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INCREASED INTEGRATION OF UKRAINIAN AND POLISH TRANSMISSION SYSTEMS AND GAS MARKETS

FINAL REPORT

Energy Security Project (ESP)

March 10, 2021

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RECORD OF DOCUMENT REVISION

REVISION	DATE	SUMMARY OF CHANGES
A	11.10.2020	
B	11.16.2020	
C	01.25.2021	
D	02.19.2021	
E	01.03.2021	
F	10.03.2021	

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ACRONYMS

ACER	Agency for the Cooperation of Energy Regulators
bcm	Billion cubic meters
bcma	Billion cubic meters per annum
BAL	Balancing Mechanism
BBL	Balgzand Bacton Line
BEMIP	Baltic Energy Market Interconnection Plan
CAAGR	Compound Average Annual Growth Rate
CAM	Capacity Allocation Mechanism
CAPEX	Capital Expenditure
CEE	Central and Eastern Europe
CEER	Council of European Energy Regulators
CEF	Connecting Europe Facility
CS	Compressor Station
DA	Day-Ahead
DES	Delivered Ex-Ships
DN	Diameter Nominal
DSO	Distribution System Operator
DUD	Dolina-Uzhhorod-Derjkordon
EC	European Commission
EEA	European Economic Area
EFTA	European Free Trade Agreement
EIC	Energy Identification Code
EL	Energy Law Act
EN	European Standards
ENTSOG	European Network of Transmission System Operators for Gas
ERO	Energy Regulatory Office
ESP	Energy Security Project
EU	European Union
EuRoPol	Polish Transit Pipeline System
FOB	Free-On-Board
FSRU	Floating Storage and Regasification Unit
GCP	Grid Connection Point
GCP Gaz-System/UA GTSO	Virtual Interconnection Point established by Gaz-System and UA GTSO based on Interconnection Point Drozdovichi and Interconnection Point Hermanowice
GDP	Gross Domestic Product
GDS	Gas Distribution Station
GIPL	Gas Interconnectors between Poland and Lithuania
GMS	Gas Metering Station
GOST	Interstate Standard
GSA	Gaz-System Auction
GTS	Gas Transmission System
GTSO	Gas Transmission System Operator

IEA	International Energy Agency
IP	Interconnection Point
ISO	International Organization for Standardization
IUK	Interconnector UK
kgf/cm²	Kilogram of Force per Square Centimeter
kPa	Kilopascal
KRS	National Court Register of Poland
LLC	Limited Liability Company
LNG	Liquefied Natural Gas
LNGT	Liquefied Natural Gas Terminal
LTC	Long-Term Contract
mcm	Million Cubic Meters
mcm/d	Million Cubic Meters per Day
ESP	Mott MacDonald Ltd
mmbtu	Millions of British Thermal Units
MPa	Megapascal
MWh	Megawatt Hour
NC	Network Code(s)
NC BAL	Network Code on Gas Balancing of Transmission Networks
NC CAM	Network Code on Capacity Allocation Mechanisms
NC INT	Network Code on Interoperability and Data Exchange
NC TAR	Network Code on Harmonized Transmission Tariff Structures for Gas
NEURC	National Energy and Utilities Regulatory Commission
NIP	Tax Identification Number (Poland)
Nm³/h	Normal Meter Cubed Per Hour
NRA	National Regulatory Authority
nTPA	Negotiated Third-Party Access
OGP Gaz System	Operator Gazociągów Przesyłowych Gaz-System S.A.
OPEX	Operating Expenditure
ORV	Open Rack Vaporizer
OTC	Over-The-Counter
PCI	Project of Common Interest (European Commission)
PE	Permanent Establishment
Petroleum	Includes Oil & Gas from Conventional and Unconventional Sources
PL	Poland
PLN	Polish Zloty New (Polish currency since 1994)
PWP	Point of Interconnection
REMIT	Regulation on Wholesale Energy Market Integrity and Transparency
RPM	Reference Price Methodology
RRM	Registered Reporting Mechanism
rTPA	Regulated Third-Party Access
SBU	Standard Bundle Unit
SCV	Submerged Combustion Vaporizers
SPA	Sales and Purchase Agreement

SSO	Storage System Operator
TAR	Tariff Harmonization
TEN-E	Trans-European Energy Networks
TPA	Third-Party Access
TSO	Transmission System Operator
TTF	Title Transfer Facility
TYNDP	Ten-Year Network Development Plan
UA	Ukraine
UA GTSO	Ukrainian Gas Transmission System Operator LLC
UAH	Ukrainian Hryvnia
UEEX	Ukrainian Energy Exchange
UGS	Underground Gas Storage
UPU	Urengoy-Pomary-Uzhhorod
USAID	United States Agency for International Development
UTG	Ukrtransgaz
VAT	Value Added Tax
VIP	Virtual Interconnection Point
VTP	Virtual Trading Point
WD	Within-Day

EXECUTIVE SUMMARY

The objective and purpose of this report are to determine areas that can be further improved to enhance the integration between Poland and Ukraine with respect to regional security of natural gas supply and increasing cross-border trade. In order to holistically cover the key elements of the gas market and infrastructure integration, the report analyses the current level of integration with respect to technical, commercial as well as legal, and regulatory elements in Poland and Ukraine, outlining potential actions to further increase integration between the two countries and taking into consideration a market forecast and outlook of challenges and opportunities of the evolving gas balance in the region including changes to the transit of Russian gas to Europe.

More specifically, this study describes the potential technical bottlenecks in the gas infrastructure in the absence of volumes from Russia to Poland via Ukraine, as well as the additional value and benefits the countries could bring to each other from the perspective of security of gas supply. The evolving gas market in the region is examined to determine potential changes to gas flows, the role of LNG, including its competitiveness, compared with the piped gas in the region, and the opportunities and business case for increased utilization of Ukrainian storage by Poland, as well as Polish imports to Ukraine to diversify its supply portfolio.

Ultimately, the analysis provides an assessment of the storage and transport tariffs, as well as potential commercial structures (such as bundled products), and recommendations for harmonization of legal and regulatory frameworks. After studying the technical capabilities, market, legal and regulatory environment, as well as the commercial aspects of integration of Polish and Ukrainian gas markets, the report also provides a guideline on how to move forward towards developing a product that will not only modernize the market but will create further opportunities for these two countries and the region beyond.

The key outcomes which are discussed in further detail in the report are:

- Regional gas demand is forecast to increase, especially in Poland due to gas to power as a switch from coal consumption. Ukraine's import demand is expected to rise over the coming decade, in part due to declining indigenous production.

- Taking into account the fact that Poland is committed to ending its imports from Russia on the expiration of the long-term supply agreement at the end of 2022, starting from 2023 physical flows from Ukraine to Poland are expected to decrease significantly.

- The virtual interconnection point between Ukraine and Poland established in 2020 increases the ability to import from Poland to Ukraine via virtual flows but if physical transit flow from Ukraine to Poland ceases from 2023, then physical flows will be required. Lack of firm capacity from Poland to Ukraine poses a major risk for further integration of the markets, as starting from 2023 there will be no possibility for shippers to transport the gas from Poland to Ukraine and to plan their activities for further periods.

- The lack of firm capacities from Poland to Ukraine creates risks of security of supply for both countries and limits the possibility to organize the gas deliveries to the impacted country in case of emergency.

- With significant investment and development of alternative import routes, including LNG, Norwegian, and GIPL (Poland-Lithuania interconnector) pipeline gas, Poland could

potentially emerge as a regional gas hub, re-exporting these volumes to neighboring countries. The success of the regional gas hub will depend on the level of integration with the UA gas market.

- US LNG is potentially a commercially viable option for Ukraine to import under the right circumstances and has additional benefits in terms of diversification of supply. However, without the establishment of firm transportation capacities from Poland to Ukraine, the possibilities for shippers to use this route will be limited and the long-term or even mid-term decisions to transport the gas from Poland to Ukraine are less likely to be taken.

- The Ukrainian TSO would be ready after 2021, contingent on infrastructure investment, to off-take up to 6 bcma from the PL-UA border if the volumes and pressures are ensured from the Polish side. The Polish TSO has not provided any information about possible volumes and capacities which could be provided from the Polish side of the PL-UA border.

- Ukrainian gas storage is vast and will continue to be able to serve Poland and the wider EU with potential for growth in the injection of gas into Ukrainian storage as gas demand rises. However, the lack of firm capacities from Poland to Ukraine will be the major challenge for the increase of potential flows from Poland to Ukraine after 2023.

- Legal frameworks can be further harmonized, including in terms of licensing in Poland to enable a streamlined process for traders or shippers to move gas from Poland to Ukraine.

- Polish market barriers such as the requirement to store obligatory gas stocks within Poland have hindered the development of its competition and market.

- Softening the mentioned requirements and license obligations in Poland is the initial requirement for further integration between the gas markets of Ukraine and Poland. Only after lifting the market access barriers in Poland, would it seem feasible to create the bundled capacity for the interconnection point and elaborate on more sophisticated bundled products.

- In the future, further amendments can be made as the SSOs engage in a bundled product and a cross-border transmission and storage bundled product is developed to integrate the LNG facilities of Poland and UGS in Ukraine. Once this product becomes available on one of the EU capacity booking platforms, chosen by involved operators, European and Ukrainian traders will have easier access to the capacities of the LNG Terminal in Poland and Ukrainian underground storage.

Technical assessment

As part of the study, a technical review of the existing Poland-Ukraine interconnection points was conducted to assess the condition and bilateral flow capabilities of the existing infrastructure in Ukraine and Poland. Analysis was conducted to determine whether Ukraine and Poland's portion of the interconnector is adequate to meet the possible future demand of bidirectional flow (including for injection/withdrawal from the western Ukrainian UGS).

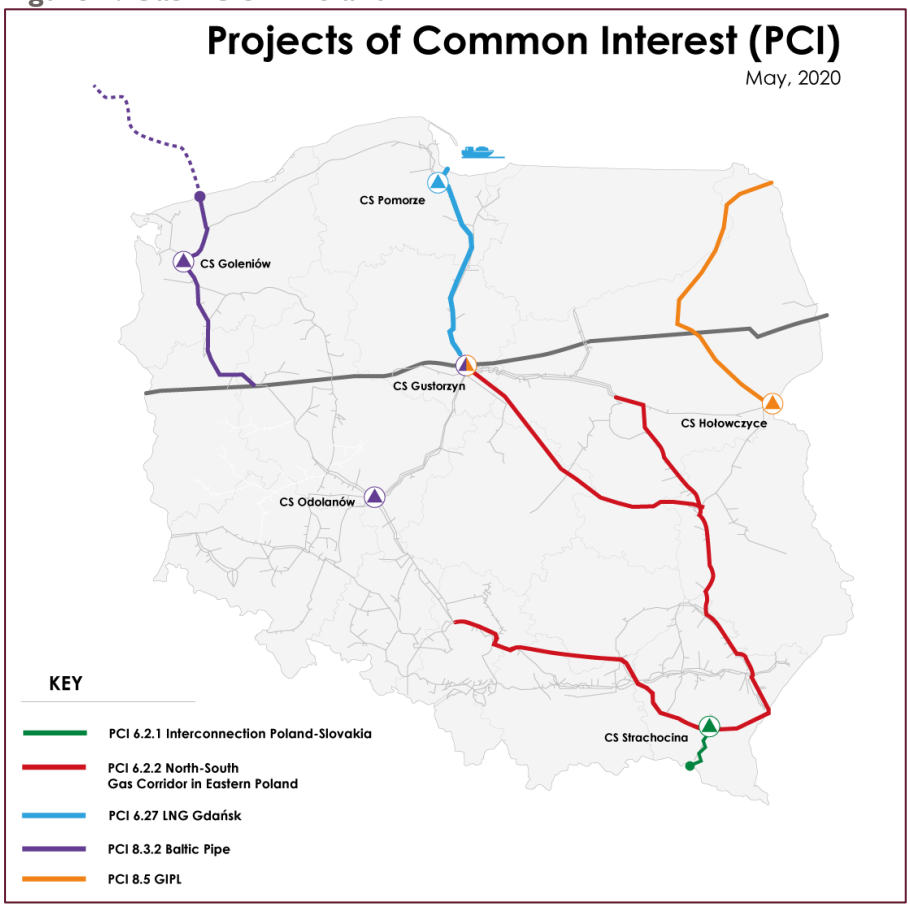
Polish infrastructure

The transmission system in Poland consists of two cooperating systems; the Transit Pipeline System (EuRoPol/Yamal) and the National Transmission System (including both high-methane and nitrogen-rich systems). The EuRoPol transit pipeline supplies gas from the Belarussian border to Germany as part of the Yamal-Europe system, with a capacity of over 32 bcma. The transit pipeline also enables a physical withdrawal of gas to the Polish domestic system as well as virtual reverse supply from Germany. The National Transmission System comprises almost 11,000 km of pipeline and 15 compressor stations, supplying gas to 921 exit points.

The PL GTS is supplied by a number of cross-border entry points with its neighbors: Germany, Czech Republic, Ukraine, and Belarus as well as its LNG terminal. Efforts have been made in recent years to increase the entry capacity from the west and south to reduce reliance on Russian imports. The PL GTS has an interconnection point on the border with Ukraine at Drozdovichi/Germanovichi which has been incorporated into a single VIP.

A number of investment projects are planned or underway for the Polish GTS, with many granted PCI (Projects of Common Interest) status by the European Commission. These can be seen below.

Figure 1: Gas PCIs in Poland



Source: Gaz-System

This includes the construction of the onshore connections to the Baltic Pipe, the Poland-Lithuania interconnector (GIPL), the interconnector with Slovakia, and pipeline investments within the North-South Gas Corridor in the Eastern Poland program. These interconnector projects are due for completion before 2023 as indicated in the Gaz-System 2020-2029 TYNDP as well as much of the gas corridor. The remainder of the pipelines in eastern Poland as well as the proposed construction

of a 4 bcma FSRU on the Baltic Coast and its associated pipeline network are outlined as part of the longer-term investments within the development plan. These investments are intended to increase interconnectivity in the region and provide increased security of supply by providing access to new sources of gas such as LNG.

The Świnoujście LNG terminal on Poland's northern coast began construction in 2010 and received its first LNG delivery in 2016. The terminal currently has a regasification capacity of 5 bcma and has two full-containment storage tanks with 160,000 m^3 capacity each. It is planned to increase the Świnoujście LNG Terminal's capacity from an initially planned 50 percent increase to 7.5 bcma, however, it is now intended to increase this further to approximately 8.3 bcma by the end of 2023 (in two stages).

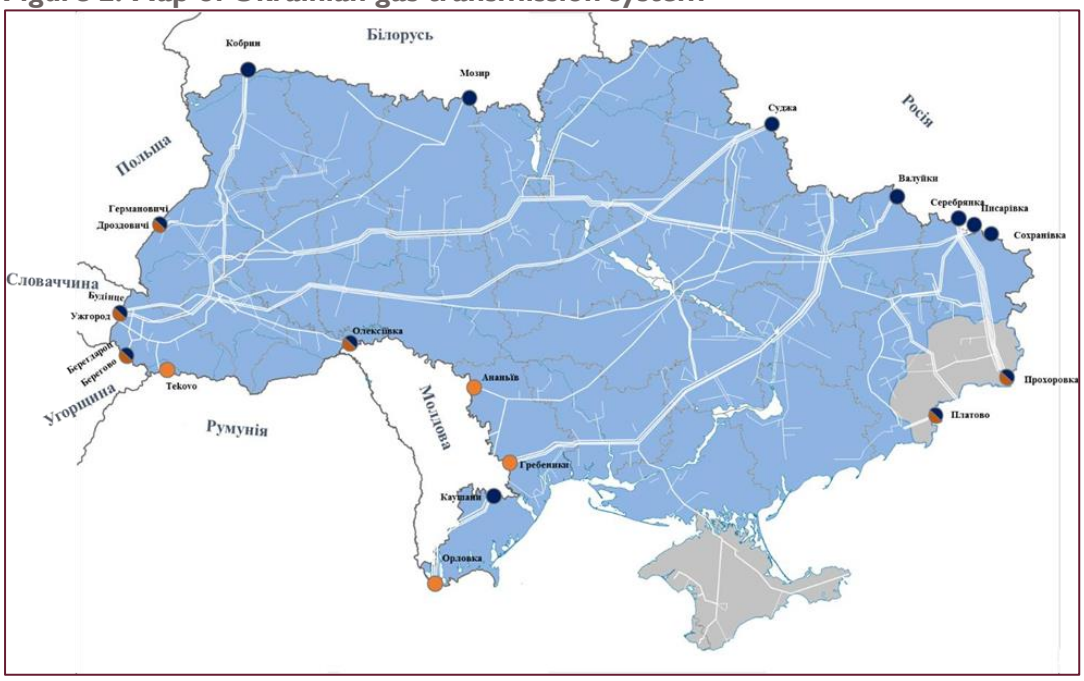
Historically, natural gas for the southern region of Poland has been supplied via the GTS of Ukraine through IP Drozdovichi. The issue of interruptible supply of Russian gas to Poland has been the main security of supply concern for many years, as any even short-term interruption in high-demand periods would lead to a shortage of natural gas resources for the needs of customers in Eastern and Southern Poland. Even being balanced from the point of view of the whole country, internal bottlenecks in the Polish GTS do not allow for transporting gas to customers in Southern Poland in full without flows from Ukraine. However, starting from 2023 it is planned that the import of Russian gas via the Ukrainian GTS will stop. In order to do so, Polish Gas TSO has initiated a number of reconstruction projects in the system as part of the North-South Gas Corridor initiative. Following completion, it may be possible to transport natural gas from LNG Terminals to the Southern region of Poland and further to Slovakia or Ukraine.

As of now, however, there are no evident plans in the programs of the Polish TSO that prescribe the creation of firm capacities from Poland to Ukraine, which poses certain risks for the continuation of constant utilization of the interconnection point between the countries.

Ukrainian infrastructure

The gas transmission system of Ukraine is one of the largest transmission systems in Europe. Its technical characteristics are the following – 33,079 km of main gas pipelines, 57 compressor stations, and 1,389 gas distribution stations. It has interconnection points with the gas transmission systems of Belarus, Poland, Slovakia, Hungary, Romania, Moldova, and Russia and has historically been used for the transit of Russian gas to the EU and Moldova. In 2012-2014 new routes for the import of natural gas to Ukraine from Poland, Hungary and Slovakia were created. However, only the Slovakian direction provides firm capacity for import to Ukraine. A map of the Ukrainian GTS is provided below:

Figure 2: Map of Ukrainian gas transmission system



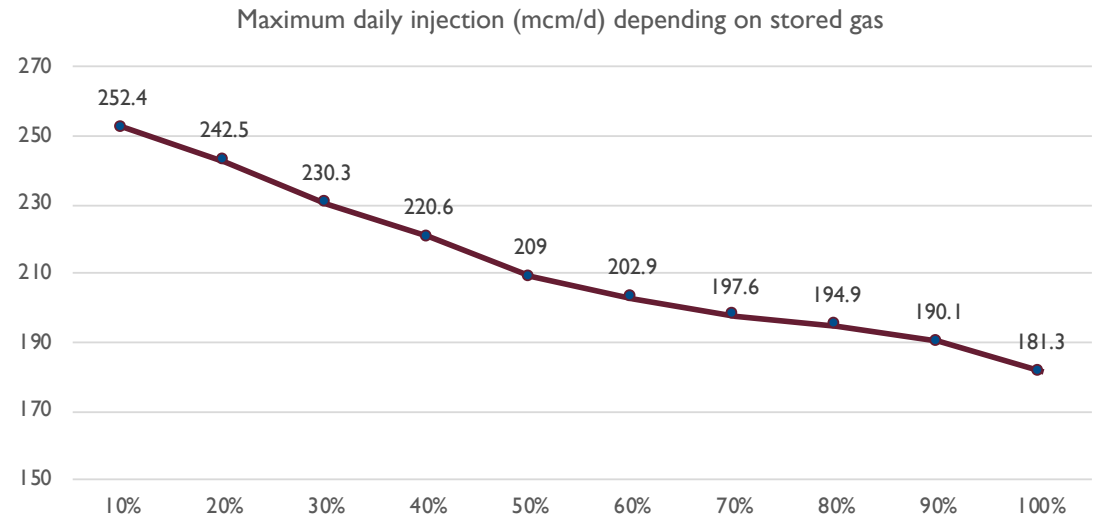
Source: UA GTSO

The UA GTSO is carrying out modernization and aims to create firm capacity from Hungary and from Poland. In the case of Poland, UA GTSO is available to physically offtake gas into the system up to 5 bcm per year in case of availability from the Polish side. Moreover, the UA GTSO launched a major reconstruction of one of the cross-border pipelines – Drozdovichi-Komarno DN500 – which prescribes full replacement of most of the sections of the pipeline. In addition, the TYNDP of UA GTSO envisages the reconstruction of CS Komarno. The FID on the reconstruction of the CS will be made after clarifying the need of market participants in the infrastructure after the expiring of the supply contract between PGNiG and Gazprom in 2022. Following these reconstructions (expected to be completed by end of 2022), the Ukrainian part of the interconnection point will be ready to offtake the natural gas flows from Poland on a firm basis in the volumes of 20.5 mcm/d (in case of entry pressure of 45 bar from Polish side). In case of entry pressure of 40 bar, the capacity will be 18 mcm/d, 35 bar – 14 mcm/d.

Apart from the major interconnection point in Drozdovichi/Germanowichi, in the Volodymyr-Volinsky region of Ukraine, there is a gas pipeline connecting the Ukrainian GTS with the gas distribution network of Poland, called the Ustilug-Hrubieszow gas pipeline. This is a high-pressure gas pipeline used to transport gas from Ukraine to consumers in the southeastern regions of Poland. The maximum capacity in this gas pipeline is 1.2 mcm per day if the pressure of 55 bar is ensured, however, it has not been utilized for the last 10 years.

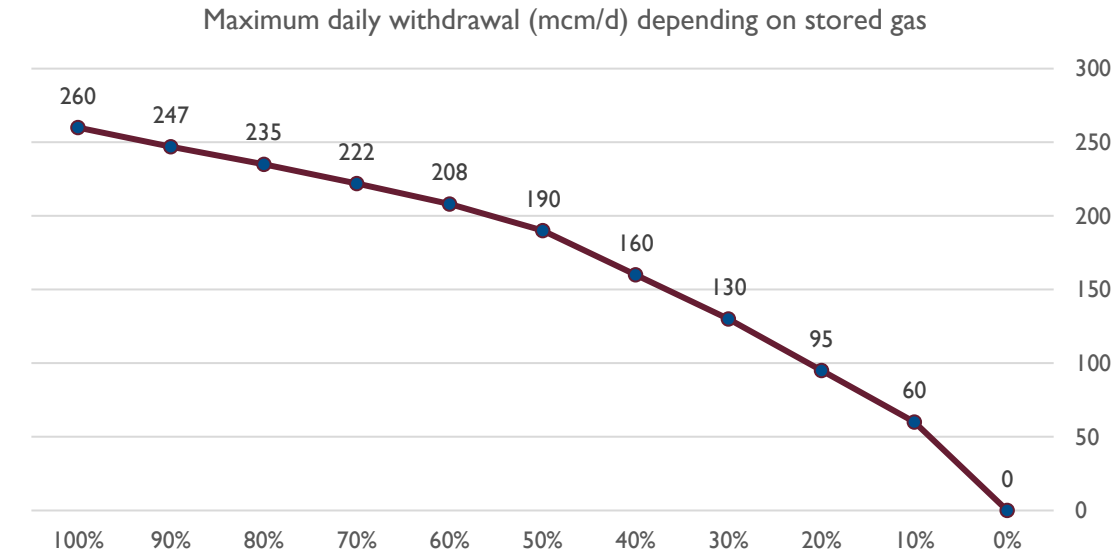
Ukraine also possesses the largest system of storage facilities in Europe. It consists of 12 underground storages all over Ukraine, most of them located in Western Ukraine. Its active volume is 31 bcm. Ukrainian storages are operated by JSC "Ukrtransgaz", the former TSO before the unbundling on January 1, 2020. The injection and withdrawal capacities of the storage facilities are shown in the figures below.

