Telemetry Studies of the Baltic Ringed Seals in the Gulf of Finland

Nord Stream 2 AG | Nov-20

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1. Baltic Marine Mammals as Endangered Species

The Nord Stream 2 pipeline through the Baltic Sea will deliver natural gas directly from some of the world's largest known reserves in Russia to the neighbouring EU gas market, with an ultimate aim of enhancing security of supply, supporting climate goals and strengthening the internal energy market.

Nord Stream 2 AG is aware of its **responsibility to preserve the conservation value of the territories on the pipeline route**. Already in the planning process, we have paid attention to the effect that the new pipelines may have on the environment and cultural heritage, and as such, cooperate closely with the relevant authorities and experts. In doing so, we also follow the best practice example set by the existing Nord Stream Pipeline.

Today, **the Baltic Sea is being heavily impacted by anthropogenic disturbance**, and its protection requires a joint effort and is a shared responsibility of the Contracting Parties to the Helsinki Convention. The seal species inhabiting the Baltic Sea are important, unique and valuable components of the sea's ecosystem, and the environmental condition of the Baltic Sea environment is critical to their survival and well-being.

The Gulf of Finland is inhabited by two protected species of marine mammals: grey and ringed seals. Grey seal numbers are increasing in the whole Baltic Sea area. It has been agreed between all Baltic Sea states that the species' conservation status is good, according to the HELCOM agreement. The **ringed seal** is fragmented into different sea areas, the **Gulf of Finland population being recognised as of special concern by HELCOM** owing to a notable drop in population during the past three decades, current low population (around one hundred individuals) and sensitivity to anthropogenic (e.g. pollution, disturbance) and natural stressors (e.g. warm winters).

As top marine predators, seals are dependent on the abundance of prey and suitable habitats: foraging areas, reefs for resting and ice for breeding. In the context of seal conservation and management, attentions have largely been paid to sites where seals can be seen, i.e. ice fields during breeding and resting areas (haul-outs). This is usually where observational data is collected, owing to easy access with established aerial and vessel-based survey methods. However, seals spend substantial part of their time (over 60%) diving in offshore waters. It is important to know the sea-use by seals for development of effective conservation measures. **Telemetry studies using GPS tags attached to the seals allow us to collect necessary information** on their behaviour and movement patterns.

It has been proven that in order to define critical seal habitats in the Gulf of Finland, it is necessary that more tags are used, and spatiotemporal coverage is increased.

With the support of Nord Stream 2 AG and in cooperation with experts and competent authorities, marine mammal scientists have been carrying out **telemetry studies of the Baltic ringed seals in the Gulf of Finland since 2017**. The project is a part of the **Environmental and Community Initiatives (Eco-I) Strategy** developed by Nord Stream 2 AG to ensure long-term positive impact of the project on the environment and residents in the project area, as well as biodiversity enhancement.

Biodiversity enhancement initiatives cover the whole territory of the Kurgalsky Nature Reserve and the Eastern part of the Gulf of Finland. They reflect the company's commitment to implementing the project responsibly in the reserve as an internationally-recognized protected area, and achieve a net gain on the biodiversity value of the Kurgalsky peninsula, as required by IFC Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources).

2. Earlier Studies on Baltic Ringed Seals

The first relevant data on Baltic ringed seals in the Gulf of Finland dates back to 1970.

A series of aerial surveys was conducted **between 1993 and 1997**, when 150-170 individuals were found on the ice. After a gap in 2000s, there was a series of aerial surveys in the Russian waters of the Gulf conducted between **2010 and 2018** by experts **Mikhail Verevkin** (St. Petersburg Scientific Centre of the Russian Academy of Sciences), **Vadim Vysotsky** (Zoology Institute of the Russian Academy of Science) and **Rustam Sagitov** ("Biologists for the environmental protection", St. Petersburg).

In **2005-2006** seals studies as part of Nord Stream baseline surveys in Russia were performed by **Biological scientific institute**. **Since 2010 regular monitoring** along the Nord Stream pipeline route was carried out from vessels.

For the **Nord Stream 2** Project, aerial and vessels surveys were performed in Russia by experts **Mikhail Verevkin** and **Rustam Sagitov** in **2013 and 2015.** Annual aerial surveys have been undertaken each April starting from 2016[1] by St. Petersburg Scientific Center of the Russian Academy of Sciences (M. Verevkin).

