Unlocking Arctic resources: New realities and future perspectives

Tony Doré

The Arctic

- Context and Activity
- A bit of big-picture Geology….
- Resources
- Environment, Technology, Cost
- Way Forward

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Recent Arctic activity

1. Cairn drilling off West Greenland from 2010 (8 wells)
2. Norway-Russian border settlement in Barents Sea, 2010
3. Statoil discoveries (Skrugard, Havis) in western Barents Sea
4. East Greenland licence rounds 2012 and 2013
5. Norwegian Barents Sea licence round, 2012
6. ExxonMobil JV with Rosneft in South Kara Sea, 2011
7. Statoil and ENI agreements with Rosneft in former Barents disputed zone, 2012
8. ExxonMobil JVs with Rosneft in North Kara, Laptev & Chukchi Seas

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Statoil Arctic presence

- Significant drilling campaigns in Barents Sea and Grand Banks

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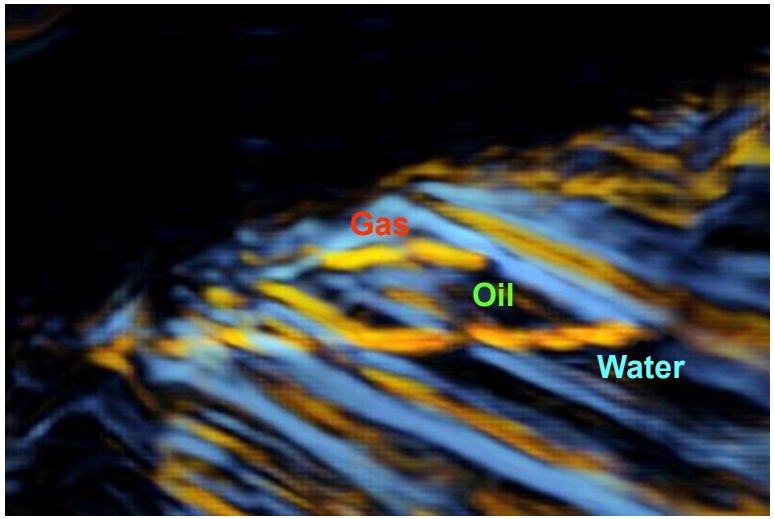
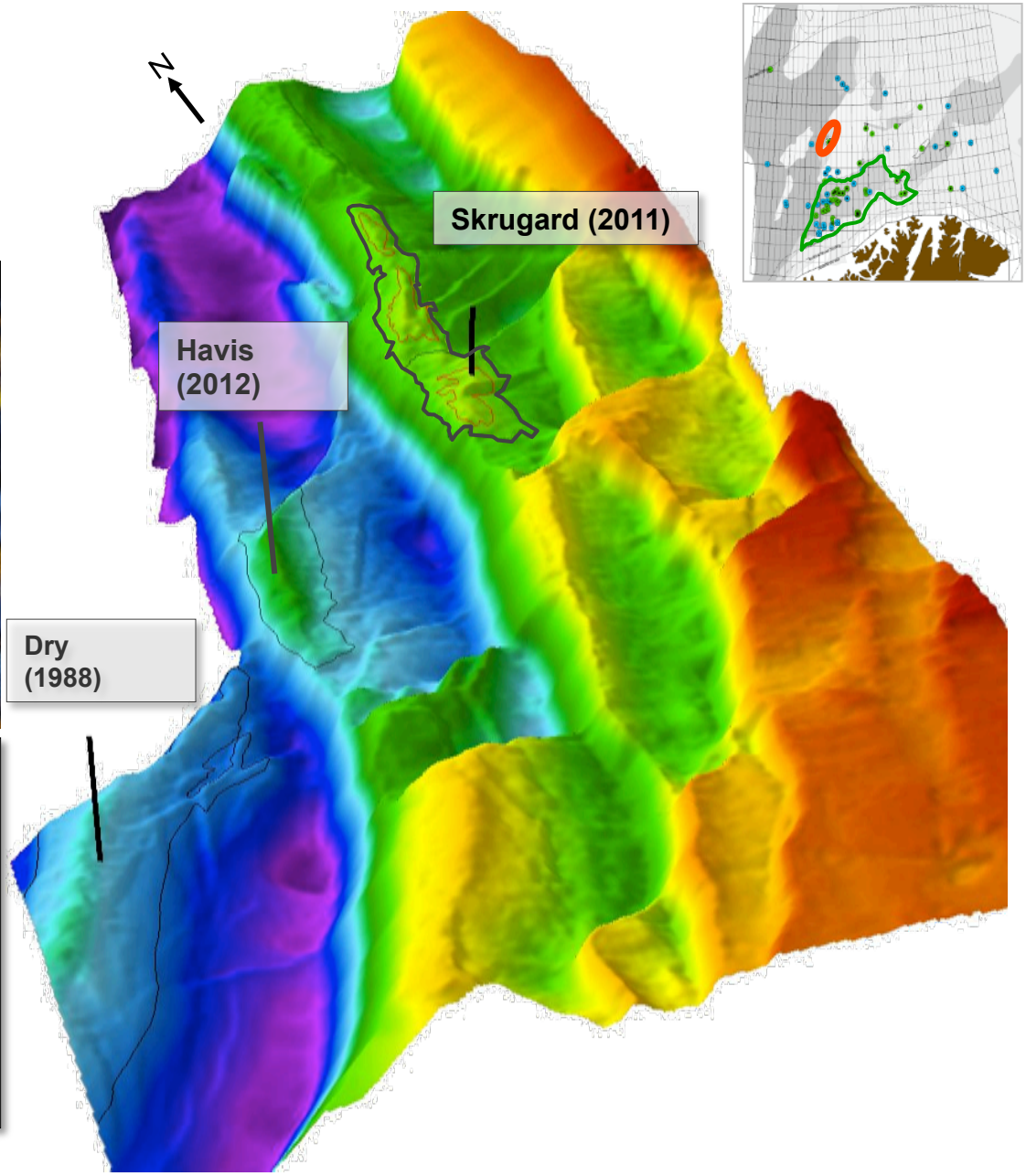
Johan Castberg