Figure 3: Injection curve of Ukrainian storage facilities



Source: UA GTSO

Figure 4: Withdrawal curve of Ukrainian storage facilities



Source: UA GTSO

Interdependence of Ukrainian and Polish gas infrastructures from the perspective of security of supply

As has been described above, historically Poland depended on the flows of natural gas from the territory of Ukraine to supply the southern regions of the country in periods of peak demand. This dependence to a significant extent defined the plans of the Polish government and the TSO in the establishment of the LNG Terminals and development of the North-South gas corridor. After 2022, it is expected that from the Polish side there will no longer be a need for constant flow from Ukraine for the purpose of security of natural gas supplies.

However, taking into account full implementation of the Third Energy Package in Ukraine, and full availability of the transmission and storage system capacities on a purely market basis under competitive tariffs, it shall be noted that Polish companies could use the capacities of the Ukrainian system for the purpose of security of natural gas supply in Poland.

From the Ukrainian side, the existing and expected LNG facilities of the Polish system create additional potential diversification of sources of natural gas supply to the country. However, after 2022, without constant flows from Ukraine to Poland, and without the establishment of firm capacities from Poland to Ukraine, this import route will not be available to market participants and it will not be possible to depend on it from a security of supply point of view. In the case of a lack of long-term bookings of the capacities for exit from Ukraine to Poland, UA GTSO may consider decreasing the capacities of the system in the Polish direction as part of its ongoing optimization program.

Conclusions to the technical assessment

- The infrastructure between Ukraine and Poland has been historically used for flows of natural gas from Ukraine to Poland. This will still be the case until the end of 2022, after which Poland plans to stop importing gas from Russia via Ukraine.

- Unless firm capacities in both directions are established, there is a significant risk that the infrastructure will no longer be actively used by the market. Currently, the capacity is limited and only offered on an interruptible basis if there is no flow from Ukraine.

- From the Ukrainian side, the ongoing reconstruction of the Komarno-Drozdovichi DN500 pipeline and planned reconstruction of the CS Komarno will ensure the possibility to deliver gas to Poland and offtake the gas from Poland on a firm basis. However, there are no evident plans by the Polish TSO to establish firm capacities in Ukraine, which may limit the prospects of active utilization and maintenance of the gas infrastructure between Ukraine and Poland in the long run.

Regulatory and legal assessment

As part of the study, the regulatory regimes in Ukraine and Poland have been studied in detail. Access to the natural gas transmission capacities between the Polish and Ukrainian transmission networks is subject to respective regulations applicable to the Polish and Ukrainian natural gas markets. Despite progress being made over the last few years in terms of harmonization of the regulatory framework within the European Community, the respective natural gas market regulations on both sides of the Ukrainian-Polish border differ and will be discussed in more detail separately for each jurisdiction.

Ukraine regulatory and legal assessment

In general, the regulatory framework of market operation in Ukraine has improved a lot since the transposition of the Third Energy Package of the EU into Ukrainian legislation in 2015. After January 1, 2020, unbundling of the GTS operator of Ukraine from the former incumbent and entry into direct interconnection agreements with adjacent TSOs by UA GTSO, market conditions significantly improved.

In Ukraine, all gas market participants, except for wholesale traders and customers, may pursue their respective activities exclusively based on a license issued by the energy regulator (NEURC). Access to the GTS is granted based on the natural gas transmission agreement. The transmission agreement is a model agreement, approved by the NEURC. On the cross-border gas operations and transit of Russian gas to the EU, the transit rules have changed since Naftogaz, UA GTSO and Gazprom signed new agreements on December 31, 2019, to continue Russian gas transit through Ukraine to Europe during 2020-2024, in full compliance with EU rules and the Third Energy Package.

The capacity at interconnection points is allocated based on auctions, or in the form of a short-haul product (explained below). Starting from July 2020, the capacity for the 2020-2021 gas year is allocated at all interconnection points in accordance with the auction bidding procedure.

Starting from January 1, 2020, the UA GTSO began offering a new service – short-haul transportation. Short-haul is a special service, which allows a discounted transmission between dedicated interconnection points with adjacent countries meaning transportation of natural gas directly between two adjacent market areas, in this case, through Ukraine. Moreover, short-haul can be combined with the "customs warehouse" regime offered by the SSO - a special customs regime (customs procedure) that allows foreign and Ukrainian companies to store natural gas in Ukraine under customs control for the period of up to 1,095 days without payment of 20 percent import VAT (so-called "conditional full exemption from import taxes").

Poland regulatory and legal assessment

As part of the EU internal market in natural gas, the natural gas market in Poland (including access to cross-border capacities between Poland and Ukraine) is governed by legislation adopted at both EU and national level and subject to harmonization within the framework of the Third Energy Package.

In order to function on the Polish gas market, all market participants have to obtain a license for their activity, which may be quite a burdensome process.

It should be noted that obtaining the license from the Polish National Regulatory Authority for foreign trade in natural gas (a license necessary for cross-border trade in natural gas, including across the border with Ukraine) requires obtaining the license for trading in gaseous fuels which means that the traders/shippers engaged in cross-border trade in natural gas must obtain two separate licenses for (a) trading in gaseous fuels and (b) foreign trade in natural gas.

Under Polish law, the licenses are available to entities with registered offices (in case of individuals – a place of residence) within the territory of the EU Member State, Swiss Confederation, or a member state of the European Free Trade Agreement (EFTA) – a party to the European Economic Area agreement, or Turkey. Thus, the licenses are not available to Ukraine-based traders and shippers without first establishing a subsidiary within Poland or other EEA countries, the Swiss Confederation or Turkey. Furthermore, the licenses for foreign trade in natural gas are issued taking into account needs related to the diversification of natural gas supplies and energy security (including the ability to comply with regulations on compulsory gas stocks and development of procedures for possible disruptions in gas supplies).

Entities engaged Poland in foreign trade in natural gas (including a natural gas exchange between Poland and Ukraine) are subject to a number of other strict security-related requirements under Polish law, such as obligations related to compulsory gas stocks, diversification, as well the public sale of natural gas. Some of those obligations may to some extent affect natural gas exchange between Poland and Ukraine, as well as hinder the use of the Ukrainian UGS for the purpose of compulsory natural gas stocks under Polish law.

Conclusions to the regulatory and legal assessment

- A step-by-step guideline for a shipper who is seeking to transport gas from Poland to Ukraine, and store gas in Ukrainian UGS for further re-export to the European market via the Polish market, was created. It illustrates, for Ukraine; there are 15 steps which are estimated to take 1 month, while for Poland; there are 21 steps which are estimated to take

7 months. Such a burdensome procedure for entering the Polish natural gas market blocks further integration of the markets of Ukraine and Poland.

- The current regulatory framework in Ukraine and Poland creates an unbalanced regime for the countries. Polish companies can get access to wholesale trading and Ukrainian storage and transmission system without the need to obtain any license, they simply need to enter into model contracts with the TSO and the SSO. The license can be completed in a month, while Ukrainian companies, will have to open a branch in Poland, obtain the license for trading and foreign trade, and create compulsory stock in the Polish storage facilities, the whole procedure taking around 7 months.

- Recommendations on development of the regulatory and legal framework include amending the Polish regulatory regime, to soften the procedures to enable further market integration and establishment of bundled capacities between the TSOs of Ukraine and Poland, as well as other more sophisticated bundled products, uniting the services of transmission, storage, LNG Terminal operators, etc.

Commercial assessment

Ukrainian storage facilities are of significant interest for Polish and other European companies for cooperation in the long run. However, the combination of potential volumes into Ukraine for storage and imports would be highly dependent on the available capacities (both physical and virtual) to provide such flows across the border, as outlined during the technical assessment summarized above. ; i.e. Poland's intention to remove Russian gas from its import profile, thus removing 'forward' physical flow and restricting the volume of virtual reverse in Poland to Ukraine direction.

Despite potentially zero transit volumes, there may be flows to Poland due to withdrawal from Ukrainian UGS, however, this would be dependent on the ability to deliver injection volumes in the first place and would only provide 'forward' flow to Poland during the winter withdrawal period.

Flows from Poland to Ukraine are currently offered on a conditional basis, dependent on bookings in the opposite direction. Therefore, the technical capabilities, limitations, and risks associated with the volumes and directions of flows given the available infrastructure may hinder the physical transportation of gas in the required amounts. It has been suggested that bottlenecks within the system may restrict booking capacity below what is currently available, especially if physical Poland to Ukraine flow is required.

It is expected that from 2023, the demand for the cross-border capacity will fall sharply in the direction from Ukraine to Poland as the transit of Russian gas ceases to Poland, from 4 bcma historically to 0-0.5 bcma depending on the utilization of Ukrainian storage. On the other hand, the demand in the opposite direction from Poland to Ukraine is expected to increase in the long run with increased imports from Poland as new gas sources come online, and for injection into Ukrainian storage. Especially if production in Ukraine does not rise as forecasted in 2020-2025, then the likelihood for a significant rise in total import requirements to Ukraine in these years becomes even higher. In these scenarios, the need for imports in Ukraine can reach up to 15 bcma by 2024 in the case of delayed investment and growth of production, or by 2029 if the growth in production is 50 percent of what is forecasted. Therefore, the demand for flows from Poland to Ukraine which was 1.9 bcma in 2019 can rise from approximately 2 bcma in 2023, to 5 bcma at the end of the decade, in the 'high' scenario cases of the market analysis conducted. Equally, withdrawal from Ukrainian

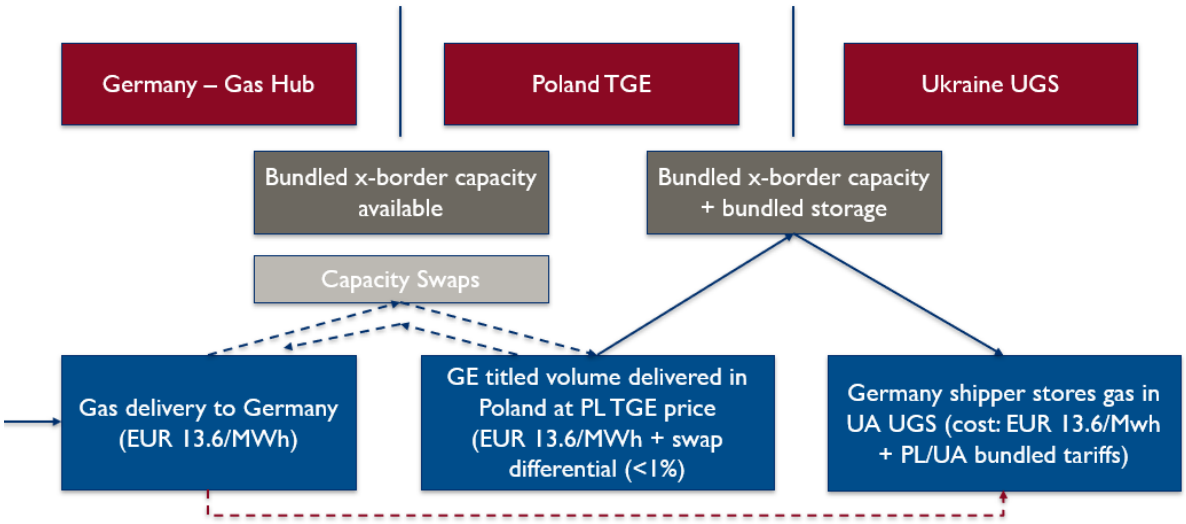
storage and transport back to Poland would rise in line with injection and may be approximately 1 bcma. This demonstrates the changes in flow directions and volumes and highlights the concerns that without establishing firm capacities from Poland to Ukraine it is unlikely that the Polish and Ukrainian markets will be ready for further integration to access these opportunities.

In addition to these changes in flow directions expected over upcoming years which contribute to the interest of Polish and European Companies over the Ukrainian storage facilities, the pricing analysis validates the commercial competitiveness of these Ukrainian assets, assuming that firm capacities from Poland to Ukraine are indeed established.

Comparing the prices between the four scenarios (storing natural gas at home in Poland, in Germany, or in Ukraine with or without short-haul tariffs), allows for an evaluation of whether the Ukrainian gas storage would be competitive for the traders who buy gas at the Polish commodity exchange (assuming no regulatory or technical barrier). As a result, with or without the short-haul discount, Ukraine appears as potentially attractive as the UGS center for Polish gas.

Figure 3 demonstrates these scenarios compared. Through the use of bundled cross-border capacity between Germany and Poland, the trader is able to engage in a swap trade between Poland and Germany. This allows the trader to effectively receive the gas that was agreed upon and intended in Germany, and in Poland at the TGE spot price. After this swap, the German trader then would have their gas allocation in Poland at Polish TGE price and hence, if a bundled cross-border capacity is available in the future between Poland and Ukraine, even the German trader can send the gas to Ukraine and keep it in the Ukrainian storage, through one single transaction.

Figure 5: Three routes for gas storage



In order to unlock this potential, and use the competitive advantage of the storage capability of Ukraine, a particular focus should be given to bundled products which in the Ukraine-Poland context could involve both the transmission system in Poland and the IP with Poland as well as the storage system assets in Ukraine. If a cross-border bundled transmission product is developed, it would have the potential to capture emerging business opportunities across Poland and Ukraine and eventually be extended to import LNG from the Poland TSO into Ukrainian storage facilities as well.

A bundled product between the Ukrainian TSO and the Polish TSO which later extended to the Ukrainian SSO would further develop the liquidity of the storage market of Ukraine by higher

utilization rates; which would lead to an expanded accessible market, improve competition by bringing down the transport costs, strengthen the energy security across the region, and integrate the trader experience by avoiding separate bookings for entry and exit capacities.

A successful product that can unlock the aforementioned benefits will be contingent upon the investment in infrastructure to develop flow capacity, and willingness from the policymakers and regulators to collaborate.

- *Conclusions to the commercial assessment*

- There is a demand for further market integration, which is confirmed by the market screening conducted in recent years by the TSOs, as well as by actual utilization of the capacities of Ukrainian transmission and storage systems by the Polish companies in 2020.

- Critical issues remain and need to be solved in order to enable further market integration, in particular;

    - establishment of the firm capacities by the Polish TSO in the direction from Poland to Ukraine,

    - significant simplification of the regulatory regime in Poland, and

    - further implementation of the EU rules and practices in the Ukrainian market.

- If the mentioned issues are solved, Ukrainian infrastructure will continue to be commercially attractive to the Polish and other EU companies, further enhancing the business case for improved integration by creating sophisticated bundled products, which will include the products currently offered by two TSOs, two SSOs and one LNG facility operator. The establishment of such products may be an ideal goal for the next several years of cross-border cooperation between the countries.

- There is mutual security of supply possibilities, which may be provided between the transmission and storage systems of Ukraine and Poland. Clear rules and competitive tariffs provided by Ukrainian TSO and SSO, can be used by Polish companies in the future to provide additional flexibility for covering peak demand in winter seasons, while access to alternative sources and routes of natural gas via Poland can be used by Ukrainian companies to ensure additional security of natural gas supply in case of emergencies. It should be highlighted though, that these options will be available to the market only in case of successful implementation of firm capacities by Polish TSO in the direction Poland-Ukraine.

Conclusions

The report concludes that Ukrainian and Polish markets have a significant potential for further integration based on the best EU experience. The key recommendations are provided in the table below:

	Recommendation	Complexity	Necessity
1	**Establish firm capacity at the cross-border interconnection point between Ukraine and Poland**	Average (taking into account that the reconstructions on the Ukrainian side are already ongoing, while internal bottlenecks from the Polish side may be eliminated by 2022)	Critical
2	**Simplification of the licensing regime in Poland for Ukrainian companies**	Complex (the process involves the cooperation of many stakeholders in Poland and would require amendment of several acts of national legislation in Poland)	Critical
3	**Allowing the use of Ukrainian gas storage facilities for storing compulsory stock required by Polish legislation**	Complex and time-consuming (requires amendments to the statute to be adopted by Parliament and signed by the President)	Required
4	**Creating a bundled product for cross-border interconnection point capacity of the TSOs**	Complex (the process depends on successful finalization of recommendations 1 and 2 and involves the participation of different stakeholders in Poland and Ukraine)	Required (in the long term)
5	**Creating a separate regime (reasonable tariff and simple requirements for Ukrainian traders) for transit from Germany and/or LNG facility to the Ukrainian border**	Complex (the process depends on successful finalization of recommendation 2 and involves the participation of different stakeholders in Poland and Ukraine)	Critical
6	**Creating a fully-fledged gas exchange in Ukraine**	Complex (the process is actively ongoing, but depends on the active participation of many stakeholders in Ukraine)	Desirable
7	**Creating a short-term product from the Polish side to allow discounted transmission tariff for the dedicated use of Ukrainian storage facilities to increase UGS utilization**	Average (the process is rather quick, takes usually up to 3 months and can be based on the examples in Slovakia[1] or Ukraine)	Desirable

[1] https://www.eustream.sk/files/docs/eng/Operationalorder_03072020_final.pdf - paragraph 5.5.

1 TECHNICAL ASSESSMENT

This section investigates the Polish gas transmission infrastructure with particular emphasis on the GTS overview, projects of common interest, and cross-border interconnection points with the Ukraine GTS. Description of the owner and operator of the GTS system will be given, along with GTS system details (such as length, operating pressure, number of compressors, etc.) It was seen that the Polish GTS is split via two cooperating systems: Transit Pipeline System (EuRoPol/Yamal) and National Transmission System, the latter divided into high-methane and nitrogen-rich systems.

In addition, the Polish Świnoujście LNG terminal will also be explored with the currently existing infrastructure being assessed, as well as the expansion plans for the terminal. This assessment will cover current and future planned capacities, terminals' contribution to energy security, services provided by the terminal, and key design parameters.

Ukraine gas transport infrastructure will also be assessed, with an overview of the Ukraine GTS infrastructure being given. Historical transit of Russian gas across the Ukraine GTS system will also be highlighted, as well as details of the underground gas storage (UGS) facilities of the Ukraine. Poland's UGS facilities will also be explored, and details will be given on the capacities and the injection and withdrawal of gas.

1.1 POLISH GAS TRANSMISSION SYSTEM

1.1.1 OVERVIEW OF POLISH GTS

The Polish gas transmission system is owned and operated by OGP Gaz-System S.A as the TSO of Poland, with the exception of the Yamal-Europe pipeline owned by EuRoPol Gaz S.A. The company was established on April 16, 2004, as a wholly-owned subsidiary of PGNiG under the name PGNiG – Przesył Sp. z o.o. On April 28, 2005, all shares of the company were transferred to the State Treasury of Poland, and the current name of the company was adopted on June 8, 2005.

The transmission system in Poland consists of two cooperating systems: the Transit Pipeline System (EuRoPol/Yamal) and the National Transmission System. Further, the National Transmission System is divided into two natural gas systems: high-methane (E) and nitrogen-rich (L).

Transit Pipeline – EuRoPol

The EuRoPol gas transit pipeline is the Polish section of the Yamal-Europe system, which transports gas from western Siberia in Russia to Germany via Belarus and Poland. The Polish section enters on the eastern border at Kondratki and transits gas east-to-west to the German border at Mallnow. The pipeline carries gas predominantly for delivery to the German border but also supplies gas domestically with two off-takes to the Polish transmission system at Wloclawek and Lwowek, which have been incorporated into the virtual interconnection point (VIP) PWP.

The pipeline has a throughput capacity of 32.96 bcma. Basic technical specifications of the Polish transit pipeline:[2]

- Operating pressure: 8.4 MPa;

[2] 'Transit Gas Pipeline System (TGPS)', Gaz-System, https://en.gaz-system.pl/customer-zone/transit-yamal-pipeline/.

- Length: 683.9 km;
- Pipeline Diameter: DN1400;
- Five compressor stations representing a total installed capacity of 400 MW: TG Kondratki, TG Zambrow, TG Ciechanow, TG Wloclawek, TG Szamotuly; and
- Five compressor connections with the pig entry and exit chambers, and 33 valve stations equipped with cut-off valve systems.

Figure 6: EuRoPol (Yamal-Europe in Poland) schematic showing route and location of the five compressor stations as blue squares

Source: Gaz-System platform

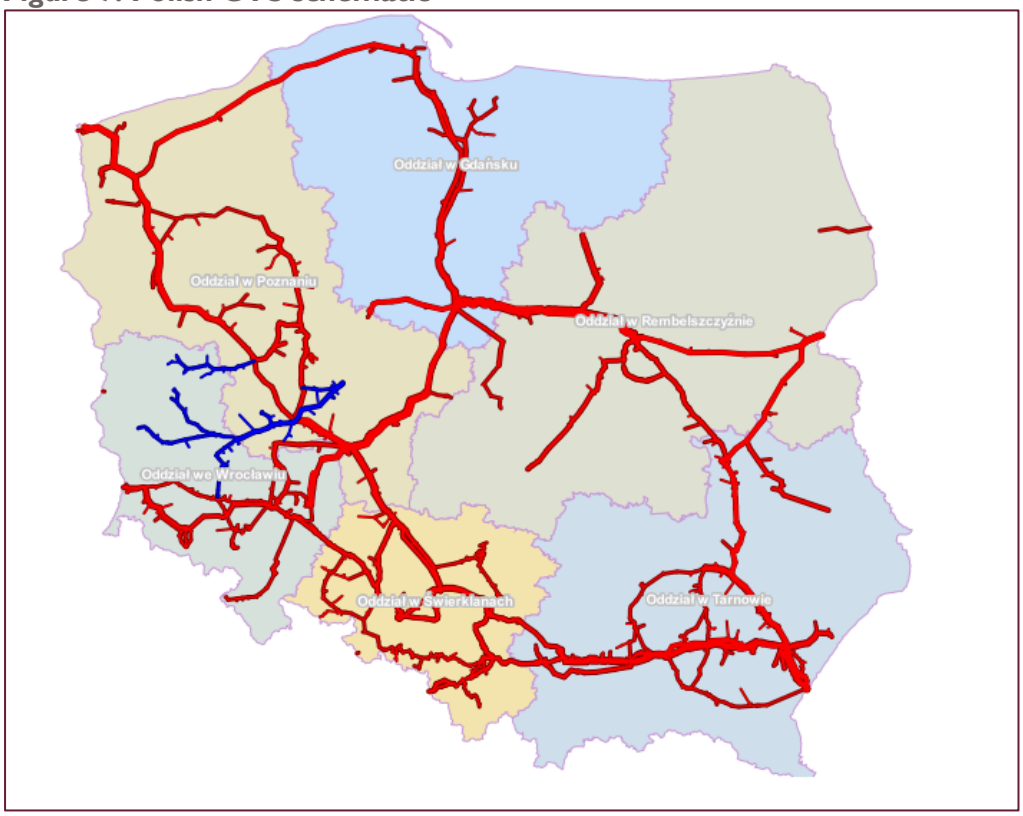
In addition to the physical entry point on the Belarussian border, interconnection agreements with German counterparts have enabled virtual reverse flow at Mallnow whereby gas withdrawn from the PWP to the Polish transmission system can be purchased from Germany and netted from deliveries to the German border. Additionally, investment and upgrades to the Mallnow interconnector, completed in 2014, enable the physical reverse flow of gas from Germany to Poland if required in the event of no (or insufficient) transit flow from east-to-west.[3]

National Transmission System

The transmission system transports gas throughout the country to supply the distribution networks and final customers connected to the network. Figure 7 shows the national transmission system, with red pipelines for the high-methane (E) network and blue for the high-nitrogen (L) system.

[3] 'Poland,' 2014 Country Reports, EC, https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_poland.pdf.

