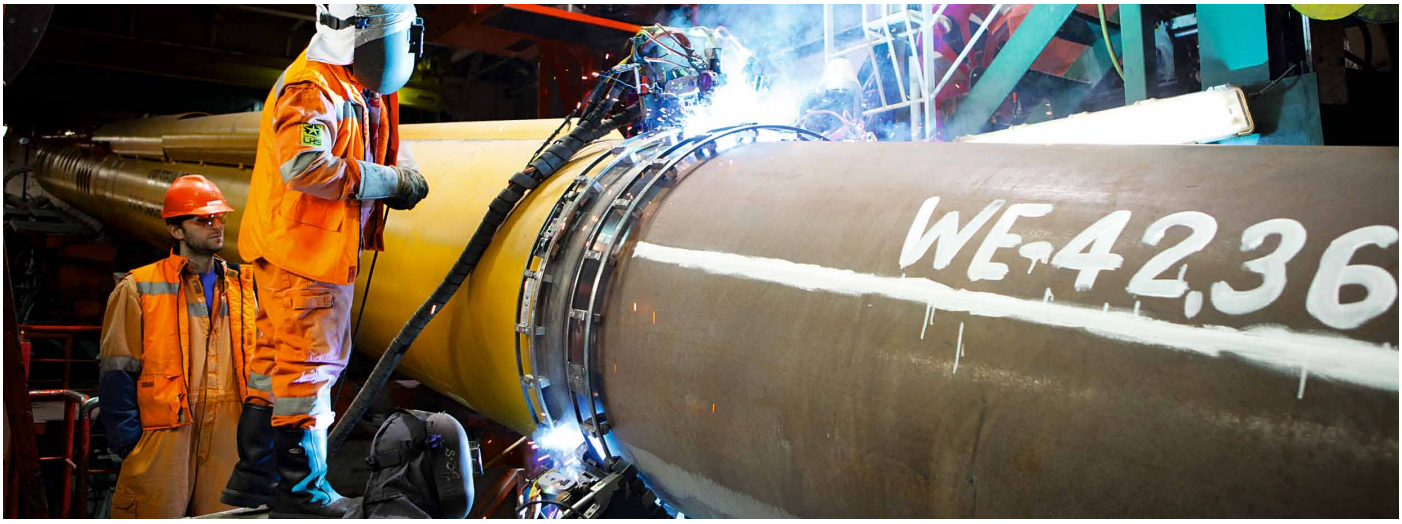
Nord Stream
The new gas supply route for Europe

FACTS

NEWSLETTER ABOUT THE NATURAL GAS PIPELINE THROUGH THE BALTIC SEA ISSUE 18 / MAY 2011



The final pipe of Line 1 of the Nord Stream Pipeline system arrived on the Castoro Sei at the end of April. It was welded onto the third section of the pipeline in May. Line 1 was laid in three sections, which will be welded together underwater this summer.

Nord Stream Lays Final Section of Its First of Two Gas Pipelines through the Baltic Sea

All three sections of the first 1,224-kilometre pipeline are now laid.

Nord Stream completed the first of its two 1,224-kilometre pipelines on schedule in just over 12 months. "The smooth-running construction programme was made possible by our meticulous planning of every aspect of this complex infrastructure project – technical, logistic, safety, environmental and operational," explains Nord Stream's Construction Director Ruurd Hoekstra. "Our planning has even proved resilient enough to cope with exceptionally challenging weather conditions in the Baltic Sea, which lead to periods of enforced downtime."

Nord Stream designed its pipelines to operate without an intermediate compressor station, but with three different design pressures and pipe wall thicknesses as the gas pressure drops over its long journey from Russia to landfall in Germany. The connection of these three pipeline sections will be carried out at the two offshore locations where the design pressure changes. The connection of these three sections (see page 4 for details) will mark the completion of Line 1 construction.

Under Pressure

Before the sections can be welded together, they must be gauged and thoroughly pressure tested (see pages 2-3 for details). These pre-commissioning activities for Line 1 started as planned in April. Sections one and two have already been successfully cleaned, gauged and pressure tested. The pressure test for section three will now follow the mechanical completion of pipe laying.

