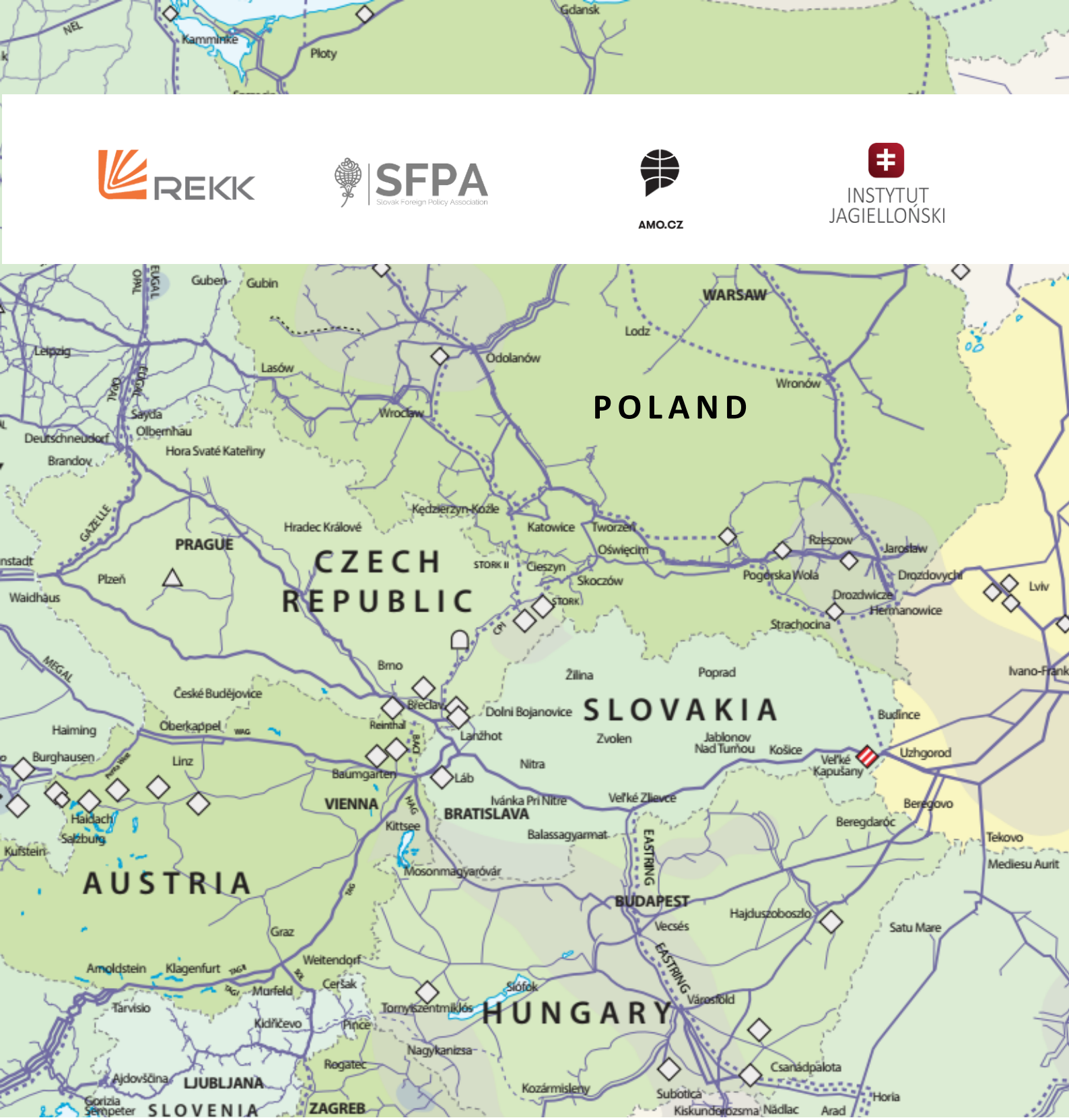

GAS FLOWS CHANGES IN V4 DUE TO NEWLY COMMISSIONED INFRASTRUCTURE

Final study

2021

Gas flows changes in V4 due to newly commissioned infrastructure

March 2021

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March 2021

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1. INTRODUCTION

This short paper has been added to the 2020-21 work program of the V4 Energy Think Tanks with the aim to follow up on previous research done on the gas market developments. Previous research has been focusing mainly on the security of supply aspects. In 2017 the gas PCI projects and the common strategy against rerouting of historical flows from Ukraine to Nord Stream 2 have been assessed. In 2018 the solidarity mechanism of the Security of supply regulation has been in the focus, in 2019 the measures taken by the V4 to prepare for a possible supply disruption of Russian deliveries via Ukraine in case the parties could not have agreed in the terms of a new transit contract.

Russian Gazprom and Ukrainian TSO signed a contract in the eleventh hour (December 2019) and agreed on the terms to deliver gas via Ukraine 2020-2024. Though the Ukrainian gas transit has not been cancelled, there have been significant changes in the main gas flows in Europe in the last two years due to the following reasons:

- Changes in LNG inflow to Europe and global gas market developments
- Changes in gas demand due to (among other factors also to) COVID-19 pandemic
- Commissioning of significant new infrastructure in 2020 and 2021, e.g. the Trans-Adriatic Pipeline, the Krk LNG terminal in Croatia, the second stream of TurkStream and the Balkan Stream.

This paper aims to give an overview of the V4 gas markets and show the changes in flow patterns and related effects on tariffs and prices.

Methods used are statistical analysis of flows, tariff benchmarking, price comparison, review of gas market related legislation in the V4.

First, a brief overview of the V4 gas markets is presented and compared to the relevant statistics of the EU28. Besides discussing the current status we show the future plans of the gas sector in the V4 based on the National Energy and Climate Plans.

Second, the developments of the V4 gas infrastructure investment plans are discussed along two lines: the first is the European projects of common interest and their financing, the second is the projects related to the Russian route diversification strategy aiming to bypass Ukraine.

Third, we present how the gas consumption, transit and flows have changed in the in the V4 due to commissioning of many new gas infrastructure between 2018-2020.

Fourth, as new investments and large changes in direction of flows do not leave the tariffs unimpacted the changes in gas transmission tariffs on the interconnection points of the V4 countries network are discussed.

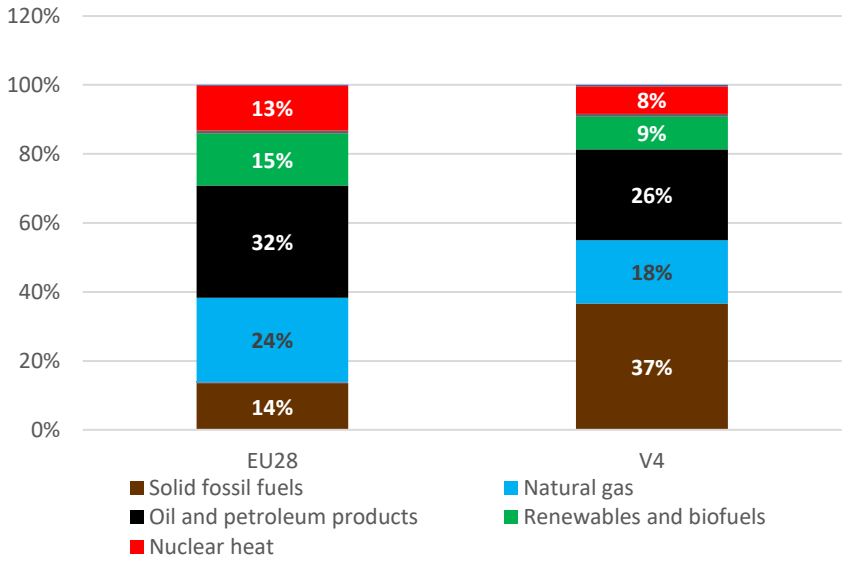
Fifth, we conclude and formulate recommendations for the V4 countries.

2. GAS DEMAND

2.1. CURRENT STATUS

Natural gas is an important part of the energy mix in the V4 region[1]: share of gas in total energy supply in the V4 was around 18% in 2018, 6 percentage points lower than the share in the EU28 (24%). In the region, solid fossil fuels have a more important role than in the EU28: 37% of energy supply originates from coal and lignite, as opposed to the 14% in the EU28. (Figure 1) Switching from coal and lignite can create an opportunity for natural gas and renewables alike.

FIGURE 1. SHARE OF FUELS IN TOTAL ENERGY SUPPLY IN THE EU28 AND V4 (2018)

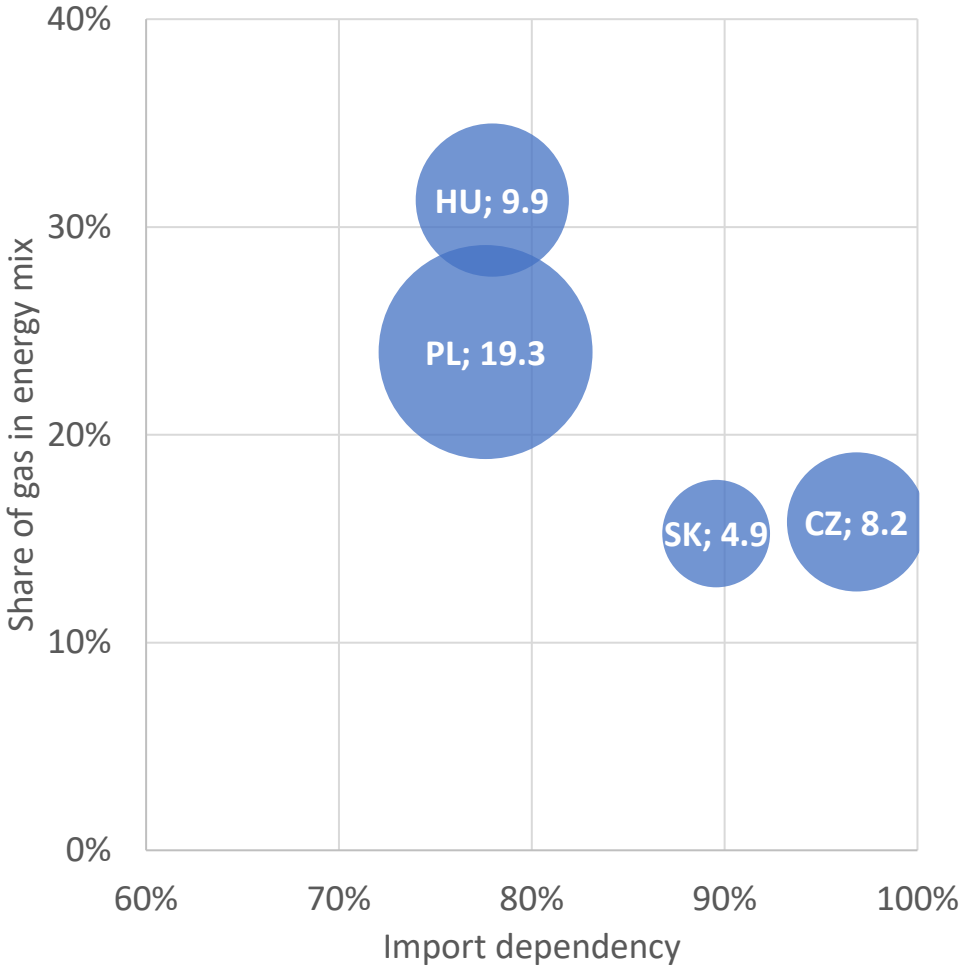


Source: REKK based on Eurostat Simplified energy balances [nrg_bal_s]

The V4 region is a net importer of natural gas. Comparing with the EU28, where 24% of the consumption is covered by domestic production, the region's import dependency is more severe. Locally produced sources accounted for only 15% of gas consumption in 2018. (Figure 3) Most gas is produced in Hungary, other countries have negligible gas production. The imported gas originates mainly from Russia, in case of Poland LNG is an alternative. As Figure 2 shows the larger import dependency of CZ and SK are coupled with smaller share of gas in the energy mix.