Figure 7: Polish GTS schematic



Source: Gaz-System platform

Table 1 shows key information about the transmission system as a whole.

Table 1: Key figures as of December 31, 2019[4]

The total length of the transmission network	10,927 km
Number of entry points[5]	67
Number of exit points[6]	921
Number of gas stations	853
Number of compressor stations	15
Number of transmission system nodes	34

Source: Gaz-System

The transmission system is supplied with gas from the following cross-border entry points:[7]

Eastern border:

- Kondratki: Polish-Belarusian border (entry point to EuRoPol)
- Wysokoje: Polish-Belarusian border
- Drozdovichi: Polish-Ukrainian border

[4] 'Transmission – Key Figures,' Gaz-System, https://en.gaz-system.pl/customer-zone/transmission/transmission-key-figures/.
[5] Physical entry points including import, off-take from UGS, delivery from production.
[6] Physical exit points including to a distribution area or network, delivery to UGS, export and delivery to final customers.
[7] Gaz-System TYNDP 2020-2029

Western border:

- Lasow: Polish-German border (part of the VIP "GCP Gaz-System / ONTRAS")
- Mallnow: Polish-German border (entry/exit point from EuRoPol, allows virtual and some emergency physically transmission from Germany to Poland along with EuRoPol at a level up to 6.1 bcma)

Southern border:

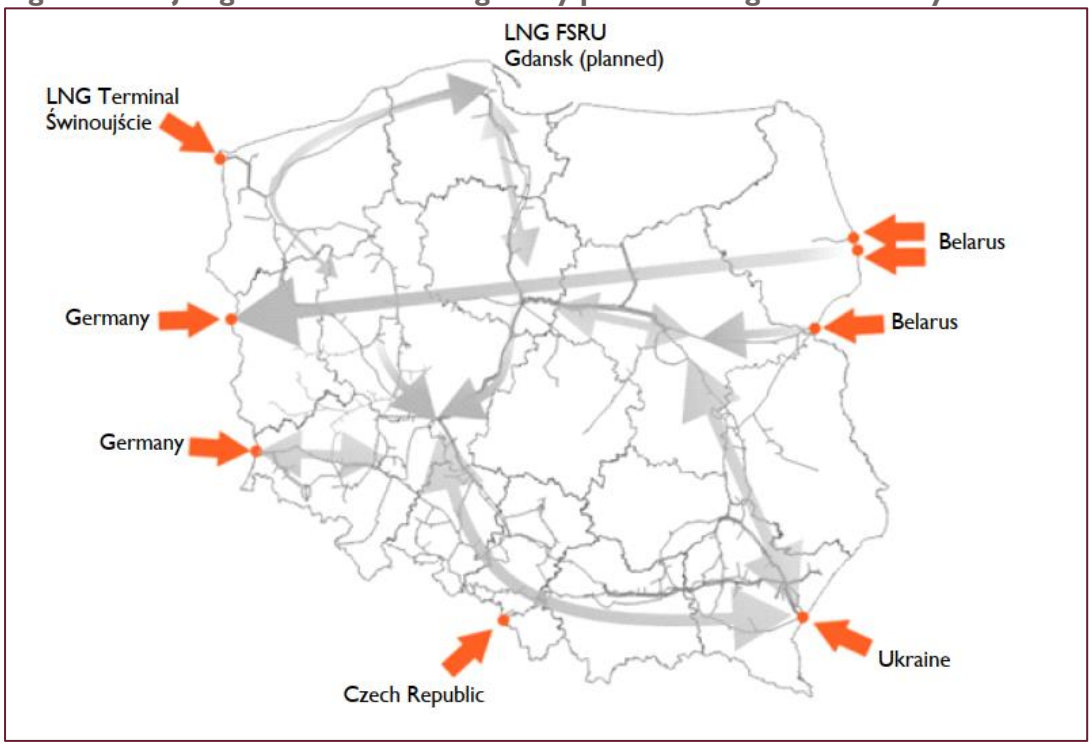
- Cieszyn: Polish-Czech border

Northern border:

- LNG terminal in Świnoujście

Figure 8 shows an overview of the entry points to the GTS and the general direction of flows around the system. There are also intake points from EuRoPol at Wloclawek and Lwowek (combined into the PWP VIP) as well as points for local import and consumption at Tietierowka (Belarusian border), Branice (Czech border), and Gubin (German border, included in the GCP Gaz-System/ONTRAS VIP).

Figure 8: Major gas routes including entry points for high-methane system



Source: Gaz-System TYNDP 2020-2029 / ESP adapted

Germanovichi/Hermanowice on the border with Ukraine is currently the only cross-border exit point from the Polish GTS (excluding the transit pipeline route to Germany). Upon completion of the bi-directional pipeline interconnectors to Lithuania (GIPL), Slovakia, and Denmark (Baltic Pipe); the exit capacity of the Polish GTS will enable cross-border flows to other countries.

Historically, Poland's GTS was expanded in such a way as to enable gas transport from east to west across the country, similar to the gas transit arrangements in Ukraine. The main import points were on the eastern border of the country, from the Yamal-Europe pipeline system. In recent years, Gaz-System has implemented a number of projects aimed at diversification of the direction and source of

gas supply. This was supported by the expansion of the cross-border interconnectors at Lasow (Germany) and Cieszyn (Czech Republic) and the construction of the Świnoujście LNG terminal.

The transmission system itself forms a trunk system consisting of:

- Transit gas pipeline system (EuRoPol);
- Eastern main line on the Jarosław – Wronów – Rembelszczyzna route;
- Southern main line on the Jarosław – Pogórska Wola – Tworzeń – Odolanów route;
- Northwest main line: Lwówek – Szczecin – Świnoujście LNG terminal – Gdańsk;
- Central Poland power supply system on the route Gustorzyn – Rembelszczyzna and Gustorzyn – Odolanów;
- Northern Poland's power supply system on the Gustorzyn – Gdańsk route; and
- Transmission system in Lower Silesia.

1.1.2 PROJECTS OF COMMON INTEREST (PCI)

Gaz-System also has a number of investment projects as listed in the TYNDP. The most significant of these include projects that have been granted PCI (Project of Common Interest) status by the European Commission. On October 14, 2013, the European Commission published a list of 248 key projects in the energy sector, including around 100 gas projects. Projects covered by PCI status benefit from faster and more efficient authorization and regulatory procedures and are also able to obtain EU financial support under the Connecting Europe Facility (CEF). On November 18, 2015, the European Commission published the second European list of projects in the natural gas sector that was granted the status of common interest. On November 24, 2017, the European Commission published the third list of 173 projects.

On these lists are critical projects within Poland for energy integration. These projects have fallen into two priority infrastructure corridors: North-South gas interconnections in Central Eastern and South Eastern Europe (NSI East Gas) and the Baltic Energy Market Interconnection Plan (BEMIP). In line with EU regulations on the security of gas supply, all the implemented interconnections enable two-way transmission.[8] Table 2 shows the Polish projects included within the initiatives and **Figure 9** is the Gaz-System representation of the PCI infrastructure developments planned.

Table 2: Two major infrastructure corridors and PCI projects in Poland

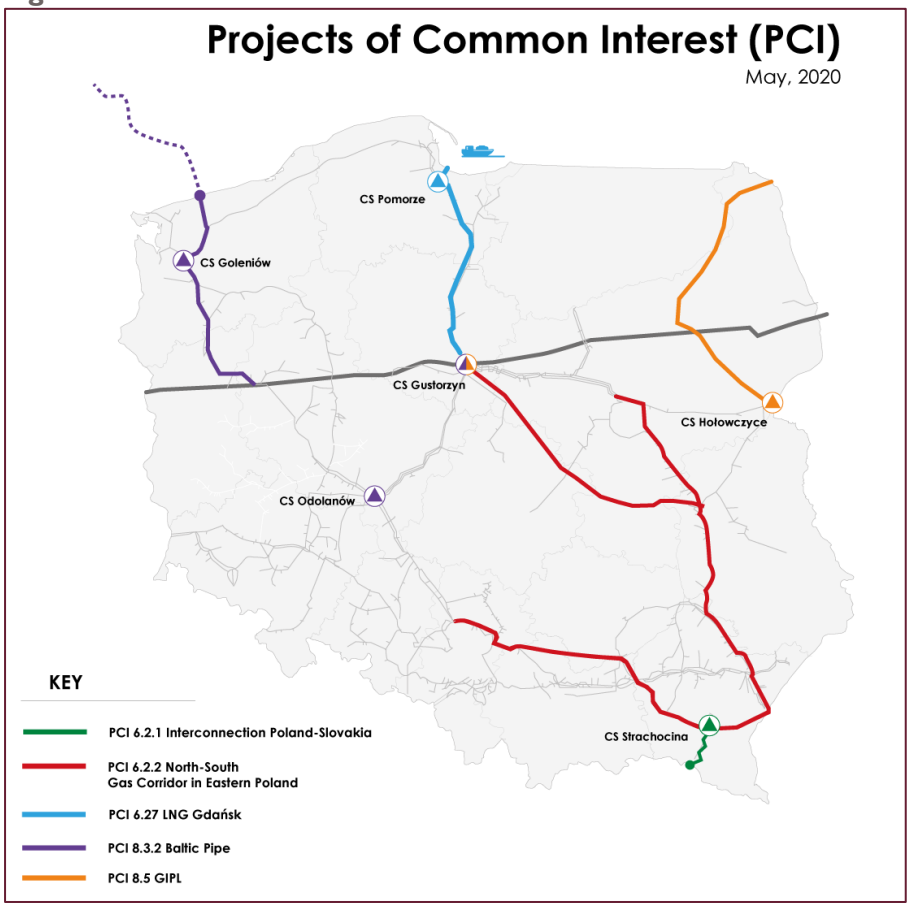
North-south gas interconnections in Central Eastern and South Eastern Europe (NSI East Gas)	Baltic Energy Market Interconnection Plan (BEMIP)
• **Eastern line of the North-South corridor in Poland including connection to Poland-Slovakia interconnector**	• Poland-Lithuania interconnector (GIPL) • Baltic Pipe gas pipeline (including onshore)

[8] Gaz-System TYNDP 2020-2029

• **The western line of North-South corridor in Eastern Poland with connection to Poland-Czech interconnector (interconnector project now on hold)**	• Expansion of the LNG terminal in Świnoujście

Source: Gaz-System TYNDP 2020-2029

Figure 9: Gas PCIs in Poland



Source: Gaz-System

The proposed construction of an FSRU in Gdansk is also on the EC's fourth list of investments given PCI status, approved on October 31, 2019.

The TYNDP indicates that many of these projects are part of the "Perspective until 2023" and are a continuation of commenced investment programs in the previous 10-year plans. There is also a list of "Perspective until 2029" investment projects that take into account the direction of investment tasks related to investment decisions that will be made according to the degree of market development in Poland and the region.

The TYNDP suggests that the majority of these projects are part of the confirmed 2023 scope, such as the Baltic Pipe pipeline, the GIPL, Poland-Slovakia interconnector, and large portions of the North-South Gas Corridor in Eastern Poland. The FSRU and associated pipelines (Kolnik - Gustorzyn and Kolnik – Gdansk) are within Vision 2029. It has been suggested that the proposed timeline for the FSRU would involve completion around 2026. Further information on these projects in Poland is available in Section 2.2.

1.1.2.1 KEY INFRASTRUCTURE CORRIDORS IN POLAND

1.1.2.1.1 North-South gas interconnection in central, eastern, and southeast Europe (NSI East Gas)

The Trans-European Networks for Energy (TEN-E) is a policy that is focused on linking the energy infrastructure of EU countries. As part of the policy, nine priority corridors and three priority thematic areas have been identified. The EU helps countries in priority corridors and priority thematic areas to work together to develop better-connected energy networks and provides funding for new energy infrastructure.

The nine priority corridors cover different geographic regions in the field of electricity, gas, and oil infrastructure. EU support for development in these corridors will connect regions currently isolated from European energy markets, strengthen existing cross-border interconnections, and help integrate renewable energy. For gas, the corridors are the North-south gas interconnections in Western Europe (NSI West Gas), North-South gas interconnections in Central Eastern and South-Eastern Europe (NSI East Gas), Southern Gas Corridor (SGC), and Baltic Energy Market Interconnection Plan in gas (BEMIP Gas).

The NSI East Gas initiative is focused on gas infrastructure for regional connections between and within the Baltic Seas region, Adriatic and Aegean Seas, eastern Mediterranean Sea, and the Black Sea, and for enhancing diversification and security of gas supply.[9]

The North-South Gas Corridor, which forms a key part of this initiative, connects the LNG terminal in Świnoujście with the Baltic Pipe and then through central Poland, the Czech Republic, Slovakia, and Hungary with the LNG terminal in Croatia. The Corridor is comprised of many bi-directional inter-system gas connections and domestic gas pipelines that are already in place or are still in various stages of the planning or construction process.[10]

Design works related to the construction of the North-South Corridor are currently underway, which will ensure the full and effective connection of the Polish GTS with the European system's main gas pipelines. It is hoped by Gaz-System that this will enable the implementation of full integration of Central and Eastern European markets, in line with EU energy policy.[11]

The North-South corridor in Poland includes:

- Western thread of the North-South Corridor;
- Eastern line of the North-South Corridor.

For the eastern line, the pipeline will connect the gas node in Strachocina (Podkarpackie Voivodeship) with the Slovak compressor station in Velké Kapušany (on the border with Ukraine). Additional details of this PCI can be found under Section 2.2.2.2.

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[9] 'Trans-European Networks for Energy', European Commission, June 8, 2020, https://ec.europa.eu/energy/topics/infrastructure/trans-european-networks-energy_en.
[10] 'North-South Gas Corridor', Gaz-System, https://en.gaz-system.pl/our-investments/integration-with-european-gas-tramsmission-system/north-south-gas-corridor/#:~:text=The%20North-South%20Gas%20Corridor%20connects%20the%20LNG%20Terminal,various%20stages%20of%20the%20planning%20or%20construction%20process.
[11] 'National Transmission System Ten-Year Development Plan 2020-2029', Gaz-System, April 2019.

For the western line the Czech Gas TSO, Net4Gas, indicated in its recently published 2021-2030 development plans, that it has shelved the Czech-Polish pipeline project, STORK II. The project has now been replaced by a smaller potential interconnection raising capacity from Poland, which may come online in 2027/2028. Further details relating to both the older shelved project and newer project are located in Section 2.2.2.3

1.1.2.1.2 Baltic Energy Market Interconnection Plan (BEMIP)

The primary objective of the Baltic energy market interconnection plan (BEMIP) initiative is to achieve an open and integrated regional electricity and gas market between EU countries in the Baltic Sea region, ending energy isolation. The initiative's members are the European Commission, Denmark, Germany, Estonia, Latvia, Lithuania, Poland, Finland, and Sweden. Norway participates as an observer. Dedicated working groups on infrastructure, markets, gas and electricity, security of supply, synchronization, renewables, and energy efficiency prepare specific measures, projects, and studies necessary for achieving the initiative's objectives and targets.

The initiative has accomplished significant achievements in integration with the Nordic electricity market. The Baltic States are now among the best-interconnected regions of Europe, with an interconnection level of 23 percent. However, further efforts are needed to complete their integration and synchronization with European networks and to develop a regional gas market.

Within the BEMIP the following PCI projects include:

- Poland-Lithuania interconnector (GIPL)
- Baltic Pipe gas pipeline (including onshore)
- Expansion of the LNG terminal in Świnoujście

The Poland-Lithuania interconnector (GIPL) aims to connect the Baltic and Finnish gas networks with the continental European gas network by the end of 2021. The pipeline will run from the Jauniūnai compressor station (Lithuania) to the Hołowczyce compressor station (Poland) and will allow flows in both directions. Further details of the GIPL can be located in Section 2.2.2.1.

For the Baltic Pipe gas pipeline, the primary aim is to increase pipeline import supplies. The Baltic Pipe project is a gas pipeline from Norwegian production in the North Sea to onshore Poland (via Denmark). The pipeline will be over 900 km, including two offshore sections in the North and Baltic seas and 570 km of onshore sections in Denmark and Poland. The pipeline will enable transport of 10 bcma from Norway to Denmark and Poland, and 3 bcma from Poland to Denmark. Additional information regarding this project can be found in Section 2.2.1.4.

The final PCI in the BEMIP is the expansion of the LNG terminal in Świnoujście. The initial indication was that the expansion of the terminal will increase its regasification capacity from 5 bcma to 7.5 bcma. However, it is targeted to eventually increase the terminal capacity to approximately 8.3 bcma by the end of 2023. Information regarding this expansion project can be found in Section 1.2.

1.1.3 CROSS-BORDER INTERCONNECTION POINT WITH UKRAINE

At the border between Poland and Ukraine, there are two physical interconnection points. Drozdovichi, which provides physical flow from Ukraine to Poland, has existed since the 1940s on the gas transmission pipeline from Lviv to Stalowa Wola. It has been providing transit gas from

Russia to Poland. Gaz-System reports a firm capacity of 12 mcm/d at this point and UA GTSO has indicated that the point has a technical capacity of 14.5 mcm/d.

The other interconnection point is Germanovichi, which was commissioned at the beginning of the 21st century and has provided physical reverse flow from Poland to Ukraine since 2012 when Ukraine was forced to ensure an alternative supply of gas. Flow is offered on an interruptible, conditionally firm basis at 6 mcm/d from September to April and 4.1 mcm/d from May to August. The stations are linked with three parallel pipelines, with one out of the three linking both stations.

Since January 1, 2020, virtual reverse capacity has also been available at these points. At Germanovichi this has been equal to the forward bookable capacity while Drozdovichi has a virtual reverse capacity of approximately 8.4 mcm/d. From July 1, 2020, these two IPs have been combined into a single virtual interconnection point (VIP): GCP Gaz-System/UA GTSO, with a new interconnection agreement between the two countries. While the physical flow has been from Ukraine to Poland via Drozdovichi (since transit of Russian gas exceeds imports to Ukraine and Polish utilization of UGS in Ukraine), for virtual flow from Poland "the condition of continuous transmission on the interruptible conditionally firm basis on GCP Gaz-System/UA GTSO exit points depends on the delivery of gas at an appropriate level to entry point GCP Gaz-System/UA GTSO." This means that if there is no flow from Ukraine to Poland, the Polish TSO cannot guarantee that it will be able to provide any capacity to Ukraine on a firm basis.

While it may be possible to technically conduct physical flow from Poland to Ukraine, depending on the hydraulics of the Polish GTS, the level of such capacity may now only be approximately 1.5-2 mcm/d. Crucially, this flow is not backed by any agreements, as the current interconnection agreement does not specify such an option. This means that capacities from Poland to Ukraine are interruptible only in the case where there is no flow from Ukraine and as such, there is a high probability that it will not be possible to guarantee flows in such a situation. This would be particularly relevant if Poland were no longer supplied by transit gas from Russia via Ukraine (possible once the supply agreement between PGNiG and Gazprom ends on December 31, 2022). There are no evident plans in PL TYNDP or elsewhere that firm capacity is going to be introduced from the PL side.

1.2 POLISH ŚWINOUJŚCIE LNG TERMINAL

Poland's LNG terminal began construction in 2010 in the Baltic port of Świnoujście, and is now the largest LNG facility in Northern, Central, and Eastern Europe, with a regasification capacity of up to 5 bcma. Construction of the LNG terminal was completed in 2015 as well as over 1,000 km of gas pipelines that were put into operation to enable the transmission of gas from the north of the country to the rest of the transmission system.[12]

Operation of the terminal commenced in 2016, during which the facility allowed Poland to increase its supply diversification and boost gas imports without increasing its dependency on Russian gas. The terminal has contributed to the energy security of Poland and Europe, as well as enabling the import of liquefied gas to Poland from global suppliers.

1.2.1 EXISTING INFRASTRUCTURE

[12] Gaz-System TYNDP 2020-2029

Currently, the technological processes and services provided by the LNG Terminal include unloading LNG from LNG carriers at the unloading jetty, LNG process storage in cryogenic tanks, LNG regasification, and send-out of natural gas to the National Transmission System, and LNG trans-shipment onto tanker trucks and ISO containers.

Regasification capacity at the terminal is currently 5 bcma, with the two cryogenic storage tanks each having a capacity of 160,000 m^3. The terminal only has a single jetty for the loading and unloading of LNG carriers. Additional infrastructure around the LNG facility includes a breakwater barrier, port infrastructure, and the Szczecin-Świnoujście connecting gas pipeline. Gaz Systems S.A set up Polskie LNG S.A as a means of constructing and operating the LNG terminal.

The key design parameters for the LNG import facilities are summarized below:

- The design capacity of LNG terminal of 5 bcma;
- Normal/maximum send-out 570,000 / 656,000 Nm^3/h (Normal conditions are defined as absolute pressure of 101.325 kPa and temperature of 273.15 K);
- LNG offloading facility designed to receive LNG from 120,000 to 216,000 m^3 (Q-flex) at the rate of 12,000 m^3/h;
- Two full containment LNG storage tanks, 160,000 m^3 each, with space for the third tank;
- Pipeline inlet pressure: 6.3 – 8.4 MPa, temperature: 1°C;
- LNG trucks loading station with two loading bays and capacity of 95,000 tons per year, with room for future expansion;
- SCV vaporizers for regasification due to low seawater temperature; possibility to install open rack vaporizer (ORV) in the future;
- No N_2 blending facilities were installed. There is no liquefaction plant included;
- LNG terminal designed according to PN-EN 1473;
- A technical platform for water intake for fire-fighting and future ORV;
- LNG trestle bridge for LNG pipelines and utilities;
- Discharging berthing complete with loading arms (216,000 m^3 capacity vessels 315 m in length, 12.5 m draft);
- Breakwater; and
- Dredging works.

