Presentation Agenda

Nord Stream 2

- Project introduction
- Permitting and Project status
- Technical update

Rambøll

- Environmental Impact Assessment (EIA)
Leading Energy Companies Are Strongly Committed to Implementing the Project

100% Shareholder

100% Shareholder support the project by providing up to 50 percent of the financing, up to 950 million euros each.

Financial Investors

Project Developer

Project Developer provides up to 50 percent of the estimated project cost.

Nord Stream 2

Nord Stream 2 supports the project by providing up to 50 percent of the financing, up to 950 million euros each.

EUR 8 billion CAPEX
EUR 9.5 billion total expenditure (including financing costs)
The Need for Natural Gas in Europe

Gas consumption in Europe

Rusland: 133 bcm  
LNG: 35 bcm  
Nordafrika: 41 bcm  
Norge: 119 bcm  
EU: 141 bcm

2015: 481 bcm  
2035: 472 bcm

120 bcm import gap to be filled by Russian gas and LNG, share will be set by the market

Drop in domestic production and lower output from other supply

Nord Stream 2 – a European Project

Already, more than half of the CAPEX of EUR 8 billion have been contractually committed in investments in European industry and services involving over 670 companies from 25 countries. A selection:

**Logistics**
1. Port of Mukran
2. Port of HaminaKotka
3. Port of Karlskrona
4. Port of Hanko Koverhar

**Pipes & Materials**
1. EUROPIPE
2. OMK
3. Chelpipe
4. PetrolValves
5. Voestalpine
6. MMK
7. Dillinger Hütte
8. Impalloy
9. Wasco Coatings
10. Blue Water Shipping

**Engineering & Surveys**
1. Saipem Fano
2. Fugro Survey
3. Geo
4. Next
5. MMT
6. N-Sea
7. Saipem Fano
8. Fugro Survey
9. Geo
10. Next

**Offshore Pipelay**
1. Allseas
2. Saipem
3. Boskalis / van Oord

**Environmental Studies, Quality Management, Safety & Inspection**
1. Ramboll
2. IfaÖ
3. DNV GL
4. Svarog
5. Business Trend
6. Delta Energy Services
7. Intertek
8. DHI
9. Orbicon

Company Headquarter in Switzerland
Nord Stream 2 Delivers Sustainable Benefits

- Most environmentally friendly of fossil fuels
- Emits 50% less CO2 than coal
- Better carbon footprint than LNG
- Ideal partner for renewable energy sources - crucial for the EU to reach its overall climate target
- Nord Stream 2 supports European energy goals
Nord Stream 2 route through the Baltic Sea

- Approximately **1,230** km long
- Route optimised for maximum efficiency and minimum impact on the environment
- Extensive and international **consultation and permitting** process
- Construction will follow the Nord Stream model
Status of Permitting in 5 Countries

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<tr>
<th>Country</th>
<th>Legislation in EEZ and territorial waters</th>
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<tr>
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<td>&gt; Federal laws about Internal Sea Water, Territorial Sea, Continental Shelf</td>
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<td>&gt; Decree of the government</td>
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<td>&gt; Water Act</td>
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<td>&gt; Finnish Act on the EEZ</td>
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<td>&gt; Energy Industry Act</td>
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<td>&gt; Federal Mining Act</td>
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**Supra-national level**

- **European Directives**
  - Environmental legislation, e.g. EIA Directive as implemented nationally

**International level**

- **Between states**
  - UN Convention of the Law of the Sea (UNCLOS)
  - Espoo Convention
  - Helsinki Convention
  - International Convention for the Prevention of Pollution from Ships, MARPOL
  - Further multilateral treaties and conventions
The Project in Denmark

Two routes considered

> Base case route (preferred route, as applied for in April 2017)

> NW route (route in EEZ as applied for in August 2018, considered due to new Danish law)

Main differences

> Length 175 km vs. 139 km

> Distance to Bornholm 11.5 km vs. 10 km

> Depth range 18-90 m vs. 28-90 m

> Not following NSP vs. following NSP
Nord Stream 2 North-Western Route

- North-western route is a valid alternative to the Base case route
- Route goes through the Danish Exclusive Economic Zone only
- Base case application procedure is not affected by new application for North-western route
Technical Design and Construction

Simon Bonnell, Head of Permitting
Project Schedule

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<tr>
<td>Feasibility Study</td>
<td>EIA Programme Consultation</td>
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<td>Environmental Monitoring</td>
<td>Permitting and Environmental Impact Assessments</td>
<td>Surveys and Engineering</td>
<td>Procurement and Delivery, Pipe Logistics</td>
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<td>Construction and Commissioning</td>
<td>Operation</td>
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</table>
Planned Timeline for Pipe-lay in Denmark

Line A
Line B
Pipeline Design

- Key parameters and pipeline components:
  - 48 inch steel pipes with:
    - Internal flow coating
    - External corrosion protection coating
    - Concrete weight coating
  - Inner pipe diameter of 1,153 mm
  - Segmented pipe wall thicknesses along the route corresponding to decreasing pressures in the range of 220, 200, and **177.5 bar**