- A new oil province in the Barents Sea
- 400 - 600 mboe
- Potential hub for other discoveries



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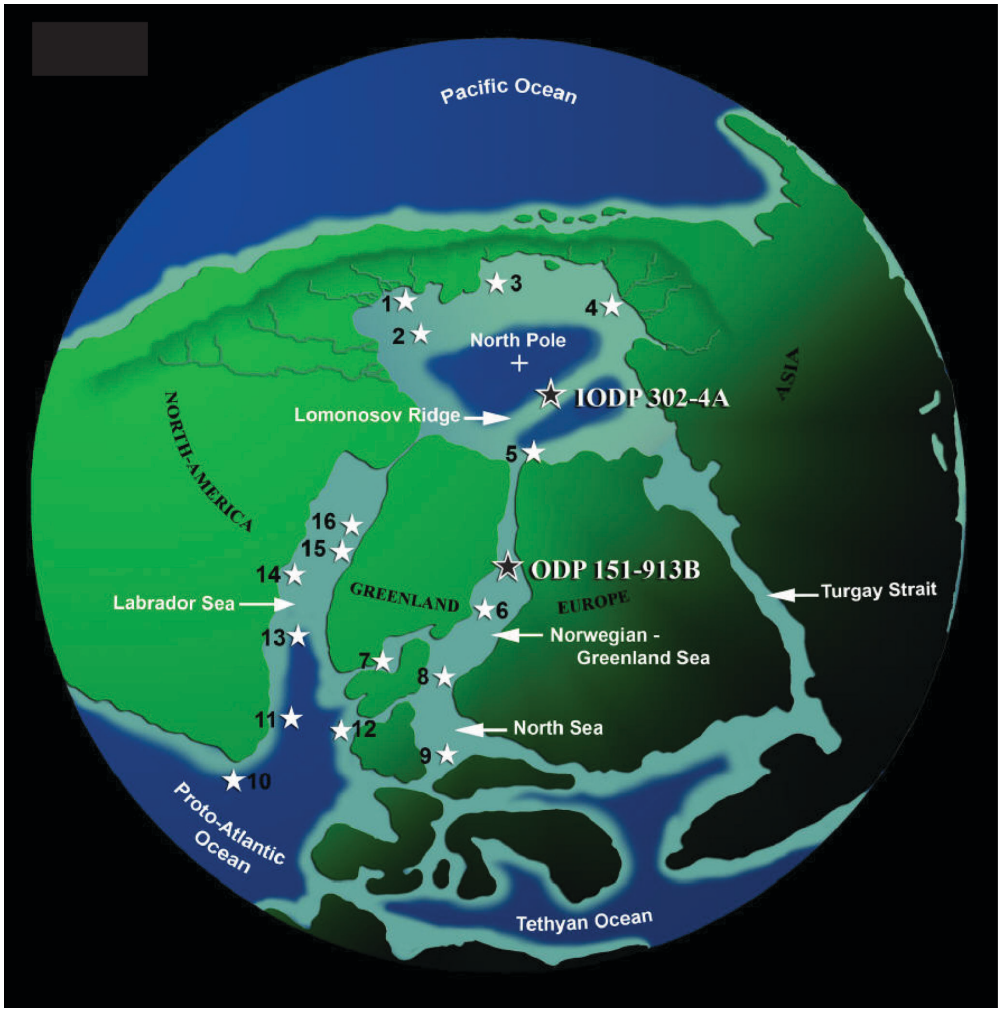
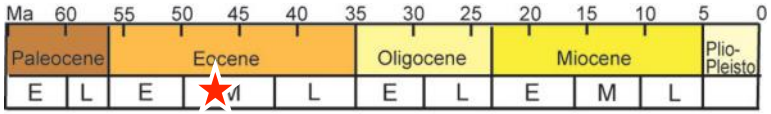
When did the Arctic become "arctic" (1)



Early Middle Eocene

- Super-greenhouse
- Isolation of Arctic
- Fresh-water lens
- Explosive Azolla growth
- Doubles biomass in 2-3 days
- Absorbed CO_2
- ?Start of ice house



