

Transit and reverse: Chained?

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If gas is not longer transited through the natural gas transmission system of Ukraine, we may also have serious problems with the reverse gas flow. That is why it is so important to integrate our gas transmission system into the European network – create conditions to improve capacities of physical natural gas supplies to Ukraine and also in other directions.

UAH 25.5 billion of net [profit of Naftogaz of Ukraine](#) for a period from January to September 2016 is a record for Naftogaz of Ukraine and the country as a whole.

After 18 years of losses suffered by the largest national company, it is good news, even though it is conditional. A profit tax from this entire sum will not be deducted to the budget before repayment of Naftogaz's debts amounting almost to UAH 60 billion. And that is bad news.

78% of net profit generated by Naftogaz (UAH 19.8 billion) is a profit from gas transit. This is worrying news, taking into consideration a plan on separation of gas transportation from other types of business activities conducted by the companies being the members of Naftogaz group (gas production and trade) approved by the government on 9 November 2016 in accordance with the European Union's Third Energy Package. In particular, given special powers/obligations of Naftogaz as a supplier of last resort, at least before April 2017.

And the most important thing: what will Naftogaz, already registered but not yet operating Main Gas Pipelines of Ukraine PJSC and a current operator of the gas transmission system of Ukraine Ukrtransgaz PJSC do, if/when [threats of Gazprom](#) to stop gas transit using the Ukrainian gas transmission system effective January 2019 — are not empty words? Who, what and how impacts gas transmission, at least, medium-term strategy and behaviour of Ukraine? What should be done and what should Ukraine strive for in order to keep gas transit? At least because it generated almost USD 2 billion in the recent years.

It is not only about keeping gas transmission, and more importantly – procuring our country with gas. Let's consider and look for the answers from the point of view of physics and political economy.

In 2016, Ukraine imported natural gas from companies being member states of the European Union and also Norway. Therefore, long-term dependence of our country on a single gas supplier, namely, Russian Gazprom PJSC, which rather frequently used gas as the means of political pressure, was allegedly liquidated. And now, after expiration of a "famous" contract of 2009, our northern neighbour threatens to discontinue natural gas transit through the territory of our country.

If the aforesaid treats are implemented, one more important question will be logical in this case: what will happen to a so-called reverse gas flow, i.e. import of natural gas to Ukraine from the European states? After all, it allowed Ukraine not to buy Russian gas according to the terms and conditions of the contract dated 2009 almost for a year.

To what extent transit is connected with reverse gas flow

Let's analyze how reverse gas flow depends on the "Russian" gas being transited through our country. Moreover, do they really supply us with the gas of Norwegian, British or other "non-Russian" production?

Let's take a look at *Slovakian direction as the most important for Ukraine among all import directions*.

First of all, let's explain why we "quoted" the word "Russian". The thing is that it is difficult to identify what gas Gazprom transmits to the Eastern border of Ukraine. It may contain large impurities of Uzbek or Turkmen gas. Furthermore, in the event of transmission of such gas through the territory of Ukraine, it is mixed with the gas of Ukrainian origin. That's why we will hereinafter call such gas a *transit* one.

Let's try to reasonably prove that it is a transit gas that we receive as the reverse gas flow from Slovakia. Specialists know it for sure. We go back to this topic not because we want to once again emphasize an obvious fact, we are doing so to make it clear what we should do in 2019, if we do not have a transit gas flow.

Natural gas quality criteria

Let's apply a natural gas quality criterion for the purpose of analysis.

Different gas suppliers have noticeably different natural gas quality. Thus, in our case, it looks rather convincing to compare gross calorific value indicators for Budince and Veľké Kapušany, transit gas flow entry points to Slovakia and exit points of the European export to Ukraine, which Naftogazbudinformatyka has calculated based on daily information provided by Slovakia from the time of commissioning the Budince exit point through which the natural gas is supplied from Europe to Ukraine.

