GREENPEACE

ANALYSIS OF THE CAIRN OIL SPILL PREVENTION AND CONTINGENCY PLAN

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INTRODUCTION

This year, Cairn Energy is drilling four exploratory wells in the icy waters of the Davis Strait and Baffin Bay off Greenland, some as deep as 1500m, a similar depth to BP's ill-fated Macondo well in the Gulf of Mexico.

Cairn is the only oil company to be drilling new deep water exploratory wells in the Arctic this year. But the rest of the industry is watching carefully and oil majors such as Shell are making plans to begin offshore drilling projects in places like the Beaufort and Chukchi Seas off Alaska next year.

For the two years that Cairn has been operating in the Arctic, it has repeatedly refused to publish an oil spill response plan - the document that supposedly shows how the company would deal with a spill. Last week, after massive public and political pressure, the Greenland government - not Cairn - finally buckled and published the oil spill response plan.[1]

This is a summary and analysis of the oil spill plan from independent expert Rick Steiner[2] and Greenpeace Arctic campaigners.

WHAT ARE THE PROBLEMS WITH CAIRN'S PLANS?

- By Cairn's own admission, clean-up operations would grind to a halt during the Arctic winter: *"during ice conditions the response may be limited to monitoring the spill with recovery operations resuming once the thaw is complete."*[3]
- If a blow-out occurred towards the end of the drilling season, a relief well would not be completed until January, by which time the ice-bound Arctic winter would have set in.[4]
- Cairn vastly underestimates the worst case scenario for an Arctic spill, claiming that, at most, 5,000 barrels per day for a maximum of 37 days would leak.[5] BP's Macondo well spilled 55,000 barrels a day over 60 days. According to the plan, the Cairn wells in question are of a similar pressure.[6] Rick Steiner states that, as a result, Cairn's wells could release comparable amounts of oil.[7] Well pressure is one of the factors that would determine the extent of a blow out, should one occur.
- The impact of a spill on Arctic wildlife would be devastating. According to Cairn, significant long-term impacts on narwhals and breeding colonies of Atlantic puffins and razorbills could be expected, whilst populations of cormorants and king eiders would be significantly depleted.[8]
- An oil spill would be very difficult to deal with when sea-ice is present. Moving ice would trap spilt oil[9] and move it away from the immediate vicinity of the blow out. Tracking each individual ice floe and recovering oil from underneath is a near-impossible task.
- One scientist says that in the event of a spill there is no known way of remotely detecting oil trapped under the ice, leaving no option but to drill randomly through the ice in the hope of finding oil trapped beneath.
- Even in ideal conditions, conventional spill response techniques – such as booms and skimmers – will at most recover a tiny proportion of spilled oil, probably less than 10%. If ice coverage is greater than 25%, booms and skimmers will be rendered completely useless.[10]
- Freezing Arctic temperatures would make spilt oil more viscous, rendering the chemical dispersants used, for instance in the Gulf of Mexico, ineffective.[11]
- If chemical dispersants are used they could have a detrimental impact on local wildlife.[12]
- Cairn claims it can cut out sections of oiled sea ice to remove and later melt in a heated warehouse, yet no evidence is offered as to the effectiveness of this technique.[13]
- Cairn admits that the uneven rocky substrate prevalent along Greenland's coastline would make it very challenging to clean up a spill.[14]
- The remoteness and sparse population of the Greenlandic and Canadian coastline make Cairn's shoreline clean-up plan wildly over optimistic.

OVERALL ASSESSMENT

There are three techniques that Cairn will employ to try and contain and clean-up an oil spill: mechanical recovery, dispersants and in situ burning.

While the entire spill plan is wholly inadequate, it is particularly worrying that it contains so little detail as to how the company would operate in icy waters and offers very few, if any, solutions for how to deal with a spill in ice-covered seas.

