



THE REAL FINANCIAL COST OF NORD STREAM 2

– ECONOMIC SENSITIVITY ANALYSIS
OF THE ALTERNATIVES TO THE OFFSHORE PIPELINE



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– economic sensitivity analysis of the alternatives to the offshore pipeline

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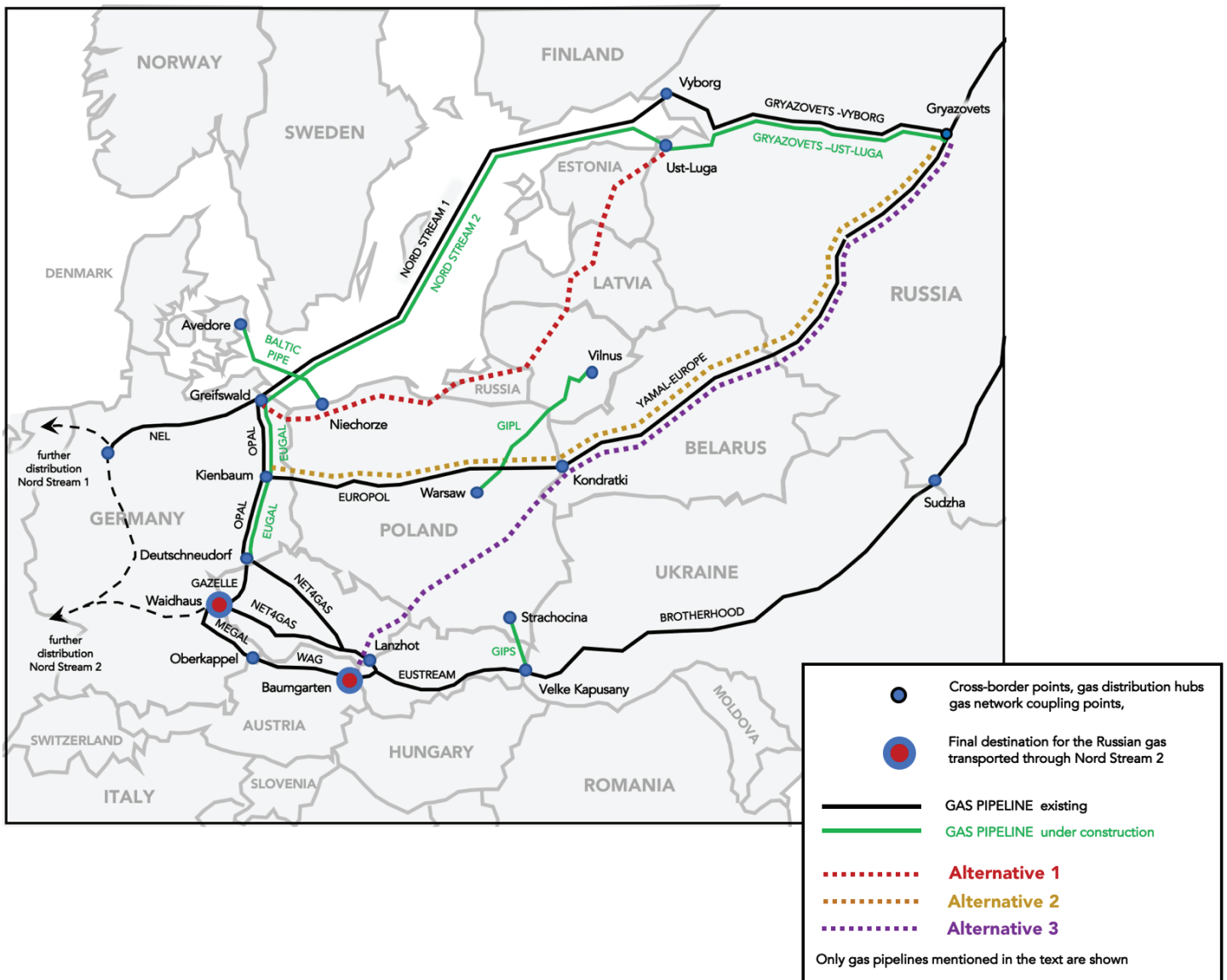
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PIPELINE FROM NOWHERE TO NOWHERE

In any economic analysis of Nord Stream 2 the first question to be considered is the actual cost of the project. Over the last couple of years, a variety of publications have provided widely differing cost projections. The recent data suggest that Nord Stream 2 capital investment will reach €9,5-10 billion.

Yet, the €9,5-10 billion is not the final construction cost of the project. Nord Stream 2 will not fulfil its function in isolation. Without additional distribution gas pipelines on both Russian and European sides, on its own, Nord Stream 2 will only be a pipe leading from nowhere to nowhere. This means that a sufficient pipeline capacity needs to be built to supply Nord Stream 2 with 55 bcma (billion cubic meters annually) from the gas fields in Western

Siberia to Baltic coast in Russia. Similarly, newly constructed pipelines will transport 55 bcma of gas over 800 km down south from the Baltic shore in Germany to one of the biggest European gas hubs in Austria, its final destination. Consequently, the overall construction cost of Nord Stream 2 route should include all the additional necessary infrastructure to achieve this objective. Conclusively, the construction cost of the offshore pipeline is only a portion of the bigger project which aims to deliver Russian gas to South-West of Europe.

