commercially viable in any case; the issue is more that Shell is likely to incur additional costs by prolonging its leases. The Beaufort Sea leases in particular were acquired at Beaufort Sea oil and gas lease sales 195 (March 2005) and 202 (April 2007).⁸⁸ As the leases have a primary term of 10 years, the ones bought in 2005 expire *"unless the lessee is conducting operations on the lease"*.⁸⁹ If Shell can show that operations are being conducted, the leases can be extended, at some extra cost. The precise procedure or costs of lease extensions are uncertain.⁹⁰

Court and regulatory challenges

Shell's drilling plans have been delayed year on year since 2007 by litigation and regulatory pressure.

Having acquired Beaufort Sea acreage in 2005 for \$44m, Shell planned to drill exploratory wells there in late summer 2007, but did not go ahead as a lawsuit was filed against the regulator by North Slope Borough and the Alaska Eskimo Whaling Commission, challenging the approval of Shell's exploration plan as it had not properly considered impacts on wildlife and on indigenous people's subsistence economy.⁹¹ The lawsuit and appeals prevented the drilling programme from going ahead in 2008 and 2009.⁹²

On May 27 2010, in the wake of the Deepwater Horizon disaster, US secretary of the interior Ken Salazar postponed

the issue of the final permits Shell required for drilling during summer 2010, alongside a moratorium on offshore drilling in US waters. Shell estimated it lost \$115m due to the moratorium in Q2 and Q3 2010.⁹³ Litigation again prevented Shell from obtaining the necessary authorisations in 2011, and the company cancelled its drilling plans.⁹⁴

Finally, in 2012 Shell obtained most of the necessary approvals⁹⁵ from the regulators and even filed a pre-emptive court case in Alaska asking the court to declare its oil spill response plans sound before civil society groups could challenge them.⁹⁶ Regardless of the result of this case, it is clear that the company's next exploration and extraction steps will be under a similar amount of scrutiny from regulators, the public and environmental organisations, making further delays likely.

Oil/gas balance questions

As Section 1 showed, gas extraction is less likely to be commercially viable in the Arctic than oil. Shell's drilling in the Burger prospect in the Chukchi Sea in 1989 – the same area being drilled in 2012 – encountered a major gas accumulation (most likely 14 trillion cubic feet of gas and 724 million barrels of condensate, according to BOEMRE⁹⁷), which the company did not consider economical at the time.⁹⁸

Altogether in the mid-1980s and early 1990s Shell drilled three exploratory wells in the Bering Sea (with Arco – now part of BP – and Gulf),⁹⁹ 15 in the US Beaufort Sea and four in the Chukchi Sea.¹⁰⁰ Following a fall in oil prices, Shell divested much of its Alaskan offshore assets in 1997–98.¹⁰¹

Shell's own presentation of its Alaska plans normally mentions both oil and gas.¹⁰² The question remains, what balance of oil and gas is the company expecting to find, and how will it be able to make gas extraction economically viable?

Questions for the company

- ☒ Has the company carried out a spill response gap analysis of its prospects in the Beaufort and Chukchi seas? If so, will the company make it available publicly?
- ☒ Has the company carried out an analysis of the environmental and financial worst-case scenario and, if so, will the company make it available publicly?
- ☒ Will the company test its spill response technology (particularly well containment devices) in Arctic conditions and make detailed disclosure of the conditions and results of these tests?
- ☒ Will the company analyse the potential effects of using in-situ burning or chemical dispersants and make detailed disclosure on this analysis?
- ☒ What oil/gas balance is Shell expecting to find in the Burger and Flaxman Island prospects? Does the company expect gas exports from these prospects to be economically viable, and under what conditions?
- ☒ How does Shell plan to finance extraction infrastructure in the event of a find?

