



## Arktiset markkinat

Arto Uuskallio

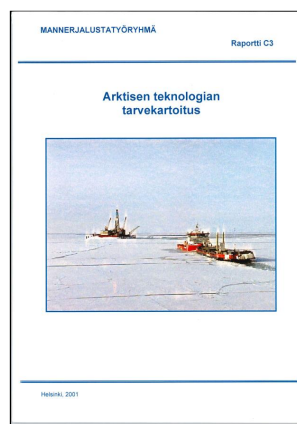
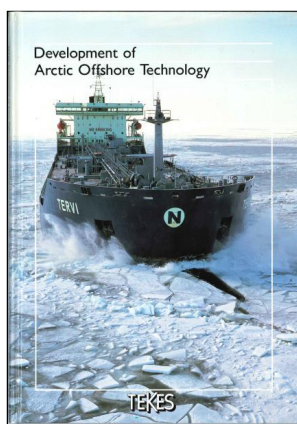
Meriklusterin tulevaisuusnäkymät  
13.10.2015

14 October, 2015

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## Katsaus aikaisempiin arktisiin ohjelmiin



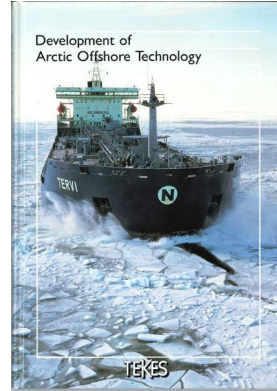
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## Katsaus aikaisempiin: TEKES –teknologiaohjelma

- Arktisen offshore- ja rakennustoiminnan kehittäminen: 1985—1989
  - ◆ Development of Arctic Offshore Technology
- Kokonaisbudjetti noin 27 MFIM, josta TEKES 17 MFIM
- Pääalueet
  - ◆ Jään ja rakenteen vuorovaikutus
  - ◆ Arktinen materiaalitekniikka
  - ◆ Arktisen toiminnan tukitoiminnot



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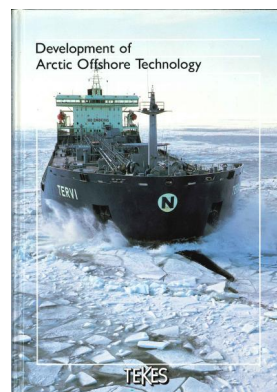
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## Arktisen offshore- ja rakennustoiminnan kehittäminen

| PROJECT TITLE  | PROJECT OPERATOR  | DURATION | BUDGET (M€)             |
|--|---|----------|-------------------------|
| 1. Ice Loads on Screw Propellers and Hull Structure                                      | VTT/Ship Laboratory   | 1986–90  | 5,900,000 (3,090,000)   |
| 2. Ice Load Measurements from Channel Markers  | VTT/Laboratory of Structural Engineering  | 1985–90  | 2,500,000 (1,740,000)   |
| 3. Measurement of Internal Stresses in the Ice Field                                     | VTT/Laboratory of Structural Engineering  | 1985–87  | 1,480,000 (1,040,000)   |
| 4. Model Tests and Analysis of Ice Forces on a Caisson-type Offshore Structure           | VTT/Laboratory of Structural Engineering  | 1985–86  | 520,000 (284,400)       |
| 5. The Kerni I Test Case Project *   | University of Oulu  | 1983–87  | 700,000* (373,000)      |
| 6. Development of Ice Technology for Deep Water Platform Design                          | Finn-Steel Oy   | 1985–87  | 710,000 (550,000)       |
| 7. The Ice-Structure Contact Problem   | Wärtsilä Arctic Research Centre (WARC)  | 1986–89  | 1,420,000 (1,068,000)   |
| 8. Mathematical Modelling of Deformation Mechanisms in Ice                               | WARC  | 1986–89  | 550,000 (413,000)       |
| 9. The Interaction Between Ship and Ice  | Helsinki University of Technology/Laboratory of Naval Architecture and Marine Engineering | 1986–89  | 2,395,000 (1,094,000)   |
| 10. Components of Resistance Encountered by a Vessel Moving Through Level Ice            | WARC  | 1987–89  | 1,800,000 (1,249,000)   |
| 11. Implementation of Model Ice and Prediction Methods for a New Ice Model Test Facility | Helsinki University of Technology/Arctic Offshore Research Centre                         | 1987–89  | 1,200,000 (750,000)     |
| 12. Dynamic Ice-Structure Interaction  | VTT/Laboratory of Structural Engineering  | 1987–90  | 800,000 (600,000)       |
| 13. Durability of Concrete in Arctic Offshore Structures                                 | VTT/Concrete and Steel Laboratory   | 1985–88  | 3,000,000 (2,300,000)   |
| 14. Ice Adhesion on Structures   | VTT/Laboratory of Structural Engineering  | 1986–87  | 750,000 (435,000)       |
| 15. The Use of Extra High Tensile Strength Steels for Arctic Ships and Structures        | Helsinki University of Technology/Laboratory of Naval Architecture and Marine Engineering | 1988–89  | 393,000 (270,000)       |
| 16. Punching Shear Capacity of Reinforced Concrete                                       | VTT/Concrete and Steel Laboratory   | 1988–89  | 500,000 (350,000)       |
| 17. Arctic Data Bank – Feasibility Study   | Elomatic Oy   | 1985–86  | 250,000 (250,000)       |
| 18. Arctic Transportation Economic Analysis Model  | Neste Oy Shipping   | 1986–90  | 1,345,000 (1,025,000)   |
| 19. Project evaluations, Final Reports, Seminars   | TEKES   | 1990     | 561,000 (561,000)       |
| Total  |   |          | 26,774,000 (17,297,000) |