From Brinkhaus et al, 2006

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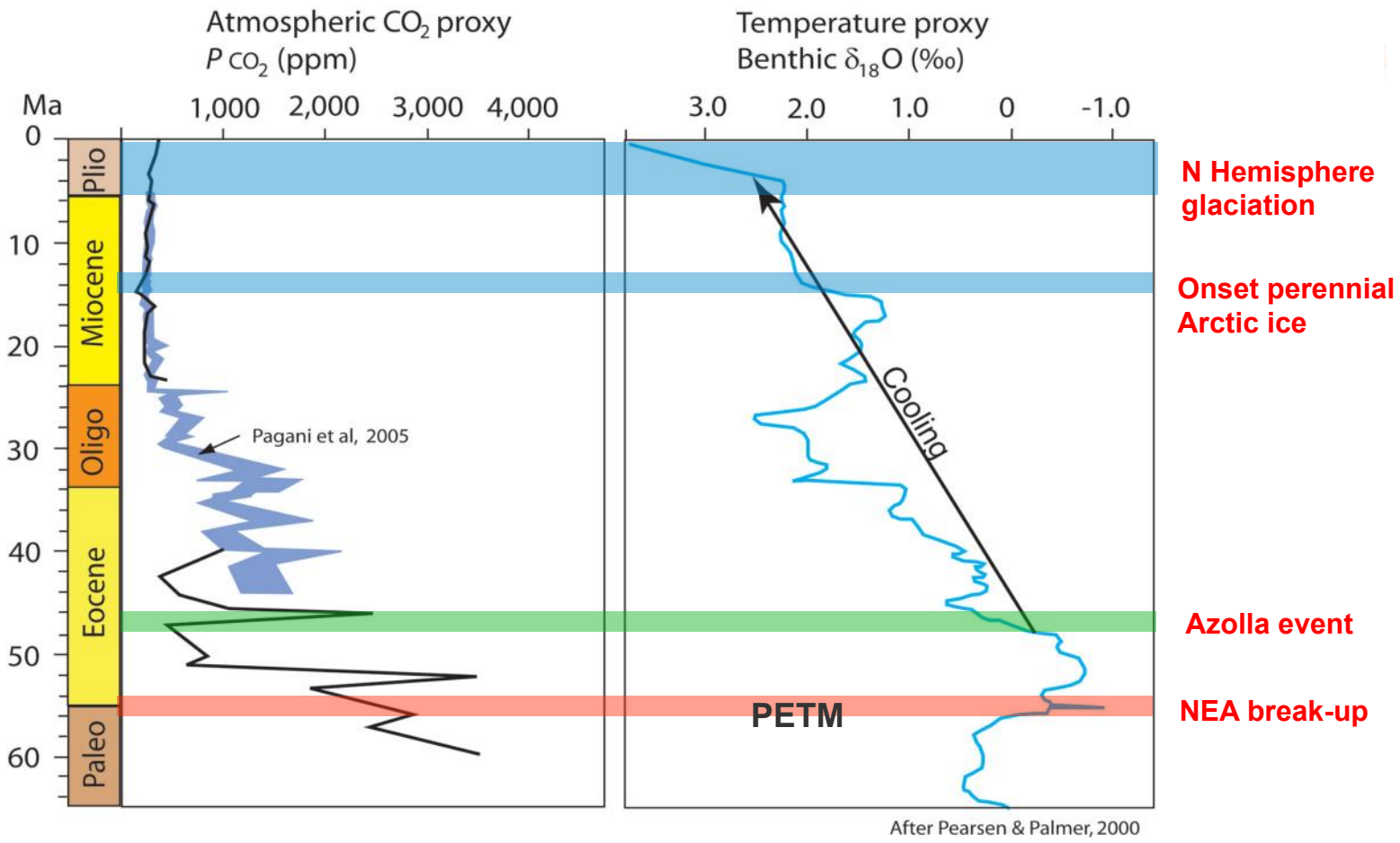
When did the Arctic become "arctic" (2)



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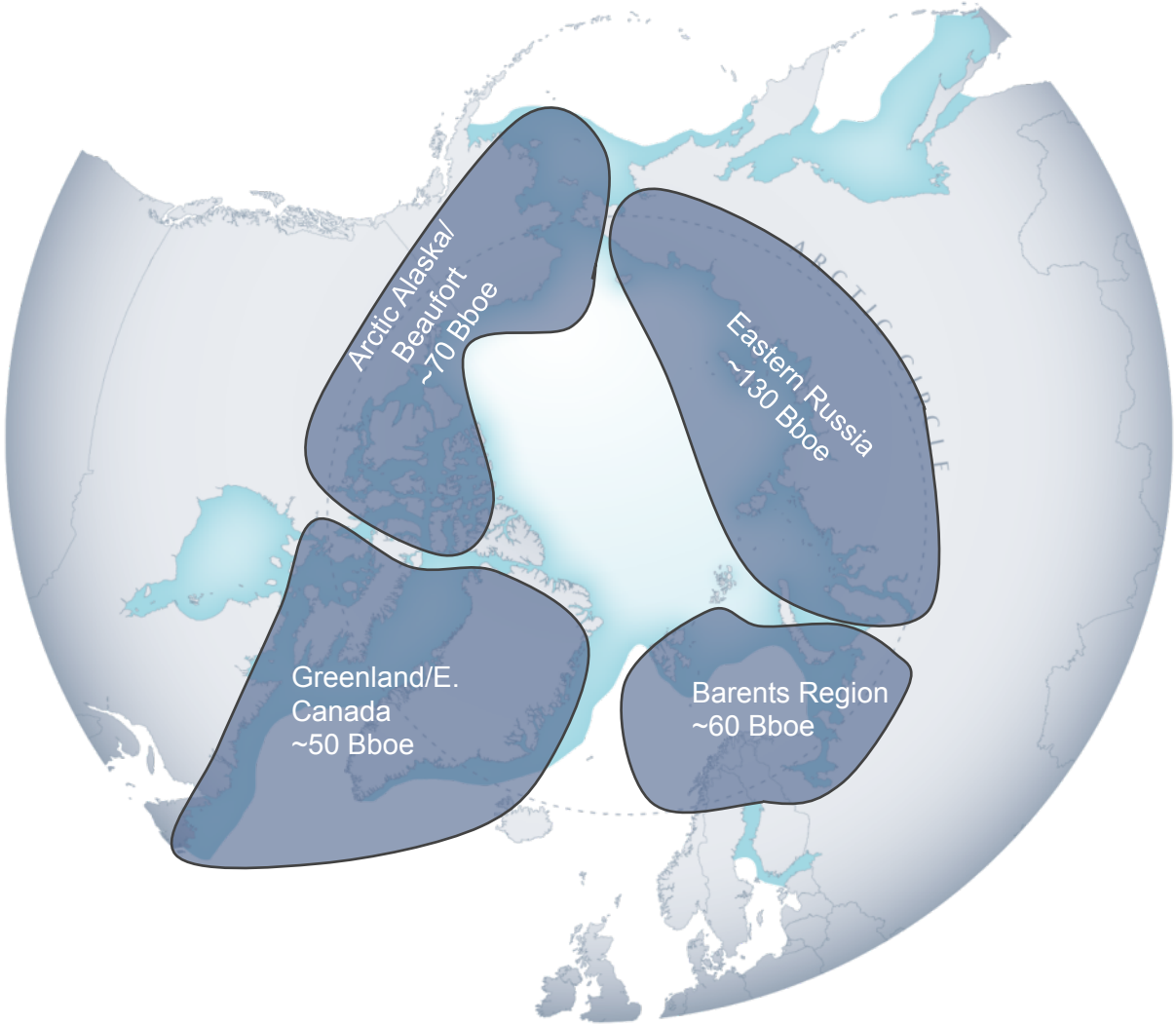
Arctic resources



- More oil-prone than gas-prone
- High potential, high uncertainty
- Key role in long term global energy supply?