4. Case study 2: Russia

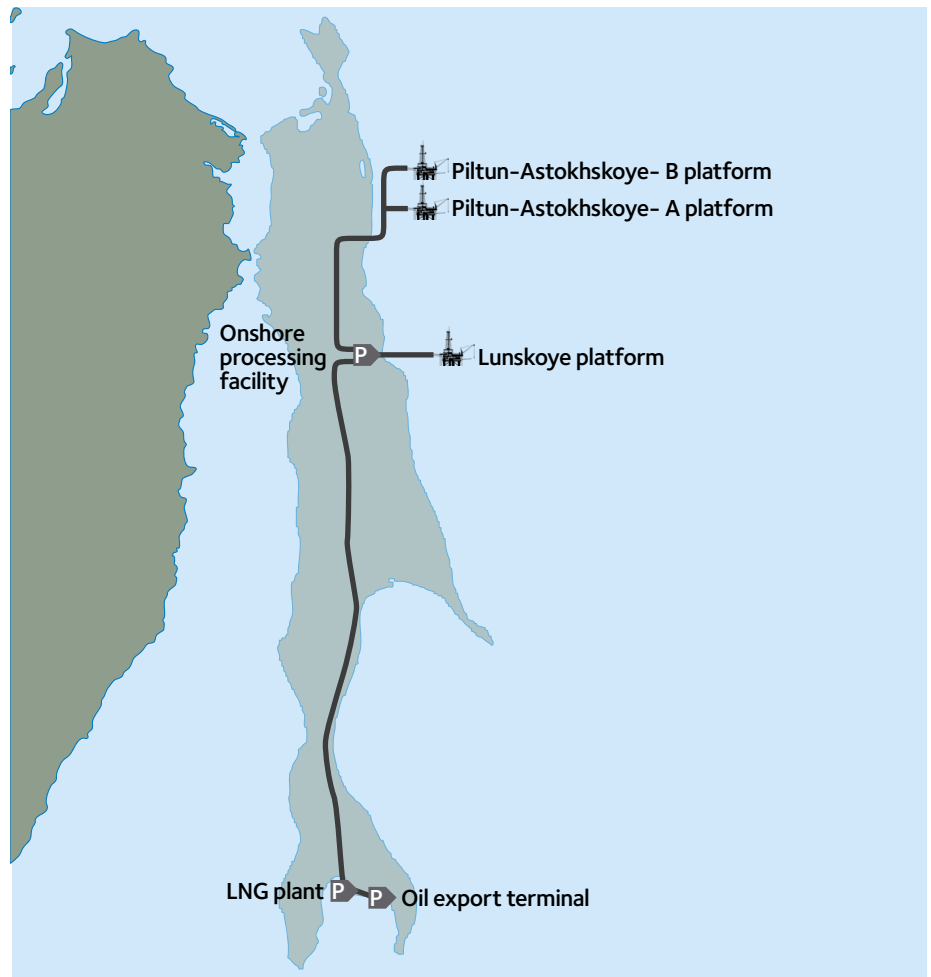
The following pages review the history of Sakhalin-2, Shell's headline offshore Arctic-conditions project, underscoring the **political, transparency and reputational risks of working in Russia**, as well as **Shell management problems associated with rising project costs**.

Sakhalin-2 is the company's main experience as operator of an offshore project in ice-covered waters,¹⁰³ but there are significant reasons to doubt it has been a positive one. The project costs overran by more than 100%. This contributed to a takeover of Shell's controlling stake by Gazprom, the Russian state-controlled oil and gas major, which dealt a blow to Shell's reserves.¹⁰⁴ Meanwhile, environmental issues have contributed to project funding problems as well as reputational issues and investor concerns.¹⁰⁵ Shell's evolving partnership with Gazprom means increased future exposure to such risks.

Background

Sakhalin-2 is one of the world's largest integrated offshore oil and gas extraction projects, as well as Russia's first offshore gas and liquefied natural gas (LNG) project.¹⁰⁶ It is managed by Sakhalin Energy Investment Company (SEIC), a joint venture currently between Gazprom (50% plus one share), Shell (27.5%), Mitsui (12.5%) and Mitsubishi (10%).¹⁰⁷ Despite losing its majority stake in 2006, Shell still has effective operational control (according to observers¹⁰⁸ and as attested by the fact that no Gazprom subsidiaries are contracted on the extraction side of the project).