[1] By region we refer to the following countries: Czechia (CZ), Hungary (HU), Poland (PL), Slovakia (SK)

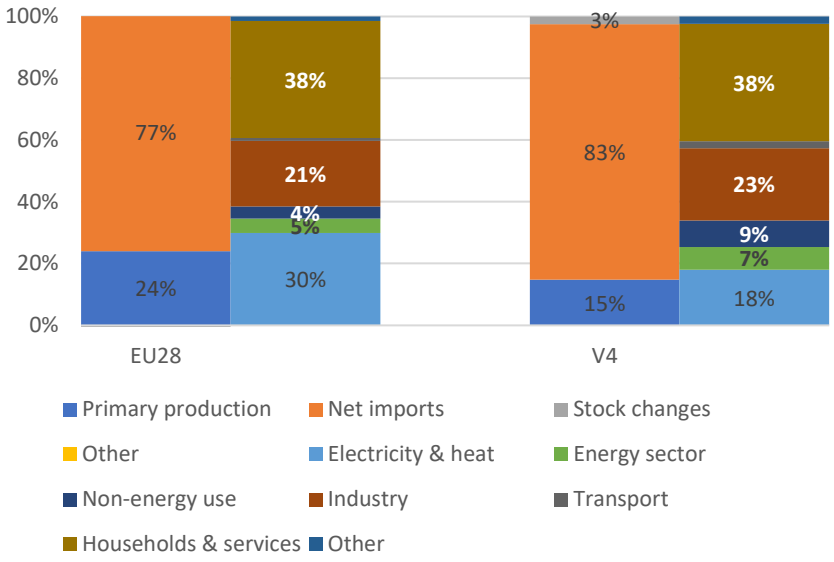
FIGURE 2. ROLE OF GAS, IMPORT DEPENDENCY AND MARKET SIZE (BCM/YEAR) IN THE V4 REGION, 2018



Source: REKK based on Eurostat

In the V4 region in 2018, 18% of gas is consumed in the electricity and heat sector, 23% is used in industry and 38% for heating in residential and services sector. In the EU28, this picture differs somewhat: in 2018, electricity and heat generation combusted 30% of gas supply, industry consumed 21% and households and services consumed 38%. The role of gas for electricity and heat generation is more important in the EU28 than in the V4, while industry and heat use have similar importance. Moreover, non-energy use for gas in the V4 (9% of all gas use) is more substantial than in the EU28 (4% of all gas use). (Figure 3)

FIGURE 3. STRUCTURE OF GAS SUPPLY AND DEMAND IN THE EU28 AND IN THE REGION, 2018

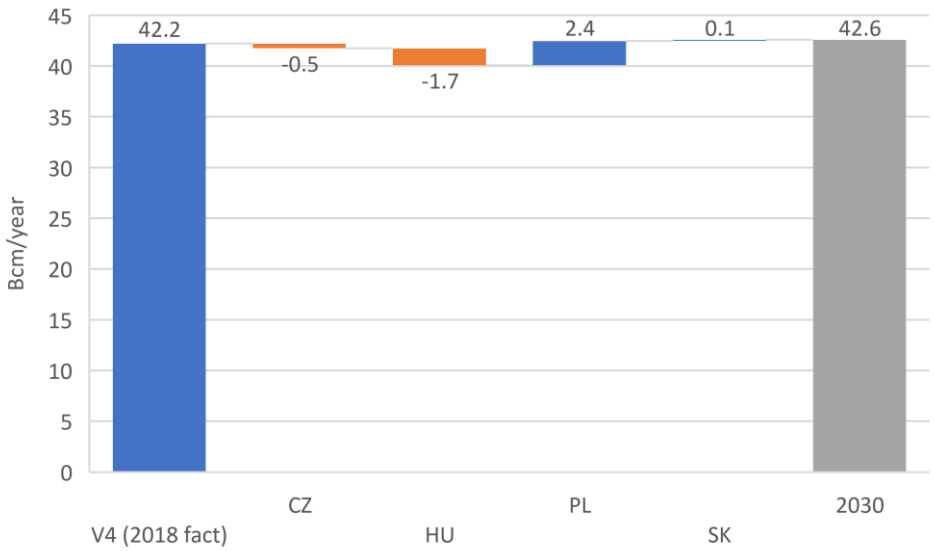


Source: REKK based on Eurostat Simplified energy balances [nrg_bal_s]

2.2. FUTURE OUTLOOK

This section aims to look into the current plans of the V4 in terms of decarbonization, and how these plans are reflected in the latest natural gas demand forecasts available.

FIGURE 4. INCREMENTAL GAS CONSUMPTION BY COUNTRIES BASED ON NATIONAL PLANS



Source: REKK based on NECPs, TYNDPS and strategic documents

Czechia: Different sources contain quite diverse gas demand forecasts. The Czech NECP[2] acknowledges the need to decarbonize the current energy mix of the country in order to meet European climate targets and set a path that would be in line with the European Green Deal.

While the NECP foresees a 6 percent demand decrease[3], in contrary. the Czech gas TSO in the TYNDP estimates a significant demand increase by about 30%. TSOs tend to be optimistic about the demand projections, therefore we took the more ambitious climate target of the ministry as a baseline in our demand summary for the region.

Hungary: For Hungary the NECP formed the basis of the demand projection. The Hungarian plans foresee a large reduction in the household consumption (approximately 2 bcm/yr by 2040) due to energy efficiency investments mainly renovation of buildings.

Poland: The WAM (with additional measures) scenario of the Polish NECP was used as a base-line. In Poland this means that gas consumption is expected to increase due to replacement of coal by gas especially in the electricity generation sector.

Slovakia: In Slovakia the NECP (although has an outlook only up to 2023) and the gas TSO (Eustream) both anticipate stagnation in gas consumption in the near future.

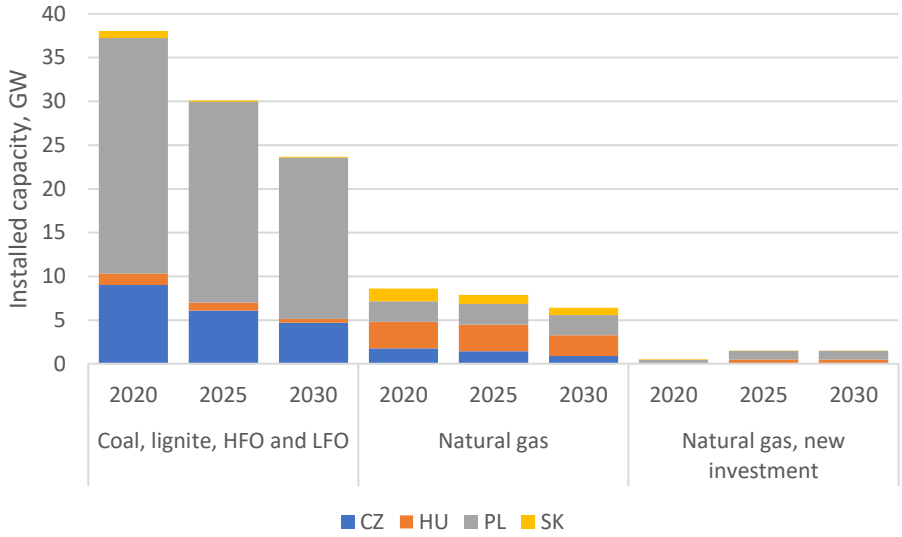
2.2.1. ELECTRICITY AND HEAT

In the coming decade the overall capacity of coal, lignite and oil-fired power plants in the region is expected to decrease by around 15 GW. This is accompanied with only a low increase of natural gas capacities. Investment under construction in gas-fired capacities is around 1500 MW in the region until 2030 (including ~1000 MW in Poland and 500 MW in Hungary replacing lignite-fired Mátra power plant).

2 "With a gradual phasing out of coal sources, the use of natural gas, biogas and, prospectively, synthetic methane and hydrogen will increase in the Czech Republic. [...] Moreover, the gas system has the potential to contribute to achieving the energy efficiency target." NECP of the Czech Republic, 2019,

3 NECP of the Czech Republic, 2019

FIGURE 5. INSTALLED FOSSIL CAPACITY IN THE REGION, GW



Source: REKK power plant database

Czechia: Czechia is looking for ways to replace coal combustion in power plants and heating plants with more environmentally friendly fuels. In February 2021, the Czech government postponed a decision on a 2038 target date to phase out coal. A broad state coal commission had recommended in December 2020 the exit date of 2038 but some ministries and other organizations, including NGOs had not agreed with the suggested date, inclining to a target exit date of 2033.[4]

In 2020, ČEZ shut down 1,000 MW in coal installed capacity which is the largest one-off shutdown of coal blocks in the company's history.

The vision of a progressive departure from coal was presented by ČEZ in autumn of 2020. The company stated that the installed capacity of coal sources in the Czech Republic will gradually decrease by 6.2 GW to 0.7 GW by 2040. Half of the capacity of coal resources in the Czech Republic is to be decommissioned by 2035. A significant but for the present uncertain portion of these plants are to be replaced with natural gas. For example, ČEZ announced that one of the units (500 MW) of the Mělník III power plant unit shall be shut down in August 2021. Instead, it will build a smaller gas boiler room with an output of 140 MW and immediately afterwards a larger district heating plant, which will supply up to 200 thermal MW.[5]

Hungary: A significant part of the Hungarian decarbonization plans is that the last coal (lignite) fired power plant unit of Hungary, the Matra power plant will be converted to low-carbon technologies (indicative date 2025). According to the long-term plans of Matra PP approved in December 2020 by the owner MVM[6], - that are subject to potential changes in terms of capacities and timing -, a 500 MW CCGT unit is planned to be commissioned instead.

4 Reuters, Czech government parties fail to agree on 2038 coal phase-out target

5 The Mělník III power plant will shut down in summer, Aktuálně, 2021

6 http://www.mert.hu/hu/zold_jovokep

Poland:

As of 2020, lignite and hard coal accounted for a combined 110 TWh (72%) of Poland's domestic electricity output. Renewables (mostly onshore wind and rooftop PV) generated 16 TWh (11%). Natural gas came third, with a yield of 14 TWh and a 9% share.

Poland's energy policy, adopted early March 2021, predicts the following composition of the generation mix for 2040 (back-end of the forecasting horizon):

- Lignite and hard coal combined: 63 TWh (28%)
- Onshore and offshore wind combined: 55 TWh (24%)
- Natural gas: 38 TWh (17%)
- Nuclear: 31 TWh (14%)
- Biofuels: 16 TWh (7%)
- PV: 15 TWh (7%)

Given the above, the volume of electricity generated from natural gas in Poland is expected to increase from the current 14 TWh to 38 TWh. This translates into a nearly-threefold increase in consumption of natural gas in Poland's power industry.