On the site of the German landfall, all piping has been completed and successfully pressure tested. For the Russian landfall site, pressure testing is expected by the end of May after completion of all welding work. Further rigorous testing will be carried out on the whole system before it becomes operational in the last quarter of 2011.

Saipem's Castoro Sei, the barge that laid 70 percent, or 853.5 kilometres of Line 1, made its way to Turku, Finland after completing section three. There, it will undergo extensive maintenance before resuming pipe laying for Line 2 in the summer. The Allseas' Solitaire, which is subcontracted by Saipem for the Nord Stream project, will again be working in the Gulf of Finland this summer.

Gas to Flow in 2011

The new pipeline system will start transporting natural gas from Russia directly to the European Union on schedule in the last quarter of 2011. "Europe will soon have the security of the privately-financed, 7.4 billion euro Nord Stream project providing a fixed link between the European gas grid and some of the world's largest gas reserves in Russia for at least 50 years," said Nord Stream's Managing Director Matthias Warnig. "At a time when recent world events have led to increased concern about nuclear energy and energy imports from North Africa, our major new infrastructure project takes on more importance for both Europe and Russia."

Construction of Line 2 is scheduled for completion in 2012. When both lines are operational in late 2012, Nord Stream will have the capacity to transport 55 billion cubic metres (bcm) a year from Russia to Europe, enough to satisfy the demand of 26 million households. Nord Stream is not the only gas pipeline planned for Europe, but it is the most advanced to date. No other major new pipeline with a capacity over 10 bcm is expected to come on-stream before 2015.

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Nord Stream Pressure Testing

> Each of the two Nord Stream Pipelines is built in three sections. Once the sections are complete, they will be subjected to test pressure higher than the eventual gas pressure for at least 24 hours. The test will confirm the mechanical integrity of the pipelines, and ensure that they can be operated safely.

From Vyborg in Russia to Lubmin near Greifswald, Germany, each of the two Nord Stream Pipelines will run 1,224 kilometres along the Baltic seabed. Each line of the twin-pipeline system is laid in three sections that will be connected underwater after being subjected to rigorous testing. The pressure testing is carried out to confirm the integrity and safety of the pipeline. The sections are filled with water and pressurised beyond the planned maximum operating pressure of the pipelines for a minimum of 24 hours. Subsequently, the water is removed from the pipeline, which is then dried before gas is introduced for the first time. The flooding of the pipeline sections and the pressure testing are controlled from the Far Samson, a construction support vessel. The ship pumps water from the Baltic Sea into its onboard filtering system to remove bacteria, sediments and any suspended solids, before this water is pumped into the pipeline segments for pressurisation. The entire process for all three sections takes about two months. Pressure testing of Line 1 started in April 2011. Testing of Line 2 is scheduled for spring 2012. The delivery of gas through Line 1 will begin at the end of 2011. By the last quarter of 2012, both lines will be operational. Combined, they will deliver 55 billion cubic metres of gas each year.

Flooding, Pressure Testing, Dewatering & Drying

Flooding Pressure

Step 1: Flooding of Section Two

Pressure testing of Line 1 starts at KP 675. Filtered seawater is pumped into this section. The PIGs (pipeline inspection gauges) are launched and travel to KP 297 at a minimum speed of half a metre per second. The PIGs will ensure that section two is completely flooded.

Step 2: Flooding Section One

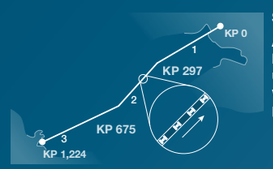
After section two has been flooded, cleaned and gauged, the ship moves to KP 297, where the process of PIG launching and flooding of section one takes place. At the same time, the vessel pressurises section two. The test pressure is higher than the operating pressure.

Step 3: Pressurising Section One

Monitoring of the pressurisation will take place from the Russian landfall. This section must withstand the test pressure for at least 24 hours to prove that the pipeline can withstand its eventual operational pressure. The vessel will stay at KP 297 for two weeks.