Sakhalin-2's two prospects (the Piltun-Astokhskoye and Lunskeye fields) are located approximately 15km north-east of Sakhalin Island in the Okhotsk Sea, east of Russia. The sea is covered with ice for around six months of the year.¹⁰⁹ The fields' combined recoverable reserves are estimated at more than 1.3 billion barrels of oil and condensate and 21 trillion cubic feet of natural gas.¹¹⁰ For the current



Sakhalin-2 project infrastructure on and around Sakhalin island, Russia

phase 2, the project is designed to extract 370,000 barrels of oil equivalent per day. In 2011, reported production levels were approximately 45.5 million barrels of oil and 515.5 million cubic feet of gas.¹¹¹

Sakhalin-2 operates under a production sharing agreement (PSA),^{iv} the first of its kind in Russia, signed on 22 June, 1994.¹¹² Starting with a 25% share in the joint venture, Shell assumed operatorship and a controlling 62.5% stake in SEIC in 2000. By that point Sakhalin-2's first installed platform (Molikpaq) had already started seasonal oil extraction. Shell's task as operator in phase 2 of the project was to bring onstream two more platforms

for year-round extraction (using subsea pipelines to bring hydrocarbons to shore) and an LNG plant. Whereas phase 1 had cost about \$1.5bn, phase 2 cost was valued at just under \$10bn. The final investment decision was made in May 2003.¹¹³

Cost overrun

In 2006, Shell was forced to disclose a substantial cost overrun on Sakhalin-2: instead of \$10bn, the cost was now \$22bn, while the start of LNG exports was not now anticipated until the third-quarter of 2008 instead of mid-2007. The actual costs (CAPEX and OPEX) of the project as of 2012 rose further to \$24.5bn. What had happened?

iv. A 'production sharing agreement' is a contract between the state and investors which has the force of law, and according to which once a certain amount of the costs of extraction ('cost oil') have been recovered by the investor, the rest of the hydrocarbons produced are divided up between the state and the company or companies involved.

A leaked US government cable quotes the then Sakhalin-2 project director David Greer: “Sakhalin Energy agreed with the [Russian government] on a \$9.6bn price tag for the project in May 2003. In the meantime... approvals took longer, steel prices rose, and contractor costs ballooned – all of which put huge pressure on the budget. By early 2004, it was already clear that costs would exceed \$13bn, and that estimate rose by early 2005 to almost \$20bn.”¹¹⁴ It was clear that the project also had serious environmental issues (see below) and safety problems, with 18 job-related fatalities recorded up until 2006.¹¹⁵

The decision to go with phase 2 was taken nine months before Shell's reserves scandal, in which the company admitted to having overstated the size of its reserves, broke publicly in 2004. Extracts from internal company documents available publicly after the scandal indicate that by May 2003 the company's board was aware of the potential impact of disclosure on its reserves calculations,¹¹⁶ so they may have been anxious to add new reserves to the books without due consideration to the potential costs.

When market valuations for IOCs are so dependent on analysts being able to identify and book new reserves, Shell is once again publicly emphasising the search for new fields. But in looking for a positive reserves replacement ratio (RRR), rash and risky decisions may be made.¹¹⁷

Political risk

The unusually favourable terms of the Sakhalin-2 contract turned into a problem for Shell as Putin's government in Russia assumed greater control over the country's resources.

The Sakhalin-2 PSA, negotiated in 1994 by a government with few options and little experience, appeared particularly disadvantageous to the Russian budget. For example, Russia was to get no share of the project until the investors' full costs had been recovered,¹¹⁸ whereas the PSA for Sakhalin-1, a similar project run by Exxon and Rosneft, involved profit for the Russian state from the start. Neither of the contracts have been made public so their full implications are hard to assess.