Here, the main focus will be put on the economic analysis of the initial investment of the Nord Stream project; and the financial comparison with the cost of constructing onshore alternatives. Three proposed alternatives are significantly cheaper in construction and the sum of the tariffs paid to the transit countries is equal to the tariffs paid in the northern route using Nord Stream 2.

A €17.2 BILLION INVESTMENT

Nord Stream 2 is currently under construction with nearly 500 km of the pipeline still to be laid in order to reach its final destination in Lubmin, Germany. The new pipeline will be an exact replica of Nord Stream 1 and will have the same technical specifications. It will also run a similar route to Nord Stream 1. It starts at the Slavyanskaya compressor station near Ust-Luga port in Russia and continues along the bottom of the Baltic Sea to finally reach the Lubmin natural gas receiving station, located near the city of Greifswald in Germany. Length of the subsea pipeline amounts 1,230 kilometres. The pipeline has two parallel lines, each with capacity of transporting 27.5 billion cubic metres of natural gas per year. Therefore, aggregated design capacity of Nord Stream 1 and Nord Stream 2 amounts 110 billion cubic meters of gas per year (bcma). Nord Stream 2 is expected to be operational before 2020.

Russian gas must be transported from the place of production – Nadym Pur Taz and Yamal fields in Western Siberia in Russia to the consumers markets. Reaching the EU border is only the first stage of gas transportation. After that, the gas has to be delivered to the actual market zones. Nord Stream 1 aimed to reach the consumers in the North Western Europe including Germany (northern and southern), Benelux countries and the United Kingdom. Gas transported by Nord Stream 2 is mainly aimed at two strategic locations in South Eastern Europe – the Rozvadov - Waidhaus gas station at the border between Germany and Czech Republic; and the Baumgarten gas distribution hub in Austria, which will deliver the gas to Italy, Slovakia, Hungary, Slovenia and Croatia.

Calculating the cost of the entire gas transit route and not just the offshore section of Nord Stream 2, allows for the assessment of full cost of transport infrastructure from the place of origin to the destination of gas. For example, in case of Nord Stream 1, an additional pipeline supplying quantity of 55 bcma needed to be constructed on Russian land spanning a 917 km distance from Gryazovets to Vyborg near the coast of Baltic sea. As the gas from Nord Stream 1 was transported to customers in Germany, Czechia, Benelux countries and the UK, a minimum of three additional gas pipelines were needed to be constructed on the gas receiving German side. Cost of construction of Nel, Opal

and Gazelle pipelines in Germany and in Czechia amounted to approximately €2.4 billion. Together with the Gryazovets – Vyborg 1 pipeline (cost of €4.5 billion), all the additional infrastructure (apart from the actual cost of Nord Stream 1) amounted to nearly €7 billion. The cost of Nord Stream 1 offshore was estimated at €8.8 billion. Hence, the actual cost of the new infrastructure necessary to transport Russian gas from the place of production in West Siberian fields to consumer markets in West Europe via the offshore Nord Stream 1 route reached approximately €15.7 billion. A similar exercise needs to be performed for Nord Stream 2. It is important to note that all the supporting gas lines distributing gas from Nord Stream 1 already operate at full or nearly full capacity; and in order to deliver and distribute additional 55 bcma of Russian gas, it is necessary to build new gas pipeline infrastructure on both sides of Nord Stream 2.

The expansion of internal infrastructure in Russia necessary to launch the Nord Stream 2 route is ongoing and requires significant investment. The new gas pipeline from Gryazovets to Ust-Luga is being built along the existing Gryazovets – Vyborg pipeline (in the vicinity of St. Petersburg and then branches off towards Ust-Luga) and can be completed in 2019. To connect directly with Nord Stream 2 at the Slavyanskaya compressor station near Ust-Luga port 920 km of pipeline is required. Cost of the second line that will transport 55 bcma of gas is being estimated to amount €3.2 billion.

Gryazovets gas distribution hub in Russia is the point of divergence for many gas pipelines (including Yamal-Europe pipeline) and the beginning of a new gas transmission route through Nord Stream 1 and 2. Up to Gryazovets all the onshore routes to Western Europe are aligned. Therefore, all the construction cost analysis of all the routes begin in Gryazovets (see the map).

