

Opinion about Russian-German gas pipeline project

1. Input data

Two pipelines with a distance of approx. 50 meters (outside diameter 1,22 m, wall thickness of 38 mm, design pressure up to 220 bar, length of approx. 1200 km, annual transmission capacity 27.5 billion m³ of each pipe. Thus amount of compressed gas is 1,4 million m³ (atmospheric pressure 308 million m³), volumetric flow rate 4 m³/s and speed of gas 3,4 m/s.

2. Breakage risk

In the Project Information Document (PID) there is quite thorough overview of possible environmental impacts and risks taking place during construction period. In the case of operating risks, there has been a discussion of less relevant risks: anti-corrosion coating materials, anodes, test water used during pre-commissioning and so on, less attention is paid in our opinion to the most relevant risk factor – **what happens if the pipeline will break in some reason (earthquake, landslide, construction error, diversion) ?**

It is stated:

“Depending on the gas concentration in the gas cloud, there will be a possibility for ignition of the cloud if an ignition source is present. An ignition of the gas cloud will lead to a flash fire. It is assumed that the area close to the sea level, where gas concentration is at a level where ignition is possible, is small.”

It is not possible to agree with this argument without authentic calculations or experimental data. In case of gas pipe breaks ~ 4 m³ compressed gas will be discharged (at least initially), whereof the capacity when reaching the sea surface is 880 m³. Detonation concentration of natural gas is between 5-14%. This kind of concentration will not emerge only in case when sufficient dispersion of gas bubbles takes place already in water environment (it depends of course on the depth of the sea and speed of water movement). If we observe an area with the height of 1 m, then for avoiding the emerge of explosive mixture, gas bubbles, that have already reached to surface, should disperse in a second $880 / 0,05 = 17\ 600\ \text{m}^2$, this is approximately over 2 hectares. **It is more likely that gas concentration will achieve lower explosion limit in a quite wide area.**

The fact that it is not possible to de-pressure before than at the beginning of the pipe makes the situation especially dangerous (from PID: „it”, this is vent system on the platform, **will not be used to de-pressure any of the pipelines**). Therefore the amount of burnt gas (probably as chain explosion) can be up to $1200 \cdot 10^3 \cdot 1.17 \cdot 220 = 308$ million m³ and if the leakage is not discovered momentarily, then it can be even bigger. The energy separating from burning of such amount of natural gas (32 MJ/m³) is approximately 10^{10} MJ, which corresponds to **118 nuclear bombs thrown on Hiroshima.**

It is clear that the demolishing influence of these “mini explosions” is not comparable with atomic bomb, but this kind of huge amount (it makes no difference if it is constant or pulsating) of energy flow will harm sea ecosystem, especially in a situation, when the accident should happen near to the coast or in shallow waters.

It is stated:

"It should be mentioned that an accident with outlet of gas will be very rare with a frequency, calculated for the planned BalticPipe pipeline, which corresponds to an accident once in about 1,000 – 10,000 years."

Calculating a probability is possible, if we take natural and other occasional factors into account. At the present case this kind of calculations are complicated because basically it is impossible to provide constant monitoring and security at the entire extent of the gas pipeline, what is accessible to everyone and even to divers with little experience.

Unfortunately nowadays diversion risk has to be considered. This risk is decreased by the fact that compared to European continent (although even there, during the planning phase of big gas and oil lines, areas of dense population concentration is avoided) there is far less human activity at the open sea, therefore the possibility of arranging diversion act with human victims is smaller.

However, Nord Stream crosses several intense traffic waterways (from Gulf of Finland and eastern and western part on the Baltic Sea to the Danish Straits, Tallinn-Helsinki intense traffic waterway), where among others, big cruise ships, with thousands of passengers on board, meander. Even don't want to imagine what happens when one of them happens to be “in the right place at the right time”.

Besides information cited above, the danger to shipping traffic is also possible through decrease in specific gravity of saturated seawater, what can cause sinking of vessels: in each second up to 880 m³ of gas will reach the sea surface, which corresponds to the displacement of quite a big ship.

In case of gas ignition huge amount of seawater is likely (up to 4 million m³) to vaporize. Less likely is the ice formation on seabed (in the case of gas dilatation), because thermal capacity on gas is small and fusion heat of water is big.

