

**Nord Stream 2 AG**

**August 2018**



# **NORD STREAM 2 CONSTRUCTION PERMIT APPLICATION SUMMARY, DENMARK NORTH-WESTERN ROUTE**

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## 1 Introduction

This document is a summary of the application for permission to construct two parallel 48” diameter subsea pipelines for the transport of about 55 bcm natural gas per year, the Nord Stream 2 Pipeline system (NSP2), on the Danish Continental Shelf in the Exclusive Economic Zone (EEZ). The application was handed over to the Danish authorities on August 10<sup>th</sup> 2018.

In Finland, Sweden and Germany, the proposed route for NSP2 will run parallel to the existing Nord Stream Pipeline system (NSP) for most of the route. In Denmark, the proposed route for NSP2, as applied for by this application, runs north and west of Bornholm (NW route). As with Nord Stream AG, Nord Stream 2 AG adheres to high standards with regard to technology, environment, labour conditions, safety, corporate governance and public consultation. The NSP Environmental and Social Monitoring Programmes have shown, that no unforeseen environmental impacts have been caused and confirmed that all construction related effects were minor, local and predominantly short-term.

The NW route is the second preferred route for NSP2 in Danish waters. Reference is made to Nord Stream 2 AG’s application for permission to construct NSP2 submitted to the Danish Energy Agency (DEA) on 3 April 2017, including Environmental Impact Assessment (EIA) and Espoo documentation. In the application of 3 April 2017, the preferred route for NSP2 in Danish waters runs on the Danish Continental Shelf in the EEZ and in Danish territorial Waters (TW) and parallel to the existing NSP pipelines (NSP2 base case route). The NW route has been evaluated as a feasible alternative compared to the NSP2 base case route. Based on the comparison of the two routes, it was concluded that in relation to environmental and socio-economic aspects, the base case route is still the preferred route.

At the time of submission of this construction permit application, the routing and the design of NSP2 has been developed, based on various surveys carried out in Denmark in 2017 and 2018. Only minor changes, which would seek to optimise the design, are expected in 2019.

At present, permits have been granted in SWE, GER and FIN and one permit out of two are received in RUS. The construction preparatory works have already been initiated in Q2 2018 at the landfalls. The pipeline system is planned to be completed and ready for gas transport by the end of 2019.

### 1.1 Applicant, Shareholder and Operator

Nord Stream 2 AG is a project company established for planning, construction and subsequent operation of NSP2. The company is based in Zug, Switzerland and is owned by Public Joint Stock Company (PJSC) Gazprom. Five European energy companies ENGIE, OMV, Shell, Uniper and Wintershall have committed to provide long-term financing for 50 % of the total cost of the project. The financial commitment by the European companies underscores the Nord Stream 2 project’s strategic importance for the European gas market, contributing to competitiveness as well as medium and long-term energy security especially against the background of expected declining European gas production.

### 1.2 Legal Reference

The application is submitted to the DEA according to section 4, subsection 1, of the Act on the Continental Shelf and Certain Pipeline Installations in the Territorial Waters and section 2(1), cf. section 1 of the Administrative Order on Pipeline Installations.

A permit to construct pipelines for transportation of gas, oil and other chemicals with the capacity of NSP2 may only be granted on the basis of an EIA. Accordingly, an EIA has been prepared for the proposed route for NSP2 (NW route) and is annexed to the application.

### 1.3 Contact

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### 1.4 Structure of Application

The application, submitted to the Danish Energy Agency, comprises the following information:

- Background information, Overview of the project, Environmental information, Safety information, Design criteria – design and installation and decommissioning.
- Detailed information is included in two appendices addressing all key environmental and technical aspects.