On the receiving side of Nord Stream 2 in Germany, the new gas pipeline called Eugal is also under construction. The Eugal pipeline should, to a large extent, run in parallel with the Opal pipeline to the Czechia-Germany border at Deutschneudorf-Brandov. Further south, the gas will be transported through the already existing Gazelle pipeline in Czechia to an additional German network entry point -- the Rozvadov-Waidhaus border connector line. The cost of the 480-km long Eugal pipeline is

COUNTRY	PIPELINE NAME	OFFSHORE vs. ONSHORE	LENGTH (km)	DIAMETER (inches)	CAPACITY (bcm/a)	TOTAL COST €	COST € per 1 km	ESTIMATED COST* €	ESTIMATED COST* € per 1 km
Baltic Sea	NORD STREAM 1 (two lines)	offshore	1224	48 each line	27.5 each line	7.4 - 8.8 bln	3.4 mln / per line	4.1 - 5.3 bln	3.36 - 4.32 mln
Baltic Sea	NORD STREAM 2 (two lines)	offshore	1230	48 each line	27.5 each line	9.5 - 10.0 bln	3.86 mln / per line	4.1 - 5.3 bln	3.36 - 4.32 mln
Russia	GRYAZOVETS - VYBORG	onshore	917	56	55	4.5 bln	4.9 mln	1.8 - 2.31 bln	1.96 - 2.52 mln
Russia	GRYAZOVETS - UST-LUGA	onshore	920	56	55	3.2 bln	3.5 mln	1.8 - 2.32 bln	1.96 - 2.52 mln
Germany	NEL	onshore	440	56	20	1.0 bln	2.3 mln	0.86 - 1.10 bln	1.96 - 2.52 mln
Germany	OPAL	onshore	470	55	35	1.0 bln	2.1 mln	0.90 - 1.16 bln	1.92 - 2.47 mln
Germany	EUGAL**	onshore	480	56	55 - 35.4	3.1 - 4.0 bln	3.8 - 4.9 mln	1.63 - 2.1 bln / per line	1.96 - 2.52 mln / per line
Czechia	GAZELLE	onshore	166	56	33	400 mln	2.4 mln	325 - 418 mln	1.96 - 2.52 mln
Poland - Lithuania	GIPL Gas Interconnector	onshore	562	28	2.3	471 - 558 mln	0.84 - 0.99 mln	550 - 708 mln	0.98 - 1.26 mln
Poland - Slovakia	GIPS Gas Interconnector	onshore	164	39	4.7 - 5.7	269 mln	1.6 mln	224 - 288 mln	1.36 - 1.75 mln
Denmark - Poland	BALTIC PIPE (offshore only)	offshore	275	36	10	442 mln	1.6 mln	346 - 445 mln	1.26 - 1.62 mln

BLACK colour indicate existing projects, BLUE colour indicates projects planned and/or under construction, GREEN colour indicates estimated cost, RED colour indicates cost which doesnt match the results obtained by using the ratio

* estimated cost based on the calculation of €35-45,000 per 1 inch per 1 km of pipeline

** EUGAL gas pipeline in Germany, with two strings running in parallel as far as Weißbach, then one string to the Czech-German border, has different capacities at entry and exit points

ALTERNATIVE ROUTES									
Russia - Latvia - Lithuania - Poland - Germany	ALTERNATIVE 1 Ust-Luga - Greifswald	onshore	1400	56	55	x	x	2.7 - 3.5 bln	1.96 - 2.52 mln
Russia - Belarus - Poland - Germany	ALTERNATIVE 2 Yamal - Europe route	onshore	2200	56	55	x	x	4.3 - 5.5 bln	1.96 - 2.52 mln
Russia - Belarus - Poland - Czechia - Austria	ALTERNATIVE 3 Gryazovets - Baumgarten	onshore	2350	56	55	x	x	4.6 - 5.9 bln	1.96 - 2.52 mln

estimated to amount €3.1 – 4.0 billion. Although being built simultaneously with Nord Stream 2, only half of the Eugal gas pipeline will be ready at the beginning of 2020.

After reaching the Deutschneudorf-Brandov border connector, the gas will be further distributed in the south-eastern direction through the existing gas infrastructure of Czechia (to Lanzhot) and Slovakia to the Baumgarten gas hub in Austria.

An even longer route is also planned to be used. After reaching the Rozvadov - Waidhaus connector line at the Czechia-Germany border, the gas can also be transported through the Megal North and Megal South interconnected gas pipeline to Oberkappel at the Austrian border and then through the Wag pipeline to the Baumgarten gas hub (see the map).

The overall cost of all the supporting infrastructure built to transport the gas through the Nord Stream 2 route amounts to approximately €6.3 – 7.2 billion which together with the cost of the offshore line of Nord Stream 2 (cost of €10 billion) amounts to an astronomical €16.3 – 17.2 billion. This is the actual cost of the Nord Stream 2 project delivering gas to South-Western Europe.

It should be noted that the commissioning the additional gas pipeline facilities on both German and Russian sides of Nord Stream 2 should be

synchronized in order to achieve the final project's profitability. Any delay (e.g. in case of Eugal construction schedule) will only increase the already monstrous costs of the project.