400+ discoveries
200+ BBOE proven
~150 BBOE Yet-to-find

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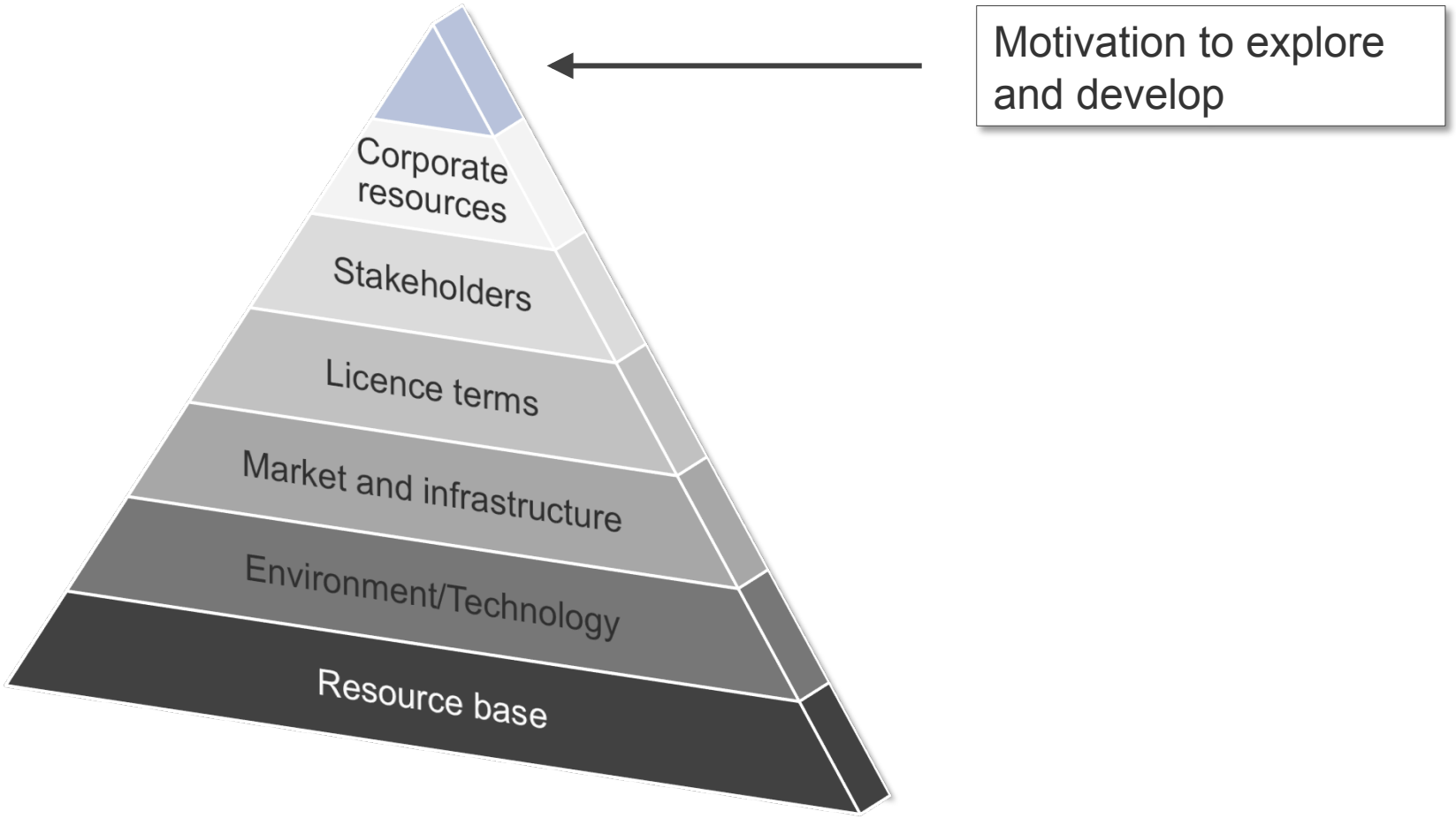
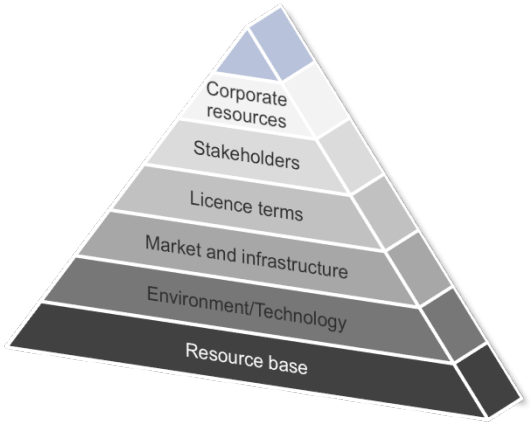
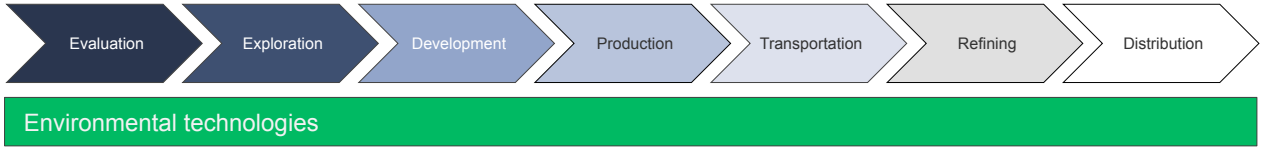
But geology isn't the main challenge in the Arctic



Motivation to go Arctic: Technology





ENABLING TECHNOLOGIES:

Ice breakers, iceberg detection, wellhead protection against icebergs, estimating icing, sub-ice drilling, relief well capabilities

ENVIRONMENT-RELATED TECHNOLOGIES:

Reduce environmental footprint

Documentation of sound impact

Effective solutions for oil spill response

Minimize blowout consequences

Reduce discharge probability

Improve leakage detection

COST REDUCING TECHNOLOGIES:

Efficient logistics solutions, power solutions, drilling cost reduction

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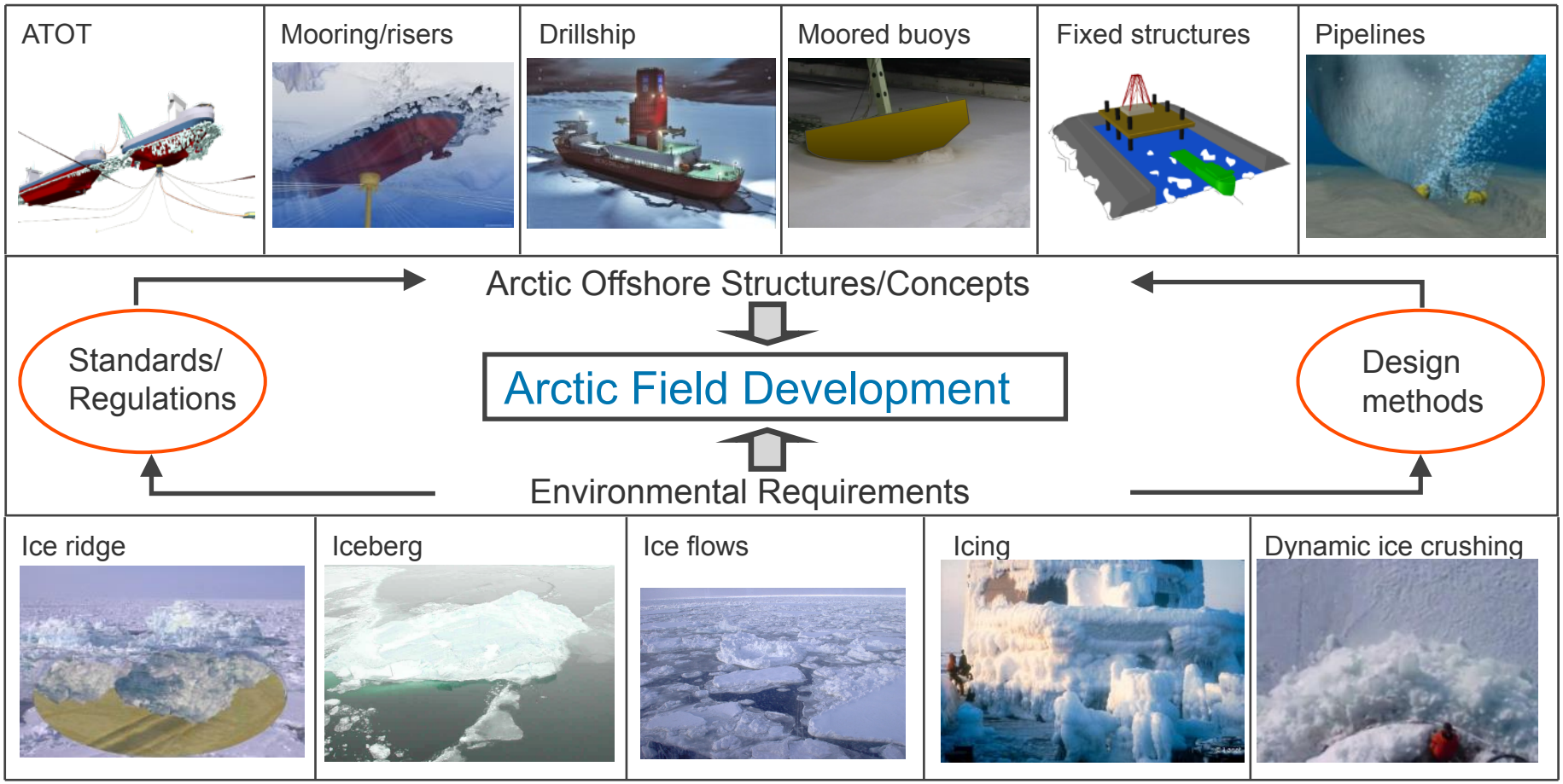
Arctic field development: Technology challenges



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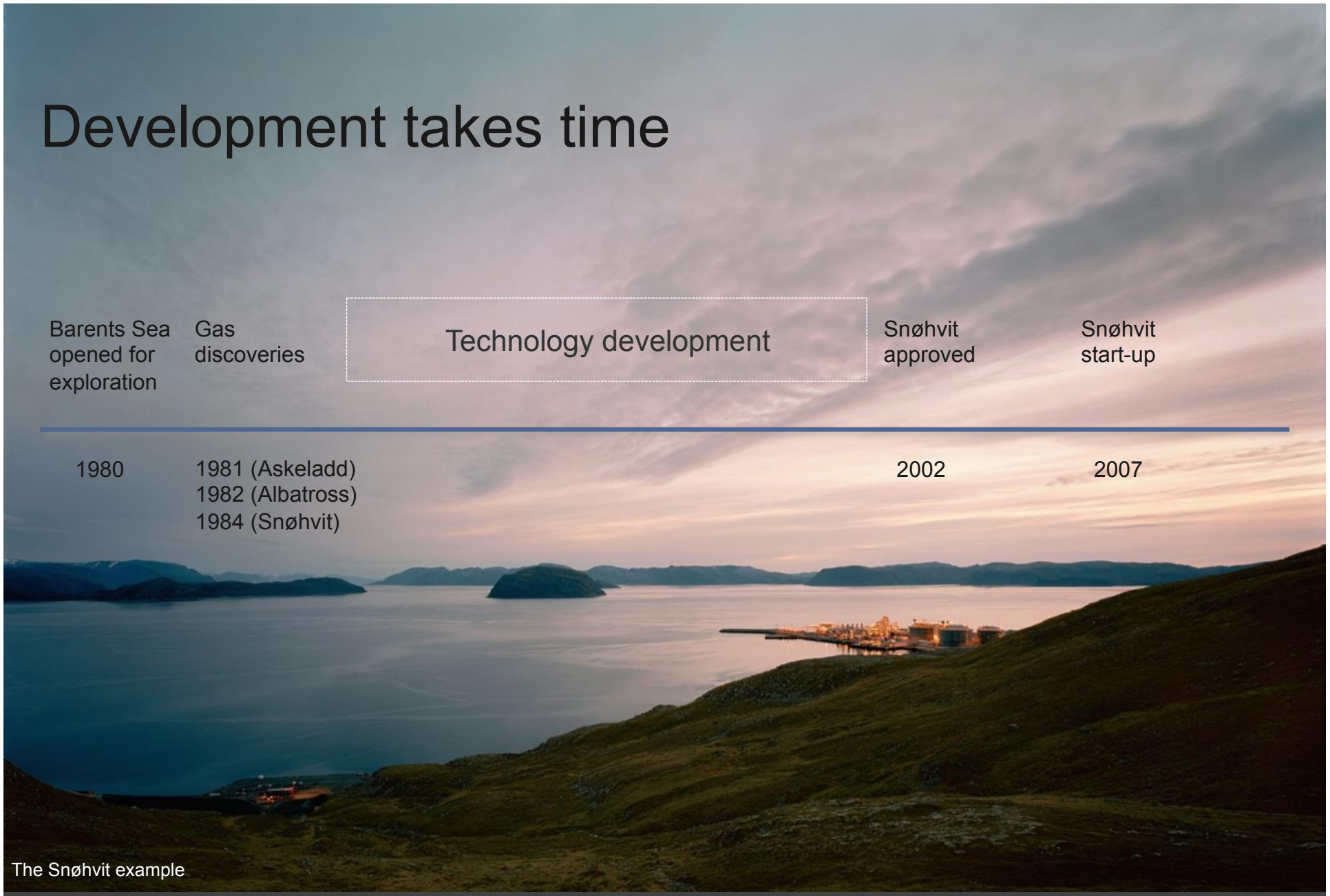
Development takes time