President Putin's administration took a far more assertive approach to oil revenues than its predecessors, elevating state-owned companies Rosneft and Gazprom to control the extraction of more than half of

Russia's hydrocarbons (through takeovers of Sibneft¹¹⁹ and Yukos¹²⁰). To protect its projects, in 2006 Shell attempted to negotiate an asset swap deal with Gazprom. However, the deal fell through when Shell was forced to reveal its Sakhalin-2 cost overrun.¹²¹ The Russian government then stepped up pressure on the project through the environmental regulator, threatening to revoke the project's environmental approval and levy unprecedented fines.¹²²

Finally, on 21 December 2006, the partners in SEIC handed over 50% plus one share to Gazprom for \$7.45bn, which commentators deemed an acceptable price for a deal made “under duress”,¹²³ “caving into government pressure”.¹²⁴ A leaked agreement, confirmed by an SEIC shareholder manager, showed the three companies also agreeing to absorb \$3.6bn of the cost overruns outside of the contract terms.¹²⁵

Looking forward

Shell is hopeful new projects will emerge in Russia in the coming years. It was even discussed as a possible replacement for BP after the latter's failure to secure a joint venture deal with Rosneft in the Kara Sea.¹²⁶ But will future deals be subject to similarly unpredictable and damaging political, and resulting financial, pressure?

Putin and his ministers have indicated that the Russian oil industry needs foreign investment and skills to assist exploration and extraction in the country's offshore Arctic.¹²⁷ A return to PSAs for this purpose was discussed in 2010¹²⁸ but instead the government decided to award control of Arctic oil and gas prospects to state-controlled majors Rosneft and Gazprom, with potential for joint ventures with private partners as minority shareholders.¹²⁹ With Putin returning to the presidential seat in May 2012, it appears unlikely that foreign companies will gain substantial control or guarantees over new Russian concessions.

Project funding under pressure

The social and environmental responsibility guidelines of international financial institutions (IFIs) and banks bound by the Equator Principles have proven to be a barrier for project funding on risky projects such as Sakhalin-2. The latter's application for financing from a coalition of banks, including the European Bank for Reconstruction and Development (EBRD), was targeted by a global coalition of environmental NGOs, which claimed SEIC's operations fell foul of EBRD's environmental and sustainability guidelines by disrupting

salmon spawning grounds vital for the fishing industry, and whale migration patterns. In 2003, the EBRD challenged the project's environmental impact assessment and consistently refused funding unless these problems were resolved.¹³⁰ By comparison, the companies running Sakhalin-1 avoided the problem by taking no project funding.

Attempting to satisfy the bank's demands contributed to the cost overrun: SEIC had to delay a number of operations, reroute an offshore pipeline, and fund a whale advisory panel and an indigenous people's programme. Crucially, the refusal meant that SEIC was unable to secure the solid reputation EBRD project funding implies. SEIC was forced to resort to a different, smaller consortium of banks led by the Japan Bank for International Cooperation.

Looking forward

The current project lenders (particularly BNP Paribas, Credit Suisse and Standard Chartered) are once again being targeted by scientists and environmental groups in a bid to prevent the installation of an additional drilling platform at Sakhalin-2,¹³¹ which was not included in the project's initial environmental assessments. As signatories to the Equator Principles, the lenders could follow the EBRD's earlier example in forcing certain requirements upon the company as a condition of lending.

However, the implications are wider than the project itself. As Russian oil industry specialist Professor Michael Bradshaw notes,¹³² Shell's Sakhalin-2 experience means it makes sense for the company to avoid project financing on similarly risky ventures and instead to fund them out of its own pocket. But the Russian companies Shell is likely to work with will need project funding for similar initiatives.¹³³ Will banks that adhere to the Equator Principles provide loans for such a project?