THE CONSTRUCTION COST OF OFFSHORE VS ONSHORE

Not surprisingly, large-diameter and long-distance pipelines imply very high capital investment. The key determinants of pipeline construction costs are: diameter, operating pressures, number of compressor stations, distance and terrain. Material (cost of steel) and labour cost are two of the most important considerations as they constitute approximately 70-80% of the total construction cost. Other factors, including: climate, the degree of competition among contracting companies, safety regulations, population density, rights of way, and different labour and tax laws in different countries cause construction costs to vary significantly from one region to another. Surveying, engineering, supervision, administration, overheads, telecommunications equipment, freight, regulatory filing fees, interest and contingencies are other costs that also need to be considered.

In the case of offshore Nord Stream 1 and 2, the route preparation also included removal of World War II era naval mines and toxic materials including

chemical waste, chemical munitions and other items dumped in the Baltic Sea in the past decades. The cost of technical bases in Finland, Sweden and Denmark was also taken into account in the final cost of the project. On the other hand, Nord Stream 1 and 2 gas pipelines are the first in the world that transport gas for over 1,200 kilometres without using compressor stations. Compressor stations (and their number along the route) increase the construction cost as well as the operating cost of gas pipelines which would increase the cost for all onshore alternatives.

The gas industry uses an interesting unit to measure pipeline costs, a currency unit per inch per kilometre (e.g. €/inch/km), measuring the cost of 1-inch diameter per kilometre length. Based on the recently built onshore gas pipelines in Europe (Nel, Opal, Gazelle) and gas pipelines under construction (Gipl, Gips, Eugal) that vary in length, diameter and transmission capacity, operating pressure, number of compression stations and various terrain location, a ratio has been derived that reflects the final construction cost of the projects. Through this calculated ratio of the cost of onshore gas pipelines in Europe can be estimated to be in the range between €35,000 to €45,000/inch/km.

Thus, e.g. a 400-km long, 48-inch size onshore gas line would cost between €480 million to €770 million. For the sake of this estimation and based on all the factors that influence the construction cost of a gas pipeline, only European projects were evaluated in order to reflect as closely as possible the proposed alternative pipeline prices, which could be constructed under similar conditions. While the records from the last 20 years shows a

reduction in the construction cost for both onshore and offshore pipelines, worldwide offshore pipeline projects are still nearly twice more expensive than similar onshore projects. A similar construction cost differences between offshore – onshore projects were observed during this exercise (see the table).

THREE TIMES CHEAPER ALTERNATIVE ONSHORE ROUTES

Here, three alternative routes are being proposed in order to verify construction cost sensitivity at various distances and with different destination points. The construction cost of the alternatives is compared to the construction cost of the route used by Nord Stream 2 pipeline.

For the purpose of this comparison, it was assumed that the newly built onshore gas pipeline will have equal capacity as Nord Stream 2 of 55 bcma and will be constructed as 56 inches diameter pipeline. This pipe size is currently one of the biggest and the most expensive currently used on the European gas pipeline market. Nord Stream 2 route:

Nord Stream II (offshore section) together with Gryazovets-Ust-Luga (Russia) and EUGEL (Germany) pipelines requires investment of €16.3-17.2 billion

Alternative 1

Ust-Luga (Russia) – Greifswald (Germany) onshore gas pipeline (through Russia, Estonia, Latvia, Lithuania, Kaliningrad exclave, Poland and Germany – see the map). This route resembles the Nord Stream 2 pipeline, but it is constructed onshore. A



NORD STREAM 2 route (Ust-Luga) Russia - (Greifswald) Germany	DISTANCE km	COST €	ALTERNATIVE 1 (Ust-Luga) Russia - (Greifswald) Germany	DISTANCE km	COST €
NORD STREAM 2	1230	€9.5 - 10.0 billion	Ust-Luga (Russia)	50	€2.7 - 3.5 billion
			Estonia	240	
			Latvia	250	
			Lithuania	190	
			Kaliningrad exclave	160	
			Poland	440	
			(Greifswald) - Germany	70	
TOTAL	1230	€9.5 - 10 billion	TOTAL	1400	€2.7 - 3.5 billion
DIFFERENCE: €6.5 – 6.8 billion					

NORD STREAM 2 route Gryazovets (Russia) - Kienbaum (Germany)	DISTANCE km	COST €	ALTERNATIVE 2 Gryazovets (Russia) - Kienbaum (Germany)	DISTANCE km	COST €
GRYAZOVETS - UST-LUGA (Russia)	920	€3.2 billion	Gryazovets (Russia)	790	€4.3 – 5.5 billion
NORD STREAM 2 (Baltic Sea)	1230	€9.5 - 10 billion	Belarus	660	
½ EUGAL (Germany)	230	€1.5 - 2.0 billion	Poland	700	
TOTAL	2380	€14.2 – 15.2 billion	Kienbaum (Germany)	50	
			TOTAL	2200	€4.3 – 5.5 billion
DIFFERENCE: €7.7 – 9.7 billion					



similar route (called Amber pipeline) was previously proposed by the Baltic states. However, the original Amber pipeline route was reconnected to Yamal – Europe. This alternative is the shortest possible land option between Ust-Luga and Greifswald and measures approximately 1400 km.