Telemetry studies have been used as a research method for seal behaviour in the Baltic Sea **since early 1990s**:

- **A study using earlier low-resolution tags was carried out in Russia with four ringed seals in 1998-1999 by Mart Jussi and Mikhail Verevkin;**
- **A seal-fisheries conflict study involving eight grey seals was carried out in Finland in 2010-2012;**
- **Five tags were put on ringed seals in the Eastern part of the Gulf in autumn 2014 as part of Gulf of Finland year campaign by Mart Jussi and Mikhail Verevkin.**

3. Scope of Nord Stream 2 AG 2017, 2018 and 2019 Studies

During 2017, 2018 and 2019 eighteen ringed seals were equipped with GPS/GSM telemetry tags at two key locations where the mammals were observed the most: north of Kurgalsky peninsula and the Moschnyi island.

[1] Due to unusually warm winter and lack of ice standard aerial survey by the approved Helcom methodology was replaced by a trial aerial survey of seals and migrating birds done in late April. Number of encountered seals was not used in population estimation.

3.1. Methodology

The telemetry study records environmental data through sensors attached to the ringed seals. The onboard GPS location system provides **geographical coordinates**, **temperature and conductivity sensors detect whether the instrument is wet or dry**. The change in pressure can be translated into diving depth. The sensor data is relayed by an onboard GSM cell phone using the public phone grid.

The seals are caught by **setting custom-made seal nets** close to the haul-out reefs. The nets are with 120-140 mm mesh size, 1.5 to 4-metre-deep and 100 meters long. The upper coiling has sufficient buoyancy to keep the net afloat and can support a seal if it gets entangled. The nets are set at sunset and controlled at first light next morning **to minimize the time the animal spends caught in the net**. Researchers select sits according to weather and expected seal presence in an attempt to maximise catching success. Seals usually get in the net when they approach or leave the reefs or change places during the night (Figure 1).

Once caught, the seal is cut out of the net, measured, weighed and photographed for possible identification in future. The telemetry tag is attached to the pelt by fast acting glue and the animal is released (Figure 2). **No sedative drugs are used during the process.** Furthermore, young seals under a certain age and weight are released to avoid potential stress and discomfort.

The tags are expected to work until the next moulting season in spring when the hair gets loose and tags are shed – as such, the maximum time the sensor spends being attached to the seal is **7-9 months**.

3.2. Project experts

Field **work is carried out by two teams** working independently in the north of Kurgalsky peninsula and the Moschnyi island. Team leaders are highly esteemed and respected marine mammals scientists: **Mart Jussi (NGO Pro Mare, Estonia) and Mikhail Verevkin (Russian Academy of Science, St. Petersburg, Russia)**. Team leaders are supported by several specialists working both in the field and in the office analyzing received data. Field work was also supported by the **Friend of the Ringed Seals Fund (St. Petersburg, Russia)**. In 2019, **Ivar Jussi (NGO Pro Mare, Estonia)** has also joined the project and did lead the expedition to the island Malyi Tyuters.
Video about field works on telemetry studies of the Baltic ringed seals.

Figure 2. Transportation of the seals caught in nets

3.3. Field work in 2017, 2018 and 2019

During the three years, in total, nineteen seals were caught during the project activities, although one male pup was considered too small to be tagged and was released back into the sea.

In 2017, the tags were put on nine ringed seals, in 2018 two and in 2019 seven ringed seals were tagged.

The current estimation of the Baltic ringed seal population in the Gulf of Finland is around **100 individuals**, therefore 18 seals represent approximately **18% of population**. It is sufficient to draw **certain conclusions on seals behavior, diving pattern, main feeding and foraging areas and general sea-use**.

Figure 2. Seal is released with an attached tag

All the marked seals were in good nutritional condition for the season in which they were caught. However, they were **lighter than comparable samples of adults caught in autumn in West Estonian Archipelago in 2007** and in the Gulf of Finland 2014. Seal body weight in autumn is a good descriptor of foraging success and energy availability in the surrounding environment. For ringed seals, **body condition before the breeding period can contribute significantly to breeding success**, i.e. more weight means more energy and nutrient reserves for giving birth and feeding pups. Therefore, the lower body weight of the 2017 sample is worth noting.