Poland's district heating is still predominantly based on coal (~90% of heat in Poland). The country's energy policy foresees a moderate increase in heat generation in CHP plants (from 208 TJ in 2020 to 212 TJ in 2040) and a large drop in heat production in district heating plants (from 83 TJ in 2020 to 46 TJ in 2040).

No official plans are currently in place in Poland for the 2050 horizon.

Slovakia: The decommissioning of the Nováky (Upper Nitra Coal Region) and Vojany (Eastern Region) coal power plants is anticipated in 2023 and 2025, respectively. The Vojany plant is being considered for transformation into a facility to use secondary fuels, while solar energy use is also under consideration. Nováky should supply heat for several towns also in future, several scenarios are under consideration (biomass and gas, waste).

According to the Slovakian NECP planned measures in the heating sector (related to natural gas) will focus on the reconstruction and modernisation of heat distribution systems and high-efficiency cogeneration plants with a maximum heat input of 20 MW to reduce the consumption of primary energy sources for electricity and heat generation.

2.2.2. HOUSEHOLDS AND SERVICES

Czechia: Over the past years, gas consumption at the household level floated around 23 – 25 TWh. Following the impacts of the COVID-19 pandemic, the consumption decrease was only apparent in the Q2 of 2020 when both the consumption at the household level and the total consumption dropped in comparison to 2019. Following the impact of the COVID-19 pandemic,

the total natural gas consumption, adjusted for temperature effects, decreased by 8%.[7] Consumption at the household level decreased by about 1.6 %.[8]

Hungary aims to reduce gas consumption via energy efficiency: household and building sector gas consumption is planned to be reduced by 2 bcm/yr in 2030 and switch from gas to RES in the district heating sector according to the Hungarian NECP (this is ~23% decrease of the 2020 gas consumption of Hungary). This aim is supported by the introduction of an energy efficiency obligation scheme from January 2021, which will gradually increase the targets and hence will deliver the most cost-efficient investments.

Poland:As of 2019, Polish households consumed about 42 TWh of natural gas (22% of the country's total natural gas consumption). The use of natural gas by households is likely to increase at a moderate pace as Poland combats the issue of smog and departs from coal used for household heating. A key impediment to a more rapid increase in gas use by households may be the price of this fuel (PLN71.2/GJ based on 2018 data by the Polish Statistical Office), relatively higher than coal (PLN32.2/GJ) and district heat (PLN 54.1/GJ) It is also worthwhile to note that Polish households have been rapidly adopting heat pumps in recent years. As of 2019, the heat pump market in Poland grew by 42% (37.3k devices sold in 2019). Further uptake of heat pumps may slow down the increase in gas use by households.

Slovakia: The forecast in Slovak NECP for heat consumption was determined by analysing the potential for the energy efficiency of thermal plants, from which to a large extent the supply of heat from district heating systems and is covered. In addition to reducing heat consumption in apartment buildings, it is anticipated that there will be significantly reduced heat consumption in public buildings supplied by heat from district heating systems.

7 Zpráva o provozu plynárenské soustavy ČR, ERU, Q2 2020

8 Calculation by the authors, based on quarterly reports by the Energy Regulatory Office (ERU)

3. SUPPLY SOURCE AND ROUTE DIVERSIFICATION

3.1. DOMESTIC PRODUCTION

Domestic gas production in the V4 countries is limited (see chapter 2.1) but concessions introduced in Hungary from 2013 did help stopping the sharp decline of production. Prognose for Hungary foresees up until 2040 stagnation or at maximum moderate increase[9], while in Czechia and in Slovakia the domestic resources do not play a significant role. Shale gas resources are present but did not prove to be economic in Poland. Therefore, - reflecting on the high share of imported gas in the supply mix, that used to be 100% Russian gas at the time of the EU accession, - the security of supply driven plans dominated the natural gas agenda setting of the V4 in the last decade. These plans focused on enabling bidirectional flow on existing pipeline infrastructure, investing into new storage sites but also into better interconnectivity within the region and to new sources around.

3.2. PROJECTS OF COMMON INTEREST

The infrastructure plans of V4 were typically part of and the European network planning, the so-called ten-year network development plan. (TYNDP process). In the framework of the TEN-E regulation[10] some projects were labelled as Projects of Common Interest (PCI), signalling their importance in strengthening the resilience of the gas networks especially against disruption of supply like the one occurred in 2009. The V4 projects were typically considered as PCI and were supported also financially via the Connecting Europe Facility (CEF).

From 2014, CEF provided 4.7 Bn EUR support for energy studies and actual investments. 15% of CEF funding was spent on studies, and 85% on works. The support was divided between electricity (60%), gas (32%), CO_2 (5%), smart grid (4%) and energy storage projects (below 1%).

The countries of the V4 region were successful in securing EU funds for the natural projects that they communicated as their priority projects. (See full list of CEF supported projects in Table 8 of the Annex). Work-related CEF support for the region's natural gas priority projects amounted to 915 Million EUR, which was 66% of all support provided to the gas projects for works (1.396 Bn EUR). Project that are considered as V4 priority projects are listed in Table 1.

[9] NECP of Hungary 2019

[10] European Parliament and Council. (2013. 4 25). Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) N. EUR-Lex: http://data.europa.eu/eli/reg/2013/347/oj

TABLE 1: PCI PROJECTS ENABLING DIVERSIFICATION OF V4 COUNTRIES AND THEIR CEF SUPPORT (2014-2020)

PCI name	Country	Applicant	CEF M€	Support share %	CAPEX M€	Planned commissioning
8.5. PCI Poland-Lithuania interconnection ["GIPL"]	LT, PL	GAZ-SYSTEM S.A. / AB Amber Grid	295	60%	492	2021 (under construction)
7.1.5. Gas pipeline from Bulgaria to Austria via Romania and Hungary	RO	TRANSGAZ S.A.	179	40%	448	2022 (1 stage ready in 2019)
6.2.1. Poland – Slovakia interconnection	SK, PL	eustream, a.s. / GAZ-SYSTEM S.A.	108	40%	269	2021 (under construction)
6.5.1. LNG Regasification vessel in Krk (terminal)	HR*	LNG Hrvatska d.o.o.	101	46%	220	2021 (ready)
6.5.1. LNG Regasification vessel in Krk (evacuation pipe)	HR*	Plinacro Ltd	16	50%	33	2021 (ready)
8.3.1 Reinforcement of Nybro — Poland/Denmark Interconnection	PL, DK	GAZ-SYSTEM S.A.	215	30%	716	2023

**Krk terminal has been included into the table as the project has been a HU priority and the bookings of the terminal belong to large extent to HU tradersSource: authors based on CEF decisions and PCI interactive map*

Source: CEF decisions and PCI interactive map, INEA

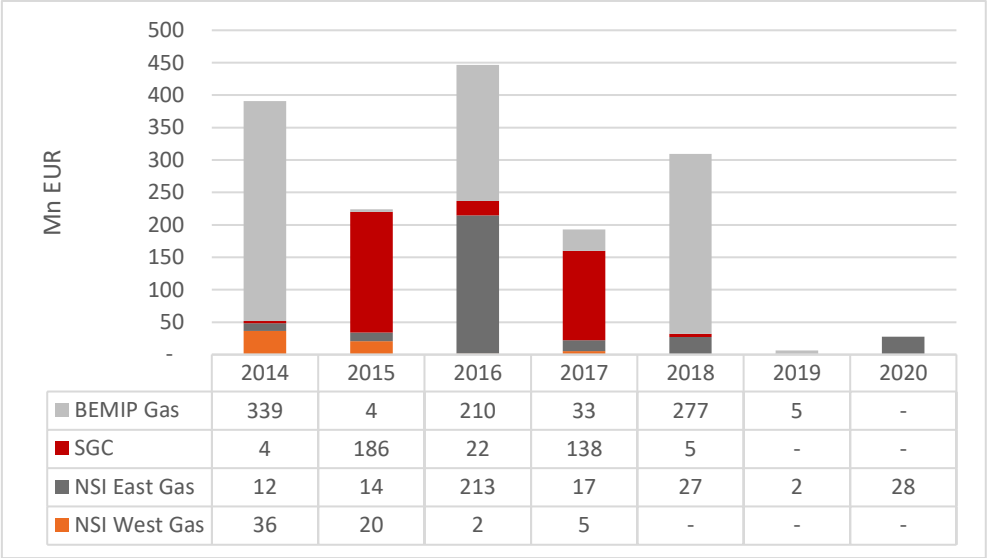
Poland has successfully secured 618 million € for the ongoing projects that are related to Poland: to the interconnector between Poland and Lithuania (GIPL) to the interconnector between Poland and Slovakia, to the Denmark Poland Interconnector. Slovakia has only one CEF supported PCI project (SK-PL), and Czechia none.[11] Hungary has no project on its territory, but it must be noted that the two source diversification projects consistently communicated by Hungary as their priority – the BRUA project that enables access to the Romanian offshore fields and the Croatian LNG terminal – both received substantial EU support (~280m€).

The 915 € CEF support was 42% of the total CAPEX of 2178 million € of these projects, out of that less than half has been commissioned so far.

[11] Actually there has been CEF works (~62 m€) awarded also to the Interconnector Czechia Poland, but it has been withdrawn as the project did not proceed.

Figure 6 shows that the golden age for gas projects to secure CEF financing has been 2014-2018. Since 2019 the strong opposition against supporting fossil fuel projects in the European Parliament has shown its consequences.

FIGURE 6: YEARLY ALLOCATION OF CEF FUNDS TO GAS INFRASTRUCTURE PROJECTS 2014-2020[12]



	2014	2015	2016	2017	2018	2019	2020
BEMIP Gas	339	4	210	33	277	5	-
SGC	4	186	22	138	5	-	-
NSI East Gas	12	14	213	17	27	2	28
NSI West Gas	36	20	2	5	-	-	-

Source: REKK data collection from CEF documents 2014-2020

The 2020 proposal of the Commission on the revision of the TEN-E Regulation[13] excludes new natural gas projects to be eligible for CEF funding. The message is clear: no more fossil fuel infrastructure will be financed by EU funds.

Looking at the forthcoming TYNDP 2021, the submitted natural gas infrastructure projects of the V4 are planned to be commissioned with a total CAPEX of ‘4900 m€, out of which ‘3800 million in the upcoming 3,5 years (until 2025). It must be noted, that based on the experience of the projects implemented in the last decade, it seems to be a reasonable estimate, that only those projects that have a Final Investment Decision (FID) already (in March 2021), have the chance to be commissioned up until 2025. This assumption leaves us with a much more modest investment estimate of ~1380 m€ into gas infrastructure. Most of the planned projects are

[12] Gas PCIs are categorised in priority corridors, these being:

- North-South gas interconnections in Western Europe (“NSI West Gas”) – no V4
- North-South gas interconnections in Central Eastern and South Eastern Europe (“NSI East Gas”) - CZ, HU, PL, SK are members
- Southern Gas Corridor (“SGC”) - CZ, HU, PL, SK are members
- Baltic Energy Market Interconnection Plan in gas (“BEMIP Gas”) – PL is member

[13] European Commission. (2020. 12 15). Proposal for a revisied TEN-E regulation. *on guidelines for trans-European energy infrastructure and repealing Regulation (EU)*. Brussels. Forrás: https://ec.europa.eu/commission/presscorner/detail/en/IP_20_2394

pipeline infrastructure, there are only two storage sites (in Poland in Slovakia), and one extension of LNG regasification capacities in Poland.