Ice presents some fundamental challenges to the effectiveness and speed of responding to a spill. Conventional spill response techniques such as booms, skimmers, dispersants and in situ burning would be significantly less effective, if not completely useless, if ice is present.[15]

Steiner concludes that:

The plan makes many questionable assumptions in its discussion of spill risk and response... It dramatically understates the potential size and impacts of a blow out from one of these four wells and dramatically overstates the potential effectiveness of any spill response.[16]

Given the extreme ecological sensitivity of the coastal environment of west Greenland, the high risk of exploratory drilling in deep water reservoirs, and the difficulties in drilling in Arctic waters, I feel Greenland deserves a much more deliberative, comprehensive and carefully developed spill prevention and response plan.[17]

The OSPC is lacking in its three primary focal areas: spill prevention, well control, and spill response. The plan is not complete, and does not provide sufficient detail with which to judge the safety of projects or the potential effectiveness of an emergency response.[18]

SPECIFIC ANALYSIS

Whilst it is not clear why this spill plan was not released for an independent third party audit, there are a number of specific areas of concern raised by carefully analysing the plan itself. They are:

1. Oil spill response
2. Well control
3. Drilling a relief well
4. Mechanical recovery
5. Chemical dispersants
6. In situ burning
7. Shoreline clean-up
8. Wildlife impacts

1. Oil spill response

The spill plan also admits that the properties of the oil Cairn is drilling for have *"not been determined so there is a lack of knowledge of how the oil encountered will weather, affecting evaporation, emulsification and therefore volume of product to be recovered"*.[19] In view of this, Cairn cannot be confident that its predictions for clean-up and response are accurate.

Cairn's modelling assumptions are not only wrong in terms of their planned worst case scenarios, but also contain a number of other optimistic assumptions that do not stand up to analysis. For example:

- Cairn has used 5 °C as the average sea surface temperature during an oil spill, yet according to the spill plan this is the maximum sea surface temperature. The modelling should be made from a worst case perspective, ie -6 °C.[20]

- Cairn's estimates about clean-up effectiveness are based on over-optimistic assumptions about the emulsification rates and the effectiveness of dispersants.[21]

Steiner concludes that:

Cairn's plan outlines a worst case spill scenario of 5,000 barrels a day for 37 days, with the oil being tracked for 60 days. These assumptions on which this is judged to be the worst possible case are highly questionable.[22]

2. Well control

The plan contains little detail on how Cairn would control a blow-out in deep water. For example, it mentions capping the well but does not specify exactly what capping equipment will be used and how.[23]

The plan makes many claims about various design standards and requirements for oil well control that Cairn's operations meet.[24] However, the lack of detail makes it difficult to ascertain which standards Cairn has actually met and to what extent.

Steiner concludes that:

The plan states that *"Cairn Energy confirmed the existing procedures and equipment fully complied with, or exceeded, the Bureau of Ocean Management (BOEMRE) recommendations"*. From the plan, it is not clear that Cairn has met all of these requirements, and this must be verified.[25]

There is a great deal left out of the well control section that would be necessary in order to judge the well design effectively: for instance, the exact blow-out preventer design and history or repair and maintenance, how many centralisers will be used to keep the well string centred for a good cement job, what casing liner and tie back will be used, the precise cement slurry formulation and so on.[26]

There is no detailed discussion of blow-out control. Would they use the Marine Well Containment System developed in the US? It does not discuss exactly what this capping equipment is.[27]

3. Drilling a relief well

Cairn says it will take 34 days to drill a relief well off Greenland,[28] yet this figure is drawn from another large operator's relief well plan for the Arctic, rather than being based on Cairn's specific Arctic projects.[29]

The plan also uses the exact same timeline for drilling a rescue well at different drill sites, even though they will be drilled in completely different areas and at completely different depths.

Cairn's drilling season for the two southern blocks – Lady Franklin and Atammik – extends until December, so should a blow-out occur in mid-November the relief well would not be completed until January, by which time the Arctic winter has well and truly set in.

It is important to remember that the relief well drilled to stop the Deepwater Horizon spill was suspended several times, mainly due to weather conditions, thereby lengthening the estimated total drill time. The potentially extreme Arctic weather conditions also could delay the drilling of a relief well.