4. Results

Overall, this study **concurs with the earlier knowledge** about the ringed seal distribution in the Gulf of Finland. The core distribution area throughout all studies is the Moshnyi - Kurgalsky area. Secondary distribution area is island Malyi Tyuters **was not used by the seals marked in 2014 and seals were in the area again in 2017 - 2019**. In all studies

(1998, 2014 and 2017-2019) the western distribution is limited to 26º30' E. Still, there is a **notable shift in seal distribution in the Narva Bay** (Figure 3): in 1998-1999 ringed seals were observed in tens in the Tiskolovo reef area and caught there. The marked animals used both Narva and Koporskaya bay relatively intensively while in the 2014 and 2017-2018 study, is appears that the bays are no longer in use. Observations **in the Tiskolovo haul-outs in 2014 and 2017-2019 show that groups of more than 10 individuals are rare**.

The relation between density and distribution suggests that a reduction in population size will lead to population **concentration in the best available habitats**, since competition is low.

The general distribution of recorded locations of marked seals **during summer to early autumn foraging season** has **a well-defined core area in the Moshnyi - Seskar-Kurgalksky Reef "triangle"**. A secondary distribution area can be found in the vicinity of the island Malyi Tyuters. There are several transits in between the mentioned regions, but the distribution patterns are highly concentrated within core areas, and movements outside the core areas are few and episodic.

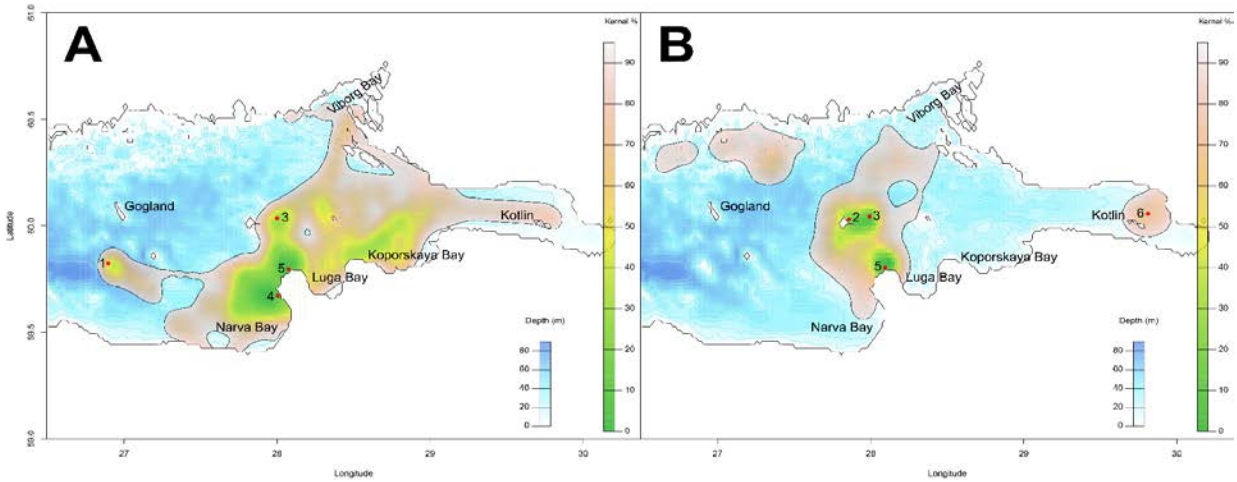

Figure 3. Difference in use of Narva Bay in A – 1998 and B – 2014, 2017

An example of summer behaviour. Female seal was tagged on the island Moshnyi on 29th of May 2018. The seal has been following the "typical" summer activity pattern with long foraging trips to the west, close to the Estonian shores. The seal used the island Malyi Tyuters western coastal slope and two distinct shoals for foraging, i.e. east from Uhtju islands and northwest from the island of Malyi Tyuters. Although Uhtju islands are known as ringed seal haul-outs in 1990-s, the seal did not visit those islands during the study but stayed in the water and rested at the water surface offshore (figure 4).