## 2 Description of the Project

### 2.1 Pipeline Route

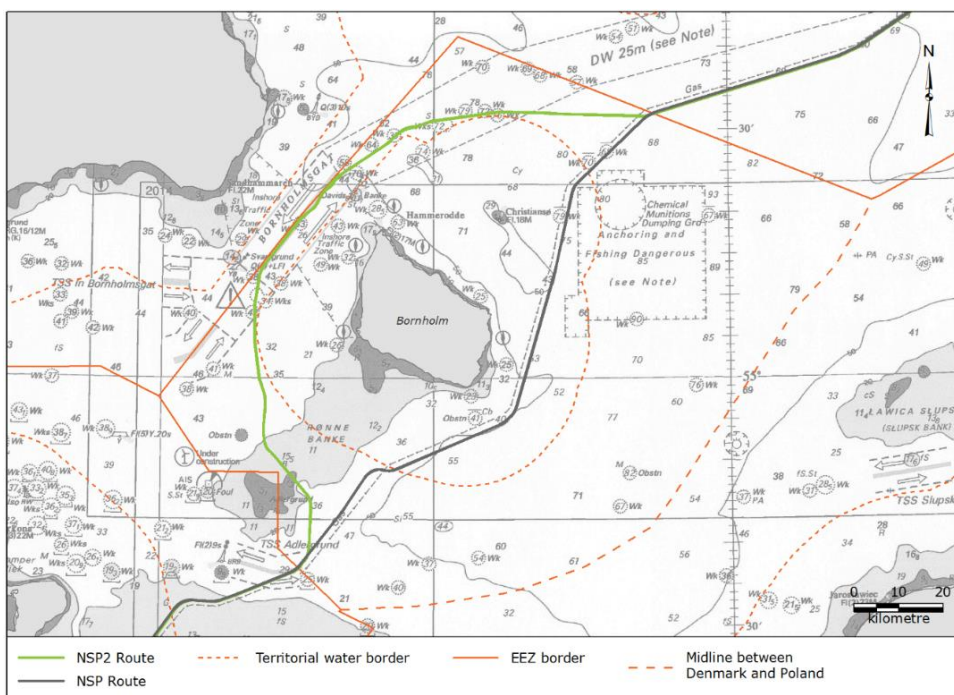


Figure 2-1 Proposed NSP2 routing in the Danish part of the Baltic Sea.

In the Danish section, the proposed NSP2 route (NW route) runs exclusively in the EEZ north and west of Bornholm, see Figure 2-1. North-east of Bornholm, the proposed NSP2 route crosses the NSP pipelines and continues west

of Bornholm until it rejoins the existing NSP pipelines close to the German EEZ. The length of the proposed NSP2 route in Danish waters is approximately 174 km.

The two NSP2 pipelines (Line A and Line B) will run parallel to one another. The application covers two pipeline corridors of +/- 150 m on either side of each alignment.

## 2.2 Time Schedule

In Danish waters, the pipeline installation phase is expected to last in total approximately 125 days for the two pipelines. Figure 2-2 shows an overview of the planned construction schedule.

Nord Stream 2 – Construction in Danish Sector		2019				2020
		Q1	Q2	Q3	Q4	Q1
Line A	Pre-lay intervention works <sup>1</sup>		■			
	Pipe-lay		■	■		
	Post-lay intervention works <sup>2</sup>			■		
	Start of pre-commissioning and gas-in <sup>3</sup>			▲		
Line B	Pre-lay intervention works <sup>1</sup>			■		
	Pipe-lay				■	
	Post-lay intervention works <sup>2</sup>				■	
	Start of pre-commissioning and gas-in <sup>3</sup>					▲

<sup>1</sup> The scope consist of rock placement in relevant locations (e.g. as a preparation for the Nord Stream pipelines crossing) according to detailed design findings.

<sup>2</sup> The scope consist of rock placement and/or post-lay trenching in relevant locations (e.g. to correct and even out the voids between a pipeline and the seabed after the pipelines are laid) according to detailed design findings.

<sup>3</sup> In accordance to the "Dry" Pre-commissioning Plan, there are no planned intervention works in Danish waters associated with the Pre-commissioning Operations, other than tracking of pigs and internal inspection tools by surface vessel.

**Figure 2-2 Construction schedule, Danish EEZ.**

## 3 Present Situation in the Project Area

All activities necessary for construction and operation of the NSP2 pipelines will be carried out in consideration of the present conditions in the project area. This ensures that the marine environment will be taken into account and, to the extent possible, protected against impacts. Similarly, all existing and planned interests in the project area are taken into account.