Although the route is 170 km longer, an estimated construction cost based on the derived ratio would amount to €2.7 to 3.5 billion. This is nearly three times less than the construction cost of Nord Stream 2. The cost of this alternative could be further optimised by constructing the new pipeline along existing gas infrastructure.

Alternative 2

Gryazovets (Russia) – Kienbaum (Germany) onshore gas pipeline (through Russia, Belarus, Poland and Germany – see the map).

This alternative closely follows the route of the Yamal-Europe pipeline. Proposed alternative route with the final destination in Kienbaum in Germany would actually remove the need for constructing approximately 230 km of Eugal pipeline from Greifswald to the Kienbaum-Mallnow gas connection (planned network coupling point of Eugal). The Alternative 2 route measures 2200 km.

Its cost based on the derived ratio is estimated at a maximum €4.3 – 5.5 billion. The construction along the existing Yamal – Europe pipeline would significantly lower the construction cost.

Length of the proposed Alternative 2 is shorter than the route used by Nord Stream 2 only by 180 km, yet the onshore construction cost is again nearly three times lower than the construction cost of the route used by Nord Stream 2.

Alternative 3

Gryazovets (Russia) – Baumgarten (Austria) onshore gas pipeline (through Russia, Belarus, Poland, Czech Republic, Austria).

length of the proposed stretch measures only 2300 km. The cost of such a gas pipeline located onshore would approximately amount to €4.3 – 5.5 bln with at least 60% of the route constructed along the existing Yamal-Europe pipeline, which again, would reduce overall costs. The estimated cost of the Alternative 3 is three times lower than the construction cost of the route used by Nord Stream 2. The Nord Stream 2 route assumes that in order to deliver gas to Baumgarten, an existing gas infrastructure in Czechia, Slovakia and Austria would be used (indicated by “x” in the table below).

Length of the route to Baumgarten through the Nord Stream 2 pipeline measures 3180 km and is over 880 km longer than the proposed Alternative 3.

Even longer version of the Nord Stream 2 route, supplying gas to Baumgarten exists. It is longer than the proposed Alternative 3 by 1003 km. This longer route assumes utilising such pipelines as: Gryazovets – Ust-Luga (920 km), Nord Stream 2 (1230 km), Eugal (480 km), Gazelle (166 km), Megal North (55 km), Megal South (207 km) and Wag (245 km). Starting from Gryazovets, passes through Ust-Luga, Greifswald, Deutschneudorf, Waidhaus and Oberkappel to Baumgarten, all together, measures 3303 km.

Results of this exercise should not come as a surprise, since on average, all offshore pipeline construction projects globally, are nearly twice more expensive than similar onshore projects. A surprising fact is that all recent pipeline construction

costs of Russian Gazprom are much higher than the average cost of similar projects. This includes both offshore Nord Stream 1 and 2 as well as onshore Gryazovets – Vyborg, Gryazovets – Ust-Luga or even anticipated cost of the South Stream project (the project has been cancelled). The fact that Gazprom construction work are being carried out without support of foreign partners/companies and without any bank loans – which increases construction costs – may be an explanation of this situation.

UNSUSTAINABLE TRANSIT COST:
READING THE SMALL PRINT

Apart from capital expenditure, substantial operating cost including gas transit tariffs, also need to be taken into account. The tariffs calculation is rarely easy to perform as this information is often commercially confidential and varies significantly between countries.

All the construction cost alternatives presented here, exclude the cost of transit tariffs, which are the most highlighted economic reason for the construction of Nord Stream 1 and 2 by Russian Gazprom and German officials. Nord Stream financial investors (Engie, OMV, Royal Dutch Shell, Uniper, and Wintershall) have claimed that the pipeline leads to economic savings due to the elimination of transit fees (as transit countries would be bypassed, meaning Ukraine, Belarus, Baltic countries and Poland), and a higher operating pressure of the offshore pipeline which leads to lower operating costs (by eliminating the necessity for expensive midway compressor stations).

Following this statement of the Nord Stream 2 financial investors, the cost of gas tariffs from the transit countries (for all three alternatives) needs to be calculated and compared to the tariffs paid on the route that utilises Nord Stream 2.

Tariffs values for Eastern Europe come from the Energy Community Regulatory Board (ECRB), which is a sole tariff regulator for the countries mentioned in the text (Poland, Belarus, the Baltic States, Czechia, Slovakia, Germany, Ukraine). ECRB establishes cost base tariffs which are non-discriminatory, if they are applied equally to comparable network users and do not provide for cross-subsidisation between them. Unfortunately, that is not always the case as the Russian Gazprom continuously appeals against such tariffs' calculations.