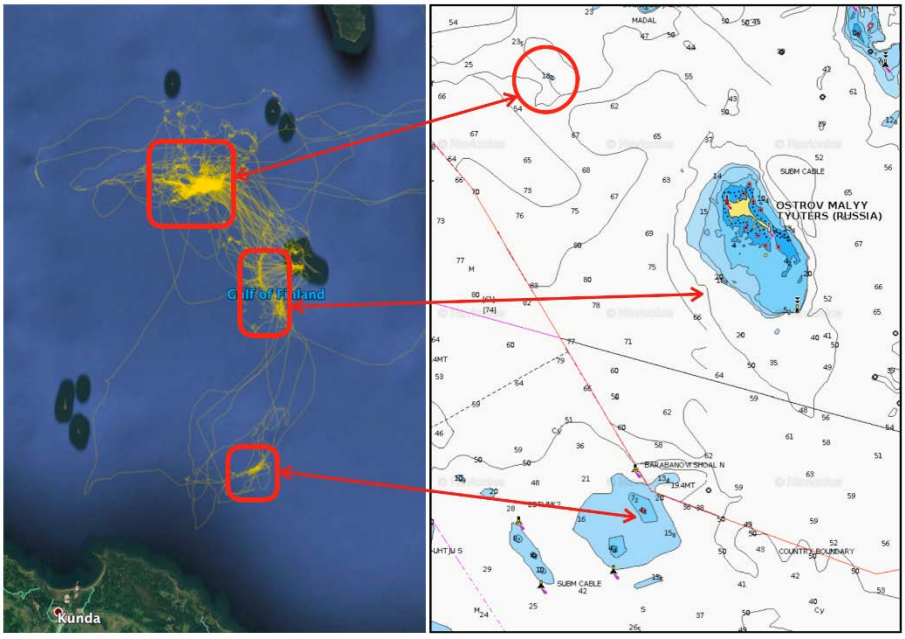

Figure 4. Seal No rs-22-740-18 location during summer 2018.

When energy reserves (body fat layer thickness) reach maximum levels, the seals shift into **"maintenance mode"**, meaning shorter foraging trips, and longer, more regular resting patterns in an effort to save reserves. Haul-outs become the principal habitat for the seals; **distribution patterns become more concentrated** compared to the foraging period. In 2017 tagged ringed seals didn't use the area around Malyi Tyuters island, however in 2018 ringed seals hauled-out at nearshore reefs of the Malyi Tyuters island.

The diverse underwater landscape of channels, shoals and slopes is the hunting ground for ringed seals. As the geography of the water area is very diverse, the best fishing waters are lying close to the resting stones so the home range of an average individual is extremely small for a seal. This also **makes them very local** - no need to go far for the food. In the other hand this **leads to isolation from the other seals**. The once-inhabited Estonian and Finnish shores are still in the range of summer foraging trips but are not any more in regular use by the seals.

During 2019 research the scientists detected some really long-range trips by a male who came to West Estonia from the eastern part of the Gulf of Finland before returning to Russian waters. In total, the seal travelled almost 700km during the period of 22 October to 1 November 2019. Later, in February 2020, the tag showed that the same male went towards Bothnian Bay. Such movements have no good explanation, but they add to hope that there is some interaction with other seals, and there might be some fresh blood coming into the Gulf too.

The third pattern of seal distribution is closely linked to **breeding**. The ringed seal is an obligatory icebreeder. Ringed seals **follow the sea as it freezes** (i.e. northern coast of the Gulf of Finland), and establish breeding lairs (females) or territories (males) in this optimal habitat. When the habitat is formed, reef haul-outs are abandoned by breeding seals as they move over to the ice.