- Erilaisia teknisiä tutkimus- ja tuotekehityshankkeita
- Yhteensä 18 tutkimusprojektia



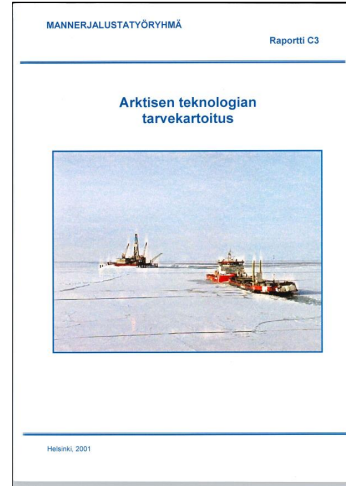
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## KTM: Arktisen teknologian tarvekartoitus

- Kauppa- ja Teollisuusministeriön teknologiaosaston tilaama raportti: 2001
- Raportti hahmottaa arktisilla alueilla lähitulevaisuudessa tapahtuvaa teollista kehitystä
  - ◆ Laivanrakennus
  - ◆ Muu meritekninen teollisuus
  - ◆ Rakennusteollisuus
  - ◆ Terästeollisuus
  - ◆ Muu teollisuus

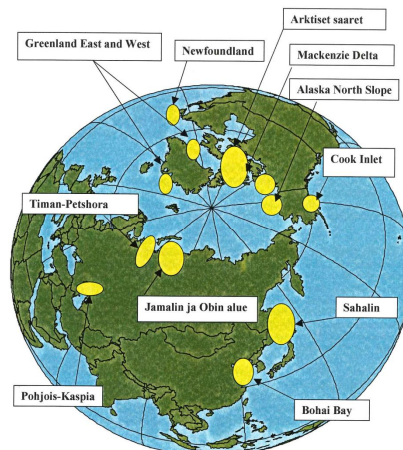


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## Tarvekartoituksessa indikoidut aktiviteettialueet



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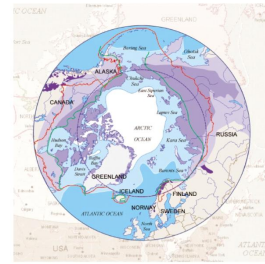
## Historiakatsaus: Selvitys arktisen toiminnan näkemyksistä ja mahdollisuuksista

- Tavoitteena "... selvittää suomalaisyritysten rahoitukselliset ja teknologiset resurssit sekä verkottumismahdollisuudet koskien osallistumista arktisten alueiden luonnonvarojen hyödyntämiseen perustuviin hankkeisiin."
- Katsaus arktisen liiketoiminnan potentiaaliin suomalaisyritysten näkökulmasta

Arktinen teknologia suomalaisten yritysten liiketoimintastrategioissa

Tero Lausala & Pauli Järppänen, Finpro

Teknologiakatsaus 128/2002



TEKES

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## Havaintoja arktisista alueista ja markkinoista