- Independent certification bodies (including DNV-GL) will certify technical design and implementation
Project Activities in Denmark

- Seabed surveys
- Cable and pipeline crossing
- Pipe-lay
- Rock placement
- Ploughing / post-lay trenching
- Transportation of materials and equipment
- Pre-commissioning / Commissioning
- Operations and maintenance
- Decommissioning

Images are for illustration only
To ensure a clear route we must identify:

- Every detail of the seabed shape: steep slopes, sediment types, rock outcrops
- Environmentally sensitive areas
- Cultural heritage and wrecks
- Cables/infrastructure
- Items that would effect installation of pipeline, from dumped cars to shipwrecks to unexploded ordnance (UXO)
Approach to Cultural Heritage

- **Assessment** of survey results by recognized marine archeologists (Viking Ship Museum) in consultation with Danish Agency for Culture and Palaces

- **Rerouting** around confirmed cultural heritage objects: 8 wrecks were identified and re-routed around

- **Safety zones** around cultural heritage objects during construction and operation

- **Monitoring** of selected cultural heritage objects as agreed with the Danish Agency for Culture and Palaces

- Current status: assessment and final surveys are undergoing
Pipe-throw

- S-throw technique for pipe-throw
- Pipe-throw speed approximately 3 km/day
- Dynamically positioned pipe-throw vessel uses thrusters for positioning (no anchors)

- Pipe-throw vessels that may be used in Denmark:
Rock Placement – Stabilization and Nord Stream Crossing

- Rock placement in Denmark is required for stabilization of the pipeline.
- Designated fallpipe vessels are used for precise position of the berms.
- The fallpipe, controlled by the remotely operated vehicle, guides the rock to its exact intended position minimizing the spread of the rock.
- The duration of each rock berm - less than 1 hour; entire rock placement will be less than two week for each pipeline.
Post-lay Trenching (Ploughing)

- Post-lay trenching is used to stabilize the pipeline.
- Post-lay trenching is performed after the pipeline is laid on the seabed.
- Post-lay trenching will be carried out using a pipeline plough.
- The excavated material displaced from the plough trench will be left on the seabed immediately adjacent to the pipeline.
- Total duration of post-lay trenching is expected to be approximately two days per line.
Operation of an Offshore Pipeline System

- Operation encompasses:
  - Supervision and control of the gas transport system
  - Asset inspection and maintenance

- The pipeline system will be remotely monitored 24 hours per day, 365 days per year

- Landfall facilities will be equipped with emergency shutdown systems
NORD STREAM 2
ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
DENMARK, NORTH-WESTERN ROUTE

PUBLIC MEETING, 14 NOVEMBER 2018
JACOB SKOU
• Basis for the EIA
• Sources of potential impact
• Modelling and quantification
• Assessment methodology
• Summary of impact assessment
• Presentation of selected topics
• Transboundary impacts
• Conclusion
BASIS FOR THE EIA

- Experiences from Nord Stream and Nord Stream 2 (Base Case route)
- Project description and technical information
- Field surveys
- Literature
- Desktop studies
- Risk analysis
- Mathematical modelling
- Expert evaluations

EIA approach/methodology is the same as for the Base Case route
BASIS FOR THE EIA

Field surveys

• Geophysical/geotechnical surveys
• Environmental surveys
  • Water column measurements
  • Seabed sediment sampling/analyses
  • Benthic fauna sampling/description
• Habitat mapping within Natura 2000 site Adler Grund and Rønne Bank
SOURCES OF POTENTIAL IMPACT

Laying the pipes  Seabed intervention  Operation
SOURCES OF POTENTIAL IMPACT

Main impacts:
- Disturbance of seabed
- Release of sediments
- Presence of vessels
- Emissions to air
SOURCES OF POTENTIAL IMPACT

Main impacts:
- Disturbance of seabed
- Release of sediments
- Presence of vessels
- Emissions to air
- Underwater noise
SOURCES OF POTENTIAL IMPACT

Main impacts:
- Structures on seabed
- Change of habitat
- Release of metals from anodes
- Presence of vessels during inspections (visual)
**SOURCES OF POTENTIAL IMPACT**

- Physical disturbance on the seabed
- Release of sediments into the water column
- Release of contaminants into the water column
- Release of chemical warfare agents (CWA) into the water column
- Sedimentation on the seabed
- Generation of underwater noise
- Physical disturbance above water (e.g. noise and light)
- Imposition of safety zones around vessels
- Emissions of air pollutants and GHGs
- Introduction of non-indigenous species
- Physical presence of pipelines and structures on the seabed
- Change of habitat
- Generation of heat from gas flow through the pipeline
- Release of metals from anodes
QUANTIFICATION OF IMPACTS

Modelling and calculations

- Dispersion of:
  - Sediment
  - Contaminants, nutrients
  - Chemical warfare agents (CWA)

- Scour/erosion
- Thruster induced currents
- Underwater noise
- Airborne noise
- Emissions
SYSTEMATIC ASSESSMENT

