

Rational Middle

Arctic Drilling: Friend or Foe of the Global Energy System?

The Arctic summer ice is melting faster than conventional climate models predicted, The Guardian warns (www.guardian.co.uk, May 2, 2013). Evidence points to the fact that the Arctic region changed due to accumulated manmade greenhouse gases, and, in turn, these changes lead to more activities encouraging further greenhouse gas emissions. The Guardian states that the new NASA satellite imagery from March 2013 reveals massive cracks in ice connecting Beaufort Gyre region to Alaska, and that new research from Rutgers University suggests the Arctic summer sea ice is connected to extreme weather.

On the one side, governments, companies and NGOs around the world are advocating for energy efficiency and reducing greenhouse gases levels in order to tackle climate change. On the other hand, emerging economies like China, India and Brazil with increasing energy demands are not yet equipped to eliminate fossil fuels from their power generation scheme in the next decades (World Energy Outlook 2012). While some experts argue that the global economy will (probably) need the fossil resources the Arctic has to offer, others warn about the large risks brought on by resource exploitation in the Arctic.

NRG Magazine wanted to see how experts would describe the relationship between the Arctic and the global energy system. Dr.ir. Sape A. Miedema, Associate Professor of Dredging Engineering at Delft University of Technology, and Dr. Maarten J.J.E. Loonen, Senior University Lecturer Arctic ecology at the University of Groningen, answered our call and provided us their own view on: "Arctic Drilling: Friend or Foe of the Global Energy System?"

Could be a Friend

When we really look at the drilling process, there is not much of a difference between drilling in the Arctic and drilling in the tropics. Because once you drill into the seafloor, you get high pressures, you get high temperatures and the actual drilling process does not really depend on the fact that you have ice above. The problem is that the ships and the platforms that are involved in Arctic drilling have to deal with the ice. Hence, it is more about the environment in which you are working, than the drilling itself. Another problem is that the ice in the Arctic is constantly moving. This means that if you put a platform somewhere, the ice is constantly pushing against it. The pressure of the often very thick ice can push the platform away, breaking the risers (the conduits that connect the surface with the subsea oil well) and causing an environmental disaster. This means that the platform and the mooring system of the platform have to be strong enough to withstand the force of the moving ice.

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Nobody wants an environmental disaster. Therefore, you have to study how to build those platforms, how to anchor them and how to deal with the ice. This is what we are investigating with our students at the Offshore Engineering Master Programme at Delft University of Technology. In some cases we can already make the right calculations that will solve the problem. The moving ice is the first problem with drilling in the Arctic. The second problem is icebergs, which are 10% above the water and 90% under water. Icebergs can have a conical like shape at the bottom.



Dr. Sape A. Miedema is Associate Professor of Dredging Engineering at Delft University of Technology. Dr. Miedema is also Educational Director of the Offshore Engineering Master Programme at the same university. Students with Bachelor’s degrees in various fields, from civil engineering to marine technology, can enrol in this master programme. The main purpose of the programme is to teach students how to develop systems and equipment for the oil and gas industry, for the dredging industry, but also for wave energy and Ocean Thermal Energy Conversion (OTEC). 240 master students are currently enrolled in the programme and 80 are expected to graduate this year. *Photo courtesy of Sape Miedema*

This conical shape can make icebergs cut through the seafloor – we call this ice scour. We know from many measurements that ice scours can go 6 metres deep into the sea soil and can cut pipelines on the seafloor.

Nowadays, there are two ways of bringing oil to the shore: with shuttle tankers and with pipelines. Since you cannot sail the whole year in the Arctic, due to the ice, pipelines are the preferred method. We know icebergs can cut through pipelines.

Based on many calculations, we also know that we should bury the pipelines 10 metres deep. If the pipeline is just below the iceberg, you get many deformations in the soil and those deformations will still damage the pipelines. Thus, in order to protect them, pipelines have to be far enough under the bottom of the iceberg. There is another challenge here.

When burying the pipelines so deep, it is very well possible that the soil in such an area is frozen (i.e., permafrost), that means you have to make a trench in permafrost. Nobody ever did that before, so we also have to do research and understand what the behaviour of permafrost is and how to make a trench in permafrost.