Therefore, it is important to state that all the tariffs presented here are the current averaged tariffs paid in each transit country with the current averaged amount of gas transported through a given gas pipeline. Certain discrepancies between the actual tariffs and those presented here still might occur. Consequently, tariffs for the three alternatives are hypothetical tariffs calculated on the basis of current averaged values in each transit country. Tariffs were calculated in euros per 100 km for 1000 standard cubic meters.

For the case of Poland, as per contract from 2010 (binding until 2022), Russia is actually paying one of the lowest gas transit tariffs in Europe. The agreement between Gazprom and PGNiG (EuRoPol) of March 2010, established tariffs at the amount of €1.55 per 1000 scm/100 km (€/1000 standard



NORD STREAM 2 route Gryazovets (Russia) - Baumgarten (Austria)			ALTERNATIVE 3 Gryazovets (Russia) - Baumgarten (Austria)		
	DISTANCE km	COST €		DISTANCE km	COST €
GRYAZOVETS - UST-LUGA (Russia)	920	€3.2 billion	Gryazovets (Russia)	790	€4.6 – 5.9 billion
NORD STREAM 2 (Baltic Sea)	1230	€9.5 - 10 billion	Belarus	660	
EUGAL (Germany)	480	€1.5 - 2.0 billion	Poland	600	
NET4GAS (Czechia)	400	x	Czechia	170	
EUSTREAM (Slovakia)	70	x	Baumgarten (Austria)	80	
WAG (Austria)	80	x	TOTAL	2300	€4.6 – 5.9 billion
TOTAL	3180	€16.3-17.2 billion			
DIFFERENCE: €11.3 – 11.7 billion					

NORD STREAM 2 route (Ust-Luga) Russia - (Greifswald) Germany	DISTANCE km	TARIFFS € / 1000 scm*	ALTERNATIVE 1 route (Ust-Luga) Russia - (Greifswald) Germany	DISTANCE km	TARIFFS € / 1000 scm*
NORD STREAM 2** offshore pipeline	1230	16.10	Russia (Ust-Luga)	50	0.00
SUM	1230	16.10	Estonia	240	2.88
** operating at at 100% capacity			Latvia	250	3.00
			Lithuania	190	2.28
			Kaliningrad exclave	160	0.00
			Poland	440	6.82
			Germany (Greifswald)	70	1.02
			SUM	1400	16.00
DIFFERENCE: €0.00					

* standard cubic meter

cubic meters/100 km). This is less than tariffs in Belarus or Ukraine. In Belarus and Ukraine, Russia pays the tariffs of €1.67 and €2.26 respectively. In December 2015, the Ukrainian government set an even higher new transportation fee mechanism, with tariffs based on entry/exit that would require payment of €3.4 to transport 1,000 scm over the distance of 100 km. To date, Gazprom has refused to acknowledge the new tariff values.

In Lithuania, Amber Grid (Lithuanian owner and operator of the gas infrastructure) charges Russia for gas transit to Kaliningrad exclave approximately €1.2 per 1000 scm/100 km. The contract signed in January 2016 is binding until the end of 2025 with this range of tariffs fixed.

The gas tariffs in Latvia and Estonia are even lower as the countries are not involved in the significant Russian gas transit to other countries. For the purpose of this comparison, the prices for all Baltic countries were equalised assuming standard price for all three states at €1.2 per 1000 scm / 100 km (still they are much lower in origin).

On average the prices for most of the Eastern European countries are significantly lower when compared to Western European ones. A fee that Russia usually pays in transit European countries (on average) amounts to €2.6 per 1000 scm/100 km, yet in Western European countries, tariffs reach above €3.5 per 1000 scm/100 km. Tariffs calculation presented in this analysis, was performed on the exemplary case of supplying 1000 scm (standard cubic meters) through all the alternative routes and then compared to the route used by Nord Stream 2.

Alternative 1

Ust-Luga (Russia) – Greifswald (Germany) onshore gas pipeline (through Russia, Estonia, Latvia, Lithuania, Kaliningrad exclave, Poland and Germany – see the map).

Tariff cost comparison shows that €16 tariffs would be applicable for both routes. The difference between tariffs applicable respectively for these two routes is nominal (€0.1), so it can be omitted.

NORD STREAM 2 route Gryazovets (Russia) - Kienbaum (Germany)	DISTANCE km	TARIFFS € / 1000 scm*	ALTERNATIVE 2 route Gryazovets (Russia) - Kienbaum (Germany)	DISTANCE km	TARIFFS € / 1000 scm*
Russia - GAZPROM (Gryazovets - Ust-Luga)	920	0.00	Russia (Gryazovets)	790	0.00
NORD STREAM 2** offshore pipeline	1230	16.10	Belarus	660	11.02
Germany - GASCADE - ½ EUGAL	230	6.90	Poland	700	10.70
SUM	2380	23.00	Germany (Kienbaum)	50	0.73
** operating at at 100% capacity			SUM	2200	22.44
			DIFFERENCE: €0.00		

* standard cubic meter

Alternative 2

Gryazovets (Russia) – Kienbaum (Germany) onshore gas pipeline (through Russia, Belarus, Poland and Germany – see the map). The tariff cost comparison shows that €23 tariffs would be applicable for both routes. The difference between tariffs applicable respectively for these two routes is again nominal (€0.16) so it can also be omitted.