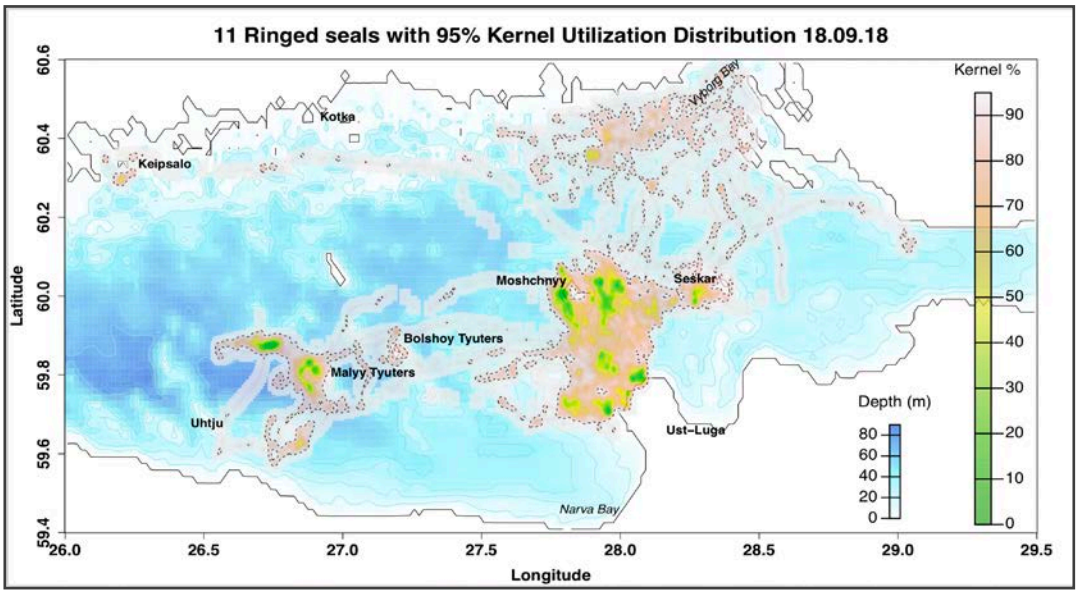

Figure 5. Seal distribution during the whole survey period

The smart technology allows to look into individual dives. The seals perform tens of thousands of them over the measured period. The technology makes it possible to see what it takes to find and catch fish or swim over the long distances. The diving depths reach the deepest parts of the sea - **over 100 meters (the record is 101.1 meters!)** and are tens of minutes long - the longest being **1824 seconds or 30 and a half minutes!** Probably those are exploratory dives, as the average depth of fishing is just around 20-30 meters where the seals spend only just around seven minutes to avoid the need to recover after every dive. The instruments are also gathering temperature profiles of individual dives, so the animals serve as platforms for oceanographic research.

Main conclusions:

- **Marking eighteen Baltic ringed seals with telemetry tags in 2017 - 2019 was a success** considering the low population in the Gulf of Finland, making it **the most extensive telemetry study of ringed seals to date.**
- **Recorded seal behaviour matched the experience from earlier telemetry projects in the Gulf of Finland.** The recorded trend in habitat use shows **further reduction in the home range.** The data makes a strong case for **the importance of the Kurgalsky reef and adjacent archipelago area as a core distribution region.**
- **Offshore areas of the Narva Bay,** where the Nord Stream 2 gas Pipeline is being laid, **is not used intensively by the species compared with foraging hotspots in the Kurgalsky reef as well as area around the Moschnyi and Malyi islands.** This is because the Narva Bay does not have a suitable environment for the seals to breed on: it has a flat sandy seabed and an active wave regime. Instead, the seals **only transit the area and here only for a very short period of time.** The seal's **use of the Kiskolskyi reef is more frequent in 2014 than observed** from shore in 2017, 2018 and 2019.

- According to the telemetry data, **seals use the channel between the islands Malyi and Seskar,** i.e. location of the Ust Luga ship **lane, for foraging. Foraging grounds appear to be closely linked to the sea bottom topography close to the islands (about 2.5 km).**
- **Seals move north when surface water gets cold to find suitable breeding ice.** This is likely to be a **long-term adaptation, as even in warm winters the suitable stable ice habitats are formed in the northeastern part of the gulf**. When the gulf freezes over, it is also possible to bread near the southern shores, but usually the first ice is formed in northeast, and seals prefer this stable, long-lasting field. **Thus, the foraging and breeding areas have distinct geographical differences.**
- Based on the research it can be said, that **habitat quality for resting, foraging and breeding is the key factor for the species survival.** It means, that **further fragmentation of the sea with new shipping routes or recreative boating is bad for the seals, fishing close to resting or feeding sites are a high risk and the little ice that still appears in the Eastern Gulf of Finland should be left for the seals where possible.** Health issues related to pollution are known to reduce reproductive success, but as we have seen pups with their mothers we know there is recruitment, it is important to grant the seals safe environment till they become adult and experienced.
- For the first time, the telemetry studies proved that **ringed seals from the eastern part of the Gulf of Finland travel long distances to other parts of the Baltic Sea**. And though the studies show that this travel pattern is fairly unique (only one male travelled to West Estonia and then to Bothnian Bay in the three years of research), it gives researchers hope that **they interact with seals from other habitats**
- The research program has turned the "mystery seal" into one of well studied seals, given their local ranges and small population size. The data is still to be scientifically analyzed, comparatively to the other ringed seals in the Baltic and beyond. But the gathered data allows to assess the status and modern threats, suggest management and conservation measures and lay ground to erasing the blanks on the road map towards secure future for the ringed seal in the Gulf of Finland.

5. Further use of research results

Nord Stream 2 is happy to contribute to the ringed seals studies and help conserve its population in the Baltic Sea. The results of the telemetry studies have made available to the expert community to be used for scientific purposes, to fill gaps in environmental databases, and to aid the development of future conservation measures.