Barents Sea opened for exploration	Gas discoveries	Technology development	Snøhvit approved	Snøhvit start-up
1980	1981 (Askeladd) 1982 (Albatross) 1984 (Snøhvit)		2002	2007



The Snøhvit example

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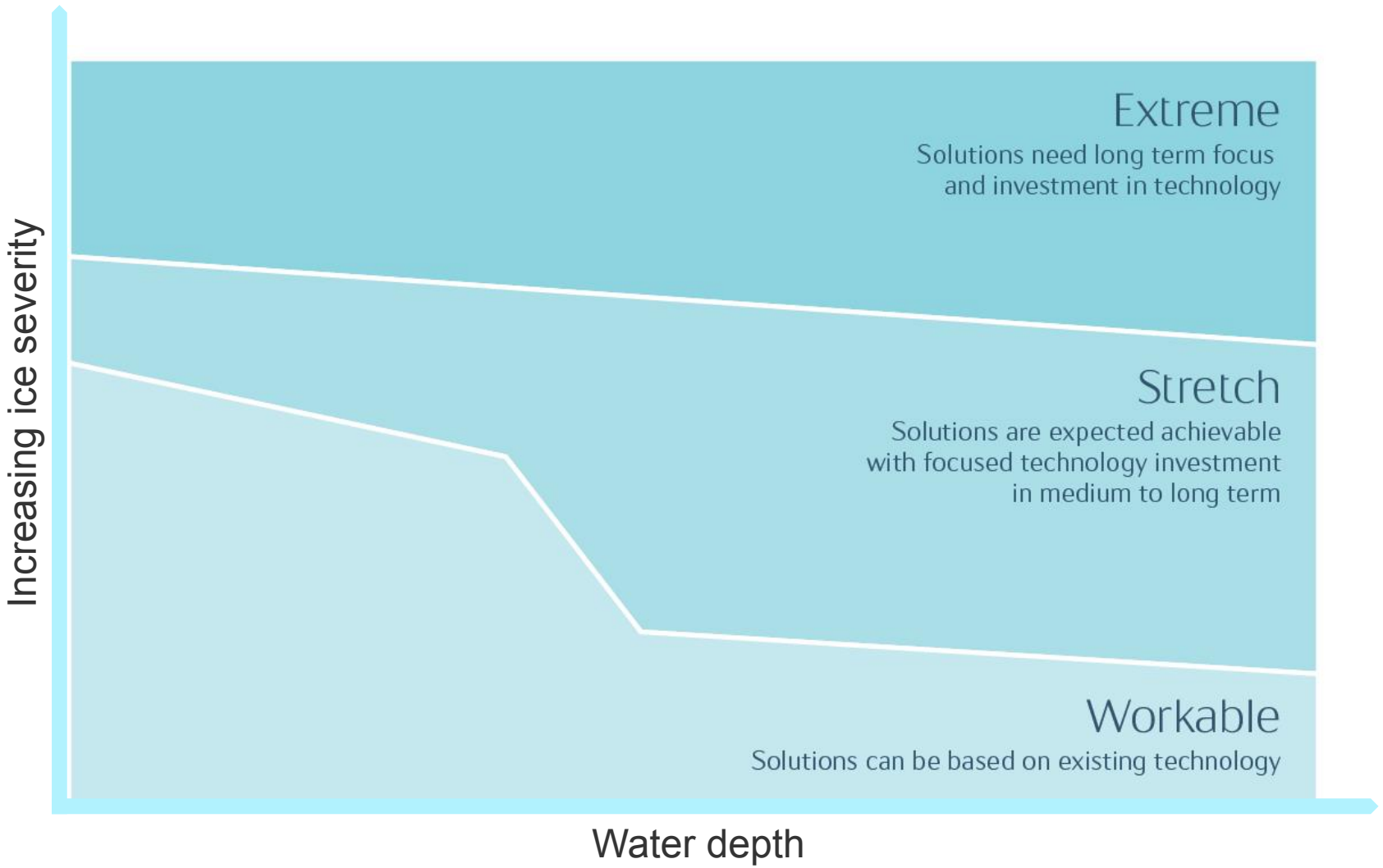
There is not just one Arctic