1.2.2 EXPANSION PROGRAM

It is now planned to increase the terminal's import capacity to bolster the available volumes of LNG that can be delivered to the Polish gas system. The initial indication was that the expansion of the terminal will increase its regasification capacity from 5 bcma to 7.5 bcma.[13] However, the current plan is to eventually increase the terminal capacity to approximately 8.3 bcma by the end of 2023. Polskie LNG (a fully owned subsidiary of Gaz-System) has indicated that it expects the terminal's

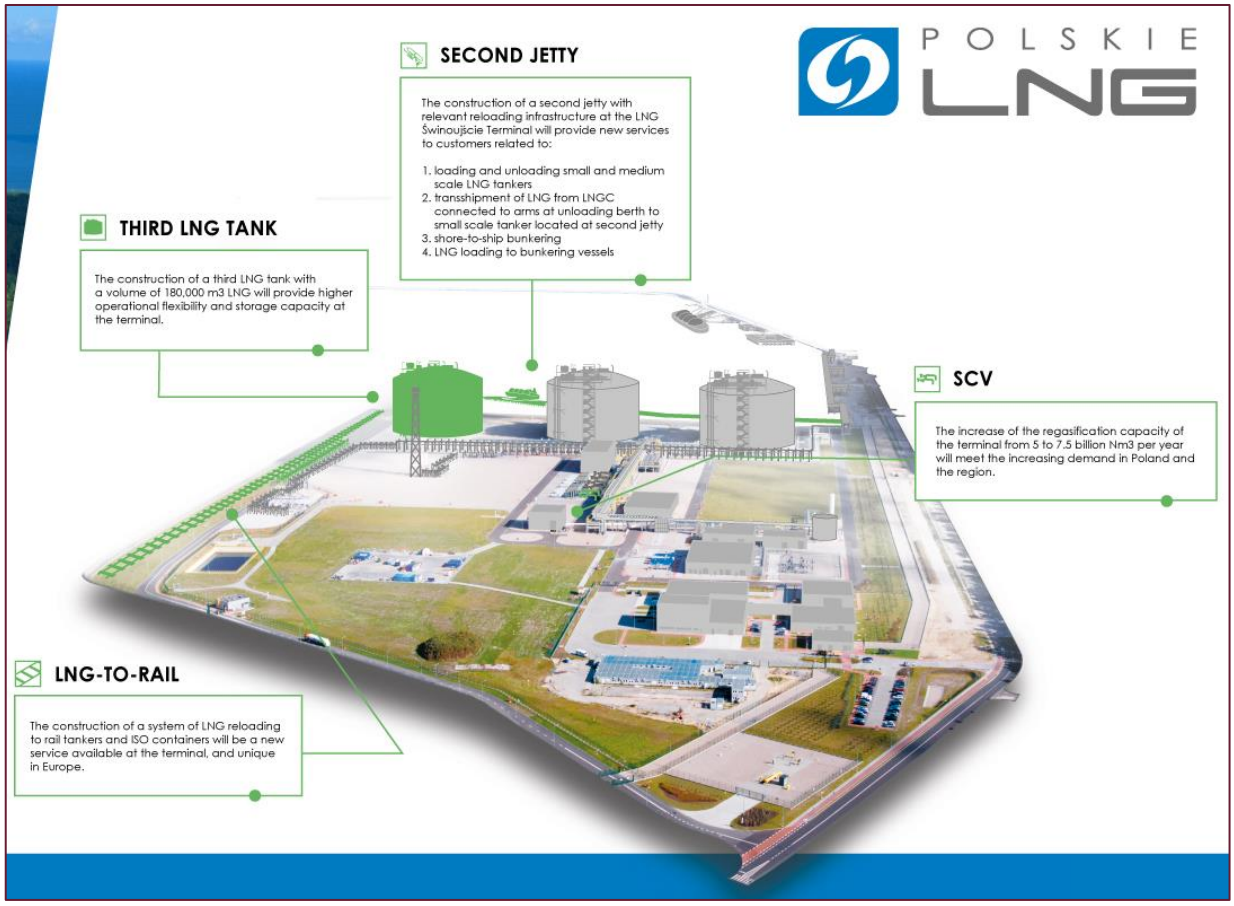
[13] 'LNG Terminal in Świnoujście,' Polskie LNG News, https://en.polskielng.pl/en/lng-terminal/lng-terminal-in-Świnoujście/.

initial capacity expansion of 50 percent to be completed by the end of 2021,[14] with the construction of the remaining works by 2023.

The expansion project has four key components:[15]

- Increasing the nominal regasification capacity of the terminal by installing additional SCVs;
- Third LNG process storage tank – increasing the operational flexibility of the LNG terminal installation and ensuring the optimum natural gas process storage capacity (180,000 m^3);
- LNG-to-Rail trans-shipment installation – extending the range of services provided with the possibility of natural gas trans-shipment onto ISO containers and rail tankers and thus reaching new prospective customers; and
- The second jetty - for loading and unloading of LNG carriers, LNG trans-shipment and handling LNG bunker vessels, and providing bunkering services.

Figure 10: Polskie LNG graphic of planned expansion works at Świnoujście, published in 2018



Source: Polskie LNG

The third cryogenic tank allows for an increase in operational flexibility, while also ensuring the optimum natural gas process storage capacity is achieved. The LNG-to-rail trans-shipment

[14] 'Contract for the extension of the Świnoujście LNG Terminal has been signed,' Polskie LNG News, February 26, 2020, https://en.polskielng.pl/en/press-office/news/news/artykul/201639/.
[15] 'Polskie LNG: Launching the Open Season 2020 Process,' Polski LNG News, February 27, 2020, https://en.polskielng.pl/press-office/news/news/artykul/201640/.

installation extends the range of services provided, with the possibility of reaching new prospective customers, by natural gas trans-shipment into ISO containers and rail tankers. Installation of the second jetty allows for additional LNG carriers, LNG trans-shipment, LNG bunker vessels, and loading and unloading operations.

The expansion is now being executed in two phases: to first increase the capacity of the terminal to 7.5 bcma and then by an additional 0.8 bcma to 8.3 bcma in the second phase. The first stage is the installation of the two additional SCV units that were ordered in October 2019.[16]

In June 2020, Polskie LNG announced that it had selected and signed agreements with a consortium to deliver the terminal expansion at a value of approximately PLN 1.9 billion ($483 million) in a "design and build" contract.[17] The project completion date was also set at the end of 2023 for the full expansion to 8.3 bcma.[18] The project will be executed by two entities:

- Polskie LNG will be responsible for the construction of the new LNG storage tank with a capacity of approximately 180,000 m^3 and the performance of the process elements of the new berth; and
- Szczecin and Świnoujście Seaport Authority shall be responsible for the construction of the hydro-technical part of the berth, hydrotechnical infrastructure for the transmission pipe rack, and completion of the mooring infrastructure.

Further projects relating to the Świnoujście LNG terminal include the Baltic Pipe project, whereby the Baltic Pipe is to be connected to the terminal to allow for Scandinavian countries to have future guaranteed access to the global LNG market. Also, there is potential for the integration of Ukraine's GTS with the LNG terminal via the Polish GTS.[19]

1.3 UKRAINIAN GAS TRANSPORTATION INFRASTRUCTURE

The GTS of Ukraine is one of the largest in Europe, a complex system that extends throughout Ukraine, with connections to the GTS of neighboring countries - Russia, Belarus, Poland, Slovakia, Hungary, Romania, and Moldova. In general, Ukraine's gas transmission system provides access to a variety of sources of gas supply – indigenous production, imports, and underground gas storage facilities. The entry capacity into the gas transmission system of Ukraine is 281 bcma and the exit capacity is 146 bcma. The overall GTS has:

- Over 33 thousand km of gas pipelines;
- Three types of compressor units, distinguished by the type of drive, namely gas turbine (370 units), electric (145 units), and gas engine (15 units);
- 1,389 gas distribution stations
- 4,603 flow metering devices;

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[16] 'Contract for the extension of the Świnoujście LNG Terminal has been signed,' Polske LNG News, February 26 2020, https://en.polskielng.pl/press-office/news/news/artykul/201639/.
[17] 'Poland signs deals to expand its LNG terminal,' Reuters, June 24,2020, https://uk.reuters.com/article/poland-energy-lng/poland-signs-deals-to-expand-its-lng-terminal-idUKL8N2E12PB.
[18] 'Contractor of the LNG terminal extension selected,' Polskie LNG, June 25, 2020, https://en.polskielng.pl/press-office/news/news/artykul/201660/.
[19] '100% Capacity of the LNG terminal in Świnoujście Reserved,' Polskie LNG News, June 5, 2020, https://en.polskielng.pl/press-office/news/news/artykul/201657/.

- 56 laboratories with 88 laboratory chromatographs, and 79 online gas chromatographs installed at the gas metering stations and large gas distribution stations.

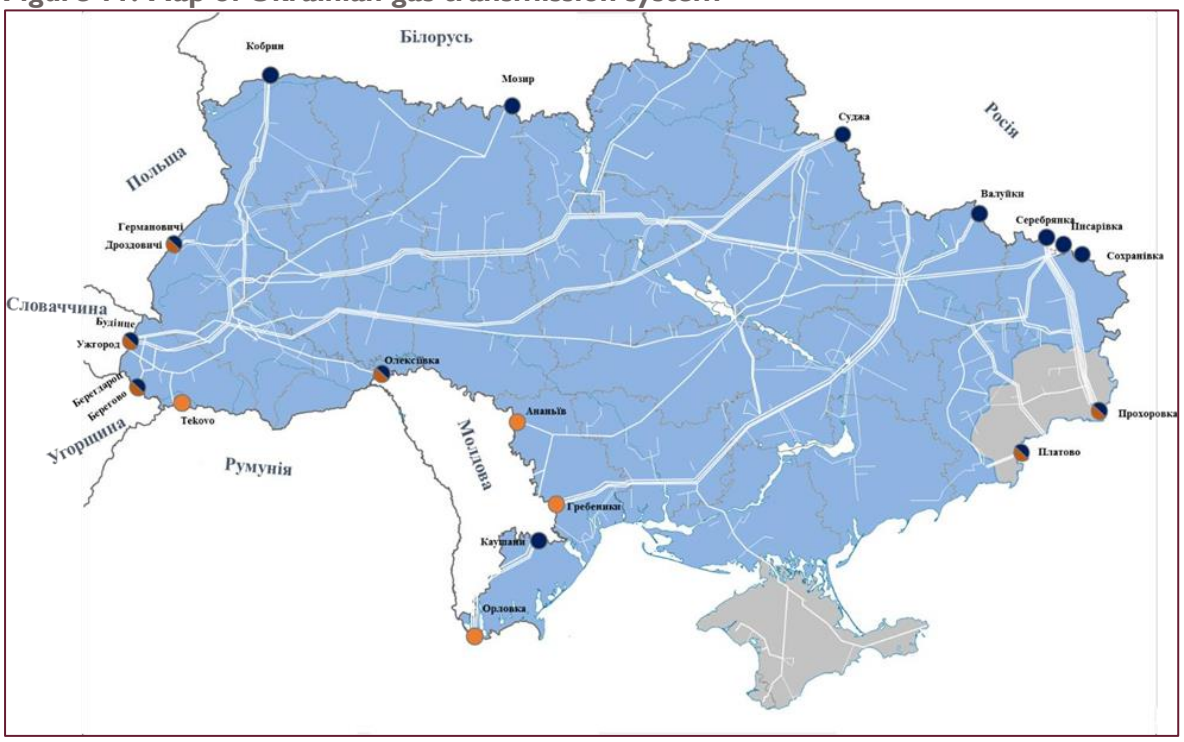
The Ukrainian GTS has been historically used for the transit of Russian gas to the EU and Moldova via a number of main high-pressure pipelines: Urengoy – Pomary – Uzhhorod, SDKRI, Soyuz, EKKR, etc. In 2012-2014 new routes for the import of natural gas to Ukraine from Poland, Hungary and Slovakia were created. However, only the Slovakian direction provides firm capacity for import to Ukraine.

Now, the UA GTSO is conducting modernization of the GTS and aims to create firm capacity from Hungary and from Poland. In the case of Poland, UA GTSO is available to physically offtake gas into the system up to 5 bcm per year in case of availability from the Polish side. Moreover, UA GTSO launched a major reconstruction of one of the cross-border pipelines – Drozdovichi-Komarno DN500 – which prescribes full replacement of most of the sections of the pipeline. In addition, the TYNDP of the GTS operator of Ukraine envisages the reconstruction of the CS Komarno. The FID on the reconstruction of the CS will be made after clarifying the need of market participants or adjacent TSO in the interest of the security of natural gas supplies for the infrastructure after the expiry of the supply contract between PGNiG and Gazprom in 2022. Following the mentioned reconstructions (expected to be finished by end of 2022), the Ukrainian part of the interconnection point will be ready to offtake the natural gas flows from Poland on a firm basis in the volumes of 20.5 mcm/d (in case of entry pressure of 45 bar ensured from Polish side). In case of entry pressure of 40 bar, the capacity will be 18 mcm/d, 35 bar – 14 mcm/d.

Apart from the major interconnection point in Drozdovichi/Germanowichi, in the Volodymyr-Volinsky region of Ukraine, there is a gas pipeline connecting the Ukrainian GTS with the gas distribution network of Poland, called the Ustilug-Hrubieszow gas pipeline. This is a high-pressure gas pipeline used to transport gas from Ukraine to consumers in the southeastern regions of Poland. The maximum capacity in this pipeline is 1.2 mcm per day if the pressure of 55 bar is ensured, however, it has not been utilized for the last 10 years.

Ukraine also possesses one of the largest systems of storage facilities in Europe. It consists of 12 underground storages all over Ukraine, most of them located in Western Ukraine. Its active volume is 31 bcm. Ukrainian storages are operated by JSC "Ukrtransgaz", the former TSO before the unbundling on January 1, 2020.

Figure 11: Map of Ukrainian gas transmission system



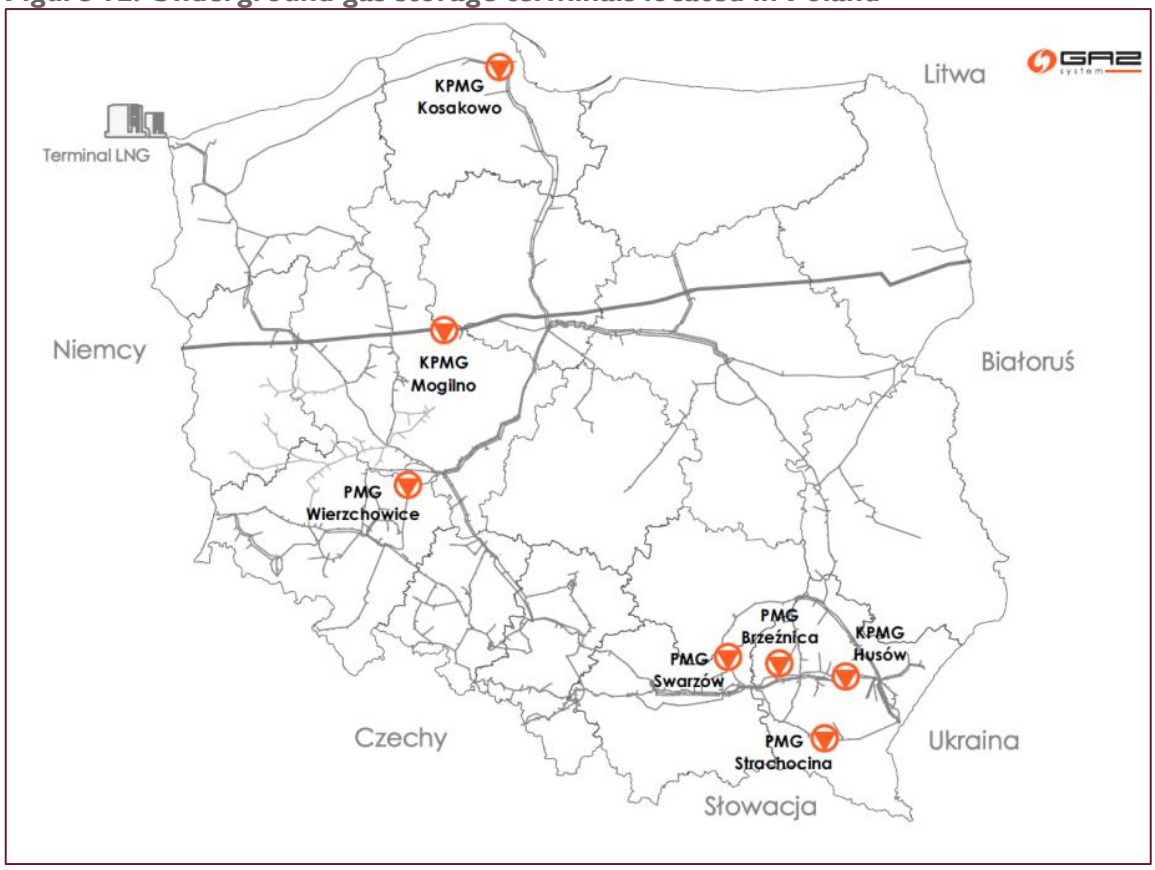
Source: UA GTSO

1.4 UNDERGROUND GAS STORAGE (UGS)

1.4.1 POLAND UGS

Currently, there are seven UGS facilities located in Poland, which are employed cooperatively with the high-methane gas transmission system to help cover seasonal and daily fluctuations in gas demand. The location of UGS facilities are highlighted across the gas transmission system below:

Figure 12: Underground gas storage terminals located in Poland



SOURCE: GAZ SYSTEM

A breakdown of the capacities for each UGS facility in Poland can be seen below:

Table 3: Capacity breakdown of the underground gas storage facilities in Poland

UGS Facility	Active Capacity		Maximum Power Injection		Maximum Receiving Power	
	mcm	GWh	Mcm/d	GWh/d	Mcm/d	GWh/d
KPMG Mogilno	589.85	6,570.9	9.60	106.9	18.00	200.5
KPMG Kosakowo	145.5	1,622.3	2.40	26.8	9.60	107.0
PMG Husow	500.0	5,625.0	4.15	46.7	5.76	64.6
PMG Strachocina	360.0	4,050.0	2.64	29.7	3.36	37.9
PMG Swarzow	90.0	1,008.0	1.00	11.2	0.93	10.4
PMG Brzeznica	100.0	1,125.0	1.44	16.2	1.44	16.1
PMG Wierzchowice	1,200.0	13,200.0	6.00	67.2	9.60	105.6
Sum	2,985.35	33,201.2	27.23	304.7	48.69	542.1

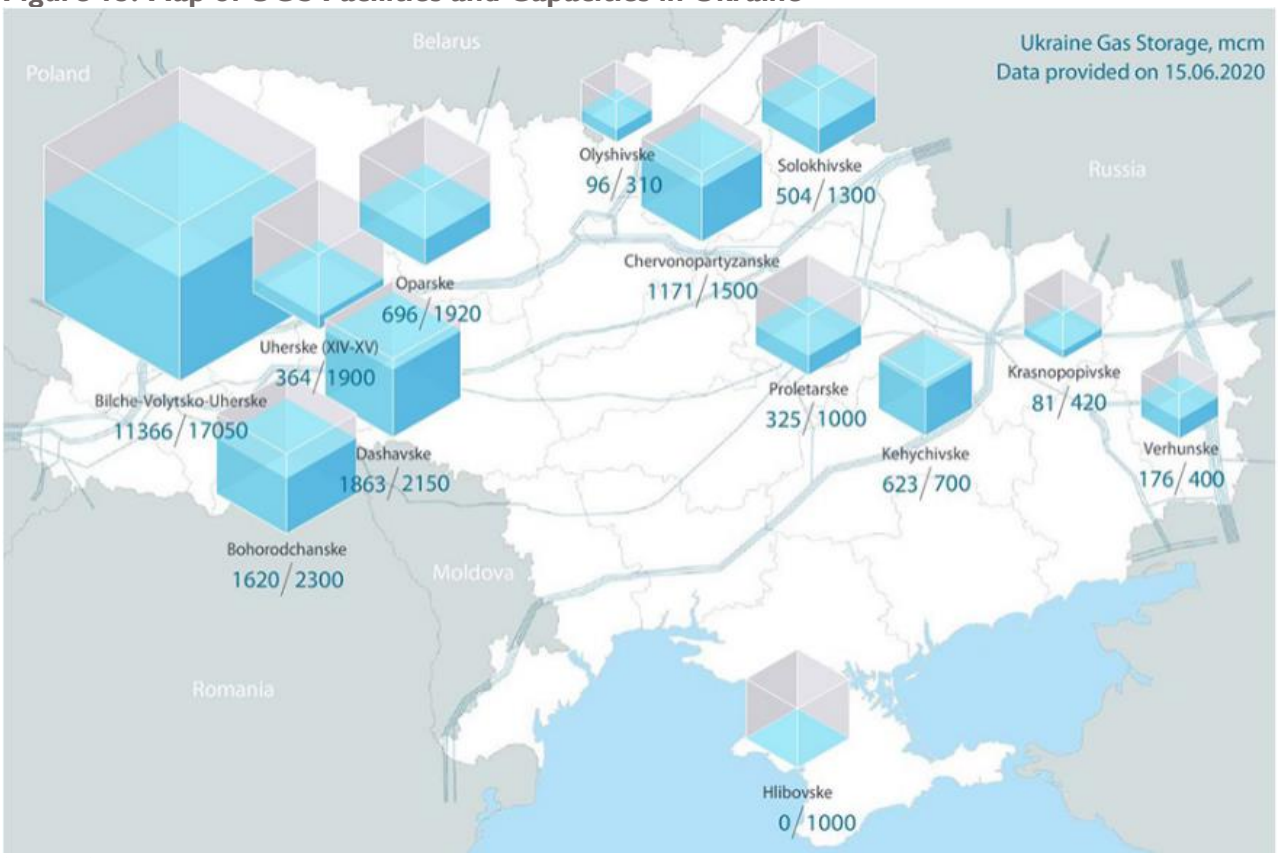
SOURCE: GAZ-SYSTEM TYNDP 2020-2029

1.4.2 UKRAINE UGS

The Ukrainian UGS facilities are operated by Ukrtransgaz (hereinafter, SSO), a subsidiary of Naftogaz Group. SSO's public ten-year development plan states that:[20]

- With an annual volume of gas consumption in Ukraine in the range of up to 35 bcma, to ensure reliable gas supply to consumers in Ukraine and to compensate for seasonal and daily fluctuations, it is enough to fill the UGS of Ukraine to 47.5-55 percent of capacity (14.7-17.0 bcm of active gas excluding 4,662 mcm of irreversible active gas technologically performing the functions of a buffer);
- To ensure reliable natural gas supplies to Ukrainian consumers during the winter period (February-March), active gas reserves in UGS facilities must be formed in such a way as to ensure daily withdrawal from UGS facilities during this period at the level of 133 mcm/d with an active gas volume in UGS facilities of about 13 bcm, as well as to develop and implement technical measures to increase the daily production capacity of gas storage facilities; and
- Taking into account the need to meet the demand of Ukrainian consumers during the withdrawal season, Ukrainian UGS facilities are able to provide consumers in other countries with free storage volumes in the amount of 14-16 bcm.

Figure 13: Map of UGS Facilities and Capacities in Ukraine



Source: Naftogaz

For the storage of gas from Poland in Ukrainian gas storage, it is particularly useful that the majority of Ukraine's capacity lies in the western parts of the country. The combined western Ukrainian UGS facilities have about 20 bcm of active volume. Detailed characteristics of these UGS facilities are given in Table 4.

[20] http://utg.ua/utg/psg/underground-gas-storages.html

Table 4: Western Ukrainian UGS data

Name of UGS	Overall Volume, bcm	Active Volume, bcm	Design Injection capacity, mcm/d		Withdrawal capacity, mcm/d		Withdrawal duration, days	Reservoir pressure, max, kgf/cm²(a)
			Max	Min	Max	Min		
Ugerskoye horizons XIV-XV	3.850	1.900	17.0	10.0	17.0	1.3	175.0	86.7
B.Volitsya (incl. Ugerskoye XVI hor.)	33.450	17.050	120.0	94.0	102.0	24.0	174.0	U.XVI-43.50; B.V.-78.0
Dashava	5.265	2.150	26.0	26.0	26.0	6.0	166.0	59.0
Opary	4.570	1.920	14.0	14.0	14.0	3.2	176.0	IV - 70.0; V - 84.40; VI - 80.90
Total	47.135	23.020	177.0	144.0	159.0	34.5	--	--

SOURCE: UA GTSO AND UKRTRANSGAZ DATA

Figure 14: Map of interconnector lines between Ukraine UGS and Poland border point

SOURCE: UA GTSO DATA / ESP ANALYSIS

1.5 TECHNICAL SUMMARY

Polish LNG Terminal at Świnoujście

- The current terminal commenced operation in 2016 and allows Poland to increase its supply diversification and boost gas imports without increasing its dependency on Russian gas
- The terminal has contributed to the energy security of Poland and Europe, as well as enabling the import of liquefied gas to Poland from global suppliers
- The design capacity of the LNG Terminal of 5 bcma
- Normal/maximum send-out 570,000 / 656,000 Nm^3/h
- LNG offloading facility designed to receive LNG from 120,000 to 216,000 m^3 (Q-flex) at the rate of 12,000 m^3/h
- Two full containment LNG storage tanks, 160,000 m^3 each, with space for the third tank
- Planned to increase terminal capacity to 7.5 bcma (first phase) and 8.3 bcma (second phase)

Polish GTS

- Owned and operated by OGP Gaz-System S.A as the TSO of Poland, with the exception of the Yamal-Europe pipeline owned by EuRoPol Gaz S.A.
- Consists of two cooperating systems: Transit Pipeline System (EuRoPol/Yamal) and National Transmission System, the latter divided into high-methane (E) and nitrogen-rich (L) systems
- EuRoPol gas transit pipeline transports gas from western Siberia in Russia to Germany via Belarus and Poland with a capacity of 32.96 bcma, operating pressure 8.4 MPa, length 683.9 km, diameter DN1400 and five compressor stations
- The National Transmission System transports gas throughout the country; total length 10,927 km, 15 compressor stations

Poland to Ukraine Transmission

- Current limitations on Polish GTS to flow gas to Ukraine
- Interconnection point at GMS Germanovichi has provided physical reverse flow from Poland to Ukraine since 2012 when Ukraine was forced to ensure an alternative supply of gas
- Flow is offered on an interruptible conditionally firm basis at 6 mcm/d from September to April and 4.1 mcm/d from May to August
- Since January 1, 2020, virtual reverse capacity has also been available at these points
- There are no evident plans in PL TYNDP or elsewhere that firm capacity is going to be introduced from the PL side

UGS

- Poland: seven UGS facilities employed cooperatively with the high-methane gas transmission system to help cover seasonal and daily fluctuations in gas demand. Active volumes range from 145.5 to 1,200 mcm, with total 2,985.35 mcm

- Ukraine: four Western UGS employed to ensure reliable natural gas supplies to Ukrainian consumers during the winter period

2 MARKET SCREENING

This section examines the evolving outlook of supply and demand with consideration of the completion of key infrastructure projects over the next decade to support the changing dynamics of gas supply and demand in Eastern Europe. The gas market has successfully liberalized in recent years and interconnectivity between countries continues to grow, enabling the market to provide alternative supply routes and increased energy security and independence.