In this context, it is significant that WestLB announced in April 2012 that it will not provide project finance for oil developments in the Arctic and Antarctic regions: “The further you get into the icy regions, the more expensive everything gets and there are risks that are hard to manage,” said Dustin Neuneyer, sustainability manager, group development, at the German corporate and investment bank.¹³⁴ For example, he said, remediation of any spills “would cost a fortune”, and natural processes by which spilt oil would be broken down are slower or non-existent at freezing temperatures. “There are projects that are evidently

'In 2006 Shell was forced to disclose a substantial cost overrun on Sakhalin-2: instead of \$10bn, the cost was now \$22bn'.



unsustainable in an encompassing sense. For WestLB, the risks and costs are simply too high". WestLB's new policy¹³⁵ is reflected throughout the sector, as Neuneyer stated: "Other banks contacted us and are very interested in this approach and policy". Will these new concerns in the banking sector raise the additional financing challenges for both Shell and its partners in Arctic projects?

Transparency issues

On 30 January 2012, Russian energy minister Sergei Shmatko announced that Sakhalin-2 would reach full cost recovery in Q1, boasting the achievement two years ahead of plan.¹³⁶ On 30 March 2012, it was announced that production sharing on Sakhalin-2 had begun, implying that all of the investors' 'cost oil' had been recovered.¹³⁷ It is unclear whether Shell has actually recouped all of its part of the \$24.5bn¹³⁸ investment. If together with its partners it has had to absorb part of the cost overrun, as well as selling the controlling stake to Gazprom for less than its worth, Shell may not have come close to recovering its initial costs. Shell appears to have made no comment on this, highlighting the general lack of financial, as well as operational, transparency in Shell's Russian projects.

Gazprom: a risky partner

Shell and Gazprom signed a 'protocol on strategic global cooperation' in November 2010.¹³⁹ The partnership aims to extend the two companies' cooperation to other offshore Arctic-conditions projects beyond Sakhalin-2, and a share swap between the two companies (akin to BP's abortive share swap with Rosneft) was discussed. Depending on the shape of the eventual partnership, particularly if it involves a share swap, it may expose Shell to risks associated with Gazprom's poor safety, environmental and transparency record.

The most recent and dramatic example of this poor record was the disaster on the Kolskaya rig, which capsized and sank on its way back from drilling in the Okhotsk Sea on 18 December 2011, killing 53 of the 67 crew.¹⁴⁰ The rig, commissioned by Gazflot, a direct Gazprom subsidiary, continued drilling outside of the approved operations season¹⁴¹ and without having passed the necessary environmental and safety assessments.¹⁴² The lack of approvals had been challenged by a prosecutors' office, but they lacked the enforcement power to prevent the drilling from going ahead. Surviving crew members pointed out that multiple technical faults in the platform and deficiencies in the towing plan had been raised by the crew to the management, which had ignored the warnings.¹⁴³ Criticisms of poor technical preparedness have also been levelled against Gazprom's pioneering Arctic drilling rig Prirazlomnaya.¹⁴⁴

How is Shell planning to work with Gazprom? Will Shell keep as much operational control over joint projects as it does over Sakhalin-2? The details of the protocol are undisclosed, and public declarations about the negotiations are inconclusive:

☒ in January 2011 Sakhalin governor Aleksandr Khoroshavin reported to Putin that the companies were discussing a share swap;¹⁴⁵

☒ in June 2011 the companies "signed the Basic Terms and Conditions of the Agreement stipulating the study of possible ways to create a joint venture for joint projects delivery";¹⁴⁶

☒ further meetings between top figures in Shell and Gazprom took place in November 2011, January and March 2012,¹⁴⁷ although little detail was publicly disclosed.

Questions for the company

- ☒ Has Shell recouped its investment in Sakhalin-2?
- ☒ What steps is Shell taking to ensure adequate funding for proposed developments at Sakhalin-2?
- ☒ What steps is Shell taking or will it take to avoid further situations where projects are at risk of pressure or takeover by the Russian state?
- ☒ Is Shell considering acquiring shares in Gazprom as part of their strategic cooperation?
- ☒ In working with Gazprom on joint projects, is Shell expecting to keep as much operational and subcontracting control as in Sakhalin-2? If not, how will Shell ensure the application of its global health and safety and environmental policies by Gazprom and its subsidiaries?
- ☒ In working with Gazprom or other Russian partners, how will Shell maintain transparency to shareholders about the operation of joint projects?