TABLE 2. COST OF TRANSMISSION, STORAGE AND LNG PROJECTS

	All projects			FID		
Investment	Cost (2020-2025), M€	Cost (2025-2030), M€	Total, M€	Cost (2020-2025), M€	Cost (2025-2030), M€	Total, M€
CZ	277	0	277	0	0	0
HU	828	0	828	0	0	0
PL	2284	1020	3304	1244	0	1244
SK	477	0	477	143	0	143
Total	3866	1020	4886	1387	0	1387

Source: ENTSOG TYNDP 2020 Annex A projects table

It must be noted that demand outlooks of the countries also call for caution in natural gas infrastructure investments, as the risk to create stranded assets is high.

Czechia: The Czech gas TSO planned to diversify its supply mix by two infrastructure projects, the Bidirectional Austria-Czech Interconnection (BACI); and the Czech-Polish interconnection (the STORK II project). Neither of the projects have been considered as Projects of Common European Interest (PCIs), both are currently marked as 'suspended' on the most updated Ten-Year Network Development Plan from 2020 and therefore are not likely not to be materialized in the coming years.[14]

Hungary: In summer 2020 two Hungarian companies (MFGT and MET Croatia) booked capacities on the to be commissioned LNG terminal in Krk. MET booked 1.3 bcm/year for three years MFGT booked 666 mcm/year for 2020/2021 and 1 bcm/year for the following six years. With that the capacities have been fully booked for the first 3 years on the terminal.[15] The first cargo (MFGT) arrived in Jan 2021. Since January the Croatian LNG terminal received two cargos. By that the long-planned source diversification of Hungary has been enabled towards the LNG market.

The first stage of the Romanian-Hungarian interconnection project (BRUA) has been commissioned in 2019 with a firm 1.75 bcm/yr capacity from Romania to Hungary. This project has been a non-conditional project, meaning that the implementation was not subject to binding open season bookings.

14 Ten-Year Network Development Plan 2021-2030, Net4Gas, 2020

[15] PowerGlobe, a Qatari company booked the remaining capacities.

In January-March 2020 companies withdrew from the booking of capacities on the RO-HU interconnector (second stage of BRUA) due to uncertainties related to the delay of FID on the Romanian offshore production fields. For this reason, the availability of new sources from Romania became uncertain.

On the Ukrainian-Hungarian border a virtual trading point has been established in 2020. Before the commissioning of this virtual point, gas needed to be shipped to Hungary from Ukraine and then back to Ukraine but now the volumes could be netted. This has provided additional trading opportunity for the market participants. Still, firm capacities from Hungary towards Ukraine are not available, negotiations are ongoing between the respective TSOs and it is expected that the Hungarian TSO will include the necessary investment to enable the firm bookings towards Ukraine into its upcoming TYNDP (to be published in May 2021).[16]

There is one more unconditional project listed in the TYNDP: the Hungarian TSO has to build a new Serbian entry point (see next chapter). The other projects (additional capacity from Serbia, capacity extension towards Slovakia, firm capacity towards Austria, Eastring, Hungary-Slovenia interconnection) are subject to binding commitments on open season procedures on these points, which so far did not happen. Therefore, it is doubtful that they will materialize in the future.

Poland: Baltic Pipe has completed the permitting phase and entered the implementation phase. Recently, all administrative permits issued by Sweden, Denmark and Poland relating to this investment have come into force. This year, the GazSystem (GS) company contracted the supply of pipes, signed contracts with the contractor of the gas pipeline in the offshore part. In 2021, the laying of the offshore gas pipeline will begin with the use of specialized ships.

GS plans to complete the LNG project a few years after the Baltic Pipe is put into operation. The FSRU terminal at Gdańsk is depending on the demand of the Polish and the regional market for natural gas, also in the form of LNG. The transport of liquefied gas is becoming more and more attractive as it allows a wide choice for the supplier and any place of receipt. The onshore gas pipelines that will connect the LNG ship in the Gdańsk port with the national transmission network are currently being designed, market research for the "floating terminal" has been started. The results of this study will allow to determine the required capacity of this facility, for the time being it is estimated at 4.5 billion cubic meters annually.

The terminal in Świnoujście is being expanded. The first part of the expansion program for the LNG terminal in Świnoujście obtained the required administrative decisions. GS also have a selected contractor for construction works and have ordered supplies of regasifiers. The expansion has two stages - the first one is planned to be completed by the end of 2021, which will increase the terminal's capacity to 6.2 bcm annual regasification capacity for commercial purposes. On the other hand, the technical capacity of the facility will increase up to 7.5 bcm annually. The second expansion stage is being carried out in parallel. By the end of 2023, GS wants to build a second quay, thanks to which the terminal will be able to receive two ships at the same time. The construction of the third reservoir at the terminal will allow the capacity to be increased up to 8.3 bcm annually. The implementation of this investment will allow for extending the scope of services provided by reloading LNG to smaller vessels, bunkering ships

[16] 76/2021 Resolution of HEPURA in January 2021

and distributing the raw material among other countries of the Baltic Sea basin. The first stage is an investment worth approximately PLN 180 million (~38 million EUR). The expansion of further elements may cost about PLN 1.6 billion (~336 million EUR).

Slovakia: In September 2018, the construction of an interconnection between Slovakia and Poland was started based on the respective agreements between the transmission system operators (Slovak Eustream and Polish GAZ-SYSTEM). The interconnector that should be put into operation in 2021 is approximately 106 kilometres long. The grant agreement enabled the Polish and Slovak network operators to use European Union financial support from the Connecting Europe Facility (CEF) totalling at maximum 104 million EUR, while Eustream has allocated maximum 52 million EUR for the construction of the Slovak part. Eastring was not on the fourth PCI list, so its future development is rather questionable.

3.3. OTHER INFRASTRUCTURE DEVELOPMENTS (2020-21)

There are projects that have been realized in connection to the Russian infrastructure strategy aiming to bypass Ukraine. The Russian large transmission projects – Nord Stream and TurkStream – need to be connected to the onshore European system, and the large trunk pipes would not make much sense without the connecting infrastructure. These projects are not PCI projects. These projects usually secure financing via long term bookings of the interested shippers. Nord Stream 2 connecting pipelines are in Germany and in Czechia (EUGAL), while TurkStream needs BalkanStream (via Bulgaria and Serbia) with an entry point to Hungary to be built. These projects are described more below:

The completion of the European Gas Pipeline Link, or EUGAL[17] is among the main recent gas infrastructure developments that related to the Czech gas system. The pipeline has become operational as of January 2020 and is running parallel to the OPAL Gas Pipeline, bringing natural gas from the Baltic Sea area to the Czech Republic border, connecting both the Nord Stream and the Nord Stream 2 Gas Pipelines with Central Europe. "The pipeline is composed of two strings of 27.5 bcm each and according to current plans EUGAL would transport up 10 bcm gas per year to Germany and 21 bcm to Czechia, which will fundamentally change the gas flows in Central Europe, as Czechia will receive the bulk of its gas needs though Germany and it will also be able to supply Slovakia."[18] This explains the decreasing Slovak imports in the first months of 2020 via the pipeline through Ukraine. (see below)

NET4GAS, the Czech Republic's Gas Transmission System Operator started on-site construction activities on the Capacity4Gas Project which is aimed to connect EUGAL with the Czech gas system in 2018. In January 2021, NET4GAS launched the operation of a new 150 km long high-pressure gas pipeline. Bearing the cost of 540 million EUR as of December 2020, Capacity4Gas Project is the biggest single investment project in the history of NET4GAS. It has been stated that "the new infrastructure [...] strengthens the connection of the Czech Republic and the

[17] According to the industry group European Network of Transmission System Operators for Gas (ENTSOG), the cost of the pipeline would be €2.620 billion." https://www.gem.wiki/European_Gas_Pipeline_Link_(EUGAL)#cite_note-:1-9

18 Quarterly Report on European Gas Markets, European Commission, DG Energy, 2020

whole CEE region with the Western European gas hubs and thus secures access to diversified gas supplies at competitive prices, including access to the planned LNG terminals in Germany. At the same time, the implementation of the project enhances the strategic role of the Czech Republic in international gas transit, also with a view to the possible future transportation of renewable gases, including hydrogen."[19] The infrastructure updates included capacity increases, capacity extension of HSK BTS, a new compressor station and the DN1400 pipeline.[20]

While some other large-scale development projects could be implemented on the transmission system, distribution networks are considered complete. All cities with more than 5 000 inhabitants and a total of 78 % of all municipalities have been connected to gas supply.[21]

In Hungary, the TSO has been reluctant to invest into the capacities that help bypassing Ukraine for long, and the Energy Office forbid to book capacities on the Western and Northern entry points (from Austria and from Slovakia) to prevent market foreclosure in 2018-2020.[22] In 2019 however, as part of the deal with Russia to fill the Hungarian storages with gas for the upcoming winter (and to reduce security of supply risk related to the expiry of the Ukrainian transit contract in 2019) the new Ten-year network development plan of Hungary has been modified. A new project has been added to the list of projects that are to be implemented by the TSO without any condition by October 2022: a 6 bcm/yr capacity extension of the reverse flow capacity from Serbia to Hungary. A further extension of the capacities by 8.5 bcm/yr is conditional – it depends on the successful outcome of an open season capacity booking procedure. This interconnection point has been transmitting the transit of Russian gas from Ukraine to Serbia, but as Serbia started to receive gas from the south from January 2021 (via TurkStream and BalkanStream) it has become obsolete. This project consists of a 15 km new pipeline laying and of installing compressor power. The cost of the project is unknown, but based on benchmarking a 37-45 million EUR is estimated for the pipeline. Due to US sanctions (CAATSA 232. Paragraph) applied from 16 July 2020 on the TurkStream pipeline and any Russian pipelines might apply to the Serbian Hungarian entry point (as the project is a direct continuation of the Balkan Stream, which is controlled by Gazprom and affiliates) the Hungarian TSO regards the legal circumstances of the project unclear and risky. For this reason the deadline for both projects (the obligatory 6 bcm/yr and the open season based additional 8.5 bcm/yr) has been postponed to October 2023.[23]

19 NET4GAS launches Capacity4Gas pipeline operation, CEE Energy News, 2021

20 Capacity4Gas Project leaflet, NETGAS, 2019

21 The State Energy Policy, 2015

22 1858/2017 Resolution of the Hungarian Energy Regulator (HEPURA) on 3 March 2017: http://mekh.hu/download/8/3e/20000/1858_2017.pdf

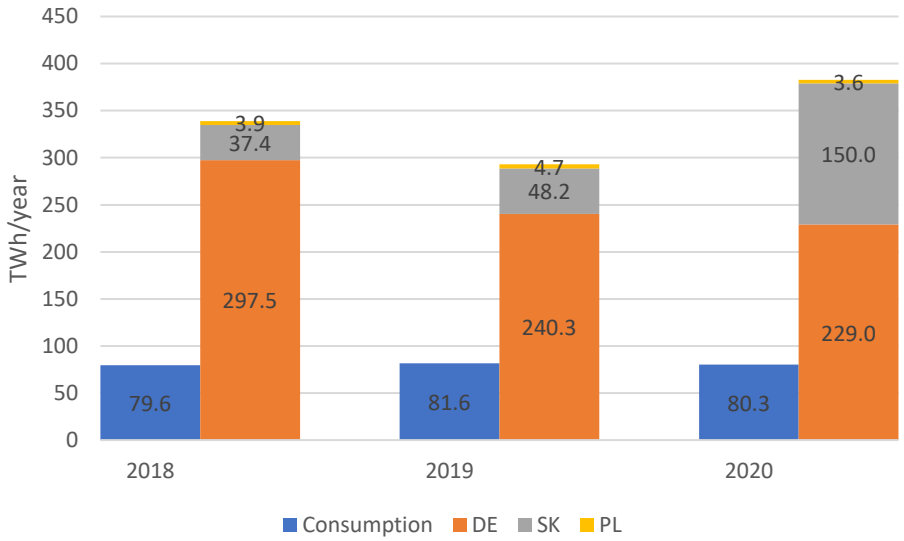
23 383/2021 Resolution of HEPURA published 21: February 2021 http://mekh.hu/download/1/88/e0000/H383_2021_sz_hat_FGSZ%20Szerb%20OS_H992_%C3%A9s_H1596_2020_hat%C3%A1rozat_m%C3%B3dos%C3%ADt%C3%A1sa0204.pdf

4. CHANGES IN GAS FLOWS

4.1. CZECHIA

Czechia has been a beneficiary of change in flows, as Figure 7 shows. Without losing the flows to Germany, the transit towards Slovakia increased.