- Received data will be further analyzed, with emphasis on ringed seal habitat availability, quality and preference;
- This data will also help to detect possible ecological and anthropogenic pressure factors which may contribute to the conservation status of the species. This involves comparative studies of ringed seas in the Gulf of Finland, Bothnia and Riga, linking the sea-use to oceanographic data such as: sea bed profiles, ice thickness and duration, potential effects of shipping and noise from ice-breaking, among other elements.
- Results of the studies will be developed into a peer-reviewed scientific research paper(s) with final results to be formulated into manuscript(s).

> Final results of the telemetry studies are to be released in one or several scientific research pieces.

6. Project Experts

Mart Jussi

PhD in biological sciences, zoo-ecologist, international expert on the Baltic ringed seal and other marine mammals, former chairman of the Estonian Parliamentary Committee on the Environment.

“As environmental experts, we are tasked with developing approaches that would allow implementing such projects with the least possible environmental damage.
With the help of telemetry, today’s research level is more accurate and has set something of a standard.
Environmental protection should be based on knowledge, and the Nord Stream 2 project is looking for such up-to-date knowledge and accurate data on the status of the Baltic Sea and, specifically, on its seals. The information being gathered now serves many different purposes – scientific purposes included.”

Mikhail Verevkin

Researcher, Member of the Environment and Natural Resources Joint Scientific Council of the St Petersburg Scientific Centre, RAS. Leading expert in the marine mammals of the Gulf of Finland.

“My experience includes researches in the Gulf of Finland before and during the installation of the pipeline, and I am still a regular visitor to the gulf area... I have not seen any negative changes in the behaviour of the animals living in immediate proximity to the pipeline.
My position is that the pipeline must be laid, it is important for the country and for Europe. This is the challenge. We need to meet this challenge while minimising impact on the environment.
This bulk of data will have enormous value not only for Nord Stream, but also for building a broader scientific understanding of the marine mammals and other wild animals that live in the Gulf of Finland.”

HELCOM seals expert group

The HELCOM ad hoc SEAL Expert Group was established according to Recommendation 27-28/2 and has been meeting annually since 2006. The group consists of marine mammal experts, scientists, and managers from the Contracting Parties around the Baltic Sea. Representatives of the fisheries sector participate as well, so as to add value to the dialogue surrounding the protection and management of marine mammals between the environment and fisheries sectors. The work is carried out in three teams: population size, distribution, and health, teams lead by Mr. Ivar Jussi, Estonia, Mr. Mart Jussi, Estonia, and Ms. Ursula Siebert, Germany, respectively.

Tri-lateral cooperation in the Gulf of Finland

The Finnish-Russian-Estonian co-operation to protect the marine environment of the Gulf of Finland started many years ago. Namely, the collaboration in the field of science and technology between Finland and the Soviet Union was agreed on and established back in 1955. As a next step, the environmental collaboration was initiated in 1968 by scientists, predominantly from Leningrad and Tallinn, who suggested setting up a joint working group that would focus on the pollution of the Gulf of Finland, and on how the marine systems and on how the marine systems and on how the marine systems function to regulate the Gulf. This laid the foundations for the later trilateral co-operation between Finland, Russia and Estonia.

After some time, the countries realised that science has a way of veering off on its own volition, and distance itself from their management and mitigation work. Once they had understood this, reuniting the two parties towards one goal was made a priority. Thus, trilateral scientific collaboration in the 1990s was oriented towards finding practical solutions and environmental improvements.

Today, the work continues and has a great importance to the scientific community and decision-makers, in terms of continuously widening and deepening knowledge about how the Gulf of Finland functions.

For more information, please visit our website: https://www.nord-stream2.com/.

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About Nord Stream 2 AG

Nord Stream 2 is a pipeline through the Baltic Sea, which will transport natural gas over 1,200 km from the world's largest gas reserves in Russia via the most efficient route to consumers in Europe. Nord Stream 2 will largely follow the route and design of the successful Nord Stream pipeline. With Europe's domestic gas production projected to halve in the next 20 years, Nord Stream 2's twin pipeline system will help Europe to meet its future gas import needs, with the capacity to transport 55 billion cubic metres of gas per year, enough to supply 26 million European households. This secure supply of natural gas with its low CO2 emissions will also contribute to Europe's objective to have a more climate-friendly energy mix with gas substituting for coal in power generation and providing back-up for intermittent renewable sources of energy such as wind and solar power.
www.nord-stream2.com