Based on the assessment the two items of main concern along the route relate to ship traffic and crossing of Natura 2000 site. For more details on these items refer to the Non-Technical Summary.

## 4 Safety Analysis

### 4.1 Risk Assessment Approach and Methodology

Risk assessments have been carried out for the two main project phases, construction and operation. The assessments were based on:

- An assessment of potential risks to the public and the environment in the construction phase according to DNV-RP-H101 and International Maritime Organization

guidelines for risk management and formal safety assessment in marine and subsea operation, performed by Global Maritime;

- An operational risk assessment related to fatalities, environment, economical losses and reputation performed according to DNV-OS-F101 for pipeline integrity and DNV-RP-F107 for potential environmental risks in the operational phase, performed by the engineering contractor, Saipem S.p.A.
- Detailed Maritime Assessment of NW pipeline routing in Danish EEZ – maritime risk analysis, outlined in accordance with the IMO Formal Safety Assessment, performed by SSPA (Maritime Solution Partner).

#### 4.2 Construction Phase Risks

The findings of the environmental quantitative risk assessment for the construction phase of the entire NSP2 route show there are no high-risk events and three medium-risk events, which are related to the ship collisions resulting in an oil spill. The theoretical relative increase in the annual oil spill frequency due to the NSP2 project is assessed to be less than 0.1‰, which is considered a very low increase. The amount of traffic caused by the activities related to the construction of NSP2 will occur within a limited time, and the implementation of mitigation measures (including the establishment of safety zones around the construction vessels and notice to mariners) will further decrease the risk of spills.

It has been concluded that construction of NSP2 will have a low impact on the current frequency of ship-ship collisions and the increase in the collision frequency due to the construction of NSP2 will be very limited. The group risks for third-party fatalities from ship-ship collisions in the Danish sector during the construction phase of NSP2 is within the DnV broadly acceptable region.

#### 4.3 Operational Phase Risks

The following failure causes that may threaten the integrity of NSP2 are managed through the application of the relevant DNV-GL standards during the design of the pipeline: natural hazards due to current and wave action, pipeline freespan sections, external interference with fishing activities and the operating temperature and pressure conditions. Environmental risks during the operational phase are related to damage to the pipeline, and the potential for gas release and ignition, which may be caused by interactions with vessels in the Baltic Sea.

All risks have been assessed in accordance with DNV-GL standards to be negligible, low or within the acceptable region.

### 5 Design Criteria and Pipeline Design

NSP2 will be designed, constructed and operated in accordance and in compliance with the international offshore standard DNV OS-F101, Submarine Pipeline Systems Edition October 2013, along with its associated Recommended Practices, issued by DNV and other standards. Further, Nord Stream 2 AG has appointed DNV-GL as independent third-party expert to confirm that the pipeline system, from Russia to Germany, has been designed, fabricated, installed and pre-commissioned in accordance with the applicable technical, quality and safety requirements.

## 5.1 Management Systems

Nord Stream 2 AG is committed to the principles of quality management, in alignment with ISO 9001:2015. Nord Stream 2 AG's HSES Policy (implemented through a HSES MS aligned to the international standards ISO 45001:2018 and ISO 14001) sets the goals as to the level of health, safety, environmental and social responsibility performance required by NSP2 staff and contractors. HSES management is an essential part of the project. Company and contractor personnel will be appropriately trained, experienced and competent to work in a way which minimises HSES risk.

## 5.2 Pipeline Design

The main characteristics of NSP2 are shown in the table below.