As significant new import pathways are completed in Poland, with large financial backing from the European Union, the goal of diversification of supply and independence from Russian gas is achievable. The decades-long status quos are no longer acceptable, and Poland is now well placed to utilize imports from Norway, Germany, and the Czech Republic and global LNG deliveries from the United States and Qatar.

The role of LNG has escalated in Europe in recent years, and with new capacities coming online, Eastern European countries like Ukraine may have the opportunity to trade and import gas from a more global portfolio in the future. As such, there will be potential impacts to the Ukrainian market, as well as opportunities.

This study provides analysis and commentary on historical trends, the growth of LNG in the region, key projects, and expected changes to supply routes. Demand forecasts in Poland and Ukraine are reviewed and analysis performed on how these may affect future gas flows. The results of which are used to determine how various aspects may manifest themselves in terms of the gas storage and import market from a Ukrainian perspective, and potential opportunities arising from these changes.

2.1 HISTORICAL GAS SUPPLY AND DEMAND

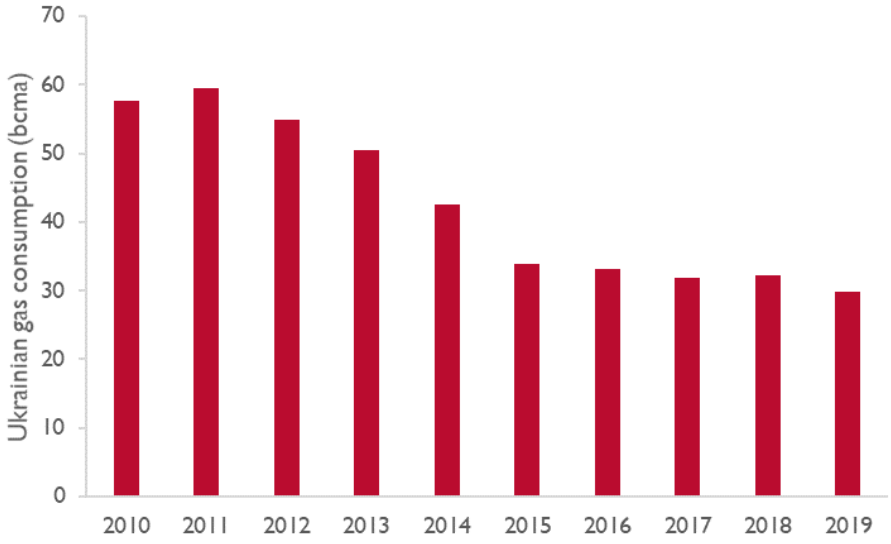
2.1.1 UKRAINE

2.1.1.1 UKRAINIAN DEMAND

Natural gas plays a significant role in Ukraine's energy sector, with a share of 29.8 percent – slightly lower than coal (32.4 percent). However, over the last decade, gas consumption in Ukraine has declined. From its peak in 2011, consumption fell by almost 50 percent but has stabilized (Figure 15). This reduction has been due to a number of factors including increased prices for both households and industry, improvements in energy efficiency, the increasing share of renewables, and dropping out of conflict zones including Crimea.[21] In 2019, consumption in Ukraine decreased by 7.7 percent due to an unusually warm winter.

[21] 'Situation of the Ukrainian natural gas market and transit system,' KPMG, April 10, 2017.

Figure 15: Gas consumption in Ukraine from 2010 to 2019

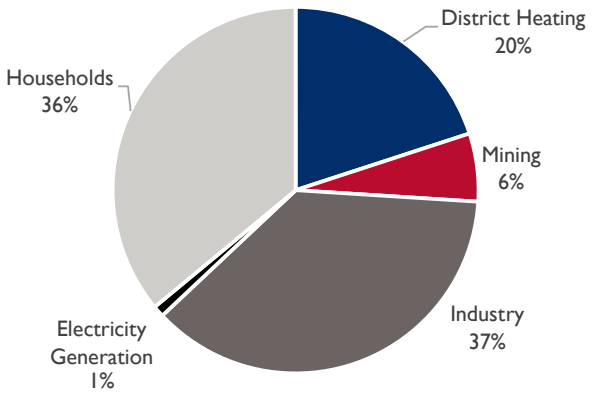


Source: UA GTSO

The proportion of consumption by sector is shown in Figure 16. Over half of the natural gas consumed goes to households directly or indirectly through district heating. There was a significant decline in consumption in this category (20 percent reduction from 2014-2016), which was mostly driven by a pricing reform that brought prices to the market level of import parity. Since 2016, gas prices have been linked to European gas hubs.[22] Gas prices are not regulated for industry and hence a free market exists in the wholesale sector. Prices for residential consumers were regulated under a public service obligation (PSO), which limited the flexibility of the market, however since August 2020, the PSO was lifted and prices for residential gas consumption are set by competitive suppliers.

Electricity generation from gas in Ukraine accounts for only 0.6 percent of generation and is significantly inferior to coal. As is common throughout Europe, natural gas consumption in Ukraine is characterized by significant seasonal fluctuations, with demand in winter up to three times higher than in the summer.

Figure 16: Sectoral split of gas consumption in Ukraine, 2018



Source: UA GTSO TYNDP 2020-2029 / ESP

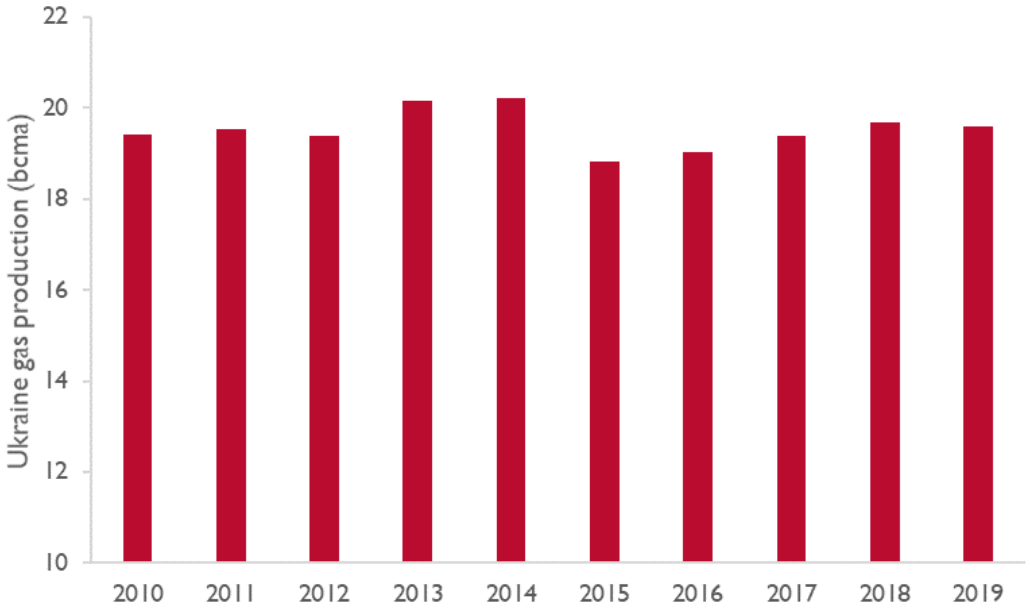
[22] 'Ukraine Gas Upstream,' Office of the National Investment Council of Ukraine, 2017.

The eastern and central areas of Ukraine are the largest gas consumers in the country. The largest regions for natural gas consumption are Kyiv, Dnipropetrovsk, and the Donetsk regions, where the largest populations and the main industrial production facilities are concentrated. In the central regions, including Kyiv, the main consumers are households and district heating companies. In the east (Dnipropetrovsk and Donetsk) there is a high level of industrialization; natural gas is an imported fuel for chemical and fertilizer production, steel and metal processing as well as the mining industries in these areas. [23]

2.1.1.2 GAS PRODUCTION IN UKRAINE

Ukraine is the fourth-largest natural gas producer in Europe after Norway, the United Kingdom, and the Netherlands. Figure 17 shows the historical production of natural gas in Ukraine. Ukrainian production has been fairly consistent over the last decade and has increased every year since 2015 following a decline in production after the peak in 2013. Domestic production currently fulfills approximately 70 percent of the national gas demand.

Figure 17: Ukraine gas production from 2010-2019



Source: BP Statistical Review

The vast majority of natural gas reserves and production are located in eastern Ukraine, where there is also a high potential for shale gas and tight gas. The main natural gas production regions are Kharkiv and the Poltava regions, where more than 90 percent of Ukrainian natural gas is produced. In addition to these two regions, gas is produced in 10 other regions: Lviv (about 3.5 percent of total production), Dnipropetrovsk (about 2.5 percent of total production), Ivano-Frankivsk (about 2.5 percent of total production), and others (less than 1 percent of total production).[24]

Ukraine has more than a century of experience producing oil and gas but remains rich in conventional gas reserves and possesses vast untapped unconventional reserves. It has an R/P ratio close to 55 years and total proved gas reserves of 1.1 tcm.[25] Only 2 percent of natural gas reserves are extracted every year, which is low compared to many other gas-producing countries. Despite

[23] 'Situation of the Ukrainian natural gas market and transit system', KPMG, April 10, 2017.
[24] 'Gas Transmission System Development Plan 2020-2029' (TYNDP), UA GTSO, 2019.
[25] 'BP Statistical Review 2020

these high reserves, Ukraine is still a net importer of gas, with approximately a third of its demand imported.

2.1.1.3 GAS IMPORTS TO UKRAINE

Since natural gas production in Ukraine is lower than consumption, natural gas imports from external sources remain important. Over the last decade, as demand for natural gas declined significantly up until 2015, the import share of consumption has fallen thanks to sustained levels of production. Imports now make up just over a third of consumption, down from over 60 percent (Russian imports) pre-2013. Until 2015, the main source of natural gas imports was the eastern border of Ukraine, where Russian gas was supplied. Since November 25, 2015, Ukraine has stopped importing natural gas from Russia, and all imports are now provided from EU countries on the western border.

Ukraine's imports are supplied across the borders with Slovakia, Hungary, and Poland. The main route of natural gas supply to Ukraine is Slovakia, although from 2018 there was a significant increase in imports from the direction of Hungary due to the decrease in tariffs for exit to the Ukrainian GTS.

In 2019, these imports totaled approximately 14.2 bcm, as follows:

- Slovakia – 9.2 bcm
- Hungary – 3.7 bcm
- Poland – 1.3 bcm

According to UA GTSO, the unbundling of Naftogaz and the conclusion of interconnection agreements with the TSOs on Ukraine's western border mean that Ukraine's entire gas import requirement could be delivered by virtual, rather than physical, reverse flow. This may reduce import prices.[26]

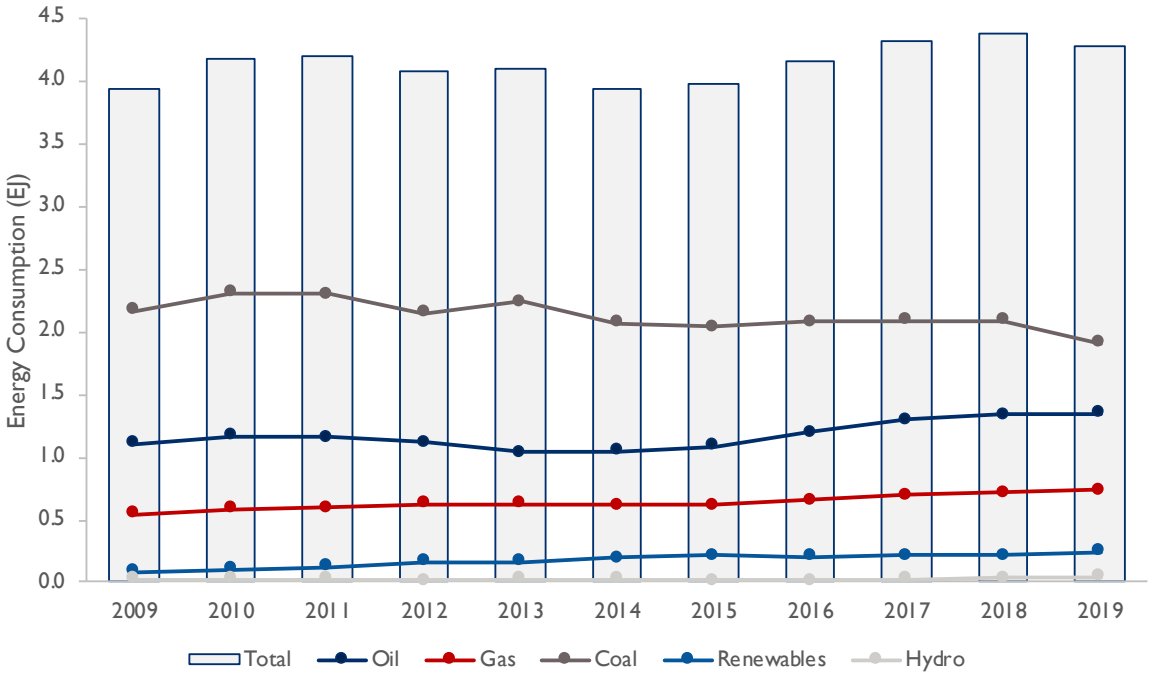
2.1.2 POLAND

2.1.2.1 POLISH DEMAND

Poland's energy balance has previously been dominated by coal due to the vast reserves it possesses and established industry for production – it has the largest coal resources in Europe. However, since the peak in 2010, coal consumption has been declining, replaced by increases in oil, gas, and renewables consumption as shown in Figure 18.

[26] 'Gas Transmission System Development Plan 2020-2029' (TYNDP), UA GTSO, 2019.

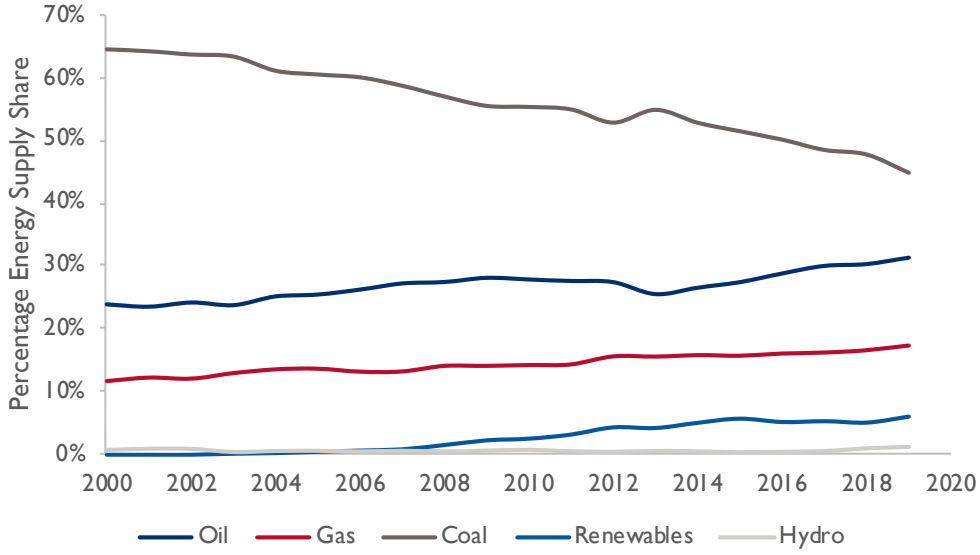
Figure 18: Polish energy consumption by source, 2009 - 2019



Source: BP Statistical Review 2020 / ESP Analysis

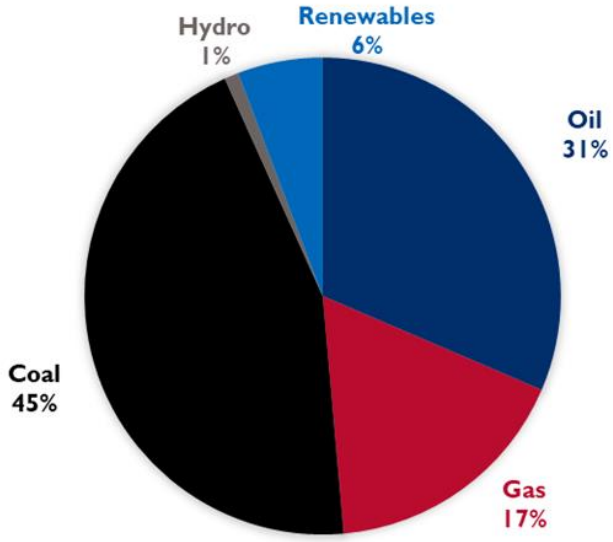
This is further emphasized in Figure 19, which shows how the energy share has evolved over the last two decades. While coal has declined from 64 to 45 percent of the energy share, gas has risen from 11 percent to 17 percent (Figure 20).

Figure 19: Polish energy source share, 2000 - 2019



Source: BP Statistical Review 2020 / ESP Analysis

Figure 20: Polish energy source share, 2019



Source: BP Statistical Review 2020 / ESP Analysis

Consumption of gas in Poland has grown from 16.2 bcma in 2010 to 20.4 bcma in 2019, or 26 percent. This has been largely due to the expansion of the domestic gas network and new industrial, residential, and commercial customers consuming gas.

PGNiG is Poland's largest oil and gas company, involved in oil and gas field development, production, storage, and transmission of these primary energy products, construction and development of the national oil and gas transmission system, and gas imports and exports. The company was established as a state enterprise in 1982 and in 1990 it was transformed into a joint-stock company.

PGNiG subsidiaries dominate across all segments of the value chain: in the gas distribution network it has 97 percent penetration, in gas storage 100 percent, in gas acquisition (purchase and extraction) 76 percent, in wholesale sales of gas 65 percent, and in retail more than 80 percent (within this sector, it accounts for 97 percent of household supply, 70 percent of services and public utility, 80 percent of agricultural use, and 78 percent of industrial use).[27]

Indigenous coal is still the primary fuel for power generation, accounting for 78 percent of electricity generation compared to 7 percent for gas – even lower than the 8 percent contributed by wind generation. Poland is contending with the challenge of promoting decarbonization of its energy consumption while ensuring economic prosperity and job security in its established energy sectors, particularly the coal industry. While progress has been made toward reducing the nation's CO_2 emissions, there has been some reluctance to fully embrace the emissions targets touted by the EU. Additionally, indigenous coal production is viewed as a guaranteed energy supply that is fully independent of Russia, which has been the primary supplier of natural gas, although this has been declining recently. The Polish government is likely to see coal as central to the country's energy mix. However, expansion of other energy sources such as gas and renewable production is expected as the decarbonization transition continues.

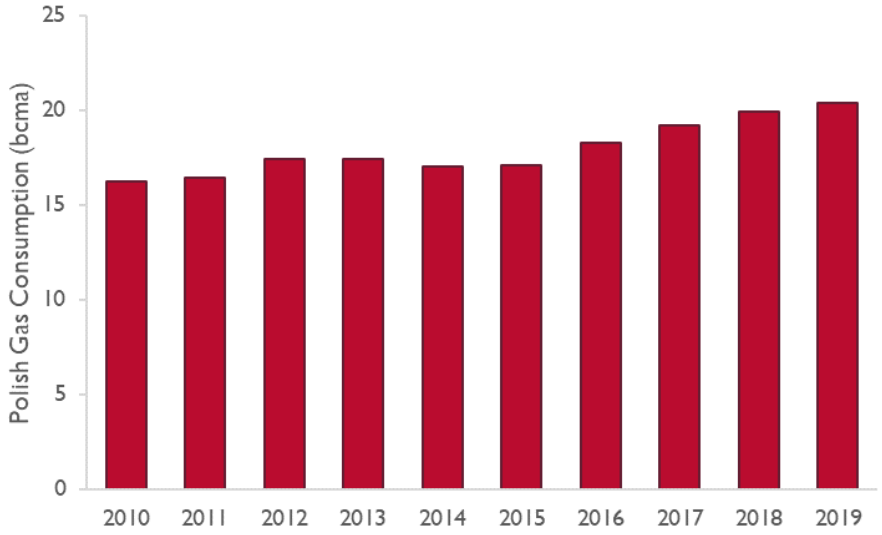
The largest sectors responsible for natural gas consumption are the industrial and residential sectors. The industry sector is responsible for over two-thirds of the total gas demand. The Polish

[27] 'Russia-Poland gas relationship: risks and uncertainties of the ever after,' The Oxford Institute for Energy Studies, June 2020.

chemical and petrochemical industry is the most important consumer of natural gas, accounting for approximately 50 percent of all industrial gas demand in the country. Within this sector, most gas is used as a feedstock for fertilizer production.

Natural gas prices for Polish industrial users have been moving around the EU average over the last decade, although they have hovered above the EU average since 2014. Once the country starts to rely largely on LNG imports from 2022, gas prices are likely to be well above the EU average. [28]

Figure 21: Polish Gas Consumption



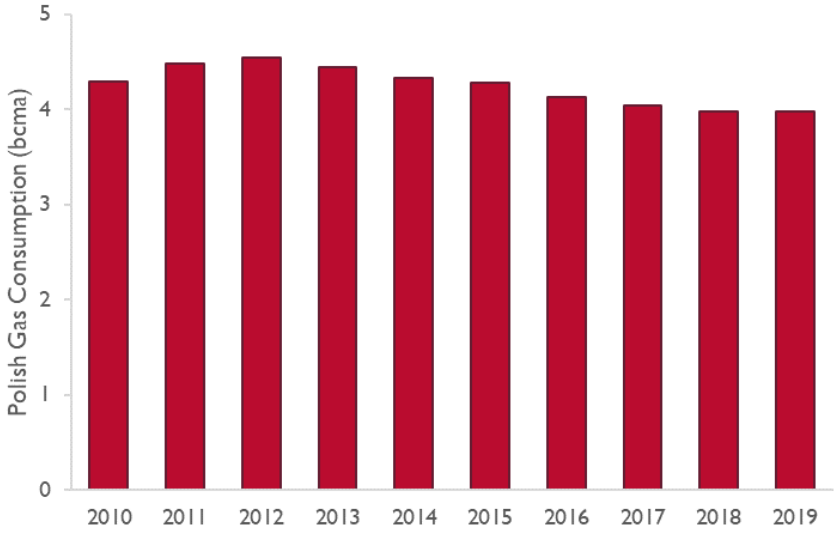
Source: BP Statistical Review 2020 / ESP Analysis

2.1.2.2 GAS PRODUCTION IN POLAND

Gas production in Poland has declined slightly over the last decade so its import gap is growing. Combined with the expiration of the Russian supply agreement at the end of 2022, this has developed into a significant challenge for the decision-makers in Poland to ensure the country's future energy security.