Aernative 3

Gryazovets (Russia) – Baumgarten (Austria) onshore gas pipeline (through Russia, Belarus, Poland, Czech Republic, Austria – see the map).

Tariff cost comparison between the original route using Nord Stream 2 and the proposed Alternative 3 shows that the latter would require less tariffs. €9.33 of difference per 1000 scm between these routes amount to over €500,000 more with the 55 bcma transported through Nord Stream 2. In the next 20 years operating time of Nord Stream 2, this will equal to over €10.0 billions of additional tariff costs paid to transport gas through the less profitable route by using Nord Stream 2.

Additionally, the tariffs for Nord Stream 2 assume 100% operating capacity of the pipeline which is currently unrealistic. Reaching full operation capacity by 2021 or 2022 is more probable.



NORD STREAM 2 route Gryazovets (Russia) - Baumgarten (Austria)	DISTANCE km	TARIFFS € / 1000 scm*	ALTERNATIVE 3 route Gryazovets (Russia) - Baumgarten (Austria)	DISTANCE km	TARIFFS € / 1000 scm*
Russia - GAZPROM (Gryazovets - Ust-Luga)	920	0.00	Russia (Gryazovets)	790	0.00
NORD STREAM 2** offshore pipeline	1230	16.10	Belarus	660	11.02
Germany - GASCADE - EUGAL	480	6.90	Poland	600	10.70
Czechia - NET4GAS	400	6.00	Czechia	170	2.55
Slovakia - EUSTREAM	70	4.60	Austria - Baumgarten	80	0.00
Austria - WAG	80	0.00	SUM	2300	24.27
SUM	3180	33.60	* standard cubic meter		
DIFFERENCE: € minus 9.33					

** operating at at 100% capacity



The longer route to Baumgarten through Gazelle, Megal North, Megal South and Wag pipelines, increases the tariffs by another €1.3 resulting in €34.9 as the final price for the entire route.

Finally, there is yet another alternative gas transit route to Baumgarten in Austria, which involves Ukrainian gas pipeline infrastructure. In December 2015, the Ukrainian government set the new transportation fee mechanism with new tariffs based on entry/exit that would require payment of €3.4 to transport 1,000 scm over the distance of 100 km. From the Russian-Ukrainian border at Sudzha gas station, to Velke Kapusany at the border with Slovakia (including fee, fuel gas for compressor stations and new taxation), Naftogaz charges €48 for the distance of 1240 km. The €48 per 1,000 scm price is an assumption that the gas for the European market would flow through

the most expensive Ukrainian route. Yet, this does not need to be the case as several different routes exist in Ukrain’s pipeline system. Previous tariffs (as in contract concluded between Gazprom and Naftogaz in January 2009) of €2.26/1000 scm/100 km resulted in the overall cost of €28 for transit through the whole Ukrainian route.

From the obtained results (in the table) it can be deducted, that there is no difference in the applicable tariffs between Nord Stream 2 route and the Ukrainian route with old tariffs. However, with the application of new tariffs, the difference becomes significant. €14.56 for every 1000 scm for the whole route through Ukraine (and Slovakia) results in over €800 million in additional annual tariffs cost, when transiting 55 mmcma of gas through Ukraine. This annual cost difference would accumulate in 20 years’ time to nearly €16

NORD STREAM 2 route Russia - Baumgarten (Austria)	DISTANCE km	TARIFFS € / 1000 scm*	UKRAINE route Russia - Baumgarten (Austria)	DISTANCE km	OLD TARIFFS € / 1000 scm*	NEW TARIFFS € / 1000 scm*
Russia - GAZPROM (Gryazovets - Ust-Luga)	920	0.00	Russia - GAZPROM (BROTHERHOOD pipeline)	-	0.00	0.00
NORD STREAM 2** offshore pipeline	1230	16.10	Ukraine - NAFTOGAZ	1240	28.02	42.16
Germany - GASCADE - EUGAL	480	6.90	Slovakia - EUSTREAM	500	6.00	6.00
Czechia - NET4GAS	400	6.00	Austria - WAG	80	0.00	0.00
Slovakia - EUSTREAM	70	4.60	SUM	1820	34.02	48.16
Austria - WAG	80	0.00	* standard cubic meter ** operating at at 100% capacity			
SUM	3180	33.60				
DIFFERENCE: OLD TARIFFS - €0.00 NEW TARRIFS - €14.56						

billion. Still, in conclusion, if Ukraine reduces the transit fee to the previous €28 (per 1000 scm), it will make no financial sense to use Nord Stream 2. This also assumes that no additional infrastructure investments would be needed in Ukraine and excludes issues of the reliability and safety of relatively aged Ukrainian pipelines, CO2 emissions and the environmental impact of compressor stations.