Step 4: Pressurising Section Three

Once sections one and two have been tested, the Far Samson moves to KP 675 to flood, clean and gauge section three. Pressurisation and monitoring of this section is performed from the German landfall. Meanwhile, sections one and two will be connected underwater.

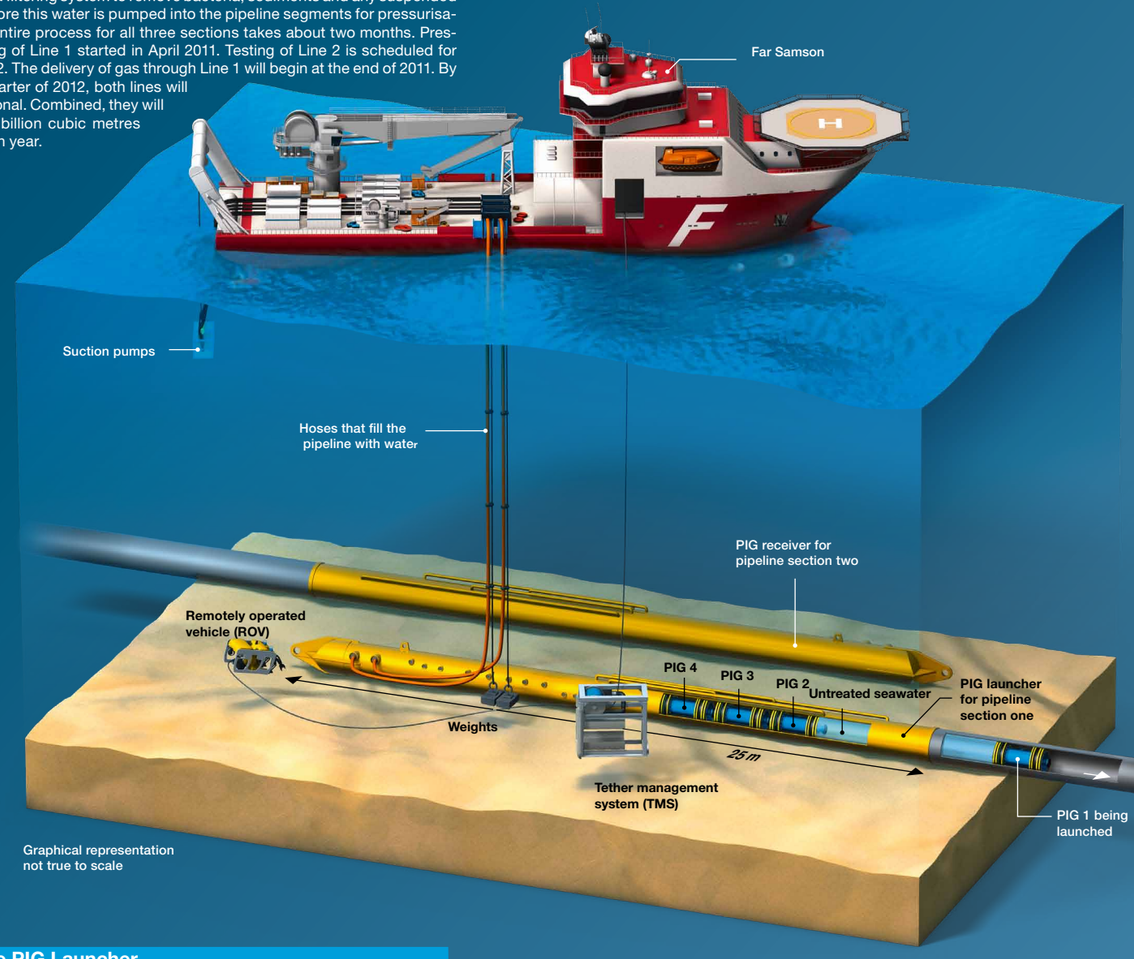


Step 5: Dewatering and Drying

After all three sections of the pipelines have been tested and welded together underwater, a train of dewatering PIGs will remove the water from the pipeline prior to subsequent drying.