Steiner concludes that:

34 days [to drill a relief well] is overly optimistic.[30]

The drilling operation window at Lady Franklin and Atammik seems too long to provide an adequate margin of safety [for a relief well to be drilled] before the ice season.[31]

4. Mechanical recovery

The oil spill plan makes the startling admission that mechanically recovering the oil using booms and skimmers would not be effective in the Arctic, and that only 10–20% of the oil could actually be removed.[32]

It states that *"booming may not be possible due to ice concentration – if ice coverage is greater than 25–30% booms are of little or no use. Other research has suggested that 10% ice coverage will render booms ineffective".*[33]

The extremely low temperatures will increase the viscosity of the oil, which by Cairn's own admission could *"cause problems for response clean up strategies when the oil is to be pumped or collected".*[34]

Cairn's plan resorts to outlandish solutions to recover spilt oil, saying that a *"section of oiled ice can be cut out and allow the ice to thaw in a heated warehouse and then separating the oil from its water".*[35] The company offers absolutely no proof that auguring for oil under ice actually works or that oiled ice can be successfully located and cut out.

Steiner concludes that:

Cairn claims that *"even in the most ideal conditions, recovery rates will never be 100% and are actually more likely to be around 10 to 20%".* In most spill scenarios in the Arctic, offshore recovery will almost certainly not be anywhere that high.[36]

The plan admits that sea ice will cause failure of booms and mechanical oil spill recovery at ice coverage as low as 10%... and that low temperatures will cause oil to solidify, and make it very difficult if not impossible to pump. These two admissions underscore the fact that oil spill response in ice-covered seas is virtually impossible.[37]

5. Chemical dispersants

The long-term eco-toxicological impacts of chemical dispersants are not well understood.

The inefficacy of dispersants in the Gulf of Mexico in dispersing the oil was widely reported.[38]

The increased viscosity of the oil due to low temperatures can render dispersants less effective and it is *"unlikely that it will be effective at all on emulsified crudes".*[39]

Finally, the plan recommends using dispersants near the shore in certain circumstances, subject to approval by the Greenland government. Most countries do not permit this.

The US National Research Council on the use of chemical dispersants states that:[40]

- *"Oil spill dispersants do not actually reduce the total amount of oil entering the environment. Rather, they change the inherent chemical and physical properties of oil, thereby changing the oil's transport, fate, and potential effects."*
- *"The window of opportunity for effective dispersant application is early, usually within hours to 1–2 days after release under most conditions."*
- *"The mechanisms of both acute and sub–lethal toxicity from exposure to dispersed oil are not sufficiently understood."*
- *"There are many important, unanswered questions about how dispersed oil might be... passed through the food chain."*

Steiner concludes that:

Dasic Slickgone NS is the only dispersant approved for use in Greenland, yet the plan contains precious little detail about its characteristics. Part of the material safety data sheet for this product is virtually ineligible, particularly the list of its hazardous ingredients, but clearly doesn't include information on its toxicity or effectiveness.[41]

Dispersants are not effective in many circumstances. If there is much sea ice this inhibits mixing of the dispersant in the water.[42]

6. In situ burning

In situ burning is most efficient in the initial period after a spill. The plan notes that *"relatively fresh oil (2–3 days exposure) is best for ignition. Once oil has been exposed for an extended period of time and becomes weathered, it is no longer amenable to ignition".*[43] However, Cairn also admits that transporting the necessary offshore equipment to deal with a blow out to the spill site would take between 51–84 hours.[44]

The plan states that in situ burning can only be used when ice cover is 30% or less, and in emulsification rates of 30% or more.[45] This is because the equipment, such as herders and booms, which is needed to ensure a high enough concentration of oil for in situ burning to take place, is only effective when the ice cover is 30% or less. This cannot be guaranteed in Greenland.

The side-effects of burning significant quantities of oil in the Arctic are unknown. The in situ burning guidelines for Alaska admit that *"the potential effects of in situ burning in the marine environment and in inland and upland areas are not well known or understood, and will vary depending on the specifics of each accident".* It goes on to say that *"potential ecological impacts of in situ burning have not been extensively discussed or studied".*[46]

Some equipment that would be used for in situ burning has never been tested, nor approved for use in Greenland or by the Greenland government.

Steiner concludes that:

The difficulties of ignition, dealing with residues and keeping wildlife away from the burn are not adequately addressed in the plan, and the burn rates are unrealistic.[47]

In most spill scenarios, in situ burning will almost certainly not be as effective as envisioned in the OSCP.[48]

7. Shoreline protection and clean-up

Cairn admits that any clean-up response will grind to a halt during the freezing Arctic winter: *"during ice conditions the response may be limited to monitoring the spill with recovery operations resuming once the thaw is complete."* [49]

Cairn admits that *"the numbers of daylight hours will affect the response time. During the winter months, there are very few hours of daylight which can cause serious operational complications."*[50] Yet there is almost no explanation of how Cairn will respond to the challenges that will arise from tackling a spill as the Arctic winter sets in for example less daylight and hostile weather conditions.