FIGURE 7. DOMESTIC GAS CONSUMPTION AND EXITS ("TRANSIT") TO NEIGHBOURING NETWORKS IN THE CZECH REPUBLIC

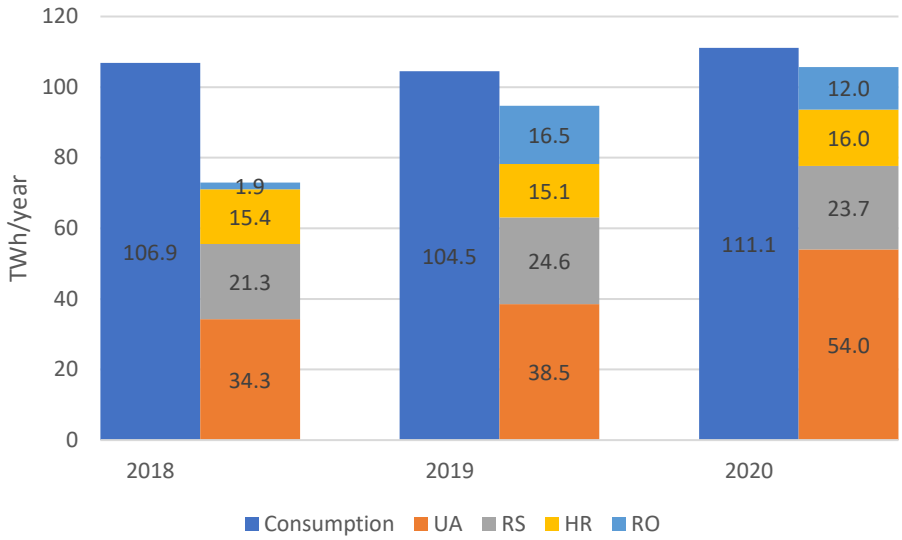


Source: ENTSOG Transparency platform. DE includes exits to NCG and Gaspool networks

4.2. HUNGARY

After the high net import from Ukraine and injection into storages in 2019 due to the preparation for the expiration of the transit contract between Russia and Ukraine, in 2020 net import from Ukraine decreased significantly.

FIGURE 8. DOMESTIC GAS CONSUMPTION AND EXITS ("TRANSIT") TO NEIGHBOURING NETWORKS IN HUNGARY

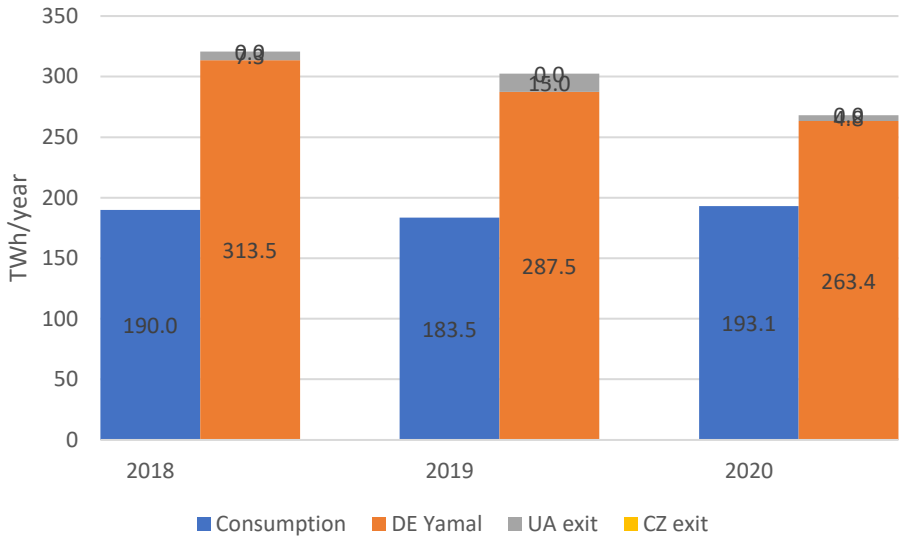


Source: ENTSOG Transparency platform

In the 2019/20 gas year due to the uncertainty of Ukrainian transit the import from Ukraine decreased which was compensated by the increased flows on the SK-HU interconnector, although this increase was only temporarily. The transit through Hungary was also significant in 2019 and 2020 mainly due to the favourable Ukrainian storage products and that Hungary could get a significant part of the European flows to Ukraine storages. Transit flows dropped significantly in 2021 because the SEE region is served by Russia from the south (through Turkey): after Bulgaria from 2021 January also Serbia gets gas through the Balkan Stream. This tendency is expected to continue, and the gas delivered to Bulgaria through TAP pipeline also will probably affect this region significantly.

4.3. POLAND

FIGURE 9. DOMESTIC GAS CONSUMPTION AND EXITS ("TRANSIT") TO NEIGHBOURING NETWORKS IN POLAND, TWH/YEAR



Source: ENTSOG Transparency platform.

The gradual drop in Yamal transit volumes in Poland predominantly results from decreased purchases from Russia bring offset by increased inflows via the Swinoujscie LNG terminal and from the EU market. Quarterly data by the Polish Energy Regulatory Office for 2020 regarding changes in delivery volumes are shown below.

TABLE 3. CHANGES OF DELIVERY VOLUMES OF DIFFERENT SOURCES IN POLAND (2020/2019)

Direction	Q1 2020 vs Q1 2019	Q2 2020 vs Q2 2019	Q3 2020 vs Q3 2019	Q4 2020 vs Q4 2019
Deliveries via the Swinoujscie LNG terminal	41%	23%	4%	-19%
Deliveries from the EU	-43%	4%	1%	6%
Deliveries from outside of the EU (mostly Russia)	-18%	-15%	4%	-3%

Source: Polish Regulatory Office

4.4. SLOVAKIA

The annual capacity of the transmission network of Slovakia is 90 bcm. The TSO mainly transports transit, only 7.4% of the transmitted volume was for domestic use in 2019 according to Eustream's annual report. The historical flow direction was shipment from Ukraine to Czechia and to Austria. The transit to Czechia has been lost when flows switched to Nord Stream 1 and connecting pipelines (OPAL and Gazelle). The utilization of the system slowly drops in Slovakia, but the main change is in the direction of flows. (Figure 10 and Figure 11)

FIGURE 10. ENTRIES TO THE SLOVAKIAN SYSTEM, TWH/YEAR

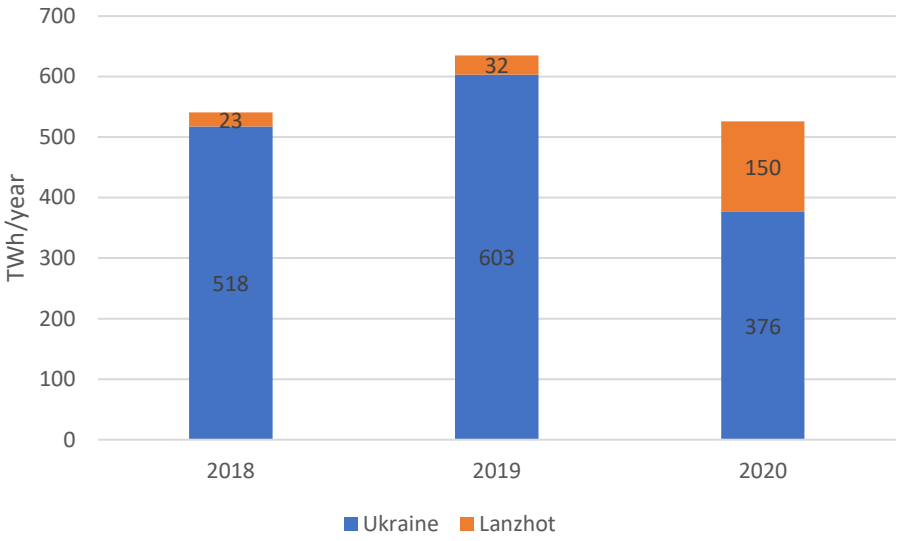
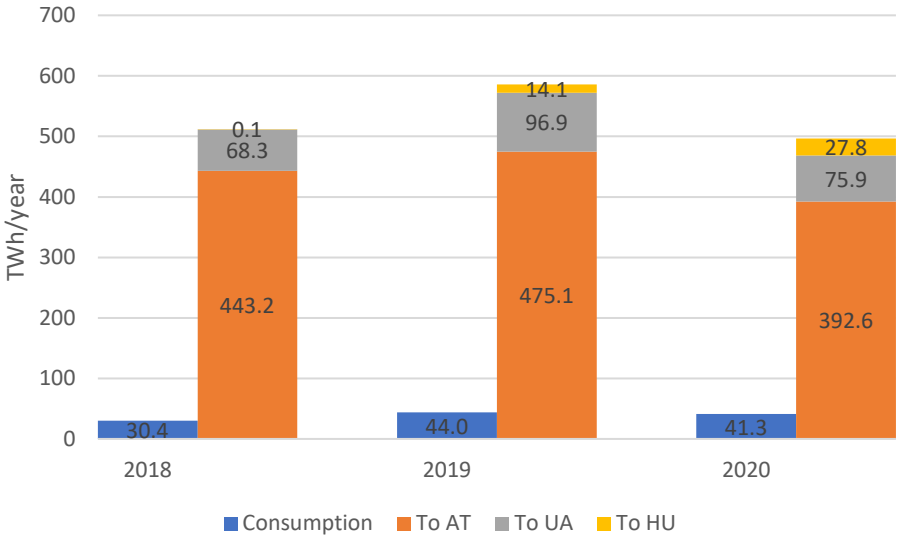


FIGURE 11. DOMESTIC GAS CONSUMPTION AND EXITS ("TRANSIT") TO NEIGHBOURING NETWORKS IN SLOVAKIA, TWH/YEAR



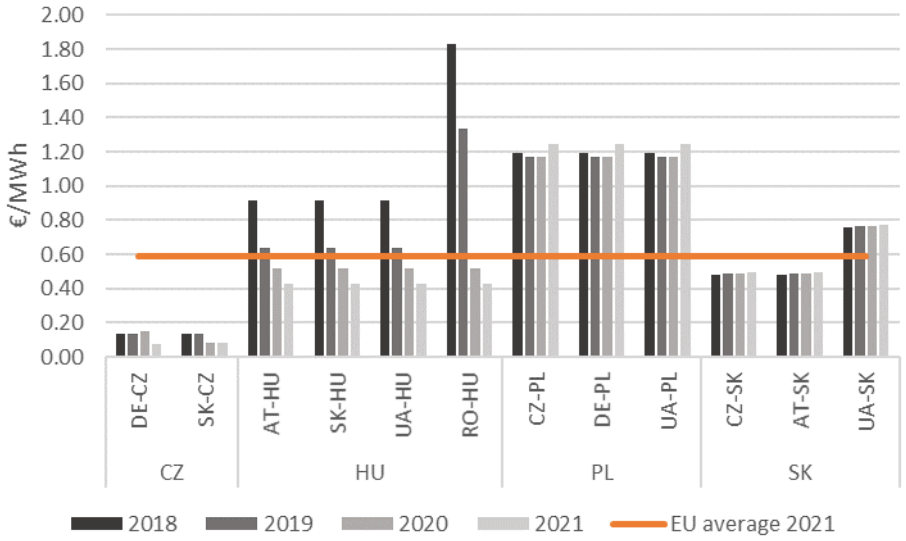
The change occurred at the beginning of 2020 on entry point from the Czech Republic. Slovakian TSO eustream doubled technical capacity from the direction from the Czech Republic

adjusting the system to the new direction of flows. Distribution node extension in Lakšárska Nová Ves was technologically completed at the end of 2019. New technology - tandem compressors with gas turbines with a total output of 46 MW was used at the beginning of 2020. The drop in transit flows is visible on Figure 11 and is expected to continue parallel to the drop in flows via Ukraine.