Pressure Testing at Kilometre Point 297

The ends of the two sections of Line 1 meet on the seabed 297 kilometres from the start of the route in Portovaya Bay, Russia. The first section, from kilometre point (KP) 0 to KP 297, is designed for an operational pressure of up to 220 bar. The second section, from KP 297 to KP 675, is designed for 200 bar. Therefore, the two segments are tested separately at rates higher than their maximum operating pressure. Following pressure testing, the two segments will be welded together underwater. The same testing procedure is applied to section three, which will then be connected at KP 675.



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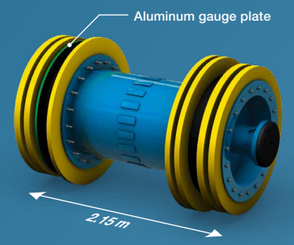
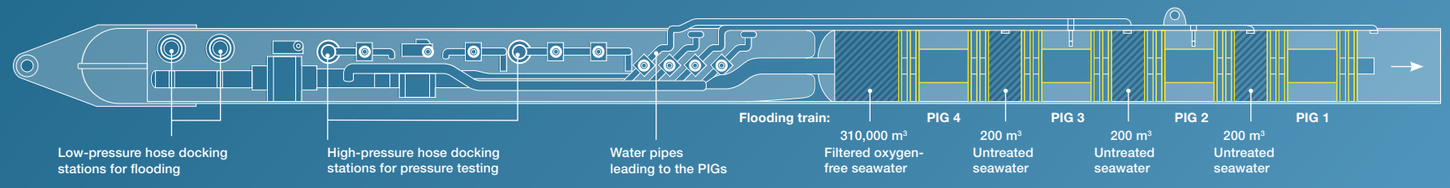


Flooding, Cleaning and Gauging PIG
The PIGs, or pipeline inspection gauges, travel through the pipeline checking its roundness and dimensions. This is done with thin aluminum gauge plates. If the plates remain undamaged, the pipeline's integrity is confirmed. As the PIGs travel through the pipeline, they also clean it.

Flooding and Pressurising
Before pressure testing can take place, the pipeline sections must be filled with water. The PIGs in the train will ensure that the section is completely filled with water and that there are no pockets of air. In a next step, the water is pressurised by pumps on the Far Samson.

The PIG Launcher

The PIG launchers are specialised heads attached to the start of the three sections of the pipelines. They house the PIGs that will clean, gauge and flood the sections prior to pressurisation. The water introduced into the sections will be filtered and de-oxygenated. It is also treated with ultraviolet light so that it is bacteria free.