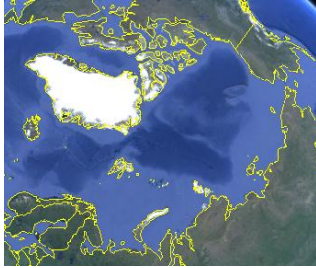
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## Arktinen alue on laaja ja monimuotoinen

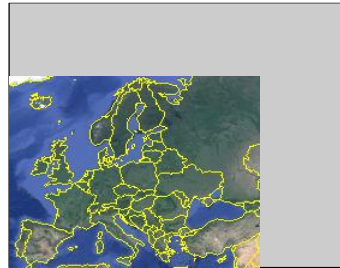
Arctic



China



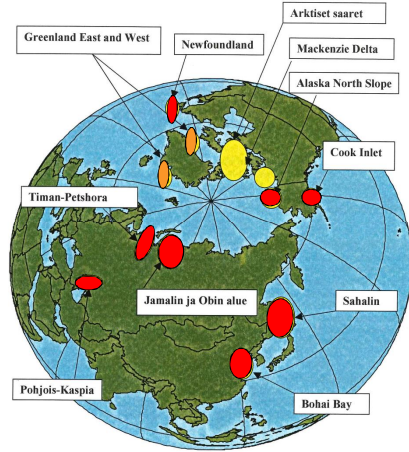
Europe



## Arktiset markkinat meriteollisuudelle

- Arktisen alueen luonnonvaroihin liittyvät projektit
  - Offshore ja onshore öljy ja kaasu
  - Kaivoshankkeet
  - Metsäteollisuus
  - Kalastus
- Arkinen laivaliikenne ja niihin liittyvät projektit
  - Kaupallinen liikenne
  - Valtiolliset hankkeet
- Polaarikoodin tuomat liiketoimintamahdollisuudet
  - ◆ Polar Water Operation Manual (PWOM)
  - ◆ Lisääntyneet koulutusvaatimukset
- Jo toiminnassa olevien öljy- ja kaasukenttien, kaivosten, teollisuuslaitosten ja yhdyskuntien modernisointi, ylläpito ja huolto
- Palvelut navigoinnille:
  - ◆ Jääpalvelut ja sääennusteet, kommunikointi,

## KTM:n Tarvekartoituksessa indikoidut aktiviteettialueet



- Monessako projektissa suomalaista osaamista mukana?
- Mikä on liikevaihto suomalaisille yhtiöille?
- Miten projekteihin on päästy mukaan?

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## Miten markkinoille pääsee:

### Ymmärrys kehityksen vaiheista: Kaivostoiminta vs. öljy ja kaasu

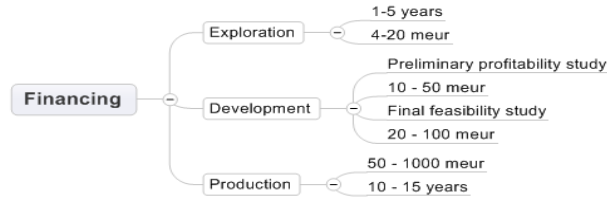
- |   |   |
|---|---|
| ■ Prospecting and early exploration <ul style="list-style-type: none"><li>◆ Claims – Prospectors, Junior companies</li></ul>              | ■ Early phase seismic studies 2D / 3D <ul style="list-style-type: none"><li>◆ Lisencing</li></ul> |
| ■ Intermediate exploration <ul style="list-style-type: none"><li>◆ Junior companies</li></ul>   | ■ Seismic 2D / 3D <ul style="list-style-type: none"><li>◆ oil and gas companies</li></ul>         |
| ■ Advanced exploration <ul style="list-style-type: none"><li>◆ Junior and senior companies</li></ul>                                      | ■ Exploration drilling <ul style="list-style-type: none"><li>◆ oil and gas companies</li></ul>    |
| ■ Mine development <ul style="list-style-type: none"><li>◆ Senior companies</li></ul>   | ■ Pre feed  |
| ■ Investment decision <ul style="list-style-type: none"><li>◆ Preliminary profitability study</li><li>◆ Final feasibility study</li></ul> | ■ Front-End Engineering and Design FEED   |
| ■ Mine development  | ■ Final Investment Decision FID   |
| ■ Mine operation  | ■ Production development  |
| ■ Mine closure  | ■ Production  |
|   | ■ Abandonment   |

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## Miten markkinoille pääsee: Ymmärrys kehityksen vaiheista: Kaivostoiminta