[28] 'Challenges of Industrial Gas Demand in the Czech Republic, Poland and Slovakia,' The Oxford Institute for Energy Studies, May 2019.

Figure 22: Polish Gas Production

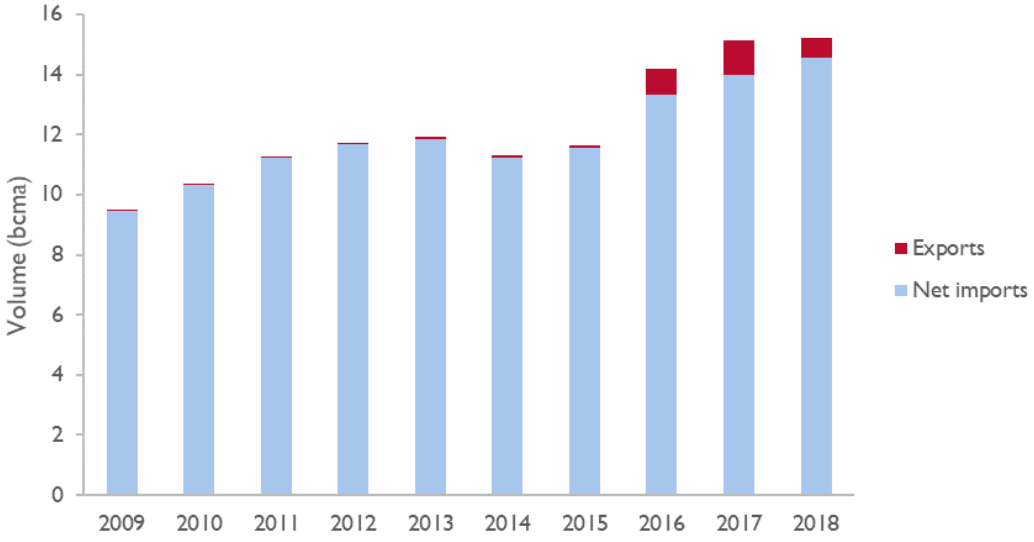


Source: BP Statistical Review 2020 / ESP Analysis

2.1.2.3 GAS IMPORTS TO POLAND

Poland is significantly dependent on gas imports, approaching 15 bcma in recent years (Figure 23). The growth in natural gas consumption has been accounted for by a rise in imports which, until the last few years, was supplied primarily via the Yamal-Europe pipeline – imported from Russia. Following the commissioning of the 5 bcma Świnoujście LNG regasification terminal in 2016, Poland was able to diversify its import sources somewhat. Poland has even started to re-export small volumes of natural gas in the past few years, mostly to Ukraine.

Figure 23: Poland's import requirements 2009-2018

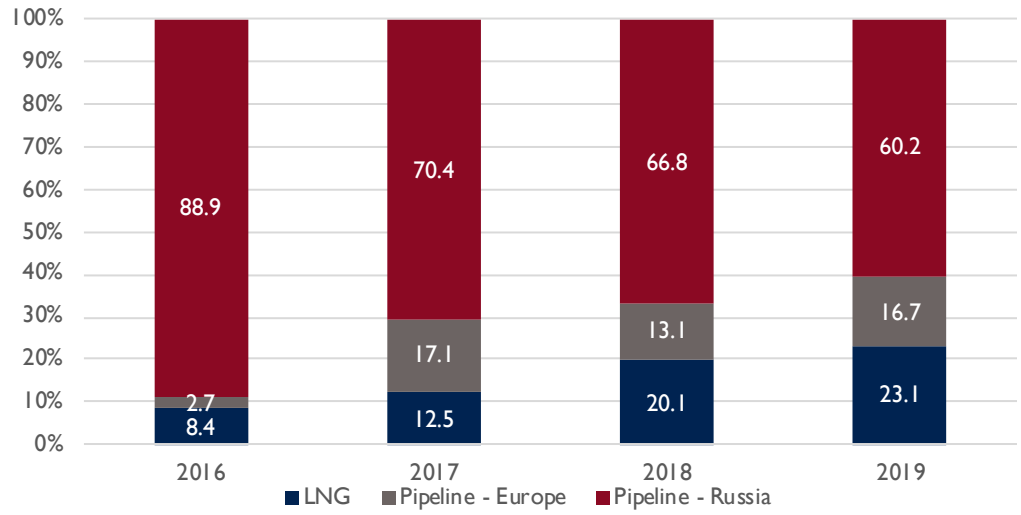


Source: Eurostat / ESP Analysis

In recent years, Poland has been fairly successful in decreasing its reliance on Russian gas to satisfy its import gap. Following the commissioning of the Świnoujście LNG import terminal and the expansion and increased cooperation at interconnection points with the nation's neighbors in Germany and the Czech Republic, the country has been able to import some gas from other sources. This has led to increased diversification of import sources, with LNG providing access to a global market of gas supplied by the United States and Qatar. For further information and discussion of Poland's ambitions to diversify its gas supply and the approach, it is taking to achieve this, see Section 2.2.1.

Figure 24 shows the evolving import share over the last few years. According to PGNiG, the import share of gas from Russia has fallen from almost 89 percent in 2016 to 60.2 percent in 2019. This 2019 import share accounts for approximately 9 bcma of import by PGNiG. The Yamal supply agreement between Poland and Russia stipulates a minimum take-or-pay volume of 8.7 bcma, which means Poland's imports from Russia are already close to this minimum. This agreement expires at the end of 2022, after which Poland intends to no longer import eastern gas.

Figure 24: PGNiG Import Share 2016 - 2019



Source: PGNiG / ESP Analysis

Poland began importing LNG in 2016 and the share of these imports has grown from 8.4 percent in 2016 to 23.1 percent in 2019, increasing the utilization of the Świnoujście import terminal capacity. Increased import capacities and utilization of the cross-border IPs with Germany and the Czech Republic, as well as an agreement for import at Mallnow (virtual reverse from Germany to Poland with gas off-take from the EuRoPol transit pipeline), has enabled further diversification via imports on the western and southern borders of the country. These EU imports have grown from a share of 2.7 percent in 2016 to 16.7 percent in 2019.

The Cieszyn connection with the Czech Republic was established in 2011, and a year later the Lasow connection with Germany was upgraded. In 2014, the reverse flow was enabled in the Yamal pipeline, allowing supplies to flow from Germany after the expansion of the metering station in Mallnow. [29]

2.1.2.4 POLISH GAS EXPORT POTENTIAL

In the coming years, multiple projects will expand and diversify Poland's import portfolio enough that the nation may begin to export gas to neighboring countries. From the perspective of Gaz-System, the TSO of Poland, domestic demand forecasts are not the only determinant in volume planning for the gas transmission service; it will also take into account the possible need for transit as well as for gas export itself.

In relation to the GTS transit function, the focus is to both expand existing and construct new interconnection points with neighboring countries. It is possible that the developments could lead to

[29] 'Benefits of Natural Gas for Poland – Needs for the Development of a Gas Hub,' Ramboll, March 7, 2018.

a surplus of options for supplying the system (domestic sources, transmission from neighboring countries, or LNG imports), compared to the requirements of domestic customers.

2.1.3 SUMMARY OF HISTORICAL GAS SUPPLY AND DEMAND

With few exceptions, European countries are not able to fully cover domestic consumption through their indigenous production. This creates an overall import demand of almost 320 bcma for the continent, which is supplied primarily by Russia. Driven by Europe's motivation to diversify its energy supplies and reduce its dependence on Russian gas, LNG has risen as an important alternative.

EU imports of LNG rose in 2018 following the trade agreement between the United States and the European Commission wherein both parties agreed to strengthen EU-U.S. strategic cooperation in energy. The International Energy Agency predicts LNG imports to Europe will increase by 20 percent by 2040, and that U.S. LNG can play a role in satisfying this rising demand.

In Eastern Europe, the situation is similar but with a greater dependence on imports from Russia. While Ukraine is the fourth-largest gas producer in the continent, it too is a net importer of gas but has been importing only from EU countries since 2015. Poland, too, intends to cease its Russian imports after the supply agreement ends at the end of 2022. Polish imports from EU countries grew from 2.7 percent to 16.7 percent of total imports from 2016 to 2019. Furthermore, Poland intends to utilize the Świnoujście import terminal and to further increase its capacity to import U.S. LNG.

While Slovakia and Hungary rely heavily on Russian gas, their efforts to diversify their import portfolio has led them to invest in significant infrastructure projects such as the ongoing Poland-Slovakia interconnector project and the Slovakia-Hungary interconnector that allows Hungary to potentially access the Western-European gas networks while also supporting the north-south gas corridor initiative.

In the Czech Republic and Lithuania, where natural gas has not been the traditional main energy source, its share is still high. The same diversification efforts are also important in these countries, particularly in Lithuania and the Baltics, which relied entirely on Russian imports in the past. To improve energy security, Lithuania completed an LNG terminal in 2014 and has started construction of the bi-directional interconnector with Poland (GIPL), which will connect the Baltics to European gas networks.

2.2 DEVELOPMENTS IN POLAND

2.2.1 POLAND'S DIVERSIFICATION OF GAS SUPPLY

2.2.1.1 DIVERSIFICATION AWAY FROM RUSSIAN GAS

Poland and Russia have the longest gas relationship in Europe, the first volumes being supplied from Russia to Poland during the late 1940s.[30] Poland has typically been the largest consumer of Russian gas in central and Eastern Europe, approximately 10 bcma. While the transit agreement expired in May 2020, the long-term supply agreement between Poland and Russia will not expire until December 31, 2022. This long-term contract has been in place since 1996 and ensures gas supply to PGNiG, Poland's largest state-run oil and gas company. PGNiG informed Gazprom in 2019 that it

[30] 'Russia-Poland gas relationship: risks and uncertainties of the ever after,' The Oxford Institute for Energy Studies, June 2020.

does not intend to renew the agreement as the country seeks to diversify its gas sources away from any dependence on Russia.[31]

As the December 31, 2022 deadline approaches to resolve the future of Polish gas supply, the Polish government and PGNiG have expressed their intention to seek an alternative future that diversifies from Russian imports. Already the progress toward this aim has been positive. In the early 2010s, Gazprom deliveries accounted for 90 percent of Poland's gas imports. By 2019 this situation had significantly changed. Out of PGNiG's total gas imports, 9 bcm was from Russia, amounting to just over 60 percent. While this is still the largest single source of gas, it is a meaningful progression from even 2016, when Russia accounted for 89 percent of imports. Imports from Russia under the Yamal contract have a minimum take-or-pay volume of 8.7 bcma.

While the share of Russian imports has declined, it has been replaced by pipeline imports from other neighboring countries. Pipeline imports from the west and south through interconnectors with Germany and the Czech Republic increased from 0.3 bcm in 2016 to 2.5 bcm in 2019. Additionally, PGNiG imported 3.4 bcm of LNG in 2019. Since 2016, when the LNG terminal in Świnoujście on the Baltic Sea near the Polish-German border started operations, LNG imports have grown from 2.6 mcm/d to 9.3 mcm/d in 2019, contributing 23 percent of imports in 2019.

The political parties that form the current Polish government, whose term in office runs from 2019 to 2023, have supported the position of the majority Law and Justice party on stopping gas imports from the east and opposing new Russian export pipelines to Europe: "We consistently strive to diversify energy supplies, including independence from energy supplies from the direction of East. This was served by the construction of 'the northern gas gate' (LNG terminal in Świnoujście). Our government will continue its expansion and construction of gas connections from Norway via Denmark (Baltic Pipe) and implemented energy cooperation with the United States in the field of import liquefied natural gas and the development of nuclear power. At the same time, we will remain in the unchanging position of opposing the construction of the Nord Stream 2 gas pipeline."[32]

2.2.1.2 CURRENT POLISH IMPORT ROUTES

Investigating the Polish cross-border points for physical natural gas flows, it is clear that Poland is taking crucial steps toward diversifying its natural gas resources and shifting from its historical eastern supply and it is interesting to see how this pattern is emerging.

As shown in Figure 25, Poland has three main entry points on the border with Belarus, where it imports the Russian natural gas delivered via the Yamal pipeline. These are Kondratki, Wysokoje, and Tietierowka (for local consumption only, i.e., not supplying gas to the whole GTS).

The Kondratki import point is where the Yamal transit pipeline enters Polish territory (EuRoPol). The majority of this flow is transit gas supplied to Germany. However, some volumes are supplied to the Polish GTS at Wloclawek and Lwowek, incorporated into the single PWP virtual interconnection point. Due to the agreements on the German border, virtual reverse from Mallnow is also available to supply gas off-taken at these points within the Polish system. This supply is discussed further below.

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[31] 'Gazprom Export to supply gas to Poland's PGNiG till end of contract,' Reuters, November 15, 2019, https://www.reuters.com/article/us-pgnig-gazprom-contract-idUSKBN1XP1HN.
[32] 'Russia-Poland gas relationship: risks and uncertainties of the ever after,' The Oxford Institute for Energy Studies, June 2020.

Figure 25: Poland's cross-border import points

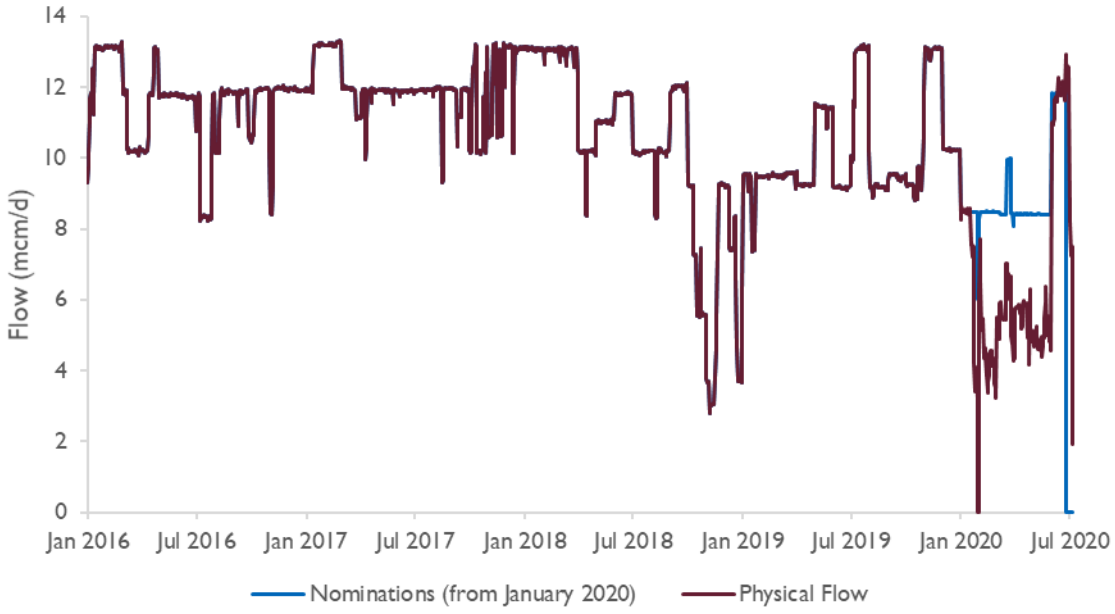
Source: ENTSOG / ESP

For example, before the end of 2018, supply at the Wysokoje import point was fairly consistent year-round at approximately 9 mcm/d or over 3.2 bcma. Since the beginning of 2019, this flow has declined overall.

Drozdovichi is the import point from Ukraine to Poland and delivers Russian gas that transits via the former. Figure 26 shows how the flows to Poland via this route have declined in recent years from a consistent 12-13 mcm/d to approximately 9 mcm/d in 2019. Since January 2020, transit gas from Ukraine has also been supplied by virtual reverse whereby Ukraine retains some volumes instead of also physically importing gas in the reverse direction. The nominations curve shown from 2020 demonstrates the actual imports to Poland, negating the virtual reverse, which results in lower physical flows.

This trend demonstrates the decline at this important point as well and shows that in reducing reliance on Russian gas, all the major import points in eastern Poland have experienced a downturn in flows. Since Poland is now importing close to the minimum take-or-pay level of the Yamal supply agreement, it is likely that these volumes will continue in a similar fashion to post-2019 values until the contract expires at the end of 2022.

Figure 26: Drozdovichi flows to Poland

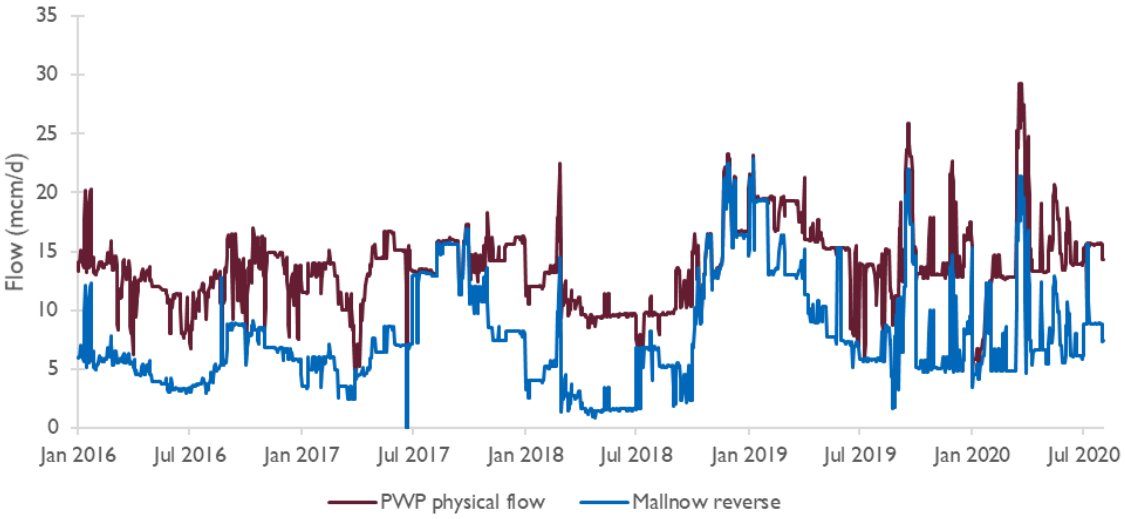


Source: ENTSOG / ESP

The shift in the gas flows to Poland from the east to the west is also demonstrated through the increase in the flows at western points. The locations of Świnoujście, Mallnow reverse, Lasów (ONTRAS VIP), and Cieszyn are the key imports points.

Point of Interconnection (PWP) is a virtual point that comprises all the physical points located at the interconnection of the Polish transmission system with the transit gas pipeline system (SGT), i.e., Lwówek and Włocławek. This point can be supplied by either Russian imports at Kondratki or virtual reverse flows from Mallnow when gas is being supplied to the German border in physical volumes (in emergency situations, physical flow from Mallnow to Poland is also possible in limited volumes). Figure 27 shows the gas supply in physical volumes at the PWP. The nominations of virtual reverse flow at Mallnow are also plotted as this shows an interesting trend and is reflective of the ongoing transformation of the import portfolio as a whole. The off-take at the PWP has not declined, but in fact, has been rising; the sustained purchase of gas from Germany is growing to fulfill this demand. The Mallnow reverse line on the graph represents virtual flows and the remainder up to the physical flow is Russian import. Here, it can be seen that in many instances over the last few years, physical imports have been entirely fulfilled by German gas, whereas there have been no occasions where supplies are entirely Russian-purchased.

Figure 27: Imports off-taken from EuRoPol (PWP)



Source: ENTSOG / ESP

Similarly, the smaller import points of Lasow (or ONTRAS VIP) and Cieszyn (Czech) have been rising in recent years. The gas flow via Cieszyn experienced the most significant rise in western Poland since the end of 2017. While the flow is smaller in quantity, it still demonstrates the Polish effort to diversify gas, as it started to import gas through the Czech Republic too. The ONTRAS VIP typically experiences physical flows of 0-4 mcm/d, while the Cieszyn point provides almost 2.5 mcm/d in the winter months.

2.2.1.3 FOCUS ON LNG GROWTH

The first major step toward diversifying Poland's gas imports, at competitive prices was made possible following the construction of the Świnoujście LNG terminal at the end of 2015, offering a capacity of 5 bcma. In 2016, Gazprom accounted for 89 percent of total Polish gas imports, but in the following years deliveries from Russia fell while LNG imports grew, supported by declining LNG prices. LNG imports from the United States, Qatar, and Norway reached 3.43 bcm in 2019, an increase of 27 percent from the previous year.

The first deliveries of LNG to PGNiG came from Qatargas, a joint venture of Qatar Petroleum, ConocoPhillips, and Mitsui & Co. Ltd. This contract was expanded in 2017 to 2.7 bcma with an increase in deliveries from January 1, 2018. In June 2017, PGNiG received the first-ever LNG delivery from the United States – a spot supply from U.S. LNG provider Cheniere Energy, which was followed in November 2018 by PGNiG signing a long-term contract with the U.S. company. By 2023 PGNiG is planning to expand its LNG portfolio. According to current plans, it will comprise contracts with a wider group of the U.S. and Qatari LNG suppliers.

Poland's ambitious LNG import strategy is further supported by a couple of major projects ongoing to increase capacity. These are the expansion of the existing Świnoujście LNG terminal and the construction of an FSRU in Gdansk.

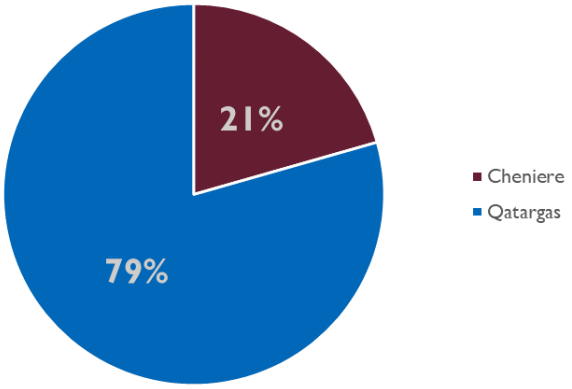
2.2.1.3.1 LNG Portfolio

Since receiving its first LNG delivery in 2016, Poland has proceeded to expand its prospective LNG portfolio by agreeing to long-term contracts with suppliers in the United States and Qatar. In 2009, PGNiG signed a long-term contract with Qatargas to supply approximately 1.5 bcma under a 20-

year agreement.[33] In March 2017, the parties built on the existing Sales and Purchase Agreement (SPA), increasing the volume delivered to 2.7 bcma. This agreement began at the start of 2018 and will run until June 2034.[34]

The other LNG import agreement currently supplying gas is with the U.S. LNG provider Cheniere Energy. In November 2018, a long-term contract was signed that stipulated the supply of 0.7 bcma from 2019-2022, rising to 1.95 from 2023 to 2042. The first delivery received from Cheniere at the Świnoujście LNG terminal was in July 2019.[35] Poland's LNG import portfolio via long-term agreements totals 3.4 bcma through to 2022. Figure 28 shows the share of suppliers in these years.

Figure 28: PGNiG LNG import portfolio from 2019 - 2022



Source: Various / ESP Analysis

Looking beyond 2022 when Poland's LNG technical import capacity will expand further, additional long-term agreements have been signed for U.S. LNG. At the end of 2018, Port Arthur LNG, a subsidiary of Sempra Energy, and PGNiG entered into a 20-year SPA for LNG from the liquefaction-export facility under development in Texas. The agreement is for the sale and purchase of approximately 2.7 bcma in regasified volume. Additionally, in 2019 PGNiG agreed on volumes of 4.7 bcma from Venture Global LNG in the United States.[36] Deliveries from these agreements are expected to begin in 2023.

This takes the total LNG import portfolio across these four agreements to over 12 bcma from 2023. Beyond 2023, the portfolio is dominated by U.S. LNG, which comprises over three-quarters of the import agreements. The proportion for each of the four companies is shown in Figure 29. Purchases from Qatargas and Cheniere will be made on a delivered ex-ships (DES) basis, while imports from Port Arthur LNG and Venture Global LNG will be purchased on a free-on-board (FOB) basis.