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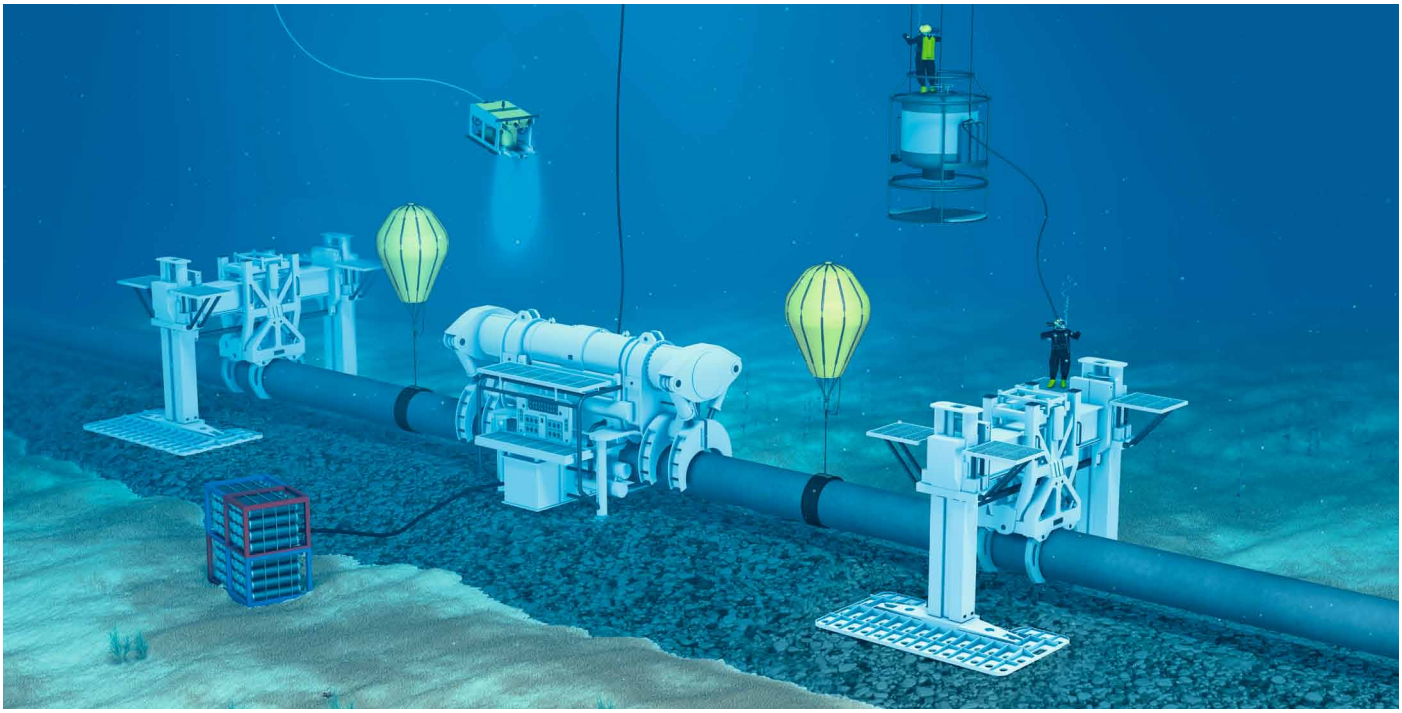

The "tie-in" process takes place on the seabed in an underwater welding habitat. Welding operations are remotely controlled from a support vessel. Divers assist and monitor the subsea construction work.

Underwater Welding to Begin this Month

The first two sections of Line 1 will be connected in May. The third section will be connected in the summer of 2011.

Each of the two Nord Stream Pipelines is built in three sections. The sections must be welded together to form the 1,224 kilometre pipelines. This "tie-in" process takes place on the seabed in an underwater welding habitat. After their completion, the sections are pressure tested (see pages 2-3), then welded together subsea, which is what is referred to as "hyperbaric tie-in".

The first tie-in for Line 1 will be carried out this month in Finnish waters at a depth of about 80 metres. The second and third sections will be connected in the summer at a depth of about 110 metres. "All underwater welding activities are controlled from the Skandi Arctic, a diving support and offshore subsea construction vessel," says Nicolas Rivet, Nord Stream's Project Coordinator for Hyperbaric Tie-ins. The vessel transports and operates all of the equipment necessary to move, lift, cut and weld the pipeline sections together. The sections are connected in an underwater welding habitat in several automated steps assisted by divers.

Rivet explains: "The Skandi Arctic has a 24-man dive system on board. The pressurised system is a living space for the divers who will work on the welding. They live here for the duration of the tie-in process." A three-man diving bell brings the divers from the diving system to their subsea work area. Divers work an eight-hour shift.

How It's Done

The pipeline segments lay parallel to each other and overlap. Therefore, the ends of each segment are cut before they can be aligned. A welding plug is then inserted into each end of the pipeline segments. The plugs are inflated for a perfect seal, and they separate the water in the pipeline segments from the dry area of the habitat. With the use of a bevelling machine, the pipeline ends are given a smooth finish to prepare them for welding. Three pipe handling frames (PHFs) lift the pipeline ends and align them before the welding can start. The pipeline segments are welded together inside the welding habitat, which is a dry zone where divers work without diving equipment, setting up the automatic welding machine. The welding is completely controlled from the Skandi Arctic. The weld is inspected and once it is approved, the subsea equipment is retrieved onboard the dive support vessel. The PHFs lower the pipeline back onto the seabed, and a remotely operated vehicle surveys the area.

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