ICELAND
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Second Icelandic Licensing Round

**Northern Dreki Area**

- Licensing Round is set to open on the 1st of August 2011
- Application deadline is on the 1st of December 2011
- Norway (Petoro) has right to participate up to 25% in licenses granted within the Jan Mayen Agreement Area
- Icelandic licensing system is similar to system in other European countries, as the Hydrocarbons Act transposes EU Directive 94/22/EC into Icelandic law
- Hydrocarbon Tax Act to be revised prior to licensing round
The North Dreki Licensing Area

**Location Reference**

- North Dreki is part of the Jan Mayen Micro-Continent (JMMC) with strong indications of continental strata and good structures.

- Similarities to the middle East Greenland coast that is part of Greenland Licensing areas, and the Møre Basin at the Norwegian coast, which is a proven hydrocarbon province.
Available Data Information System

Iceland Continental Shelf Portal

Online GIS based Web-Portal (National Energy Authority & Iceland Geosurvey)

http://www.icsp.is
2D Seismic reflection data surveys over the Jan Mayen Area

Commercial Surveys

- WI-JMR-08 (2008)
- ICE-02 (2002)
- IS-JMR-01 (2001)

NPD-NEA Surveys

- J-79 (1979)
- JM-85 (1985)
- JM-88 (1988)

2009 Spectrum commercial survey, reprocessed JM-85 data
Seismic reflection & refraction data surveys across the Jan Mayen Area

**Academic Surveys**

**Important OBS Data Research**

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Borehole & Seafloor Samples around the Jan Mayen Area

Academic DSDP & ODP Cruises

- 5 wells during Leg 38 in 1974
- 1 well during Leg 151 in 1993
- 2 wells during Leg 162 in 1995

Wells have core analysed based density and vertical velocity data available that enabled a depth – seismic tie (TWT) to confirm the Top Eocene marker for 3 wells on the Ridge.
Tectonic History of the JMMC
Collage based on results of recent research publications and observations at the JMMC

Data Source Reference List:
Magnetic Strength (0 to -300 nT) Map
(JM-85 Gravity/Magnetic data set modified after Gunnarsson, K. 1995)

Clues to the main structural outlines of JMMC

- Early to Late Oligocene composite sheet of flat-lying intrusive covering subsided continental crust just before oceanic crust started to form on the Kolbeinsey Ridge and the Iceland Plateau.
- SDR (Seaward Dipping Reflectors)
- Free Air Gravity >50Gal following the main structural blocks of the JMMC.
- Important Fault / Fractures Zones that influence and subdivide the JMR.
Top Paleocene Structure Map  
(Depth Range: 170m – 6100m)

Structural Compartmentalization of the JMMC

- Early to Late Oligocene composite sheet of flat-lying intrusive covering subsided continental crust just before oceanic crust started to form on the Kolbeinsey Ridge and the Iceland Plateau.

- SDR (Seaward Dipping Reflectors)

- Free Air Gravity >50Gal following the main structural blocks of the JMMC.

- Important Fault / Fractures Zones that influence and subdivide the JMR.

- Top Paleocene Faults

- Minor reverse faulting visible (poss. since the Middle Miocene parallel the opening of the Kolbeinsey Ridge)
Stratigraphy

- The Norwegian and Greenland margins give the end points of the possible sub-Tertiary strata for the JMR.

- Well documented correlation of source and reservoir rocks for those end points.

- A similar geological development for the Jan Mayen area especially in comparison with the Greenland margin might be a reasonable assumption, but has not been proven through exploration drilling.

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<tr>
<th>AGE Ma</th>
<th>LITHO. GREENLAND</th>
<th>JAN MAYEN MICROCONTINENT</th>
<th>LITHO. M. NORW. SHELF</th>
<th>POTENTIAL RES. ROCKS</th>
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<tr>
<td>QUATERNARY</td>
<td>FIRE + LITHOFACIES</td>
<td>Sediments seen below volcanics + reworked cretaceous fossils in oligocene</td>
<td>Thin oil prone Shales</td>
<td>Potential oil prone shale</td>
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<tr>
<td>TERTIARY</td>
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<td>Rich oil prone marine source</td>
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<td>Lower Ror minor source</td>
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<td>EARLY MIDDLE LATE</td>
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<td>PERMIAN</td>
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<td>Marine Ravrevfell E.G. Heigeland Basin IKU-well</td>
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Sagex (2008)
New 2D Seismic Quality Data = More Possibilities for Data Interpretation

Possible Sub Tertiary unconformities become better visible below the Top Paleocene
Regional Correlations important for comparison to the history of the JMMC
Collage based on results of recent research publications and observations at the JMMC
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Collage based on results of recent research publications and observations at the JMMC

**Danmarkshavn & Thetis Basins**

![Diagram of Danmarkshavn & Thetis Basins](Modified after Dinkelman, M.G. et al, 2010)

**Vøring Basin**

![Diagram of Vøring Basin](Modified after Brekke, H. et al, 2000)

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**Jameson Land Basin, Liverpool High & Basin**

![Diagram of Jameson Land Basin, Liverpool High & Basin](Modified after Henriksen, N. et al, 2008)

**Jan Mayen Micro-Continent**

![Diagram of Jan Mayen Micro-Continent](Modified after Henriksen, N. et al, 2008)

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**Møre Basin**

![Diagram of Møre Basin](Modified after Brekke, H. et al, 2000)

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Kangerlussuaq

![Diagram of Kangerlussuaq](Modified after Henriksen, N. et al, 2008)
Main Hydrocarbon Exploration Risks for the Dreki Area

- Structural and stratigraphic analysis uncertainties due to difficulties of sub-basalt seismic imaging and complex structural history.

- Nowhere near deep offset, sub-Tertiary penetrating well control to tie seismic to stratigraphy, therefore seismic analogue comparison with East Greenland and Norway examples are primarily applied.

- Potential source rock uncertainties, if present most probably similar to East Greenland type locations.

- Seismic anomalies, slick mapping indicate that hydrocarbons may be present, but could not be confirmed through sea-floor sampling.

- The location of the JMMC relative to the Icelandic hot-spot during opening of the North-Atlantic requires a review of traditionally used geothermal gradient models for maturity modeling and analysis.
Hydrocarbon Potential for the Dreki Area

- Best analogue comparison with East Greenland exploration examples and Møre Basin for the Norwegian side.

- Post Paleocene sedimentary rocks of sufficient thickness and age.

- Indications of pre-opening sedimentary strata of possibly Paleozoic, Triassic-Jurassic and maybe Cretaceous age, primarily underneath the west flank areas of the ridge.

- Potential reservoir rocks, focus on locally shallow marine to generally marine deposits, especially submarine fans / turbidite deposits for post Paleocene deposits, and possibly focus on limestone platform to continental deposits for the pre-opening formations.

- Potential traps present, both structural and stratigraphic.

- Hydrocarbon maturation is probably high if sufficient source rocks are present.
Thank you very much for your attention!

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