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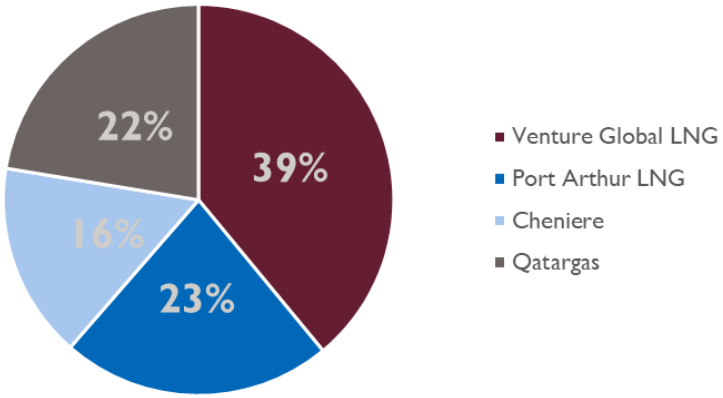
[33] 'Update 2 – Qatargas agrees to double LNG supplies to Poland,' Reuters, March 14, 2017, https://www.reuters.com/article/qatar-poland-lng-idUSL5N1GR30N.
[34] 'PGNiG signed a strategic agreement with Qatargas,' PGNiG News, March 14, 2017, http://en.pgnig.pl/news/-/news-list/id/pgnig-signed-a-strategic-agreement-with-qatargas/newsGroupId/1910852
[35] 'First cargo of U.S. LNG under long-term agreement between PGNiG and Cheniere arrives in Poland,' PGNiG News, July 26, 2019, http://en.pgnig.pl/news/-/news-list/id/first-cargo-of-us-lng-under-long-term-agreement-between-pgnig-and-cheniere-arrives-in-poland/newsGroupId/1910852.
[36] 'Poland's PGNiG agrees to buy more LNG from Venture Global project in U.S.,' S&P Global Platts, June 12, 2019, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/061219-polands-pgnig-agrees-to-buy-more-lng-from-venture-global-project-in-us.

Figure 29: PGNiG LNG import portfolio from 2023



Source: Various / ESP Analysis

2.2.1.3.2 Świnoujście Terminal Expansion

In 2015, construction was completed on Poland's first LNG terminal and more than 1,000 km of gas pipelines were put into operation, enabling the transmission of significant volumes of gas from the north.[37] Poland's LNG terminal in the Baltic port of Świnoujście is the largest LNG facility in northern, central, and Eastern Europe, with a regasification capacity of 5 bcma. Poland now plans to increase the terminal's import capacity to bolster the available volumes of LNG that can be delivered to the Polish gas system. The initial indication was that the expansion of the terminal will increase its regasification capacity from 5 bcma to 7.5 bcma.[38] However, the current intention is to increase the terminal capacity to approximately 8.3 bcma by the end of 2023.[39] A more detailed breakdown of the planned expansion works can be found in Section 1.2.2.

2.2.1.3.3 Poland FSRU

Poland is also developing another LNG project in the Bay of Gdansk on the Baltic Sea. This project is the construction of floating storage and regasification unit (FSRU). The primary role of the FSRU is to supply the national grid with regasified natural gas for consumption in Poland and its neighboring countries in Central and Eastern Europe. The FSRU will also be capable of providing additional services such as reloading the LNG to smaller tankers and bunkering natural gas-fuelled vessels.[40] The FSRU will have a capacity of 4 bcma and will be operational by the start of 2026. The secretary of state responsible for energy projects has also indicated that this capacity could be doubled in the future to 8 bcma to supply neighboring countries.[41] The project is on the EC's fourth list of investments given PCI status, approved on October 31, 2019.

2.2.1.4 BALTIC PIPE CONSTRUCTION

The second major development in Poland's diversification of gas supply is the construction of the Baltic Pipe to increase pipeline import supplies. The Baltic Pipe project is a gas pipeline from

[37] Gaz-System TYNDP 2020-2029
[38] 'LNG Terminal in Świnoujście,' Polskie LNG News, https://en.polskielng.pl/en/lng-terminal/lng-terminal-in-Świnoujście/.
[39] 'Contractor of the LNG Terminal extension selected,' Polskie LNG News, June 25, 2020, https://en.polskielng.pl/en/press-office/news/news/artykul/201660/.
[40] 'Poland's Gaz-System moving forward with FSRU project,' LNG World News, March 27, 2017, https://www.lngworldnews.com/polands-gaz-system-moving-forward-with-fsru-project/.
[41] 'Poland plans floating terminal to boost LNG imports,' Business Records, May 2, 2019, https://www.brecorder.com/2019/05/02/494139/poland-plans-floating-terminal-to-boost-lng-imports/.

Norwegian production in the North Sea to onshore Poland (via Denmark). The project is a collaboration between the Danish gas and electricity TSO, Energinet, and Gaz-System.

The pipeline will be over 900 km, including two offshore sections in the North and Baltic seas and 570 km of onshore sections in Denmark and Poland. The pipeline will enable transport of 10 bcma from Norway to Denmark and Poland, and 3 bcma from Poland to Denmark.[42] The pipeline will cross the routes of the two Nord Stream pipelines and so will require agreements with the operators of these lines on the technical and environmental safety of the crossovers.

The strategic objective of this pipeline is to provide a new gas supply corridor to the European market and the project is recognized by the European Commission as a Project of Common Interest, with subsidy financing from the EU. It is currently planned that the Baltic Pipe will be fully operational by October 1, 2022. The reasons for granting the project PCI status included the strengthening of supply diversification, market integration, price convergence and security of supply, primarily in Poland and Denmark and secondarily in Sweden, Central and Eastern Europe (CEE), and the Baltic region. One of the announced goals of the project was to connect the Baltic Pipe to the LNG terminal in Świnoujście, which could guarantee Scandinavian countries access to the global LNG market in the future.

Gaz-System is responsible for the construction of the undersea pipeline in the Baltic Sea. In 2019, the European Commission, via the CEF, granted nearly €215 million for Baltic Pipe construction works. In the beginning of May 2020, Gaz-System reported that it had selected Saipem Ltd. as the offshore Baltic Pipe contractor with the contract reportedly quoted at €280 million.[43] On May 11, 2020, Gaz-System reported that it had received the last remaining construction permit for works in the Swedish Exclusive Economic Zone in the Baltic Sea.[44] This permit for laying the gas pipeline, issued by the Swedish Ministry of Enterprise and Innovation, completed the process of obtaining construction permits for all sections of Baltic Pipe in all the countries it will pass through. Earlier, the complete set of administrative decisions had been obtained in both Poland and Denmark.

It is expected that activities at sea will begin in the second half of 2020, with the launch of pipeline pre-lay route surveys. Vessels preparing the seabed for pipeline installation will be mobilized in the Baltic in the first half of 2021, according to the current schedule. The laying of the pipeline is currently scheduled to start in summer 2021, with final handover for operation in October 2022.

The Baltic Pipe will help Poland reduce its reliance on Russian gas and could potentially also allow the country to emerge as a regional gas hub that routes excess gas supplies to central and Eastern Europe. However, considering the completion date of October 2022 is only three months before the expiration of the supply agreement with Gazprom, its timely completion will be critical in order to fully implement the switch from Russian gas at this time.

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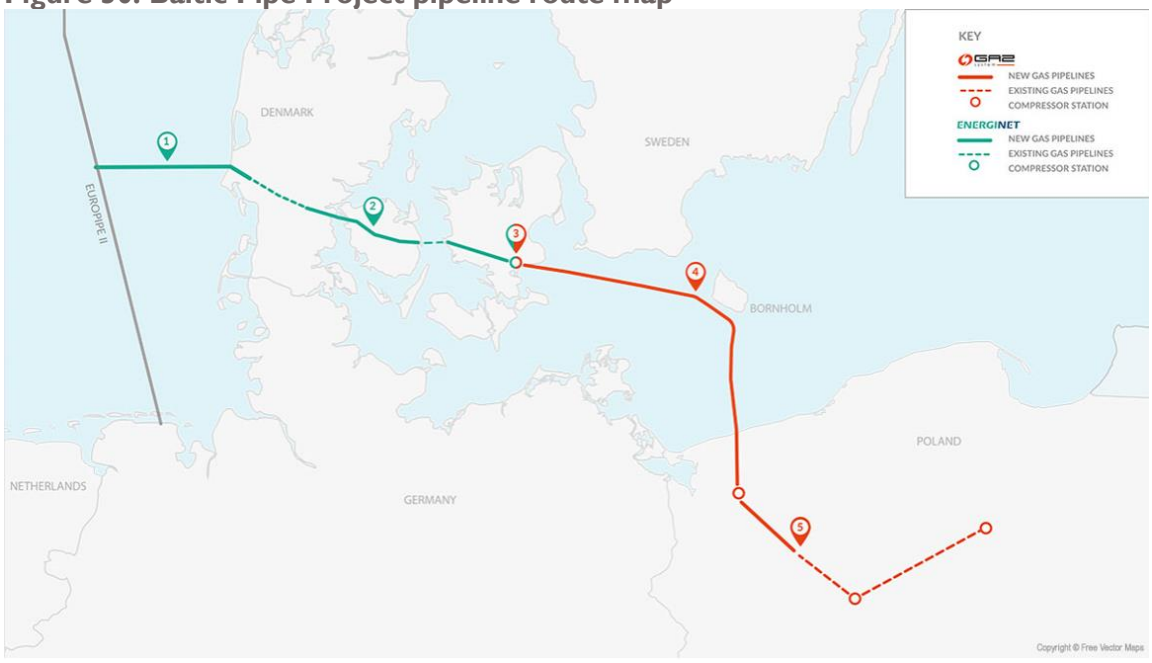
[42] 'About the Baltic Pipe Project,' Baltic Pipe website, https://www.baltic-pipe.eu/about/.
[43] 'Gaz-System selected pipelay contractor for Baltic Pipe offshore,' Baltic Pipe News, May 4, 2020, https://www.baltic-pipe.eu/gaz-system-selected-pipelay-contractor-for-baltic-pipe-offshore/.
[44] 'Gaz-System holds all construction permits for Baltic Pipe project,' Baltic Pipe News, May 11, 2020, https://www.baltic-pipe.eu/gaz-system-holds-all-construction-permits-for-baltic-pipe-project/.

Figure 30: Baltic Pipe Project pipeline route map

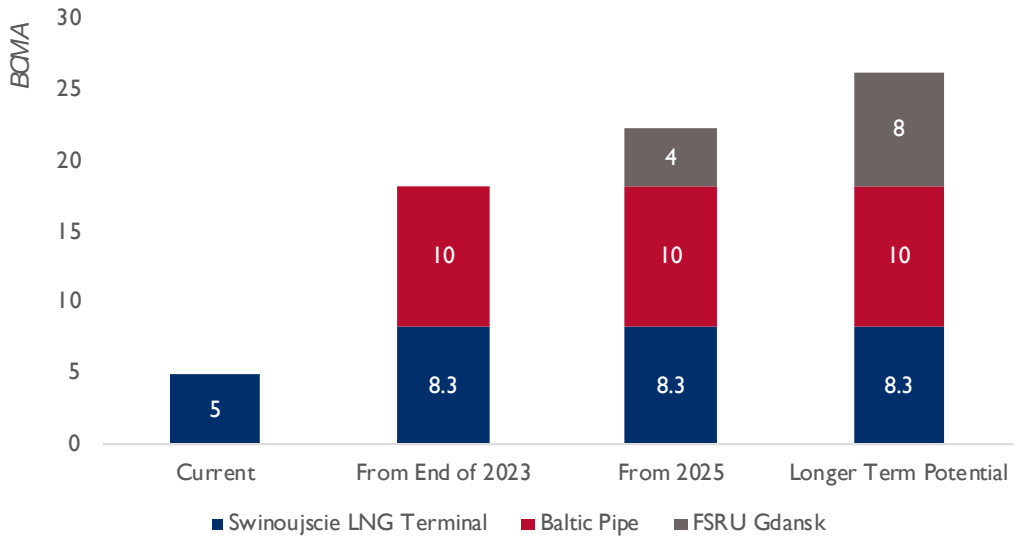


Source: Baltic Pipe Project

2.2.1.5 SUMMARY OF POLAND'S GAS IMPORT CAPACITY DIVERSIFICATION

Poland has ambitious plans to entirely redesign its import sourcing compared to its historical reliance on Russian gas. In order to achieve this goal, multiple import projects are in development over the next decade (particularly in the early 2020s) that are intended to enable Poland to cease Russian gas imports at the end of the Yamal supply agreement expiring December 31, 2022. Figure 31 demonstrates the expected timeline of these import projects and showcases how Poland may be able to replace its current approximately 9 bcma of imports from the east.

Figure 31: Overview of Polish import capacity development from LNG and Baltic Pipe



Source: ESP

2.2.2 POLAND'S AMBITION AS AN EASTERN AND CENTRAL EUROPEAN GAS HUB

Poland's ultimate ambition in growing its import capacity is not solely to replace consumption of Russian gas with Norwegian and LNG imports, but also to make Poland a distributor of gas in eastern and central Europe.

With regional gas supply security and the development of a competitive gas market across the region, multiple interconnection projects are being implemented between these nations. This includes the Poland-Slovakia gas interconnection, which is an important part of the North-South gas interconnections in the Central Eastern and South-Eastern Europe (NSI East Gas) Project. Additionally, the Gas Interconnection Poland-Lithuania (GIPL) carries PCI status, with the aim of integrating the Baltic gas market with the rest of Europe. At the same time, work has been ongoing for constructing interconnectors between Poland and the Czech Republic and between Poland and Ukraine (with the potential for greater usage of the gas storage facilities in western Ukraine).

2.2.2.1 POLAND-LITHUANIA INTERCONNECTOR (GIPL)

GIPL is a gas pipeline project implemented by AB Amber Grid of Lithuania and Gaz-System S.A. of Poland. The pipeline will run from the Jauniūnai compressor station (Lithuania) to the Hołowczyce compressor station (Poland) and will allow flows in both directions. It will have interconnection capacities of 2.4 bcma from Poland to Lithuania and 1.9 bcma in the opposite direction. The total length is approximately 343 km in Poland and 165 km in Lithuania. Construction began in January 2020 and the current timeline indicates that the pipeline will be operating by the end of 2021.[45]

Figure 32: GIPL map

Source: Gaz-System

In general, the Baltic countries and Finland can only receive pipeline gas from Russia. The only access to alternative gas sources and suppliers in the region is LNG import via the Klaipėda FSRU in Lithuania, which started operating in 2014. Once GIPL is completed, Lithuania, other Baltic countries and Finland will be integrated into the EU gas transmission system. The estimated value of the GIPL

[45] 'Gas Interconnection Poland – Lithuania (GIPL),' Amber Grid, https://www.ambergrid.lt/en/projects/gas-interconnection-poland-lithuania-gipl.

project is €500 million. The project is financed by Gaz-System and Amber Grid and co-financed with a significant grant from the EU.

The project carries the status of an EU PCI and, along with the Baltic Pipe and the expansion of Świnoujście LNG terminal, is included in the initiative to connect the Baltic gas market to Europe.[46]

2.2.2.2 POLAND-SLOVAKIA INTERCONNECTOR

The Poland-Slovakia gas interconnection will be a high-pressure, bi-directional pipeline between the two countries. The Polish section will be 58 km long, while the Slovakian part will be up to 106 km long. On September 6, 2019, Gaz-System initiated the construction of the Polish section. The pipeline will connect the gas node in Strachocina (Podkarpackie Voivodeship) with the Slovak compressor station in Velké Kapušany (on the border with Ukraine). Commissioning is expected in early 2022, after which the capacity toward Poland will be 5.7 bcma and that toward Slovakia will be 4.7 bcma. The gas pipeline diameter will be 1,000 ESP, with an operating pressure of 8.4 MPa.[47]

The connection of the Slovak and Polish gas transmission systems has been designated an EU PCI and as such benefits from EU funding through the CEF program. The interconnection is a part of the EU energy infrastructure priority corridor NSI East Gas.[48]

Figure 33: Map with Poland-Slovakia interconnector shown in dashed blue

Source: Eustream

2.2.2.3 POLAND-CZECH REPUBLIC INTERCONNECTOR

Initially, the project aimed to add a capacity of 6.5 bcma toward Poland and 5 bcma toward the Czech Republic and was due in 2023. However, the Czech Gas TSO, Net4Gas, indicated in its recently published 2021-2030 development plans that it has shelved the Czech-Polish pipeline project, STORK II. The project has now been replaced by a smaller potential interconnection raising capacity from Poland, which may come online in 2027/2028. "The current 10-year plan does not

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[46] "Gas Interconnection Poland – Lithuania (GIPL): Backbone of Regional Market Development," Gaz-System S.A. presentation, http://www.lsta.lt/files/seminarai/140226_Lenkijos%20ambasada/Pranesimai/04_sek_-_gipl.pdf.
[47] 'Construction of a gas interconnection between Poland and Slovakia,' Gaz-System, https://en.gaz-system.pl/fileadmin/pliki/open-season/02_CONSTRUCTION_OF_A_GAS_INTERCONNECTION_BETWEEN_POLAND_AND_SLOVAKIA.pdf.
[48] Project of common interest (PCI) No. 6.2.1: Poland – Slovakia Interconnection, Eustream, https://www.eustream.sk/en_transmission-system/en_pl-sk-interconnector/en_project-of-common-interest-pci.

expect the STORK II project in their earlier planned form, mainly because it is not included in the European list of projects of common interest at the moment," Net4Gas said. Net4Gas has been focusing its investment on other parts of its gas infrastructure to increase the volumes it can accommodate from north Germany, especially once Nord Stream 2 begins to transport gas.[49]

2.2.3 SUMMARY OF KEY PROJECTS AND DEVELOPMENTS IN POLAND

Natural gas supply sources and routes in Eastern Europe are beginning to evolve, particularly in Poland. The first major step toward diversification of Poland's gas imports was made possible following the construction of the Świnoujście LNG terminal at the end of 2015, offering a capacity of 5 bcma.

In 2016, Gazprom accounted for 89 percent of total Polish gas imports, but in the following years deliveries from Russia fell, with growth in LNG imports supported by declining LNG prices. LNG imports from the United States, Qatar, and Norway reached 3.43 bcm in 2019, while Russia's share of Poland's natural gas imports declined to 60 percent.

The Polish government has made clear that when the long-term supply contract with Gazprom (which stipulates a minimum take-or-pay volume of 8.7 bcma) expires at the end of 2022, Poland will expect to cease importing gas from its eastern border. Instead, the country will look to the new infrastructure projects of the Baltic Pipe, Świnoujście LNG terminal expansion, and the available volumes from its southern and western borders, which have been established over the last decade, to enable a full transition from its historical Russian energy dependency.

LNG has seen meaningful growth in imports to Europe in recent years, and with the expansion of the Świnoujście terminal in Poland in the early 2020s and the prospect of an FRSU on its Baltic coast in the latter half of the decade, it is possible that Poland will emerge as a hub via which its neighbors can source new global gas imports.

With regional gas supply security an important consideration and the development of a competitive gas market across the region, multiple bi-directional interconnection projects are being implemented that will support the flows of gas in the region. This includes the Poland-Slovakia gas interconnection and the GIPL, which aims to integrate the Baltic gas market with the rest of Europe. However, there are no evident plans available in PL TYNDP or elsewhere to create firm capacities towards Ukraine.

2.3 UNDERGROUND GAS STORAGE

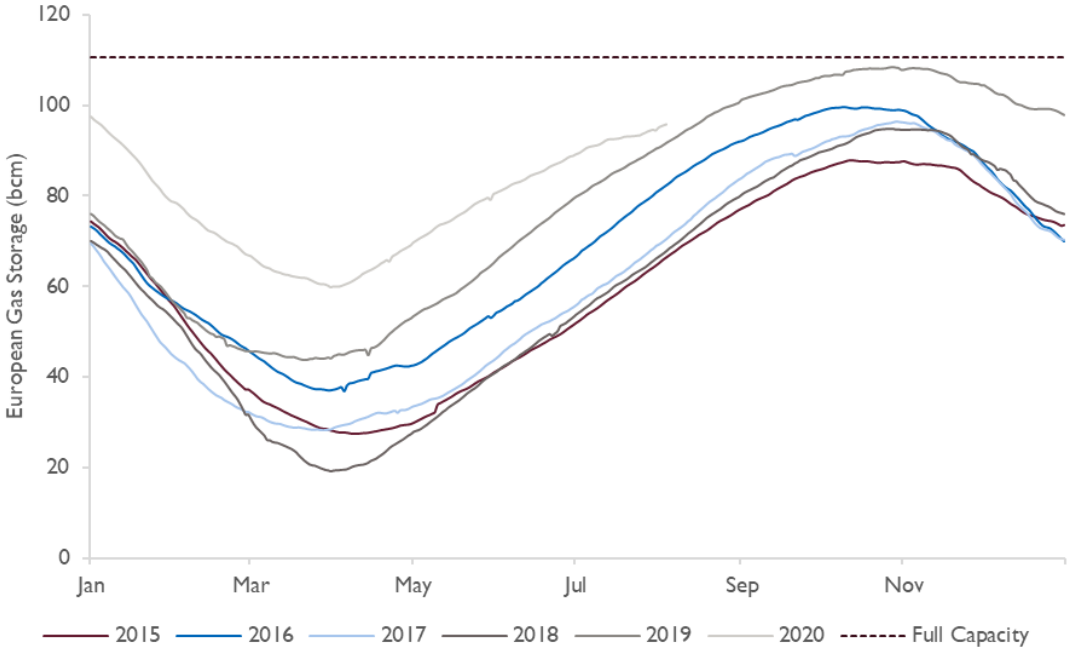
Levels of gas held in European storage facilities are at record highs and have been since 2019, when injection into storage across Europe was boosted by fears that Ukraine and Russia might not have reached an agreement on transit, with the previous agreement expiring at the end of 2019. This caused European customers that relied on gas supplied via Ukraine to ensure the security of supply in case gas flows were severely limited at the beginning of 2020. Although this excess storage led to higher withdrawals in the first quarter of 2020, storage stocks remained at a record high level at the end of March.

Later that year, the economic impact of the COVID-19 pandemic and national lockdowns across Europe reduced demand for natural gas, which resulted in an oversupplied market. In response,

[49] 'Net4Gas scales back Poland, Austria interconnector plans," Reuters, July 16, 2020, https://www.reuters.com/article/us-net4gas-pipelines/net4gas-scales-back-poland-austria-interconnector-plans-idUSKCN24H1XK.

injection into gas storage was utilized instead of significant reductions in pipeline gas imports, meaning that storage in Europe has been heading toward capacity. This growth in storage volumes in 2020 occurred earlier than the typical peak in late October at the beginning of the heating season.

Figure 34: European gas storage volumes



Source: GIE / ESP Analysis

At the beginning of the 2019 heating season in Europe, the gas storage volume (about 110 bcm) reached up to 98 percent of total capacity. In 2020, with storage piling up from the previous year and the decline in gas consumption due to COVID-19, storage levels remained much higher than in previous years. At the minimum, 53 percent of storage capacity was still full in mid-March 2020, while in the same season last year storage fell to 40 percent of capacity (and has reached below 20 percent in previous years). As of July 2020, 80 percent of capacity was already full. Hence, in 2020, gas storage in Europe is likely to be full even earlier than the usual peak season.

With markets oversupplied, UTG (SSO which manages storage in Ukraine) and UA GTSO have been encouraging traders to place volumes in Ukrainian storage by offering discounted transportation tariffs and a "customs warehouse" arrangement to exempt stored gas from customs duties. The virtual reverse agreements that have been put in place on many of the cross-border points have also enabled the movement of gas from Europe to Ukraine by effectively increasing Ukraine's import capacity.