**Table 5-1 Design operating conditions and technical specifications for the NSP2 pipelines.**

Property	Value (range)
Throughput	55 bcm per annum (27.5 bcm per annum per pipeline)
Gas	Dry, sweet natural gas
Design pressure per segment	Kilometre point (KP) 0 – ~KP 300: 220 bar ~KP 300 – ~KP 675: 200 bar KP 675 – ~KP 1250: 177.5 bar (Denmark)
Design temperature	+40°C (max.)/-10°C (min.) for the offshore sections
Pipeline inner diameter	1,153 mm
Pipeline wall thickness	41.0 mm, 34.6 mm, 30.9 mm and 26.8 mm (depending on pressure range, 26.8 mm in Denmark)
Buckle arrestor thickness	34.6 mm
Linepipe and buckle arrestor material	C-Mn steel
Internal flow coating	Low solvent epoxy, average roughness $R_z \leq 3 \mu\text{m}$ , thickness minimum 90 $\mu\text{m}$
External corrosion coating	Three-layer polyethylene (3LPE) of 4.2 mm minimum thickness
CWC thickness and density	60 mm to 110 mm, 2,250 kg/m <sup>3</sup> to 3,200 kg/m <sup>3</sup>
Corrosion protection anodes	Zinc-based anodes in low-salinity water; aluminium anodes in other areas (In Denmark, only aluminium anodes are expected to be used)

## 6 Offshore Pipeline Installation

### 6.1 Project Logistics

The construction of NSP2 requires onshore support facilities such as concrete weight coating plants and interim stockyards which result in onshore and offshore transportation. No onshore support facilities and onshore transportation are planned on the Danish territory. Offshore pipe supply and material supply (e.g. rocks) are the major logistics activities in Danish waters. The logistics concept considers at present that all pipes to be laid in Danish waters are coming out of German production and will be concrete weight coated in the Port of Mukran, Germany.

## 6.2 Route/Engineering Surveys

A number of surveys (including geophysical, geotechnical, munitions screening and cultural heritage screening surveys) were performed as part of the design phase (2017-2018). The objectives of the surveys are to collect all data necessary to identify optimal pipeline route to inform pipeline design, identify and map potential obstacles (such as munitions, geological features, cultural heritage areas or environmental constraints), and to determine the crossing points of existing infrastructures.

## 6.3 Installation Processes, Vessels and Equipment

### 6.3.1 Pipe-lay

Pipeline installation will be carried out by pipe-lay vessels adopting the conventional S-lay technique. The individual pipe joints will be delivered to the pipe-lay vessel by pipe supply vessels, where they will be assembled into a continuous pipeline and lowered to the seabed. It is anticipated that a dynamically positioned vessel will be used for pipe-lay in the Danish section of the route.

### 6.3.2 Seabed Intervention Works

The offshore installation of the pipelines potentially requires additional stabilisation and/or protection against hydrodynamic loading in some areas. Rock placement will be necessary for the NSP pipeline crossing and for stabilisation purposes in the shipping lane as well as south-west of Bornholm over the Rønne Banke area. Post-lay trenching is anticipated in the shipping lane as well as before and after crossing of the Rønne Banke area.

## 7 Crossing of Infrastructure

The proposed NSP2 route crosses several power and communication cables as well as NSP. Specific crossing designs will be developed for each cable and pipeline crossing. Typically, concrete mattresses will be used for cable crossings, and rock placement for pipeline crossings.

Crossing designs will be agreed with the cable/pipeline owners, with details incorporated into the Crossing Agreements. This approach was successfully applied for the NSP cable crossings.

## 8 Pre-Commissioning and Commissioning

Pre-commissioning serves to confirm the mechanical integrity of the pipelines and ensures they are ready for safe operational use with natural gas. Pre-commissioning does not involve any activities in Denmark.

Commissioning comprises all activities that take place after pre-commissioning and until the pipelines commence natural gas transport, including filling the pipelines with natural gas. No commissioning activities will take place in Danish waters.



## **9 Operation**

Nord Stream 2 AG will be the owner and operator of the pipeline system. The system is designed for an operating life of at least 50 years. An operations concept and security systems will be developed to ensure the safe operation of the pipelines, including avoiding over-pressurisation, managing and monitoring potential gas leaks and ensuring material protection. The operation system is currently planned to be set up in a very similar way as NSP.

## **10 Decommissioning**

Decommissioning procedures will be developed before the end of the operational life of NSP2 in accordance with Danish legislation and in agreement with the authorities.