5. CHANGES IN GAS TRANSMISSION TARIFFS AND PRICES

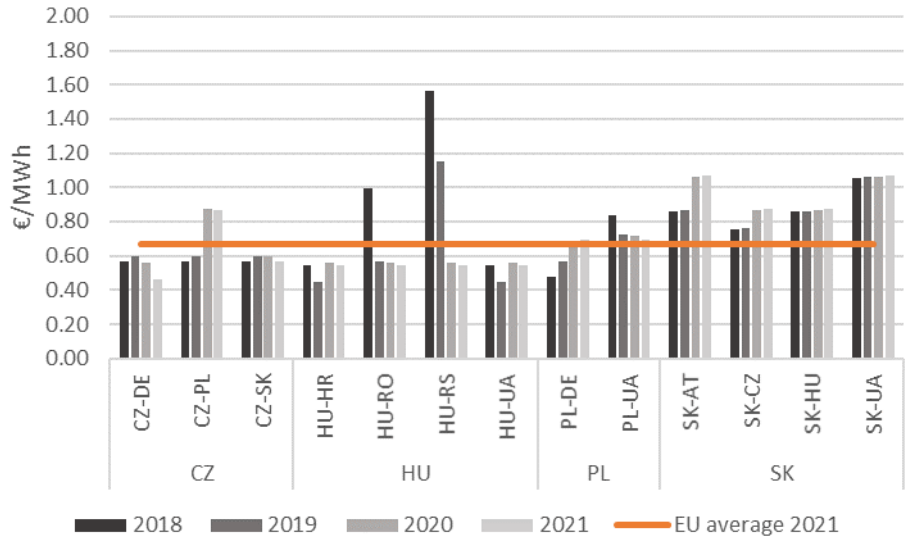
5.1. CHANGES IN TARIFFS

12. FIGURE: ENTRY TRANSMISSION TARIFFS IN V4, 2018-21



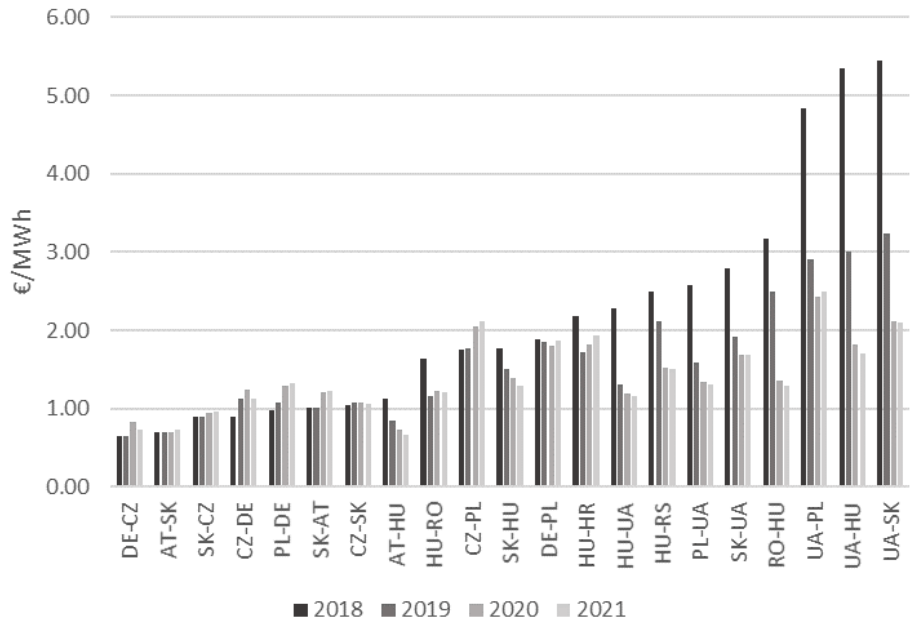
- Entry tariff range varies in the region much more than exit tariffs do: entry tariffs are between 0.07-1.24 €/MWh, EU average entry tariff is 0.59 €/MWh. Czech tariffs are much lower, Polish tariffs are much higher than EU average.
- HU: entry tariffs decreased significantly throughout the different tariff revisions. The tariff decrease reflects on the increased transit flows on the system in 2018-2020. The RO-HU tariff decreased to the level of other tariffs, due to the implementation of the Tariff Network Code which allows no „extra" tariff element.
- SK: entry from UA is the most expensive entry point by 2021.

13. FIGURE: EXIT TRANSMISSION TARIFFS IN V4, 2018-21



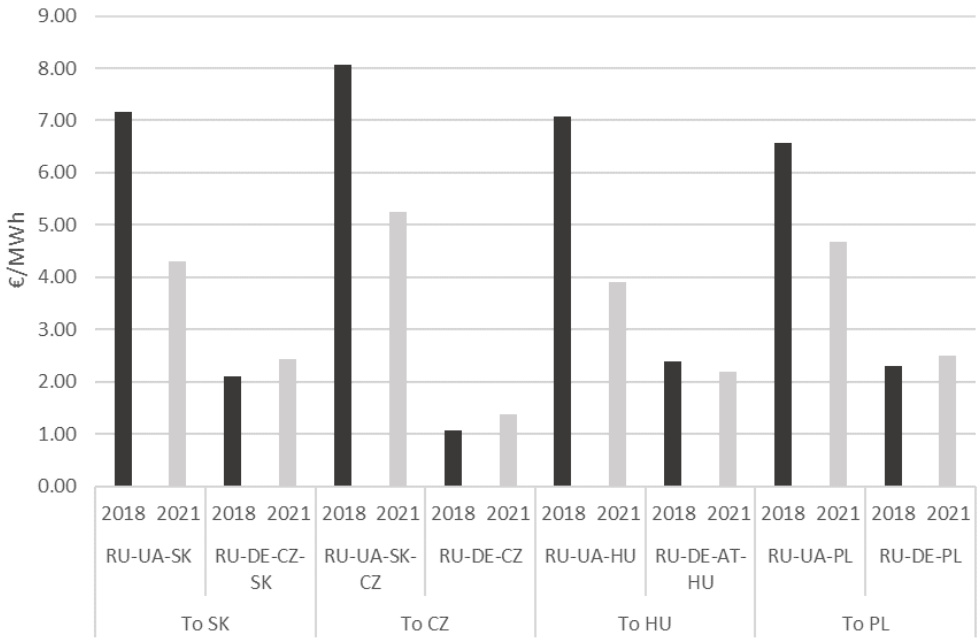
- Exit tariffs are higher on average than entry tariffs (especially by 2021), EU average: 0.67 €/MWh
- Exit tariffs are within a range of 0.46-1.07 €/MWh in V4, where Slovakian exit tariffs are the highest in the V4, especially towards Ukraine.
- HU: outlier exit tariffs were also decreased to a normal level towards Romania and Serbia.
- Transmission towards West (historical routes) is getting more expensive (PL-DE, SK-AT, SK-CZ).

14. FIGURE: SUM OF ENTRY AND EXIT TARIFFS IN V4



- Tariffs of the borders of Ukraine were outliers (both directions) – they gradually decreased to a normal level but are still among the higher ones.
- The cheapest borders are mostly the „western import" ones (DE-CZ, AT-SK, AT-HU).

FIGURE 15.: SUM OF TARIFFS ON DIFFERENT ROUTES REACHING V4 COUNTRIES



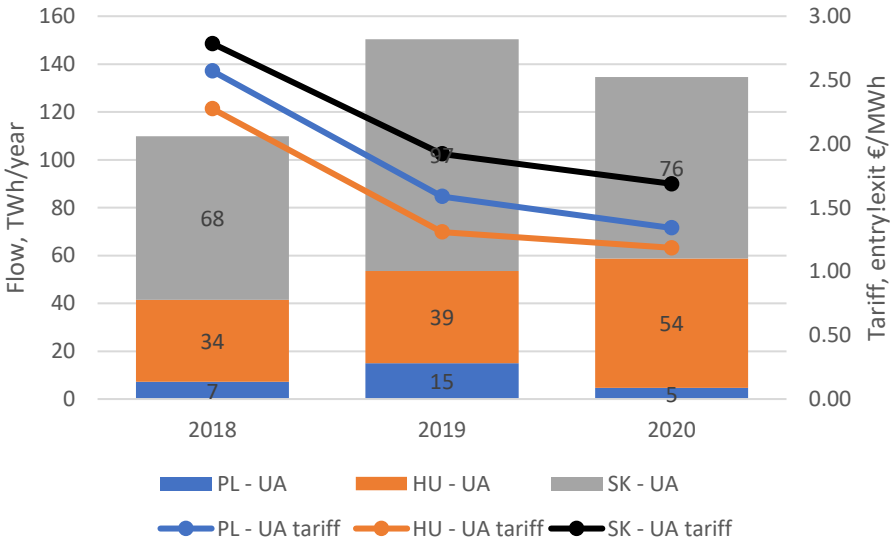
Source: REKK transmission tariff database

Figure 15 compares the Western and Eastern routes of the Russian deliveries. The Western route does not include the tariff of Nord Stream, as no published tariff is available. Different studies estimate - based on the 9.5 billion EUR investment cost of the project ~16 €/1000 cubic meter tariff, which translates to ~1.5 €/MWh in our tariff benchmarking[24]. With this additional cost added to the German route the Ukrainian route is still slightly more expensive than the Nord Stream 2 route despite the substantial tariff decrease from 2018 to 2021.

Ukraine is also an important transport designation of V4 transit. Figure 16 shows the total deliveries to Ukraine via the V4 countries. The majority of the deliveries is transmitted via Slovakia, despite the highest tariffs on the SK-UA IP. There is a clear tendency of tariff decrease, but the order of the tariffs did not change: SK is the most expensive, followed by PL and HU.