I am not in favour, nor against Arctic drilling. I do think Arctic drilling will start one day, and the moment it starts, we have to make sure that we will have solved all the technical problems, so it can be done in a safe manner. We cannot prevent oil companies from drilling in the Arctic and installing platforms in those areas, but we can help them drill there in the safest possible manner, both for the environment and the people.

There is another aspect related to drilling in the Arctic. 10-50% of the world’s oil and gas resources are estimated to be in that region. If we look at the increase in energy consumption on this planet, we cannot miss the 10-15%. Additionally, the world will have 9 billion people by 2050, and they will all need energy. If we do not find alternatives for energy supply soon enough, then we need Arctic drilling. Of course, costs also have to be taken into account. The Arctic is probably the most expensive drilling location on the planet. Oil companies will only drill there if they can also make a profit. Nevertheless, if we do not have alternatives, Arctic drilling could be a friend of the global energy system. ●

Foe, because...

Our sympathy for the Arctic was triggered by looking at beautiful pictures with ice full of shades of whites and blues. Sir David Attenborough has brought the beauty of the polar areas and its wildlife into our homes with BBC documentaries like Frozen Planet. I have experienced this beauty in my 25 summers in the High Arctic on Spitsbergen studying migratory birds. I am in love with this place of beauty and wilderness. But like the migratory birds, I leave the Arctic when temperatures sink below zero and the light disappears for several months.

The Arctic was always remote and difficult to access. But the Arctic is under threat. Global warming makes the sea ice retreat in summer. The local warming process accelerates. White heat reflecting surfaces of ice change into dark heat absorbing surfaces of water. Enhanced levels of water vapour in the atmosphere act as extra greenhouse gasses and cause additional warming. The Arctic belongs to the areas on our globe where regional warming has been most pronounced. There is a serious risk of passing a tipping point when changes will accelerate and become irreversible. The prospect of losing this biome makes me sad.

“Drilling in the Arctic has a higher risk for ecological disaster than drilling in other parts of the globe”

But why not approach this from a positive side and use this opportunity with improved access to formerly closed grounds. Why not exploit the natural resources, as we have always done all over the globe? Let us make the Arctic



Dr. Maarten J.J.E. Loonen is senior lecturer at the Arctic Centre of the University of Groningen in the Netherlands. He is biologist and station manager of the Netherlands Arctic Station in the northernmost settlement and largest international research base on Spitsbergen (www.arcticstation.nl). He has spent over 25 summers in the Arctic studying consequences of change in migratory birds and the ecosystem.

Photo: Cecilia Sandström

contribute to global warming by burning carbohydrates and exploit the treasures which have been hidden for us under the ice...Can you live with such an attitude?

Nothing is lost forever by letting the Arctic oil exploitation rest for a better moment in the future. Drilling in the Arctic has a higher risk for ecological disaster than drilling in other parts of the globe. The main risk to consider is the unlikely event of an accident. The arctic environment with many months of darkness and destructive forces of drifting ice increases the risk of an accident. We can minimize that risk but never eliminate it. We easily accept small risks as if they are zero. In the Netherlands we have our civilisation built below sea level and go to bed without realizing that there is still a risk for flooding. History has shown that even unlikely accidents do happen.

An oil spill in the Arctic will be more difficult to control than anywhere else. Natural breakdown processes are slow due to the low temperature and conditions for removing any spilled oil are more complicated. The remoteness

and inaccessibility of the area will make it difficult to support cleaning by bringing in extra people or boats. Sea ice can be a physical obstruction for any emergency operation. Chances are high that removal of oil during winter will be impossible. Oil will be encapsulated in sea ice. Sea ice is not solid. It is full with brine channels, where the water does not freeze due to the high salinity. In these brine channels oil will be stored until the next melt. Then, the oil will re-appear and form a top layer on the ice and later on the water. The whole ecosystem will be faced again with the spilled oil in the next summer and potentially many summers afterwards.

In my opinion, we live in a period of great uncertainty for dramatic changes in the Arctic ecosystem. This is not the moment to run additional risks. If we can agree on a moratorium, the oil will be there for later exploitation. I see a lot of benefits in a slowly increasing shortage of fossil fuel to stimulate our economy to a more sustainable society. And I hope that we and the Arctic will be able to survive the threats of global warming. ●