Ben Chalmers, Mining association of Canada at Canada Mining Seminar, Säätöytalo

### Ajurak ja Pokak lisenssit

investment decision could be made in 2016 and drilling could start on one or more exploration wells in summer 2020 within two exploration license areas that carry combined auction commitments of C\$1.76 billion (US\$1.71 billion). "Based on the potential we see, we decided to proceed to the next step, although we've not



## Arktinen toiminta vaatii pitkäjänteisyyttä

- Korkeiden tuotantokustannusten takia vain suuria projekteja kehitetään
  - ◆ Suuret budjetit
  - ◆ Suuret taloudelliset riskit
  - ◆ Viivästymät todennäköisiä
  - ◆ Minimiviivästys on vuosi
- Esimerkki offshore-toiminnan aikataulusta Beaufortin merelle

| Activity   | Estimated Timing |
|--|------------------|
| Reserves Assessment  |                  |
| Market Assessment  |                  |
| Conceptual Engineering   |                  |
| Economic Modeling  |                  |
| Budgeting  |                  |
| Assessment of Regulatory Environment   |                  |
| Feasibility Study  | 0.5 - 1.5 years  |
| Reservoir Engineering  |                  |
| Drilling and Completions Engineering   |                  |
| Cost and Schedule Engineering  |                  |
| Public and Regulatory Consultation   | 0.5 - 1.5 years  |
| Environmental Fieldwork  |                  |
| Engineering Fieldwork  | 1 - 3 years      |
| Construction Engineering Design  |                  |
| Business and Economics Analysis  |                  |
| Development Plan   |                  |
| Environmental Impact Assessment  |                  |
| Socio-economic Impact Assessment   |                  |
| Decommissioning and Abandonment Plan   | 1 - 2 years      |
| Public Regulatory Review Processes   |                  |
| Regulatory Approvals   |                  |
| Permitting   | 2 - 5 years      |
| Detailed Design  |                  |
| Procurement and Construction of Infrastructure                               |                  |
| Development Drilling   |                  |
| Procurement and Construction of Facilities                                   |                  |
| Facility Start-up/Commissioning  | 5 - 7 years      |
| <b>TOTAL Median Estimated Development Timeframe</b>                          | <b>14 years</b>  |
| <b>TOTAL Estimated Development Timeframe Reduced 30% for Concurrent Work</b> | <b>10 years</b>  |

Source: Beaufort-Sea-OG-activity-forecast-2012-2017



# Maakohtainen arvio öljy- ja kaasuhankeista

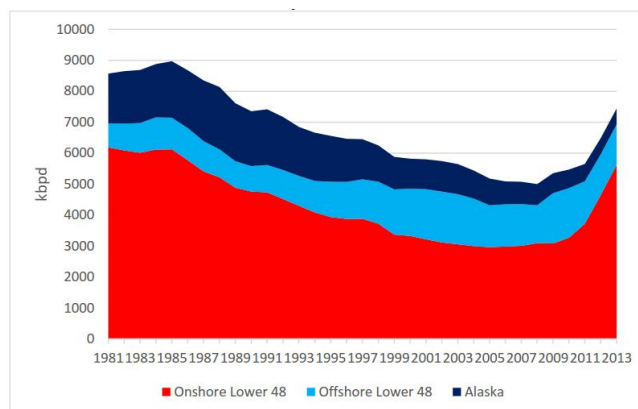
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## USA

- Alaskan rooli vähenemässä
- ◆ ympäristöön liittyvät luvat ja poliittinen vastustus



Source: US Energy Intelligence Agency

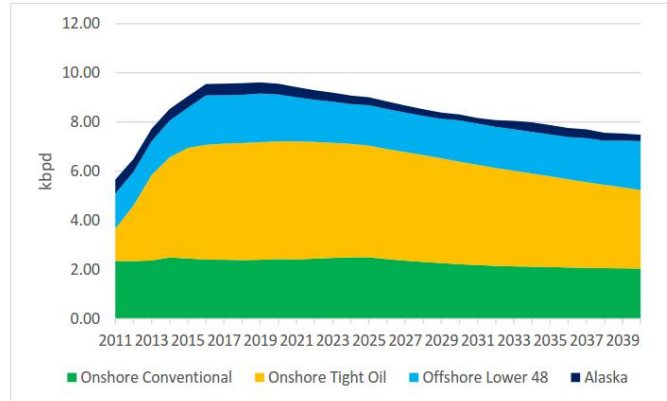
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## EIA arvio USA:n öljyntuotannosta vuoteen 2040