Sources of potential impact:
- Physical-chemical
- Biological
- Socio-economic

Impact:
- Negligible
- Minor
- Moderate
- Major
### IMPACT SUMMARY

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<tr>
<th>Environment</th>
<th>Resource / receptor</th>
<th>Construction</th>
<th>Operation</th>
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<td><strong>Physical-chemical</strong></td>
<td>Bathymetry</td>
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<td>Sediment quality</td>
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<td>Hydrography</td>
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<td><strong>Water quality</strong></td>
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<td>Climate and air quality</td>
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<td><strong>Biological</strong></td>
<td>Plankton</td>
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<td><strong>Benthic flora and fauna</strong></td>
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<td>Fish</td>
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<td>Birds</td>
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<td>Biodiversity</td>
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<td><strong>Shipping and shipping lanes</strong></td>
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<td>Commercial fishery</td>
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<td>Cultural heritage</td>
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<td><strong>Tourism and recreational areas</strong></td>
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<td>Raw material extraction sites</td>
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<td><strong>Military practice areas</strong></td>
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<td>Environmental monitoring stations</td>
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The impacts, either individually or in combination, are assessed not to be significant.
MINOR IMPACTS - CONSTRUCTION PHASE

Water quality

**Source of impact:**
Release of sediment and contaminants into the water column during pipe-lay and intervention works.

- Local
- Temporary
- Reversible

The water quality will quickly (within hours after construction) return to pre-impact state (baseline).

Marine mammals

**Source of impact:**
Underwater noise causing behavioural response and/or masking of other sounds (e.g. communication).

- Local
- Temporary
- Reversible

Impact only in the vicinity of the construction vessel and only on individual level not on population.

Ship traffic

**Source of impact:**
Imposition of Safety Exclusion Zones of ca. 2 km around vessels.

- Local
- Temporary (lay speed 3 km/day)

NSP2, in conjunction with the Danish Maritime Authority, will announce the locations of the construction vessels and the size of the requested Safety Exclusion Zones.
MINOR IMPACTS - OPERATION PHASE

Benthic flora and fauna

**Source of impact:**
Physical presence of the pipelines and rocks changing the habitat (reef effect) – introduction of new hard substrate and possible colonisation by benthic flora and fauna.

- Local
- Long-term

The pipelines and rocks occupies a very limited/negligible area and no significant changes to the benthic environment is foreseen.

Commercial fishery

**Source of impact:**
Physical presence of the pipelines and rocks. Potential for trawl gear to get stuck will result in fishermen having to adapt their trawl patterns.

- Local
- Long-term

Experience from the NSP pipelines, however, shows that fishermen can coexist with the pipeline system and no gear has been reported lost or damaged.
• NSP2 route crosses Natura 2000 site, Adler Grund and Rønne Banke for ca. 17 km
• Designated habitats include 1170 reefs and 1110 sandbanks
• Detailed habitats mapping was performed by Orbicon in 2018
• Pipeline route was optimized to avoid reefs and sandbanks
• Conclusion of appropriate assessment: there will be no adverse impacts on the integrity of the Natura 2000 site Adler Grund and Rønne Banke, its conservation objectives, structure or function
GENERAL EIA CONCLUSION

- Construction and operation of NSP2 (NW route) can cause negligible to minor impacts on the environment.
- The impacts, either individually or in combination, are assessed not to be significant.
- Construction and operation will follow industry best practice and all relevant safety regulations.
- Thus, the NW route can be constructed and operated in the Danish EEZ with due respect to the environment and safety.
THANK YOU
TRANSBOUNDARY IMPACTS

• The Espoo Convention requires international cooperation and public participation if significant transboundary impacts may occur.

• Impacts are considered transboundary if they cross national borders.

• An Espoo hearing is ongoing in accordance with the Espoo convention.

• The potential transboundary impacts have been described in relation to:
  • Regional and/or global receptors
  • Neighbouring countries
TRANSBOUNDARY IMPACTS
REGIONAL AND/OR GLOBAL RECEPTORS

- Regional or global receptors include e.g. hydrography, climate, fisheries, Natura 2000.

- Overall, no significant transboundary impacts on regional or global receptors.
  - Local and temporary impacts on “Shipping and shipping lanes” during construction.
  - Experience from the existing NSP pipelines has demonstrated that fishermen can coexist with the pipeline system, and the impact on fishery is assessed to be minor.
  - No significant or adverse impacts to designated habitats and species in “Natura 2000 sites”.

- This is in line with the monitoring results during construction and the first years of the operation of NSP.
TRANSBOUNDARY IMPACTS
NEIGHBOURING COUNTRIES

• Neighbouring countries: Germany, Sweden, Poland.

• No significant transboundary impacts on neighbouring countries.

• Germany and Sweden:
  • Local and temporary impact have been identified on ship traffic due to “Imposition of safety zones around vessels” in TSS’s.
  • Pipe-ly across borders will cause negligible transboundary impacts.

• This is in line with the monitoring results during construction and the first years of the operation of NSP.
Thank you