Table 1. Average indicator of high calorific value in 2016 at the Budince exit point and Veľké Kapušany entry point, kWh/cubic meter at 20°C

Point of Slovakian GTS	Budince, planned indicator	Veľké Kapušany, planned indicator	Budince, actual measured value	Veľké Kapušany, actual measured value
Gross Calorific Value (GCV)	10.6293	10.6276	10.6304	10.6344

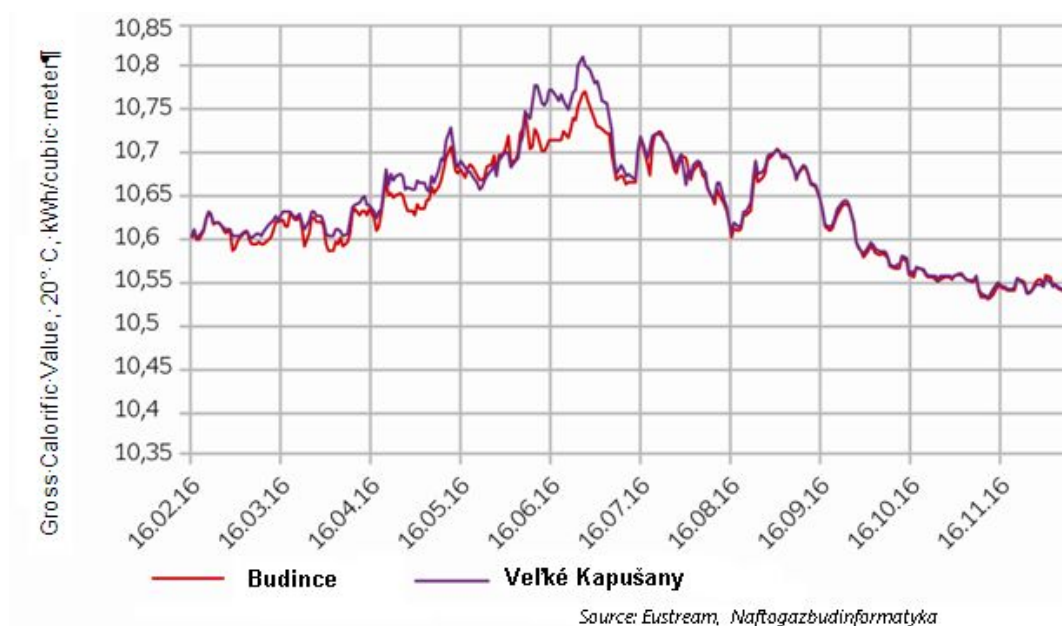
GSV index is specified under standard conditions valid in Ukraine, namely: measurement temperature 20°C, combustion temperature 25°C, GSV (20,25).

Different standard conditions, namely, measurement temperature 0°C and combustion temperature 25°C, GSV (0,25) apply on the European gas market ([for example](#)).

Standard conditions are recalculated in accordance with the DSTU (State Standards of Ukraine) ISO 13443:2015.

Data match – accurate, in the third decimal place. In addition, dynamics of behaviour of both gas flows is absolutely identical.

Figure 1 Daily indices of measured gross calorific value under 20°C for Russian gas flows incoming to Slovakia at the point Veľké Kapušany and “European” gas outgoing from Slovakia at Budince point, which is imported by Ukraine



In fact, considering measurement and calculation error, only one line would have left on the graph, even though it shows two different gas flows – incoming in Ukraine from Slovakia and outgoing from Ukraine to Slovakia.

As a transit gas flow is delivered to Slovakia through Ukraine at the point of Veľké Kapušany, it is rather obvious that the same transit gas flow is supplied in the reverse direction.

According to the specific calorific value, it is hard to confuse a transit gas with competitors. Norwegian, British and Danish gas have a noticeably higher calorific value, and natural gas of Dutch and German production – noticeably lower. Table 2 shows quality specifications of import natural gas in Germany according to the data contained in the European confidential report, which is now in public domain on the Internet (Contract N.:21844 INGAS Report on gas composition range in Europe DB0.1).

Table 2. Quality indicators of export natural gas of key German suppliers, kWh/cubic meter

Indicator	Russia: H gas	Norway: H gas	Denmark: H gas	Netherlands: L gas	Germany: L gas
High calorific value	10.56	11.08	11.63	9.80	9.31
Lower calorific value	9.51	10.01	10.52	8.84	8.38

Natural gas produced in Germany is similar to the Dutch one in terms of quality, and British gas – to Norwegian. Therefore, we think there is no doubt in origin of the natural gas that enters Ukraine and exits Ukraine at the Ukrainian-Slovak border. Moreover, we may state with reasonable confidence that it is all about not only some gas, it is about a transit gas flow, which arrived through Ukraine. This is calorific values of gas flows are correlated in both directions.

Gas balance outlook

According to the information of the International Energy Agency (IEA), a gas balance of Slovakia is presented in Table 3. IEA provides all data according to the European standard, which is 15°C. We calculated them subject to 20°C.