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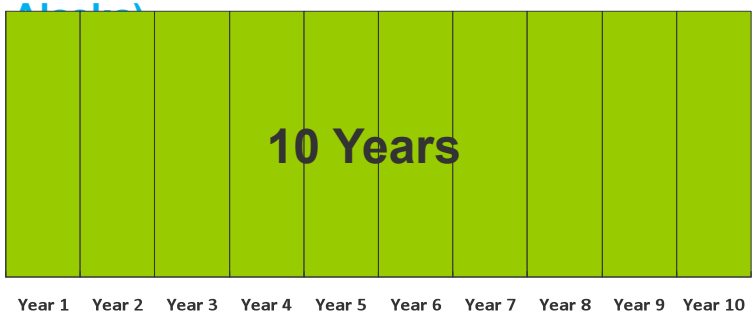
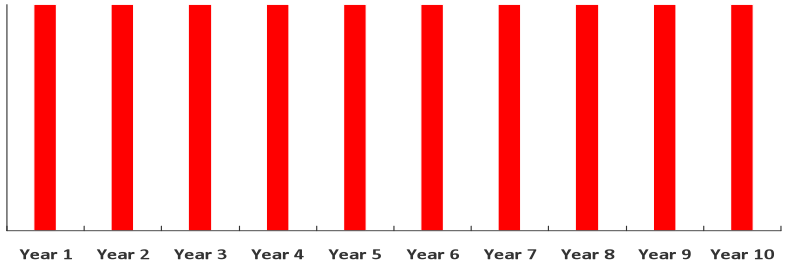
Licence periods

Enough time to operate?

License term - **US Offshore (GoM and Alaska)**

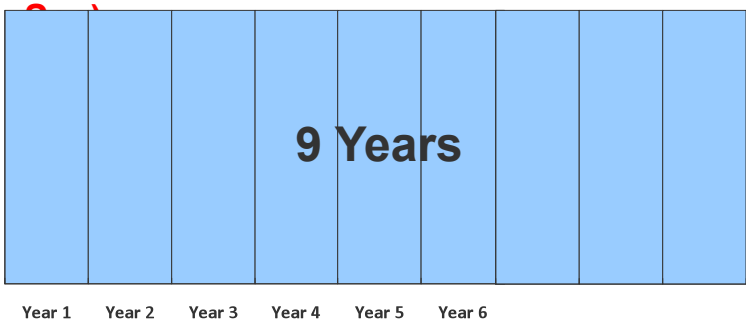


Effective operating period (Alaska)

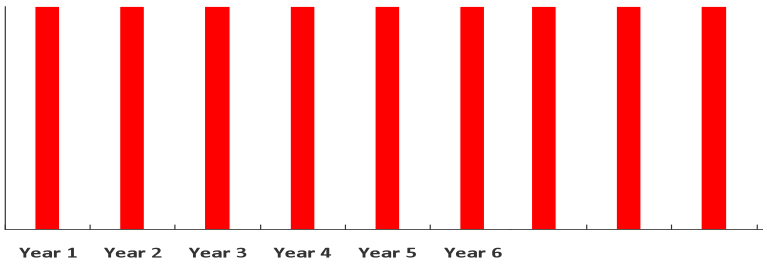


Effective operating period in Chukchi Sea:
2.5 – 3 years

License term - **Offshore Canada (Beaufort Sea)**



Effective operating period (Beaufort Sea)



Effective operating period:
1.5 – 2 years

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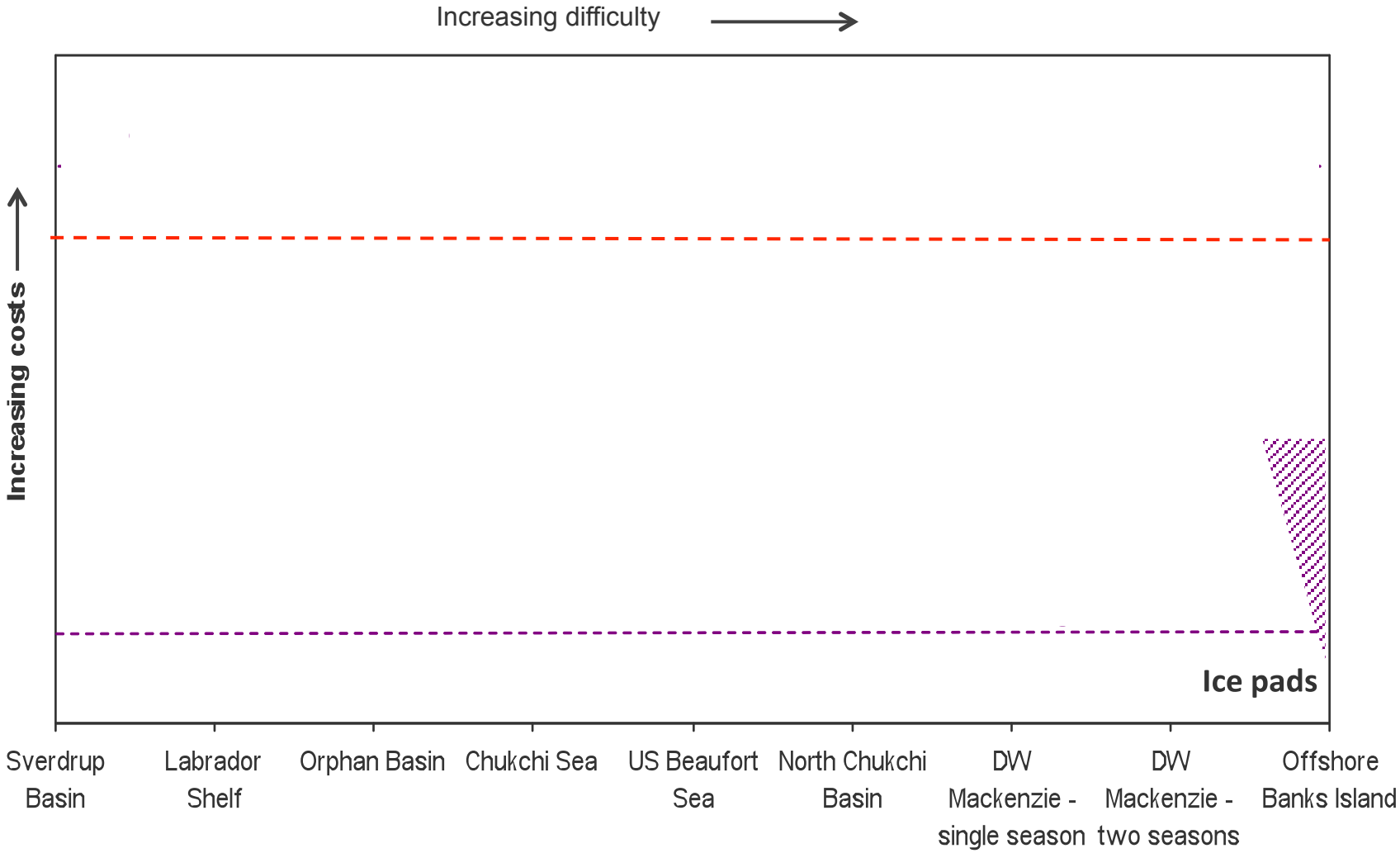
Active stakeholder engagement