3. Impact of natural gas (methane) on living organisms

“Toxic gases affect marine organisms more directly and fast than dissolved or suspended toxins. Gas enters through gills instantly to organism of fish and disables important functional systems (respiration, nervous system, hematogenesis, enzyme productivity)”, Stanislav Patin, ["Environmental Impact of the Offshore Oil and Gas Industry"](#).

Hydrates of methane can accumulate in winter and dissociate in summer in the warmer water, that way realizing free methane.

Third critical factor is the change in oxygen regime. Hypoxia can cause massive dying of fish.

A clear causal connection was found in conjunction with massive dying of fish and accidents in the Sea of Azov in 1982 and 1986, when during the drilling huge amounts of natural gas separated into the sea. For example 69 and 28% of Turbots caught in 1982 and 1986 were already dead in nets (Stanislav Patin, "[Environmental Impact of the Offshore Oil and Gas Industry](#)").

Information about the impact of methane and its homologues to benthos is very limited, but existing materials refer that benthic ecosystem is disturbed and trophic system outlives very big changes. There have been found big populations of *begetti* at the coast of North Sea and California. These microorganisms use hydrocarbons as a food, and hereby they are origin segments on benthic food chain. (Davis, 1988; Howard, Thomsen, 1989).

4. Justification of the project

The project is justified with increasing energy needs of European Union,

It is stated in the PID:

“TEN-E has identified the so-called NG1 ‘Axis’ comprising a transmission corridor from the England to the northern continental Europe (including the Netherlands, Denmark and Germany) and with further connections to the Baltic Sea region countries and Russia ... Nord Stream is responding to the need for such a corridor as it is proposed by EU.”

In fact, Nord Stream corresponds to NG 1 ‘Axis’ only partly, in the meaning of broadening to Russia, **discussed alternatives could have been in much better in accordance with including of new EU markets (Finland and Sweden or Latvia, Lithuania and Poland)**. Also the fact that compared to a period of 1996-1999 Europe, especially European Union and the area of the Baltic Sea, has changed relevantly, should be pointed out.

Besides this project, Nord Stream considered 2 alternatives:

- a) Through Finland, the Bothnian Bay and Sweden (reference to new markets in Sweden)
- b) Through Finland until Hanko, along the Baltic Sea with a spur line to Sweden.

Based on economical considerations the present project was chosen. **It does not turn out from the PID, when was the feasibility study carried out and what kind of expenditures were taking into account, e.g were transit costs included?**

Generally construction of sea facilities is considerably more expensive than land facilities, it is true, that sea pipeline is 212 km shorter than the mixed pipeline, but **the pipeline through Finland over the Bothnian Bay and through Sweden would run in the extent of 1045 km on mainland**. In a situation, where other EU member countries (Sweden, Finland, Lithuania, Latvia ...) are also interested in natural gas, **project of Nord Stream raises serious doubts in the context of European Union**. Wouldn't it be more reasonable and eventually cheaper to route gas through potential markets?

5. Deadlines

It turns out from the PID that several constructional and technological problems are still unsolved, at the same time; strict deadlines have been set for starting the construction and environmental impact assessment (EIA) process.

In case of so large-scale project, which affects directly 9 countries and the Baltic Sea, the time for public display (1 month) for examining the EIA programme is very short.

During the planning of the activity (EIA, detailed projection, manufacturing of the pipeline and delivery start already in the beginning of the year 2007) it has been already presumed that EIA will be positive.

As the reflection of several substantial risk factors has been very superficial, the project is not acceptable in this form.

6. Conclusion

The project presented in the PID does not consider possible breaks or significant leakage of the pipeline. Security and in fact the monitoring system is absent (only so-called “intelligent pigs” is planned to use once in 5 years for testing the pipes). There is no de-pressuring system, except in dispatch station.

There is no attention paid on the most important issue: **what happens if the gas pipeline will break**, how to avoid this kind of catastrophe and if it still occurs, how to carry out rescue works. Damages to environment have not been assessed, neither the possibilities for compensating them.

Taking into account the aforementioned information, installation of gas pipeline along the bottom of the Baltic Sea in this way, considering environmental risks and possible human losses, is unacceptable.

Especially high is the risk in the Gulf of Finland, because it is:

- a) lower
- b) narrower
- c) **with very intense shipping traffic.**

From the economical side, it seems that the project can only be justified to avoid transit costs, problems with third countries and land owners, at the same time **leaving the most important part of environmental risks to be handled by the same third countries.** These problems can also be solved in some other way, further more several of these third countries are also interested in natural gas from Russia.

Respectfully,

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