[24] Piotr Przybyło: The real financial cost of Nord Stream 2 (2019) Economy and Energy Programme https://pulaski.pl/wp-content/uploads/2019/05/Raport_NordStream_TS-1.pdf

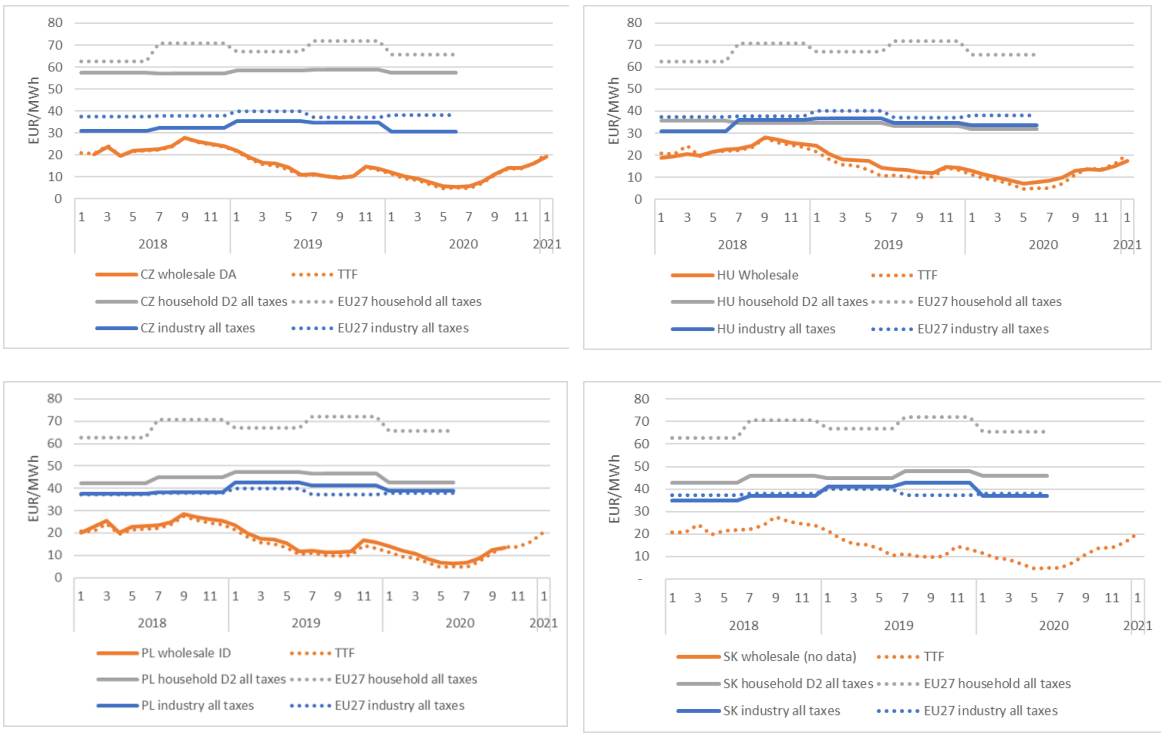
FIGURE 16. FLOWS TO UKRAINE (TWH/YEAR) FROM THE V4 COUNTRIES AND APPLICABLE TARIFFS (EUR/MWH)



In 2020 we saw a slight shift to Hungary of the Ukrainian flows, which was due to a timely introduction of tariffs in line with the CAM network code by FGSZ.

5.2. PRICE DEVELOPMENTS

FIGURE 17. WHOLESALE AND RETAIL GAS PRICES IN V4



Source: Eurostat and EEX. Household and industry retail prices have a frequency of 6 months.

Wholesale price developments:

Figure 17 illustrates that V4 region is an integrated part of the EU price region as prices on local markets move strongly together with the TTF price. However Hungarian prices (CEEGEX) also follow the Western European prices, the spread is highly affected by the local demand-supply changes which reflects the quite low liquidity of this market. In Hungary an interesting period started by the end of 2020 when prices on CEEGEX dropped below than the TTF in strong contrast to previous years observed prices. This tendency lasted throughout the first quarter of 2021 as well.

Retail price developments:

Figure 17 also shows that price drop in wholesale prices do not appear in household retail prices in Hungary and Czechia. This means that the end consumers are protected from the actual wholesale price developments, this means that their consumption is not affected by the real market outcomes.

6. CONCLUSIONS

The study summarized the latest market developments and potential future impacts of main natural gas infrastructure investments that were commissioned in the last two years up until 2021 in the V4.

Important new source options are provided by the Krk LNG terminal for Hungary since January 2021. The first phase of BRUA has enabled Romanian sources to enter Hungary.

Parallel to these PCI projects large investments occurred into projects that enable the Russian gas to bypass Ukraine. The Nord Stream 2 project is being delayed, but onshore continuations of the project (OPAL and EUGAL) allow the transport of increased amount of gas from West to East. The flow from Czechia to Slovakia and from Slovakia further to Hungary was a new phenomenon in 2020.

The Southern route of the Russian strategy, Turk Stream1 and 2 are fully commissioned since 2019 and 2020 respectively. The continuation of the Southern route on the Balkans has also been commissioned via Bulgaria to Serbia in January 2021. Implementation of a new entry from Serbia to Hungary has been delayed to October 2023 because of the legal uncertainties surrounding the project due to potential US sanctioning.

As a consequence of these developments in 2020 the flow on the systems of Slovakia and Poland decreased, in Czechia and in Hungary increased. With the loss of the Serbian transit Hungary will most probably face substantial transit decrease in 2021.

Transmission tariffs on the system show a trend of harmonization: outlier tariffs disappeared. The Ukrainian interconnection points still are among the most expensive ones despite a more than twofold decrease from 2018 to 2021. Entry tariffs vary on a wide scale, CZ tariffs being ~7 times lower than the Polish ones.

Our analysis on the PCI projects and their support via the Connecting Europe Facility between 2014-2020 found that the V4 region has been extremely successful in achieving EU working grants, 66% of the gas infrastructure grants were spent on projects that are priorities of the V4. The 915 million EUR CEF working grant allocated to V4 natural gas projects was 42% of the total CAPEX of the 2178 million EUR investment. However, only part of these projects has been implemented (the Krk terminal and the 1st phase of BRUA).

The revision of the infrastructure regulation (TEN-E) does not support any further CEF allocation to gas projects. The previously allocated funds however secured the FID to many of the projects that are V4 priorities, among them the Baltic Pipe connecting Denmark and Poland, the BRUA 2nd phase and the GIPL project.

The projects listed in the ENTSOG TYNDP 2020 foresee a 4 900 million EUR investment into gas infrastructure in the upcoming 3.5 years (until 2025). The gas demand forecasts do not support this large investment volume, as the V4 gas demand is rather stagnating according to our estimate until 2030. The increase of Polish gas demand is offset by the planned decrease of Czechia and Hungary, while Slovakia foresees stagnation. Based on these figures a more realistic estimate is that only the projects with an FID will be commissioned, this suggests 1387 million EUR.

The new project submissions of Slovakia and Czechia reflect on the decarbonization agenda of the EU and propose projects that help transforming the current gas infrastructure in a decarbonized future.

Based on the analysis we propose that the following recommendations should be kept in mind for the decision makers in the V4:

- In our view any further investment into new gas infrastructure would further increase the risk of stranded assets and lock in into the infrastructure.
- End-user gas prices in the V4 do not reflect market developments and benefits of low prices in 2019-20 were not shared with the household consumers. If the difference of wholesale and retail prices was used to support energy efficiency and renewable district heating options, this would be the best way to decarbonize the heat market.
- The natural gas security of supply agenda has been a strong basis of V4 cooperation in the 2010 decade. This agenda is outdated and needs revision. In our view the cooperation on projects enabling good practices to decarbonize the heat sector in the V4 could be a good candidate for cooperation. V4 countries could address together the problem of inefficient, polluting and unhealthy heating system in the low income consumer category.
- Common training programmes for energy efficiency professionals and building sector employees could help to secure renovation funds in an efficient manner for the benefit of household consumers and industries of the V4.
- The region shall not miss out the potential of the EU decarbonization agenda and propose projects to utilize existing infra for decarbonization goals. Hydrogen related options are also to be considered as discussed in our P2G paper.

7. DOCUMENT SOURCES

	NECP	Energy strategy	Gas TSO TYNDP	Annual report of NRA
CZ	CZ		TYNDP 2021-2030	2019
HU	HU	2020	TYNDP 2020	2019
PL	PL	PEP 2040	TYNDP 2020-29	2020
SK	SK		TYNDP 2021-2030	2019

ENTSOG TYNDP 2020

INEA CEF decisions and Interactive PCI map

8. ANNEX: GAS INFRASTRUCTURE

TABLE 4. GAS TRANSMISSION INVESTMENT PROJECTS OF V4

Code	Project Name	Country	Maturity Status	PCI 4th List Code	Project Commissioning Year First	CAPEX (M€)	OPEX (M€)	From	To	Capacity GWh/d
TRA-F-752	Capacity4Gas – DE/CZ	CZ	FID	not PCI	2019	515	11	CZ	CZ	454
TRA-F-918	Capacity4Gas – CZ/SK	CZ	FID	not PCI	2019	13	0.4	CZ	SK	333
TRA-F-286	Romanian-Hungarian reverse flow Hungarian section 1st stage	HU	FID	not PCI	2019	n.a.	n.a.	RO	HU	48.9
LNG-F-272	Upgrade of LNG terminal in Świnoujście	PL	FID	not PCI	2023	66.8	12.75	LNG	PL	76.57
TRA-F-212	Gas Interconnection Poland-Lithuania (GIPL) - PL section	PL	FID	8.5	2021	430	11	LT	PL	58.3
TRA-F-247	North - South Gas Corridor in Western Poland	PL	FID	not PCI	2021	n.a.	n.a.	PL	PL	0
TRA-F-275	Poland - Slovakia Gas Interconnection (PL section)	PL	FID	6.2.1	2021	680	16	SK	PL	174.5
TRA-F-190	Poland - Slovakia interconnection	SK	FID	6.2.1	2021	143.4	0.67	PL	SK	143.96
TRA-F-902	Capacity increase at IP Lanžhot entry	SK	FID	not PCI	2019	n.a.	n.a.	CZ	SK	884
TRA-A-133	Bidirectional Austrian Czech Interconnection (BACI)	CZ	Adv.	not PCI	2024	20	0.12	AT	CZ	201.42
TRA-A-136	Czech-Polish Gas Interconnector (CPI)	CZ	Adv.	not PCI	2023	257.14	0.52	PL	CZ	153.2
TRA-A-123	Városföld CS	HU	Adv.	6.24.4.3	2022	20	3.1	-	-	-
TRA-A-377	Romanian-Hungarian reverse flow Hungarian section 2nd stage	HU	Adv.	6.24.4.6	2022	14.4	3.7	RO	HU	76.5
TRA-A-656	Eastring – Hungary	HU	Adv.	not PCI	2025	530.9	8.3	RO	HU	617
TRA-A-1173	Poland - Denmark interconnection (Baltic Pipe) - onshore section in Poland	PL	Adv.	8.3.2	2022	340	8	PL	PL	0
TRA-A-271	Poland - Denmark interconnection (Baltic Pipe) - offshore section	PL	Adv.	8.3.2	2022	620	22	DK	PL	306.8
TRA-A-273	Poland - Czech Republic Gas Interconnection (PL section)	PL	Adv.	not PCI	2023	70	1	CZ	PL	219.1
TRA-A-621	Poland - Ukraine Gas Interconnection (PL section)	PL	Adv.	not PCI	2022	10	1	PL	UA	153.2
TRA-A-628	Eastring - Slovakia	SK	Adv.	not PCI	2025	146.1	7	HU	SK	617