Table 3. Gas balance of Slovakia, million cubic meters at 20°C

Indicator	2014	2015	Q2 2016	August 2015	August 2016
Own production	100	94	22	10	7
Import (incoming gas volumes to the country)	40,925	48,776	12,085	4,802	5,041
Export (outgoing gas volumes from the country)	36,789	44,292	10,338	4,235	4,290
Changes in warehouse stock	333	-120	1,203	468	503
Gross consumption	3,903	4,698	566	110	255

Source: IEA Monthly Gas Survey to August 2016.

To understand a *structure of gas balance formation*, we studied incoming and outgoing gas flows of Slovakia, taking into consideration the fact that the country practically consumes natural gas of import origin.

Table 4. Incoming and outgoing gas flows of Slovakia in 2015, billion cubic meters at 20°C

Entry/exit point	Incoming gas flows	Outgoing gas flows
Baumgarten	2.6	38.3
Lanzhot (border with the Czech Republic)	16.17	4.92
<i>Veský Kapuľany (transit gas)</i>	38.6	0
Budince	0	10.0
Total	57.37	53.22
Difference (consumption by Slovakia)	4.15	

Source: Eustream.

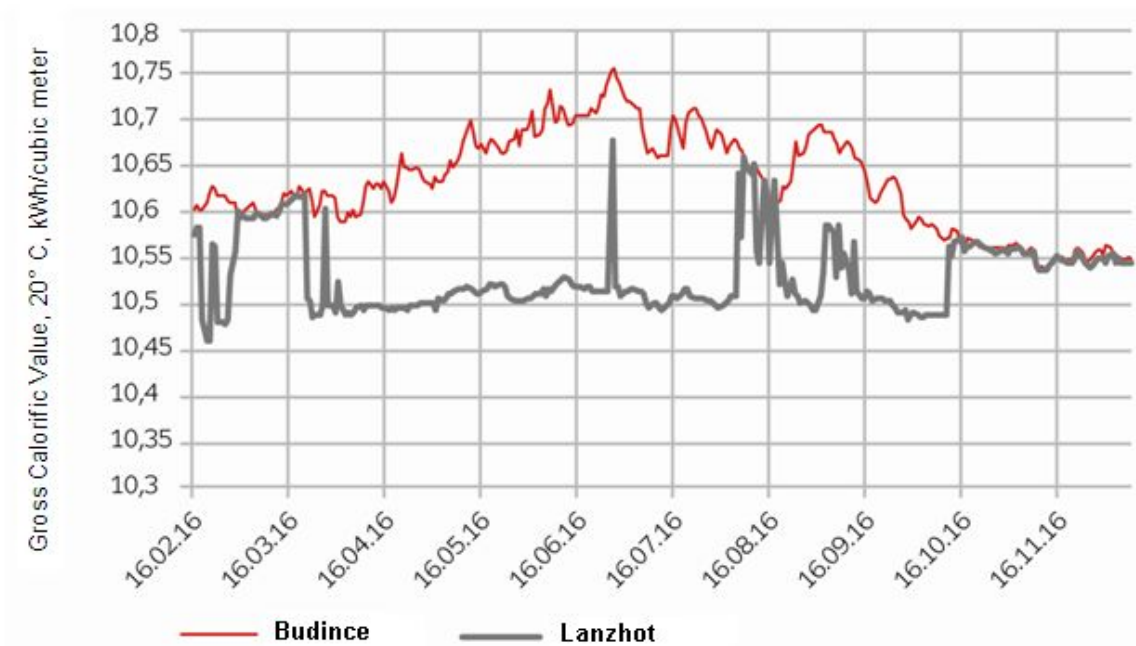
There may be doubts regarding the origin of almost 11 billion cubic meters of natural gas, which represent a balance of gas flows at the point of Lanzhot. According to Net4Gas, 16.7 billion cubic meters of natural gas

arrived in Slovakia in 2015 through Lanzhot, in 2016 – only 2.7 billion. A zero gas flow is during the period 11 October to 13 December 2016.

Did they send these gas flows to Ukraine? Our study, which is based on the data provided by Net4Gas, revealed that the high calorific value of gas incoming and outgoing at this point noticeably differs from the data for Budince first mentioned above. It is obvious that this is not the gas that is delivered to Ukraine.

Comparison of dynamics of high calorific value we apply to identify original of the natural gas for Budince and Lanzhot is shown in *Figure 2*.

