

Nord Stream 2 AG

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# NORD STREAM 2 CONSTRUCTION PERMIT APPLICATION SUMMARY, DENMARK, SOUTH- EASTERN ROUTE

## **NORD STREAM 2**

Construction permit application summary, Denmark, South-eastern 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 and Exclusive Economic Zone (EEZ) area south and east of Bornholm. The application was handed over to the Danish authorities on April 15, 2019.

In Finland, Sweden and Germany, NSP2 runs parallel to the existing Nord Stream Pipeline (NSP) system for most of the route. In Denmark, the proposed route for NSP2, as applied for with this application, the SE route, runs south and east of Bornholm and the existing NSP. The eastern part of the SE route in Danish waters splits into two potential route variants, the SE route V1 and the SE route V2, respectively. The combination of the SE route with V1 and the combination of the SE route with V2 are applied for by the permit application as two equally proposed routes such that the DEA, subject to the environmental consultations and assessments to be carried out, may decide to grant a construction permit for either the combination of the SE route with V1 (referred to as the "NSP2 route with V1") or the combination of the SE route with V2 (referred to as the "NSP2 route with V2").

The SE route is an alternative to the NSP2 base case route 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 base case route for NSP2 in Danish waters runs on the Danish continental shelf through the Danish EEZ area and in Danish territorial waters (TW), parallel to the existing NSP pipelines to the east and south of Bornholm (NSP2 base case route). On 10 August 2018, Nord Stream 2 AG submitted an application for an alternative route for NSP2 in Danish waters, which would run to the north and west of Bornholm and solely within the Danish EEZ (NW route). The application for the NW route is currently under authority review and represents a viable route alternative.

At the time of submission of this construction permit application, the routing and the design of NSP2 has been developed based on a detailed route survey including munitions and cultural heritage screening surveys carried out in Denmark in 2018-2019. Only minor changes, which would seek to optimise the design, are expected in 2019.

Permits have been granted in Sweden, Germany, Finland and Russia. Onshore and offshore construction preparatory works have begun in 2018 in all four aforementioned countries, and pipe-lay is presently underway in German, Swedish and Finnish waters. The pipeline system is planned to be completed and ready for gas transport within the second half of 2020.

### 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 Gazprom. The five European energy companies ENGIE, OMV, Shell, Uniper and Winterhall 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 strategic importance of NSP2 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.

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 results of NSP's Environmental and Social Monitoring Programmes have confirmed that construction-related impacts were minor, local and predominantly short-term and have additionally demonstrated a positive trend in environmental recovery after construction.

## **1.2 Legal references**

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 two proposed routes for NSP2 (i.e., the combination of the proposed NSP2 route with V1 and the combination of the proposed NSP2 route with V2) and is annexed to the application.

## **1.3 Contact**

Nord Stream 2 AG, Baarerstrasse 52, 6300 Zug, Switzerland

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## **1.4 Structure of application**

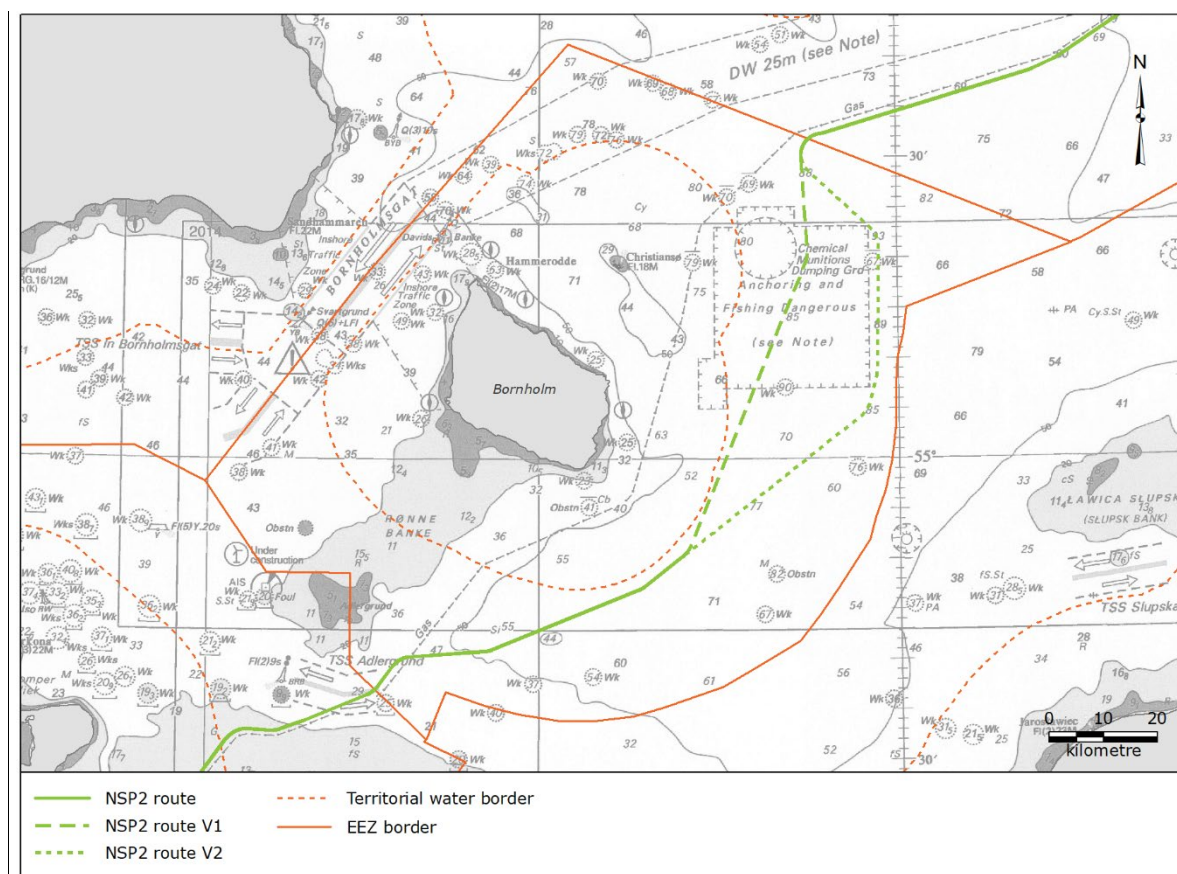
The application, submitted to the DEA, comprises the following information:

- 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**

In the Danish section, the proposed NSP2 route (SE route) runs exclusively in the EEZ south and east of Bornholm, see Figure 2-1.



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

The eastern part of the proposed NSP2 route in Danish waters splits into two potential route variants, the NSP2 route V1 and the NSP2 route V2, respectively. South-west of Bornholm, the proposed NSP2 route crosses the NSP pipelines and continues towards Germany next to the NSP route. In the Danish section, the length of the route is approximately 147 km if the combination of the proposed NSP2 route with V1 is selected, or approximately 164 km if the combination of the proposed NSP2 route with V2 is selected.

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 115 days if the combination of the proposed NSP2 route with V1 is selected, and approximately 125 days if the combination of the proposed NSP2 route with V2 is selected. Figure 2-2 shows an overview of the planned construction schedule.

Planned construction schedule Danish Sector	2019	2020			
	Q4	Q1	Q2	Q3	Q4
Construction Permit					
Pre-lay intervention works (NSP crossing) <sup>1</sup>					
Pipe-lay Line A window (pipe-lay approx. 45 days)					
Pipe-lay Line B window (pipe-lay approx. 45 days)					
Post-lay intervention works <sup>2</sup>					
Pre-commissioning <sup>3</sup>					

<sup>1</sup> Rock placement (e.g. as a preparation for the NSP crossing) and mattress placement for cable crossings

<sup>2</sup> Rock placement (e.g. NSP crossing) and potentially, according to as-laid survey results, rock placement or plough trenching

<sup>3</sup> No planned intervention works associated with the Pre-commissioning operations, other than tracking of pigs by surface vessel

**Figure 2-2 NSP2 construction activities in the Danish sector.**

### 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 main topics of concern along the route relate to the proximity of the proposed route to the primary chemical munitions dumping area, military practice areas and environmental monitoring stations. For more details on these topics, refer to the Non-Technical Summary of the Environmental Impact Assessment report.

## 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..

### 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 two medium-risk events, which are related to 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 notices 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-GL 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, commercial ship traffic, dropped objects/anchors 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 Det Norske Veritas (DNV), as well as 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 and is certified to 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 1230.4 (NSP2 route with NSP2 route V1) / 1248.1 (NSP2 route with NSP2 route V2): 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 / 41.0 mm (34.6 mm in Denmark)
Line pipe 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
Concrete weight coating thickness and density	90 mm to 110 mm, 2,400 kg/m <sup>3</sup> to 3,040 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 results in onshore and offshore transportation. No onshore support facilities and onshore transportation are planned within 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) are carried out as part of the project. The objectives of the surveys are to collect all data necessary to develop the detailed scope of work for the project, identify and map potential obstacles (such as munitions, geological features, cultural heritage areas or environmental constraints), and to determine the crossing points of existing infrastructure.

### 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; they will then be assembled into a continuous pipeline string on board the pipe-lay vessel 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 pipelines potentially require pre- or post-lay intervention works in some areas. These intervention works may be required for pipeline stabilisation or integrity reasons. Rock placement will be necessary for the NSP pipeline crossing, and either rock placement or post-lay trenching will be carried out shall stabilization of the pipelines be required at some locations.



#### **6.4 Construction status**

Permits have been granted for the NSP2 project in Germany, Sweden, Finland and Russia. At both landfalls in Germany and Russia, construction works are ongoing, and offshore, the Allseas vessels Audacia has completed the offshore part of the pipeline in Germany; the Allseas vessels Solitaire and Pioneering Spirit are continuing pipe-lay in Swedish and Finnish waters.

### **7. CROSSING OF INFRASTRUCTURE**

The proposed NSP2 route crosses several telecom 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. During pre-commissioning in Danish waters, a support vessel may be employed to monitor the cleaning and gauging process within the pipeline.

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. During commissioning in Danish waters, a support vessel may be employed to monitor the gas filling process within the pipeline.

### **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 to 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.