Local communities

Barrow, Alaska – population 4500

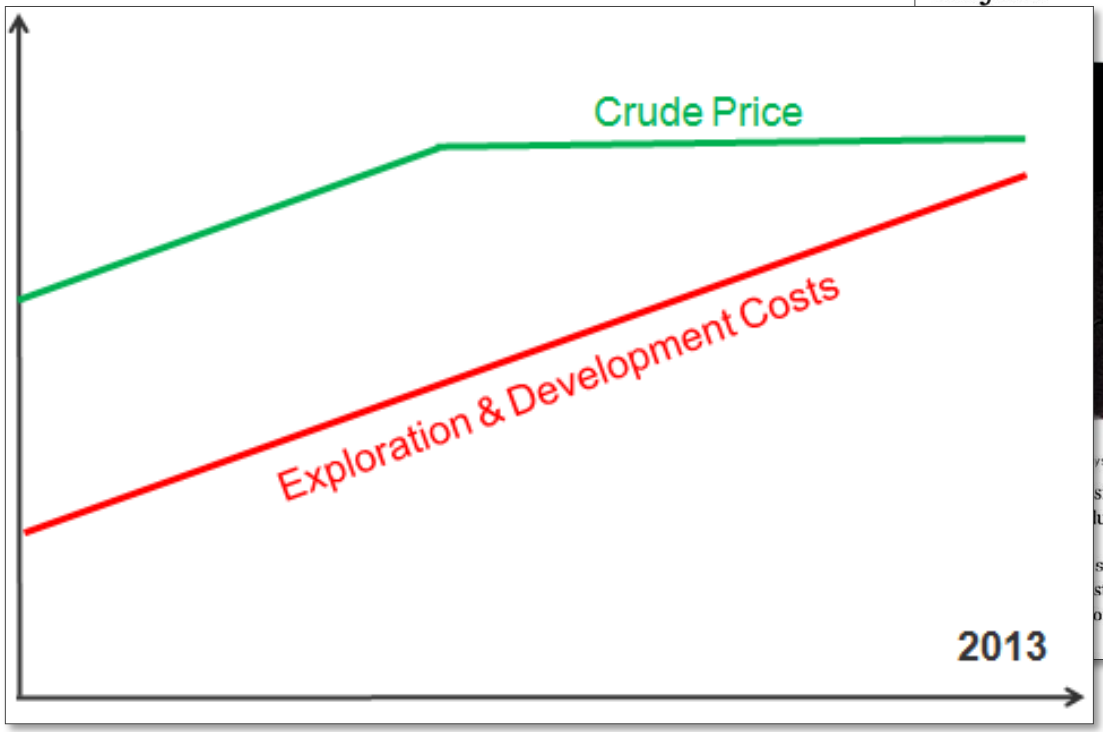
Point Lay, Alaska – population 250

Drilling costs, North-American Arctic



Offshore exploration in 2013

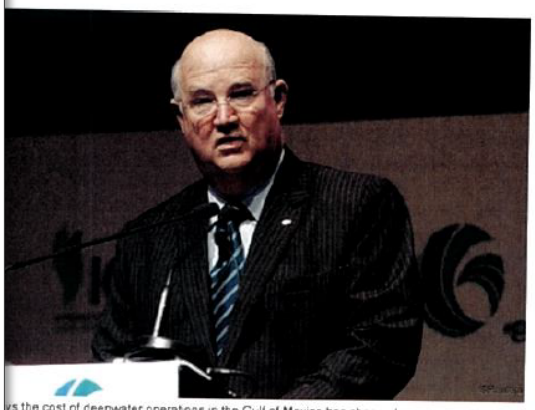
High costs, low margins



FINANCIAL TIMES

September 8, 2013 4:00 pm

Exploration: Rising cost of complex projects hits majors



ys the cost of deepwater operations in the Gulf of Mexico has changed

since the devastating accident at BP's Macondo well in the Gulf of Mexico, and it is business lucrative waters. Apart from one thing: costs.

second-quarter results in July, George Kirkland, executive vice-president of exploration and st structure in the deepwater of the gulf had changed since the tragedy, one of the worst oil s orkers were killed. The cost of wells is 20-25 per cent higher, he said.

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Arctic exploration: Summary (1)

- Arctic geology provides very favourable setting for oil & gas
- Arctic may contain large proportion of the world's undiscovered conventional petroleum resources
- There are "many Arctics", requiring different approaches to:
- Enabling technologies
- Environmental management
- Investment
- Consideration for local stakeholders and the environment must underpin all activity
- Cost and low margins are key Arctic constraints

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Arctic exploration: Summary (2)

- **Arctic exploration and development will be stepwise:**

Oil > Gas
Ice-free > Seasonal ice
Shallow > Deep
Onshore > Offshore

- **Nobody can do it alone. Partnership models are critical:**

Company + Government
Company + Company
Company + Local Stakeholders

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There's never been a better time for good ideas

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