Source: EIA

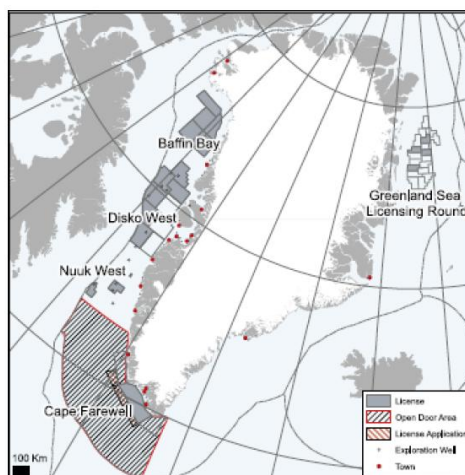
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## Grönlanti

- Suuret potentiaalit, mutta ei vielä onnistuttu porauksissa



Source: Nunaoil.

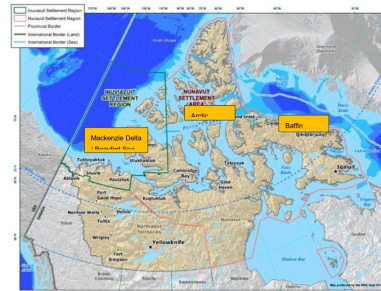
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## Kanada

- Beaufort Mackenzie
  - ◆ Ajurak / Pokak: ExxonMobil, Imperial Oil, BP
  - ◆ Viivästynyt aikataulu koeporauksille – tavoitteena ollut poraus 2020
- Arktiset saaret
  - ◆ Paljon pieniä kenttiä - liian pieniä hyödynnettäviksi
  - ◆ Amaligak suurin – ei kuitenkaan taloudellisesti kannattava
- Grand Banks
  - ◆ Hibernia
  - ◆ Terra Nova
  - ◆ White Rose



Source: Canadian National Energy Board.

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## Venäjä

- Venäjällä paljon hankkeita
    - ◆ Sahalin, Karan meri, Yamal, Petsoran meri, Barentsin meri jne.
  - Offshore hankkeiden etenemistä hidastavat tällä hetkellä erityisesti pakotteet
    - ◆ Vain 1% offshore kenttien tarvitsemista laitteista tuotetaan Venäjällä
    - ◆ Yhteistyö Kiinan kanssa offshore teknologian hankkimiseksi
- The Diplomat: Sino-Russian Relations in the Arctic: Thawing Out or Freezing Up?



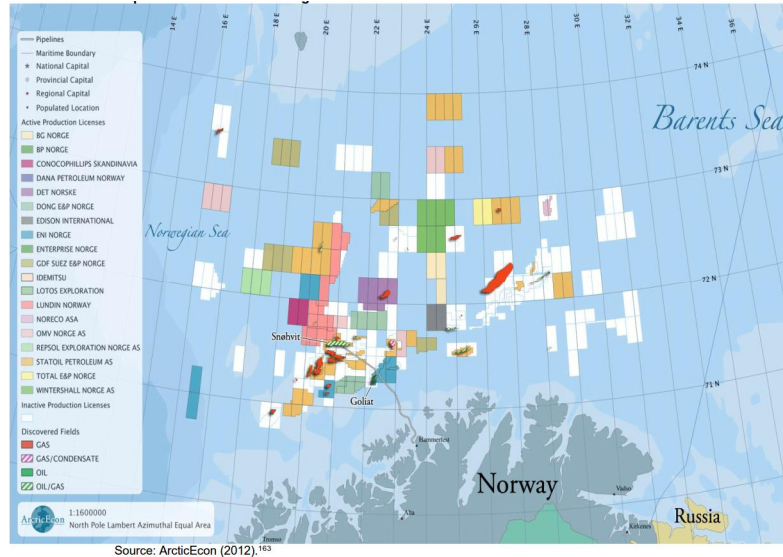
Source: EIA.