Figure 2 Daily indices of measured gross calorific value under 20°C at the entry point to Slovakia from the Czech Republic Lanzhot and “European” gas outgoing from Slovakia at Budince point, which is imported by Ukraine



It is absolutely obvious that it is about another gas different from the Ukrainian transit. We will try to investigate its origin.

It is clear from *Table 5* that the main gas is delivered to the Czech Republic through cross-border points of Brandov (from OPAL), HSK-Olbernhau and Lanzhot. So, the main share of gas incoming to the Czech Republic is of Russian origin: from Nord Stream, from Yamal–Europe pipeline (through Gaspool German gas area) and Ukrainian transit (through Lanzhot).

Table 5. Structure of natural gas received by the Czech Republic in 2015

Entry point	Annual gas transmission volume, billion cubic meters
Brandov-OPAL	27.05
HSK-Olbernhau	6.6
Lanzhot	5.15
Waidhaus	3.6
HSK	1.93

Source: Net4Gas, Naftogazbudinformatyka.

The exception is 8% of gas delivered through Waidhaus from NCG German gas area. However, most likely, it is most like that it is about a virtual flow because German gas transmission operators (GTOs) declare lack of technical capacity of gas transmission towards the Czech Republic at Waidhaus point.

Nevertheless, high calorific value of transit gas delivered from Nord Stream and Yamal–Europe pipeline is clearly different from the same value of gas going through the territory of Ukraine.

Table 6. Average measured high calorific value of Russian natural gas supplied via different gas pipelines, kWh/cubic meter (20°C)

Budince – incoming gas flow to Ukraine from Slovakia	Vesky Karulany – incoming transit gas flow	Lanzhot – outgoing gas flow from the Czech Republic to Slovakia	OPAL – incoming gas flow to the Czech Republic	HSK-Olbernhau – incoming gas flow to the Czech Republic
10.63	10.63	10.53	10.49	10.50

It means that such analysis confirms the fact that Ukraine receives a transit natural gas from Europe. And it is not even close to the Norwegian gas in the Czech Republic/Slovakia.

Potential of gas transmission criterion

According to the European Commission, "in 2015, Slovakia, Hungary and Poland supplied 10.4 billion cubic meters of natural gas to Ukraine; supplies originated from Slovakia amounted to 9.7 billion cubic meters" (see Quarterly Report on European Gas Markets, Volume 9). If it is adjusted to different standards of gas volumes provision applied in Ukraine and Europe, Slovak supplies correlate well with the data of BP World Energy Review 2016 on "Rest of Europe".

Neither country neighbouring Slovakia has 9.7 billion cubic meters of gas for Ukraine.

Except for Russia, theoretically, Slovakia could have received such quantity of gas only in Germany or through Germany from Norway. Neither the Netherlands nor the Great Britain has such volumes of gas not encumbered by contractual liabilities. Nevertheless, Norway is also problematic in this context because it currently feels considerable difficulties with export potential (which Russia takes advantage of). There's no sense talking about Algeria because Spain and Italy import gas from there and a distance is rather long, which means high amount of expenses.

However, Slovakia was not able to deliver such quantity of natural gas through the territory of the Czech Republic or Austria due to capacity limitations on the route from Germany. On the border of the Czech Republic and Germany, the latter does not even offer any guaranteed capacity in the direction Czech Republic/Slovakia/Ukraine.

Through the Czech Republic

Waidhaus is the main entry point into the gas transmission system of the Czech Republic from Germany. There is no guaranteed (solid) capacity from Germany at the main entry point to the Czech Republic from Germany. Nevertheless, the Czech Republic is ready to receive 15 billion cubic meters of gas per annum (ENTSOG Transmission Capacity Map 2016).

However, a Czech operator mentions that it provides capacity on its part only before establishment of exceptions from requirements of the Third Energy Package by OPAL and Gazelle. In addition, a profile German gas transmission operator *Open Grid Europe* declares unlimited capabilities of virtual reverse. It means that *Germany may use swap to give up its gas from Gazprom supplied through Ukraine to Slovakia for the relevant compensation.*

Theoretically, such compensation may be represented by the natural gas supplied to Austria or the Czech Republic under gas transmission contracts, which stably have their quota on gas transmission capacity (as a result, almost nothing of gas transmission capacities is available in Ukrainian direction).

On other entry points from Germany to the Czech Republic

1. HSK-Olbernhau. Long-term capacity was offered for ordering in the recent years at the level approximately 2 billion cubic meters per annum. Commencement of reverse gas flow to Ukraine (middle of 2013) did not almost affect dynamics of capacities. It means that gas was transmitted under other contracts different from reverse gas flow for Ukraine. Actual gas flow (obviously, to long-term customers) is almost 100% of technical capacity. Free

long-term capacity in Ukrainian direction is zero.