To a disadvantage of the Nord Stream 2 route, Gazprom secured its gas transit through Slovakia and it will operate on ship-or-pay conditions until 2029. This means that the transit fees (on pre-Nord Stream 2 volumes) will be paid irrespective of whether the gas is transported or not. As Gazprom committed to the contract with Eustream, the tariffs will increase the cost of the gas transmission through Nord Stream 2.

THE TRUE MOTIVES BEHIND THE NORD STREAM 2

All the presented values for the country transit tariffs are based on estimations as they are subject to exchange rate changes, tax changes and different applied routes of transit. There is yet a striking lack of difference between the alternative routes and the Nord Stream 2 route in terms of paid tariffs. Three proposed alternative routes clearly indicate that there is no financial justification of bypassing the Eastern European transit countries as the tariffs there are significantly lower than in other Western European countries (at least for the time being). This excludes Ukraine with its current high tariffs. Although the economic viability of bypassing Ukraine with its new tariffs would make sense in the long term, it would become more profitable to shift the gas transit to other existing gas transit

corridors (for example through Belarus and Poland). The payback time for constructing a totally new route worth €17.2 billion would be 22 years taking into account the new gas tariffs in Ukraine.

Nevertheless, the obtained cost results undeniably indicate that the Nord Stream 2 project is unprofitable as there is no economic evidence to rationalise the expensive construction of the new offshore route. All the proposed onshore alternatives are extensively cheaper to construct and do not represent any substantial threat to the cost of gas transmission tariffs. They also avoid the gas transmission through Ukraine with its more expensive tariffs.

The enormous construction cost differences between the three alternatives and their equivalent routes through Nord Stream 2, indicate that the investment of €17.2 billion was not financially viable as the alternative route was three times cheaper in construction (€5.9 billion).

Furthermore, costs which here were not accounted for, are the extensive costs of decommissioning the underwater Nord Stream 2 pipeline. Therefore, to fully comprehend the total cost of this major gas pipeline project, it would be necessary to also include the decommissioning expenditure.

Constantly changing environmental regulations (in Europe and in the rest of the world) would significantly affect the future final cost of its uninstallation. It is difficult to predict precisely what cost will be incurred in 20-30 years when environmental regulations will surely be tightened. However, this does not change the fact that dismantling offshore gas pipelines is more expensive than the liquidation of land gas pipelines.

As Nord Stream 1 appears to be more financially profitable assuming it delivers gas to Northern part of Europe through the route shorter and less expensive than the one through Ukraine, it is difficult to comprehend the economic sense of Nord Stream 2 unless other non-financial factors are added to the equation.

Whilst it is too late to halt the construction of the project, it is of utmost importance to verify these non-financial reasons that led to construction of Nord Stream 2. Political reasons are the first that come to mind. Undoubtedly, the customers of the gas transported through the most expensive pipeline ever constructed, would like to know why they pay such a high price.

There is a significant risk that to assure full operational capacity of Nord Stream 2, Gazprom will continue decreasing the quantities transited to Western Europe through Ukrainian routes and subsequently through the Yamal-Europe pipeline through Poland. This will increase the dependency of these countries on the political games of Russia's Gazprom.

Therefore, to become independent from Russian supplies, all the bypassed countries should continue searching for alternative gas sources and routes, developing their own infrastructure; and investing in more significant future gas developments. A united front of these countries should prevent a situation in which all the states in Eastern Europe will have no option but to buy Russian gas regardless of the direction or country it is transported from.

More political pressure should be put especially by Eastern Europe (with a leading role of Poland) to preclude a situation where Germany (and Austria) distribute gas from Russia to countries in Eastern Europe. This situation could arise not because Germany (and Austria) offer the shortest transit way or the lowest-priced gas to their customers, but because there will be no existing alternatives other than Russian gas transported through Nord Stream 1 and 2. If such situation will become reality, the status of Eastern countries like Poland, Ukraine, Belarus and the Baltic states will drop from being a transit country involved in gas distribution to an end-line client buying an expensive gas from an expensive pipeline, distributed through a route bypassing their own states.

Author's biography



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Globally experienced upstream oil and gas project leader with nine years of industry exposure, two M.Sc. and MBA degree. Led and mentored subsurface teams of up to 12 members improving NPV of a 500 m USD project by 50% through optimal well placement. Experienced in exploration and development projects in Africa, Europe and the Americas where my cross-cultural awareness and multilingual skills improved managing all-suite projects' stakeholders. Mitigated projects' risk and uncertainties by developing strategies across digital transformation, operational processes and communication.



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