Kolskaya rig capsized and sank on its way back from drilling in the Okhotsk Sea, killing 53 of the 67 crew. It had been commissioned by Gazflot (Gazprom subsidiary) to drill outside of the approved operations season.

5. Conclusion

The Deepwater Horizon disaster revealed deepwater exploration's inherently risky nature and its inadequate regulation, risk assessment and risk management. But the industry's push into Arctic offshore extraction with regulatory and investor community support suggests that the correct lessons have not yet been learned from the tragedy.

Booking new reserves is a priority for Shell as it seeks to boost its reserves replacement ratio. But rather than simply focus on volume, it is critically important to consider the quality of the reserves in terms of both commercial feasibility and inherent risks.

As with many frontier oil projects, questions remain about the medium- and long-term economic viability of Arctic projects, which are dependent on high oil prices and fiscal subsidies.

In addition, such projects present new and unique challenges for the oil industry. Across all Arctic waters, the potential environmental and financial impact of any potential major oil spill has not yet even been assessed. Shell and other companies acknowledge the ineffectiveness of existing technology to deal with such a spill but have chosen to focus on the supposed low probability of it happening rather than prepare for its inevitable high impact. In the wake of Deepwater Horizon, this approach seems unwise.

In addition to these general risks, particular Arctic-conditions territories present their own issues. The dramatic track record of Shell's Sakhalin-2 project in Russia and particularly of its partner company Gazprom suggest a significant risk of cost overruns and interventions by the Russian government, as well as a severe lack of transparency.

This report is intended to inform investors of the specific risks facing Shell as the company plans to expand its Arctic operations. It suggests a number of questions investors should ask Shell to enable them to understand whether the company has adequately assessed the various risks it faces and is taking appropriate steps to mitigate and manage them.



GENERAL QUESTIONS ON SHELL'S ARCTIC PROGRAMME

- ☒ **With concerns over Arctic oil developments increasingly manifesting themselves in the finance sector, will Shell's determination to pursue Arctic projects, undermine investor confidence in the management of the company?**
- ☒ **The financial impact of the Gulf of Mexico oil spill on BP plc demonstrates the company-wide impact of failings at a single operation. Investors should consider whether potential failings at Shell's Arctic projects, which are driven by its Exploration & Production division, pose a significant risk to the overall financial health of the Royal Dutch Shell group?**

SPECIFIC QUESTIONS ON SHELL'S ARCTIC PROJECTS

- ☒ **What is Shell's overall spending on Arctic exploration compared with its overall exploration budget?**
- ☒ **When does Shell expect any of its new Arctic investments to start extraction?**
- ☒ **Has Shell recouped its investment in Sakhalin-2?**
- ☒ **What steps is Shell taking to reduce the possibility of further intervention by the Russian government in Sakhalin-2 and possible future projects?**
- ☒ **In working on future projects with Gazprom, is Shell expecting to keep operational and subcontracting control? If not, how will Shell ensure the application of its global health and safety and environmental policies by Gazprom and its subsidiaries?**
- ☒ **In working with Gazprom or a different Russian partner, how will Shell maintain transparency to shareholders about the operation of joint projects?**
- ☒ **What steps is Shell taking to ensure adequate funding for proposed developments at Sakhalin-2?**
- ☒ **Has the company carried out a spill response gap analysis of its prospects in the Beaufort and Chukchi seas? If so, will the company make it available publicly?**
- ☒ **Has the company carried out an analysis of the environmental and financial worst-case spill scenario and, if so, will the company make it available publicly?**
- ☒ **Will the company test its spill response technology (particularly well containment devices) in Arctic conditions, and make detailed disclosure of the conditions and results of these tests?**
- ☒ **Will the company analyse the potential effects of using in-situ burning or chemical dispersants and make detailed disclosure on this analysis?**
- ☒ **What oil/gas balance is Shell expecting to find in the Burger and Flaxman Island prospects? Does the company expect gas exports from these prospects to be economically viable, and under what conditions?**
- ☒ **How does Shell plan to finance extraction infrastructure in the event of a find in Alaska?**

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