2. *Olbernhau/Brandov*. Russian gas is delivered here from such gas pipelines as Yamal–Europe and Nord Stream/OPAL. There has been no long-term capacity in the recent years.

3. *HSK-Olbernhau*. In certain periods, the Czech gas transmission operator shows free capacity in the equivalent of 1.5 billion cubic meters per annum.

Through Austria

Total annual technical capacity of cross-border points at the entry from Germany to Austria makes up to *11 billion cubic meters per annum*. However, annual capacity available for ordering at the entry points from Germany to Austria is approximately 600 to 800 million cubic meters of guaranteed capacity and 2 to 3 billion of normal cubic meters of interrupted one.

Total annual technical capacity of cross-border points at the exit from Austria to Slovakia makes 8.6 billion standard cubic meters per annum. Available guaranteed capacity from Austria to Slovakia at the point (Baumgarten/Petrzalka) – 3.5 billion cubic meters per annum.

Resulting volume of available technical capacity (guaranteed capacity) for transmission of an alternative resource from Germany through Austria in Ukrainian direction is assessed up to 1 billion normal cubic meters per annum through Slovakia, and an interrupted one from Austria through Slovakia – 2 billion normal cubic meters.

So, it is impossible to deliver almost 10 billion cubic meters of natural gas from Germany to Slovakia/Ukraine under a current condition of existing capacities of gas transmission at cross-border points on the route in Ukrainian direction.

The aforementioned analysis certifies the fact that *it is early to speak about complete integration of the natural gas transmission system of Ukraine into the European network. If we want to actually become an equal partner on the European market of natural gas, we need to actively develop joint infrastructural projects that procure natural gas transmission with the use of the Ukrainian gas transmission system both from North-West Europe to the states of Central and Eastern Europe and further to the Balkans and backwards. It is also very important to be granted access to LNG terminals through the European gas transmission network.*

Maybe, after 2020, as they say at UkrGasVydobuvannya and the government that we will manage to reach self-sufficiency with natural gas produced in Ukraine at the cost of increase in production of UkrGasVydobuvannya PJSC and private gas production companies. However, it is extremely necessary to have safety and alternative possibilities. Taking into consideration the aforementioned information, let's mention:

1. Our analysis of connection between a transit gas and gas imported to Ukraine from Europe covers physical gas flows only.

2. From a legal point of view, European traders are fully eligible to supply transit gas to Ukraine not violating any laws of the EU and contracts with Gazprom. Swap operations should be kept in mind too.

3. In 2015, Russia tried to stop a reverse gas flow through Slovakia to Ukraine by reducing volumes of gas supply to Europe through Veľké Kapušany. It did not manage to do it in spite of the efforts and billions of US Dollars spent on the operation "stop reverse". In our opinion, it failed to implement it because of the following two reasons: winter turned out to be rather warm; thus, companies, which were the recipients of gas from Gazprom PJSC through Veľké Kapušany, managed to compensate it by means of other sources and routes of supply.

Summarizing the aforesaid, the following conclusion may occur. If gas is not longer transited through the natural gas transmission system of Ukraine, we may also have serious problems with reverse gas flow. That is why it is so important to integrate our gas transmission system into the European network – create conditions to improve capacities of physical natural gas supplies to Ukraine and also in other directions.

First of all, it is construction of a new gas interconnection Poland-Ukraine. Moreover, such

interconnection should be finished no later than January 2019.

In previous articles we wrote about the possibilities of physical supplies of natural gas in the volumes 8 to 10 billion cubic meters of gas per annum from Germany to Ukraine through Poland. There are also possibilities of gas supplies through the natural gas transmission system of Poland from LNG terminal at Swinoujscie.

Finally, beside Ukraine, there are some other examples of receiving transit gas on reverse basis. For example, Poland equipped both physical and virtual reverse on the main Yamal–Europe pipeline and proves that, first of all, it decreased direct dependence on Gazprom and, secondly, receives transit gas from Russia on reverse basis from Germany at much lower prices than directly from the Russian Federation.

Ukraine needs to connect to a new interconnection with Poland by direct participation in this process in the first place. It will become a real step to the connection of Ukraine to a network of connected border interconnections developed in the EU, which will procure operative management of gas transmission flows in the European Union member states. Contrary to all internal conflicts. Otherwise, Ukraine will be left behind a real energy European integration.