The plan admits that the geography of Greenland's coastline makes it impossible to clean up a spill, noting that "the coastal environment in Greenland does not facilitate containment, recovery or protection due to the uneven rocky substrate that prevails in the region".[51]

Cairn admits that in some cases *"clean up techniques can be damaging and in some circumstances oiled shorelines are best left to recovery naturally".*[52] In simple terms, Cairn is admitting it will not clean up some damaged shorelines.

Finally, there are serious questions as to whether Cairn and Greenland have the capacity to mount a comprehensive shoreline clean-up given the remote and sparsely populated nature of much of Greenland's coastline. The plan itself says a large labour force will be required to clean up the shoreline, though this may not be locally available.[53]

It is clear that a blow-out at a Cairn well would cause oil to reach Canada, yet there is no information as to whether the Canadian government has given formal approval to this spill plan and whether this response plan is also supposed to cover the Canadian coastline or whether a separate plan exists.

Steiner concludes that:

The plan's estimates for how effective the clean up will be are wildly optimistic. Cairn claims it can clean 8,793 barrels of oil a day. A more realistic figure would be 650 barrels a day.[54]

The plan fails to adequately address the enormity of logistic requirements for dealing with a spill off Greenland.[55]

8. Wildlife impacts

Greenland's coastline would be extremely sensitive to an oil spill given the rich and diverse wildlife that the region is home too.

Cairn has failed to assess the different areas off Greenland that could be impacted by a spill. Any credible plan must prioritise areas according to the different environmental sensitivity of each region and how this changes depending on the season.

The plan notes there would be long-term and potentially significant impacts on narwhal populations.[56] It adds that marine mammals, such as seals and walruses, may be affected through the food chain.[57]

It suggests that that marine mammals living in open water would probably avoid heavily affected areas.[58] This is untrue as oil spills have been known to cause extensive injury to marine mammals. Thousands of marine mammals died as a result of the Exxon Valdez spill in the Gulf of Alaska in 1989, including 1,000–2,800 sea otters[59] and over 300 seals,[60] and killer whales populations decreased by 40%.[61] Many of these species have yet to fully recover.

Fish would also be affected by a spill, although Cairn maintains that the toxic concentration would not be high enough to cause mortality, adding that adult salmon and cod would naturally avoid any spilt oil.[62] This ignores the fact that oil coming ashore from a spill in summer and autumn would almost certainly remain in near-shore areas through the next spawning season, affecting reproduction of these important fish populations in the process.[63]

Finally, and most significantly, Cairn's plan does not even contain a wildlife response plan, which details how and where affected wildlife would be handled, cleaned and rehabilitated.[64]

Steiner concludes that:

The discussion of sensitive species is overly simplistic and dramatically understates the potential impacts.[65]

The plan notes that *"a high proportion of the breeding adult Atlantic puffins and razorbills from important breeding colonies in the outer Disko Bay are likely to be exposed to oil during a spill... and populations of cormorants and king eiders are likely to be significantly depleted".*[66] The impact on these important breeding sites is likely to be quite severe.[67]

CONCLUSIONS

This plan makes it apparent that an oil spill in the Arctic would be near-impossible to contain and clean-up. Conventional oil spill techniques such as booms, dispersants and in situ burning simply would not work in freezing and icy conditions, and the plan offers no other viable solutions for locating and removing oil when ice is present.

The assumptions on which Cairn's plan is based are often over-optimistic and over-simplistic including: the ability to mount a shoreline clean-up along Greenland's and Canada's coastline; the estimated time it would take to drill a relief well; and how effected wildlife would be treated and rehabilitated.

In short, the plan is wholly inadequate. Greenland should cancel Cairn's drilling programme this year and refuse future licences because this plan – and all previous experience of oil spill response technology in the Arctic – shows that we simply cannot deal with the consequences of an accident.

ENDNOTES

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17. Review of Cairn OSCP – Professor Rick Steiner, p1
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20. Cairn OSCP, p21, Table 5
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