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## Norja: Tarve uusille kentille

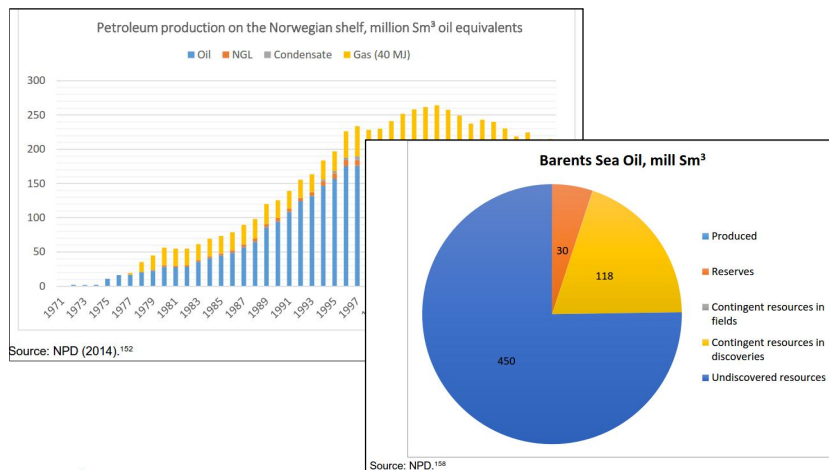


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## Norjan öljyntuotanto



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# Arktinen laivaliikenne

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## Environment for Arctic shipping is changing...

- Northern Sea Route and North-West Passage transit is at it's infancy.
- New shipping regulation and ship design rules
- New satellite communication channels are built
- New navigation aids are built
- New ship concepts
- Reduction of ice cover
- More storms?
- Bigger waves?

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### ...so Arctic shipping is changing too

- Expected increase in number of ships
- Expected increase in average ship size
- Destination traffic will be developing first
  - ◆ This is already happening with Yamal LNG project
- Experiences from destination traffic will set the trend for transit traffic – e.g. insurance costs

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### However the current situation for transit...

- All the cargo vessels have been normal ice strengthened vessels with 1A / 1A Super ice class - or corresponding RMRS class: ARC4 / ARC5.
- No concrete plans new buildings for the transit traffic in the Arctic
- No extended season transit traffic
- Transit traffic has been single voyages.

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## Animation: Ship traffic in the arctic in 2011

video source: <http://www.arctic-lia.com/>

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### What are the pre-conditions for year-round container traffic?

- SAR functions available
- Possible assisting icebreakers
- Right cargo – Cargo is the King
- Right routes – total logistics chain
- Redundancy in winter time 
  - ◆ what to do with the extra vessels during summer time?
- Favourable insurance terms
- Favourable political climate
- World economics
- Companies willing to take the first step 
  - ◆ Reliable co-operation partners
  - ◆ Everybody wants to be a good 2<sup>nd</sup>
- What else and can we check something as done already?

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# Yhteenvetoa

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## Oil price

- Price of oil is notoriously hard to predict.
- Who would have predicted back in 2008, when the price of a barrel of Brent crude, an industry benchmark, was \$35, that the price would have risen to \$130 four years later - Now the same oil is back down
- Some areas of the Arctic are easier to get at, and thus cheaper to exploit, than others
  - ◆ Greenland is more expensive than Alaska
  - ◆ Alaska is more expensive than Barents
- Prices are important to projects and building them, but exploration will continue, even with fluctuating oil prices due to long-term interests in finding more resources.

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## Sanctions

- Russian development continues in areas that are not under sanctions – Sakhalin and Caspian Sea
- Finance related sanctions have slowed development down also on these areas.
  - ◆ However, new financing channels are opening in e.g. China – this means that also production will move to China.
- Russian government seems to support financially “star pupils”
  - ◆ Rosneft, Novatek, Gazpromneft etc.
  - ◆ How long the money lasts?



## Arctic offshore

- Increasing energy price drives towards Arctic reserves – especially oil
- Decreasing energy prices slow down the development
- Effect of environmental regulation
- Effect of Sanctions
- Arctic development is expensive -> only large / huge fields are developed
- The Arctic is unexplored and under-explored
- Various technologies used due to varying environmental conditions
  - ◆ ice, icebergs. shallow water.
  - ◆ etc.
- Long lead times and delays
- High value technologies:
  - ◆ risk reduction
  - ◆ low emission / zero discharge
  - ◆ time efficient
  - ◆ space / weight efficient
- Understand current state-of-the-art and also customer needs
- The drivers are in principle the same as in open water offshore, but due to different conditions the solutions are different.





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***Creativity is the solution, and our business***

***Towards new joint challenges***

***Thank You!***

14-Oct-15

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