TRA-N-325	Slovenian-Hungarian interconnector	HU	L. Adv.	6.23	2023	205	10	SI	HU	12.8
TRA-N-524	Enhancement of Transmission Capacity of Slovak-Hungarian interconnector	HU	L. Adv.	6.2.13	2022	58	0.11	HU	SK	102
TRA-N-1202	GCP GAZ-SYSTEM/ONTRAS - incremental capacity project	PL	L. Adv.	not PCI	2023	n.a.	n.a.	PL	DE	48.6
TRA-N-245	North - South Gas Corridor in Eastern Poland	PL	L. Adv.	6.2.2	2029	1020	22	PL	PL	0
TRA-N-1235	Firm transmission capacity increase at the IP Veľké Zlievce	SK	L. Adv.	not PCI	2022	26.18	1.95	HU	SK	102.2

Source: ENTSOG TYNDP 2020 Annex A projects table

TABLE 5. GAS STORAGE INVESTEMENT PROJECTS OF V4

Country	*Code*	*Project Name*	*Maturity Status*	*WGV (mcm)*	*Withdrawal Capacity (mcm/d)*	*Injection Capacity (mcm/d)*
SK	UGS-A-356	Underground Gas Storage Velke Kapusany	Adv.	340	3.75	3.75
PL	UGS-N-914	UGS Damasławek	L.-Adv.	800	8.90	17.70

Source: ENTSOG TYNDP 2020 Annex A projects table

TABLE 6. LNG REGASIFICATION PROJECTS OF V4

Country	*Code*	*Project Name*	*Maturity Status*	*Project Yearly Volume (bcm/y)*	*Project Ship Size (m3 LNG)*	*Project Storage Capacity (m3 LNG)*
PL	LNG-F-272	Upgrade of LNG terminal in Świnoujście	FID	2.5	90000	180000

Source: ENTSOG TYNDP 2020 Annex A projects table

TABLE 7. ENERGY TRANSITION RELATED PROJECTS IN THE V4 REGION

Country	Code	Project Name	Maturity Status	Project Type	Technical Parameters	CAPEX
CZ	ETR-N-306	Greening of Gas (GoG)	L.-Adv.	Hydrogen and synthetic methane	Production of hydrogen (2400 m3 H2/d) or synthetic metan (1200 m3 CH4/d).	-
SK	ETR-A-312	P2G Velke Kapusany	Adv.	Hydrogen and synthetic methane	The projects expects to install P2G technology with power about 78 MW. Produced hydrogen will be injected into planned UGS Velke Kapusany at rate about 1,23 GWh/day. Compressor units as well as other infrastructure will be used from the UGS Velke Kapusany. The power of compressor unit should be around 8400 kW.	78
SK	ETR-N-315	G2F - Gas to Future	L.-Adv.	Hydrogen and synthetic methane	Injecting hydrogen to existing gas storages. The injected hydrogen to NAFTA reservoirs should be at the rate of 1.32 GWh/day. In order to produce hydrogen and inject it in system at 2% vol. of hydrogen in NAFTAs capacity. It is expected to install P2G technology with power about 84 MW.	-
SK	ETR-N-913	Modification of NP23 MW turboset to a hydrogen-ready low-emissions at CS04	L.-Adv.	Hydrogen and synthetic methane	Modification of compressor power output 23 MW to allow hydrogen blending	-
SK	ETR-N-916	Measures for achieving hydrogen blending readiness of the transmission syst	L.-Adv.	Hydrogen and synthetic methane	Achievement of hydrogen blending readiness in metering and leakage detection	-
SK	ETR-N-920	Measures for the reduction of methane emissions	L.-Adv.	Methane Emissions	Reduction of methane emissions (other pollutants)	-

Source: ENTSOG TYNDP 2020 Annex A projects table

TABLE 8: GAS INFRASTRUCTURE PROJECTS THAT RECEIVED CEF FUNDS (2014-2020)

PCI name	Corridor	Action type	Action location	Max EU fin assistance	Year
7.1.5. Gas pipeline from Bulgaria to Austria via Romania and Hungary	SGC	works	RO	179.32	2015
6.1.1. Poland – Czech Republic Interconnection [currently known as Stork II] between Libhošť – Hať (CZ/PL) – Kędzierzyn (PL)	NSI East Gas	works	PL, CZ	62.66	2015
6.2.1. Poland – Slovakia interconnection	NSI East Gas	works	SK,PL	107.74	2016
6.5.1. LNG Regasification vessel in Krk (HR)	NSI East Gas	works	HR	101.40	2016
6.5.1. LNG Evacuation pipeline	NSI East Gas	works	HR	16.43	2017
7.3.2. LNG storage located in Cyprus [currently known as the "Mediterranean Gas Storage"]	SGC	works	CY	101.26	2017
6.8.3 Gas Interconnection Bulgaria-Serbia (IBS) -	NSI East Gas	works	BG	27.60	2020
6.13.1. Városföld-Ercsi– Győr pipeline + enlargement of Városföld Compressor station + modification of central odorization	NSI East Gas	study	HU	1.38	2015
6.6. PCI Interconnection Croatia – Slovenia (Bosiljevo – Karlovac – Lučko – Zabok – Rogatec (SI))	NSI East Gas	study	HR	4.83	2015
6.8.2. Necessary rehabilitation, modernization and expansion of the Bulgarian transmission system	NSI East Gas	study	BG	0.85	2015
7.1.1. Gas pipeline from the EU to Turkmenistan via Turkey, Georgia, Azerbaijan and the Caspian [currently known as the combination of the "Trans Anatolia Natural Gas Pipeline" (TANAP), the "Expansion of the South-Caucasus Pipeline" (SCP-(F)X) and the "Trans-Caspian Gas Pipeline" (TCP)]	SGC	study	TR	2.22	2015
6.1.1. Poland – Czech Republic Interconnection [currently known as Stork II] between Libhošť – Hať (CZ/PL) – Kędzierzyn (PL)	NSI East Gas	study	PL,CZ	1.52	2014
6.2.1. Poland – Slovakia interconnection	NSI East Gas	study	PL,SK	4.60	2014
6.23. PCI Hungary – Slovenia interconnection (Nagykanizsa – Tornyiszentmiklós (HU) – Lendava (SI) – Kidričevo)	NSI East Gas	study	SI	0.38	2014
6.4. PCI Bidirectional Austrian – Czech interconnection (BACI) between Baumgarten (AT) – Reinthal (CZ/AT) – Brečlav (CZ)	NSI East Gas	study	AT,CZ	0.07	2014
6.5.1. LNG Regasification vessel in Krk (HR)	NSI East Gas	study	HR	4.90	2014

PCI name	Corridor	Action type	Action location	Max EU fin assistance	Year
6.9.1. Independent Natural Gas System LNG Greece	NSI East Gas	study	GR	1.76	2014
6.9.2. Aegean LNG import terminal	NSI East Gas	study	GR	0.25	2014
7.1.1. Gas pipeline from the EU to Turkmenistan via Turkey, Georgia, Azerbaijan and the Caspian [currently known as the combination of the "Trans Anatolia Natural Gas Pipeline" (TANAP), the "Expansion of the South-Caucasus Pipeline" (SCP-(F)X) and the "Trans-Caspian Gas Pipeline" (TCP)]	SGC	study	TR	2.01	2014
7.1.5. Gas pipeline from Bulgaria to Austria via Romania and Hungary	SGC	study	RO	1.52	2014
7.4.2. Interconnector between Turkey and Bulgaria with a minimum capacity of 3 bcm/a [currently known as "ITB"]	SGC	study	BG	0.19	2014
6.20.2. Chiren UGS expansion	NSI East Gas	study	BG	3.90	2015
6.5.1. LNG Regasification vessel in Krk (HR)	NSI East Gas	study	HR	0.55	2015
6.5.2. Gas pipeline Zlobin – Bosiljevo – Sisak – Kozarac – Slobodnica (HR)	NSI East Gas	study	HR	2.25	2015
7.1.1. Gas pipeline from the EU to Turkmenistan via Turkey, Georgia, Azerbaijan and the Caspian [currently known as the combination of the "Trans Anatolia Natural Gas Pipeline" (TANAP), the "Expansion of the South-Caucasus Pipeline" (SCP-(F)X) and the "Trans-Caspian Gas Pipeline" (TCP)]	SGC	study	TR	2.56	2015
7.3.1. Pipeline from offshore Cyprus to Greece mainland via Crete	SGC	study	GR,CY	2.00	2015
6.20.2. Chiren UGS expansion	NSI East Gas	study	BG	0.13	2016
7.1.1. Gas pipeline from the EU to Turkmenistan via Turkey, Georgia, Azerbaijan and the Caspian [currently known as the combination of the "Trans Anatolia Natural Gas Pipeline" (TANAP), the "Expansion of the South-Caucasus Pipeline" (SCP-(F)X) and the "Trans-Caspian Gas Pipeline" (TCP)]	SGC	study	TR	3.54	2016
7.1.6 Metering and Regulating Stations for the connection of the Greek transmission system with TAP	SGC	study	GR	0.24	2016
6.24.1 Romanian-Hungarian reverse flow: Hungarian section 1st stage CS at Csanád-palota (1st phase)	NSI East Gas	study	HU	0.92	2016
6.25.1 Pipeline system from Bulgaria to Slovakia [currently known as "Eastring"]	NSI East Gas	study	SK,HU	1.00	2016

PCI name	Corridor	Action type	Action location	Max EU fin assistance	Year
6.25.4 Infrastructure to allow the development of the Bulgarian gas hub	NSI East Gas	study	BG	0.92	2016
6.5.1. LNG Regasification vessel in Krk (HR)	NSI East Gas	study	HR	0.75	2016
6.8.2. Necessary rehabilitation, modernization and expansion of the Bulgarian transmission system	NSI East Gas	study	BG	0.18	2016
7.1.3. Gas pipeline from Greece to Italy via Albania and the Adriatic Sea [currently known as the "Trans-Adriatic Pipeline" (TAP)]	SGC	study	GR,IT	14.02	2016
7.3.2 Removing internal bottlenecks in Cyprus to end isolation and to allow for the transmission of gas from the Eastern Mediterranean region	SGC	study	CY, EL	4.48	2016
6.1.12 Tvrdonice-Libhošť pipeline, including upgrade of CS Břeclav (CZ)	NSI East Gas	study	CZ	0.27	2017
7.1.1. Gas pipeline from the EU to Turkmenistan via Turkey, Georgia, Azerbaijan and the Caspian [currently known as the combination of the "Trans Anatolia Natural Gas Pipeline" (TANAP), the "Expansion of the South-Caucasus Pipeline" (SCP-(F)X) and the "Trans-Caspian Gas Pipeline" (TCP)]	SGC	study	GR,AZ	1.87	2017
7.3.1. Pipeline from offshore Cyprus to Greece mainland via Crete	SGC	study	GR,CY	34.50	2017
7.1.1. Gas pipeline from the EU to Turkmenistan via Turkey, Georgia, Azerbaijan and the Caspian [currently known as the combination of the "Trans Anatolia Natural Gas Pipeline" (TANAP), the "Expansion of the South-Caucasus Pipeline" (SCP-(F)X) and the "Trans-Caspian Gas Pipeline" (TCP)]	SGC	study	TR	5.04	2018

Source: REKK data collection from CEF documents 2014-2020