It is widely viewed that these changes made it more likely that substantial volumes of European gas would be injected into Ukrainian storage during the summer of 2020, above the volumes typically held in Ukraine for seasonal balancing on the domestic market. This would not only help to ease the oversupply situation in Europe but could also hasten the integration of the Ukrainian and European gas markets.[50]

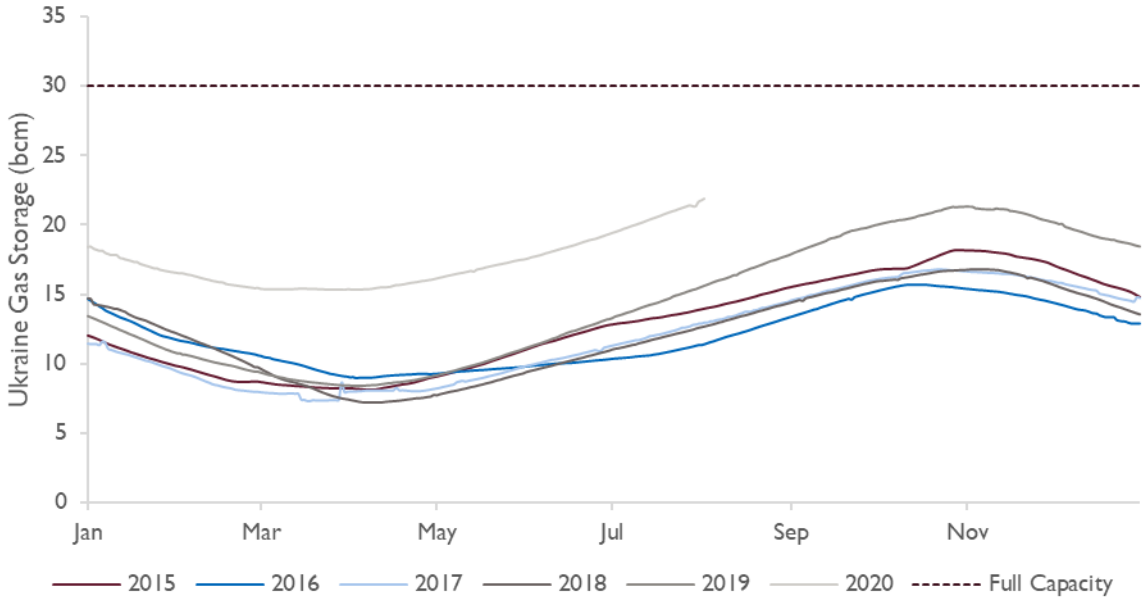
[50] 'European gas storage: backhaul helps open the Ukrainian safety valve', The Oxford Institute for Energy Studies, May 2020.

2.3.1 UKRAINIAN STORAGE

While the general trend in Ukrainian gas storage levels is similar to the rest of Europe, the utilization rate sets it apart. Until 2020, utilization ranged from a minimum of 23 percent to a maximum of 70 percent in November 2019. While storage units in many of the neighboring countries were nearly 100 percent full in the same season, Ukraine had a remarkably high volume still available – with a total capacity at 30 bcm. Given the current trends, Ukraine will have record-high utilization in the peak season of 2020.

As of August 2020, 74 percent of the storage capacity in Ukraine is being used, which is more than the usual peak season in previous years. However, even with this utilization, Ukraine is still likely to have the greatest storage capacity available in Europe this year. Levels held at the beginning of May 2020 were already approaching the amount stored at the peak periods in 2017 and 2018 when volumes were under 17 bcm. Comparison to the levels in 2019 is distorted due to the market response to transit disruption fears, but even then, volumes held at the start of August 2020 already exceeded the 2019 peak. With Naftogaz not intending to import gas for Ukraine in the summer of 2020, most of the storage capacity remaining is available to store gas from other European countries.

Figure 35: Ukrainian gas storage volumes



Source: GIE

Since May 2020, the rising volumes of stored gas in Ukraine are primarily stored by non-Ukrainian customers and, given the vast storage capacity, this service will likely still be available until the beginning of the heating season. While the unique dynamics of the gas storage market in Europe have resulted in unprecedented utilization of Ukrainian storage, it is a good opportunity to demonstrate the value of storing gas in Ukraine.

2.3.2 UKRAINIAN INCENTIVES FOR STORAGE USE

Given the high utilization of gas storage in Europe, at times reaching close to capacity, measures Ukraine has taken in recent years to promote the use of the country's UGS have had an impact. In April 2019, UTG set up the customs warehouse facility where it stores imported volumes, for up to three years, net of taxes and customs duties (saving 20 percent import VAT). Both residents and

non-residents of Ukraine may store gas under this regime. The storage tariff for the customs warehouse is €0.82 /MWh and is the lowest in Europe.[51]

On January 1, 2020, UA GTSO launched a short-distance gas transportation service that provides discounted tariffs for the transportation of gas between the border and UGS facilities.

Additionally, in April 2020 the Slovakian TSO announced unspecified discounts of up to 40 percent on tariffs when exit and reentry capacity is booked on the Slovakia-Ukraine border.[52]

"Short-haul" is a service that enables traders to access a discounted transmission rate between dedicated interconnection points between adjacent countries. More often, foreign traders use short-haul service for gas transportation to Ukrainian underground storage facilities. Using cross-border interconnection points in western Ukraine, they receive attractive transportation discounts. Since they were introduced earlier this year, offering short-haul services has helped Ukraine to attract record interest from foreign companies. In February 2020, non-resident companies transported 15 mcm to UGS under these tariffs, 59 mcm in March, and 225 mcm in April.[53] In August 2020 alone, 2 billion cubic meters of gas were short-hauled into Ukraine.[54]

According to UA GTSO, in the first half of 2020, 3.7 bcm of imported volumes were transferred to UGS facilities to be stored in the customs warehouse, including 49 percent (or 1.8 bcm) in short-haul mode. During this period, the share of imports in short-haul mode amounted to 26 percent of the total volume of imported gas to Ukraine.[55] Since then, the share of short-haul has increased, particularly since July 1 and the initiation of the VIP.

2.3.3 FLOWS FROM EUROPE TO UKRAINE

While Ukraine has very large storage facilities, the capacities available for gas flow across its western borders to transport the gas are not as extensive. The capacity to import from the western direction was only developed after 2014 when Ukraine was seeking to diversify from Russian gas, formerly its sole source of gas imports. Ukraine only imports gas for consumption from its western borders via Slovakia, Poland, and Hungary.

The capacity available for European customers who wish to transport gas to Ukraine for injection into the vast UGS facilities depends on the cross-border technical and commercially available capacity as well as the competition from Ukrainian companies importing for domestic consumption.

Following the end of the previous transit agreement in Ukraine between Naftogaz and Gazprom, as of 2020, new interconnection agreements can be made with EU neighbors to enable virtual reverse

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[51] "1.4 billion cubic meters of natural gas stored in Ukrainian UGS in customs warehouse regime," UTG News, August 2, 2019, http://utg.ua/en/utg/media/news/2019/1-4-billion-cubic-meters-of-natural-gas-stored-in-ukrainian-ugs-in-customs-warehouse-regime.html.
[52] 'European gas storage: backhaul helps open the Ukrainian safety valve,' The Oxford Institute for Energy Studies, May 2020.
[53] 'In January-April 2020 gas injection into UGS increased by 33%,' UTG News, 13th May 2020, http://utg.ua/en/utg/media/news/2020/in-january-april-2020-gas-injection-into-ugs-increased-by-33-percent.html.
[54] 'Ukraine gas market should focus on three goals to build on success ERU,' Independent Commodity Intelligence Services, September 29, 2020, https://www.icis.com/explore/resources/news/2020/09/29/10557622/ukraine-gas-market-should-focus-on-three-goals-to-build-on-success-eru
[55] 'Operation Results of the Gas TSO of Ukraine for the first half of 2020,' UA GTSO News, July 24, 2020, https://tsoua.com/en/news/operation-results-of-the-gas-tso-of-ukraine-for-the-first-half-of-2020/.

flows ("backhaul") in line with European rules. Instead of flows in two directions, where virtual flows are enabled, the net of these flows is transferred physically across the border.

In the first half of 2020, this was implemented on the Polish, Slovakian and Hungarian borders. Since then, single virtual interconnection points (VIPs) have been created with Hungary and then Poland to increase convenience for traders with the use of a transparent mechanism for capacity allocation using auctions on certified platforms. UA GTSO has found that demand for the new service has been growing throughout the first half of 2020. [56]

In the first six months of 2020, natural gas imports from the EU to Ukraine reached 7 bcm, an increase of 1.4 bcm from the same period in 2019. These import volumes include the virtual reverse of 1.7 bcm, of which 1.2 bcm is from Hungary and 0.5 bcm from Poland.[57]

2.3.3.1 CAPACITY FOR IMPORTS AND STORAGE AT THE WESTERN BORDER

The majority of Ukraine's physical imports from Europe are sourced from Slovakia and cross the border at the Budince IP. This is a single-direction border crossing from Slovakia into Ukraine and enters in proximity to the Dolina-Uzhhorod-Derjkordon (DUD) pipelines and transit pipelines of Urengoy-Pomary-Uzhhorod (UPU), Progress, and Soyuz. Eustream indicates that this IP has a firm exit capacity of 27 mcm/d and an interruptible capacity of 13 mcm/d, giving a total of 40 mcm/d. UA GTSO reports firm entry capacity of 27 mcm/d and interruptible capacity of 15.5 mcm/d, totalling 42.5 mmcm/d. On the Slovakian border, UA GTSO signed a new interconnection agreement with Eustream on December 31, 2019, which came into effect on January 1, 2020.

On the border between Ukraine and Poland, the Drozdovichi IP transports gas from Ukraine to Poland and the Hermanowice IP operates in the reverse direction. At Hermanowice, Gaz-System indicates an interruptible (conditionally firm) capacity between 4.2 and 6.3 mcm/d. Ukrainian imports at Hermanowice were reported by Gaz-System as 0.6 bcm in 2018 and 1.3 bcm in 2019. Gaz-System has indicated virtual reverse flow at Hermanowice up to the original forward flow capacities and a virtual reverse flow capacity at Drozdovichi of approximately 8.4 mcm/d.

On the Ukraine-Hungary border, the Beregovo IP transports gas from Ukraine to Hungary, with the Beregdaroc IP in the reverse physical direction. UA GTSO reported in the 2020-2029 TYNDP that Beregovo has a technical capacity of 40.2 mcm/d from Ukraine to Hungary and 17.1 mcm/d in the reverse direction via Beregdaroc. On May 1, 2020, it is understood that the IPs on the border between Hungary and Ukraine were unified into a single VIP called Bereg in accordance with a virtual flow agreement. Under the new agreement, 45.5 mcm/d of firm capacity and a further 40.5 mcm/d of interruptible capacity will be available from Ukraine to Hungary, coupled with 86 mmcm/d of interruptible capacity from Hungary to Ukraine.[58]

Both the Polish and Hungarian virtual IPs are implemented according to the CAM network code and use an auction-based capacity allocation mechanism via booking platforms.

The potential opportunities brought about by signing virtual flow agreements have already been demonstrated, the majority of flows to storage from Poland and Hungary were via virtual reverse.

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[56] 'Operation Results of the Gas TSO of Ukraine for the first half of 2020,' UA GTSO News, July 24, 2020, https://tsoua.com/en/news/operation-results-of-the-gas-tso-of-ukraine-for-the-first-half-of-2020/.
[57] 'Gas imports to Ukraine increased by 24% in the first half-year of 2020,' UA GTSO News, July 1, 2020, https://tsoua.com/en/news/gas-imports-to-ukraine-increased-by-24-in-the-first-half-year-of-2020/.
[58] 'Ukrainian and Hungarian TSOs establish single virtual interconnectionr point "Bereg,"' UA GTSO News, April 29, 2020, https://tsoua.com/en/news/ukrainian-and-hungarian-tsos-establish-single-virtual-interconnection-point-bereg/.

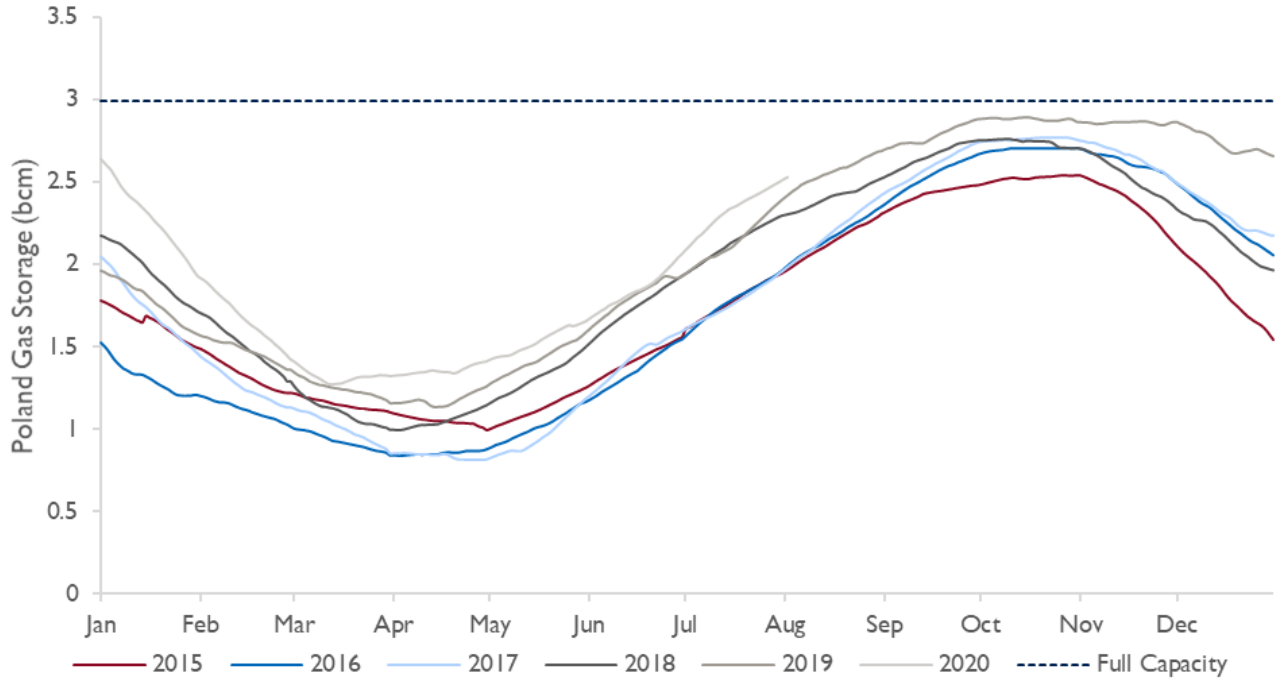
The addition of backhaul agreements with Eustream, FGSZ, and Gaz-System has vastly increased the virtual reverse capacity, with virtual reverse agreements up to about 100 mcm/d. However, and crucially, this is on an interruptible basis. In reality, not all of this interruptible virtual reverse will be available, because the maximum virtual flow available is the forward flow of transit gas from Ukraine to each border IP.

The stated capacities of the interconnectors between Ukraine and its neighbors Slovakia, Hungary, and Poland indicate that capacity from Poland to Ukraine is much more limited than at the other points. It is also the case that if there is no forward flow from Ukraine to Poland, the physical reverse capability is limited. However, the Budince point at the border with Slovakia should enable firm flow to Ukraine of approximately 9.5 bcma, with additional conditional capacity also bookable. The stated technical capacities of the interconnectors with Slovakia and Hungary suggest that assuming no disruptions to operations and availability of gas supply from the respective transmission systems of these neighbors, capacity at the interconnectors would enable Ukraine to import sufficient volumes to meet domestic requirements. Further study would be required to determine whether there are similar limitations, as is the case of supply gas from Poland at these two points in the event that transit flows to Slovakia and Hungary cease.

2.3.4 POLISH GAS STORAGE

Poland uses its gas storage facilities, which cooperate with the GTS, to play an important role in covering the seasonal and daily fluctuations in gas demand.

Figure 36: Polish gas storage utilization



Source: GIE / ESP Analysis

Following the general European trends, Polish storage capacity was almost full in October 2019. 2020 utilization levels did not differ as drastically as in the neighboring countries because Polish gas storage typically operates close to capacity at the beginning of the heating season. As of August 1,

utilization of the UGS in Poland was at 84 percent and as of August 31, it was at 98 percent, demonstrating that stocks reached storage capacity before the normal end of the injection period.

2.3.5 FOCUS ON FLOWS BETWEEN POLAND AND UKRAINE

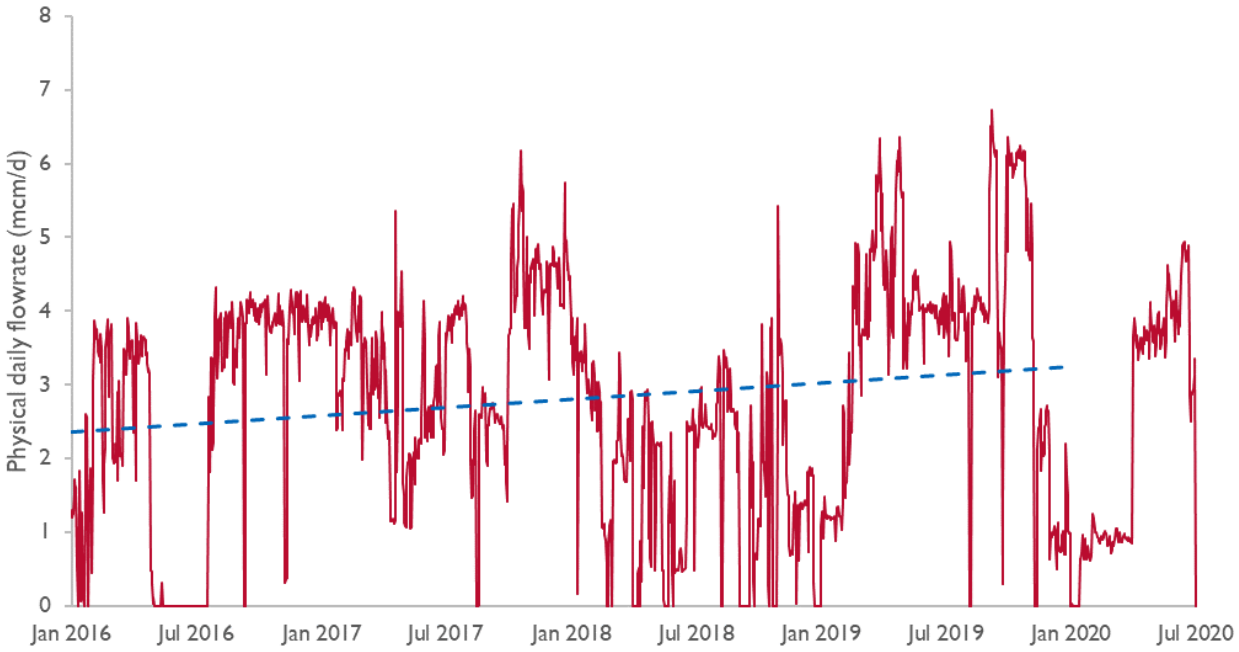
At the border point between Poland and Ukraine, there are two physical interconnection points. Drozdovichi provides physical flow from Ukraine to Poland and has existed since the 1940s on the gas transmission pipeline from Lviv to Stalowa Wola. It has been providing transit gas from Russia to Poland. Gaz-System reports a firm capacity of 12 mcm/d at this point and UA GTSO has indicated that the point has a technical capacity of 14.5 mcm/d. The other interconnection point is Hermanowice, which was commissioned at the beginning of the 21st century and has provided physical reverse flow from Poland to Ukraine since 2012 when Ukraine was forced to ensure an alternative supply of gas. Flow is offered on an interruptible conditionally firm basis at 6 mcm/d from September to April and 4.1 mcm/d from May to August. The stations are linked by three parallel pipelines, with one out of the three linking both stations.

Since January 1, 2020, virtual reverse capacity has also been available at these points. At Hermanowice, this has been equal to the forward bookable capacity, while Drozdovichi has a virtual reverse capacity of approximately 8.4 mcm/d. From July 1, 2020, these two IPs have been combined into a single virtual interconnection point (VIP) called GCP Gaz-System/UA GTSO with a new interconnection agreement between the two countries. While the physical flow has moved from Ukraine to Poland via Drozdovichi because the transit of Russian gas exceeds imports to Ukraine and Polish utilization of UGS in Ukraine, for virtual flow from Poland, "the condition of continuous transmission on the interruptible conditional firm basis on GCP Gaz-System/UA GTSO exit points depends on the delivery of gas at an appropriate level to entry point GCP Gaz-System/UA GTSO." This means that in case there is no flow from Ukraine to Poland, the Polish TSO cannot guarantee that it will be able to provide any capacity to Ukraine on a firm basis.

While it may be possible to technically conduct physical flow from Poland to Ukraine, depending on the hydraulics of the Polish GTS, the level of such capacity is only approximately 1.5-2 mcm/d.

Crucially, this flow is not backed by any agreements, as the current interconnection agreement does not specify such an option. This means that capacities from Poland to Ukraine are interruptible only in the case where there is no flow from Ukraine, so there is a high probability that it will not be possible to guarantee flows in such a situation.

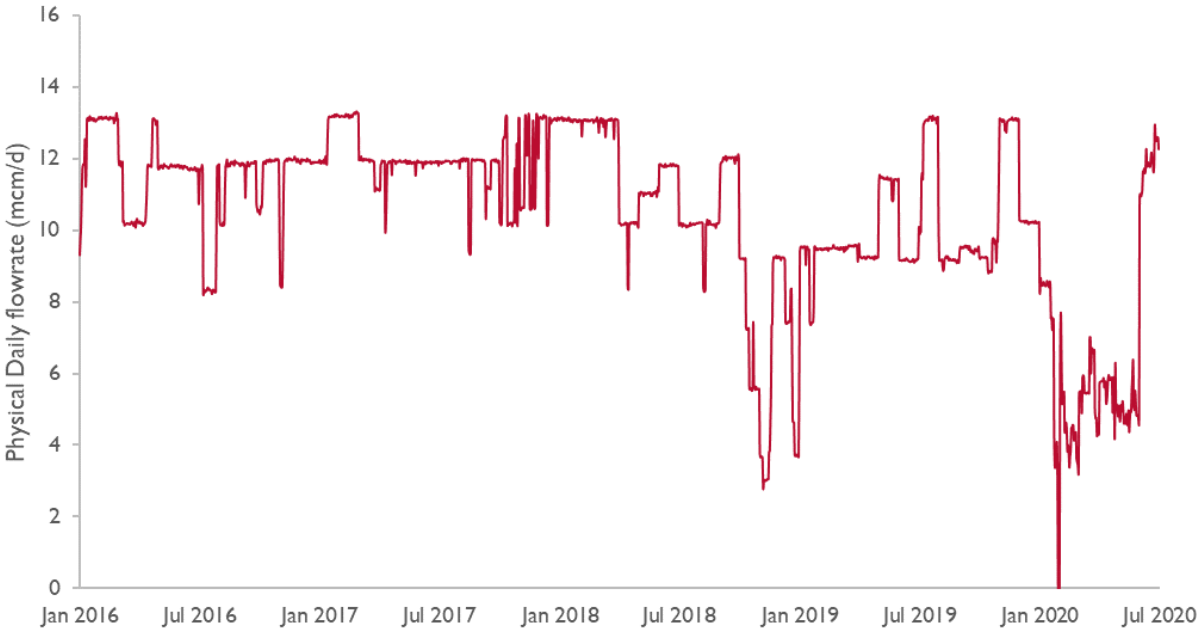
Figure 37: Daily physical flows from Poland to Ukraine via Hermanowice up to initiation of the VIP in July 2020



Source: ENTSOG / ESP Analysis

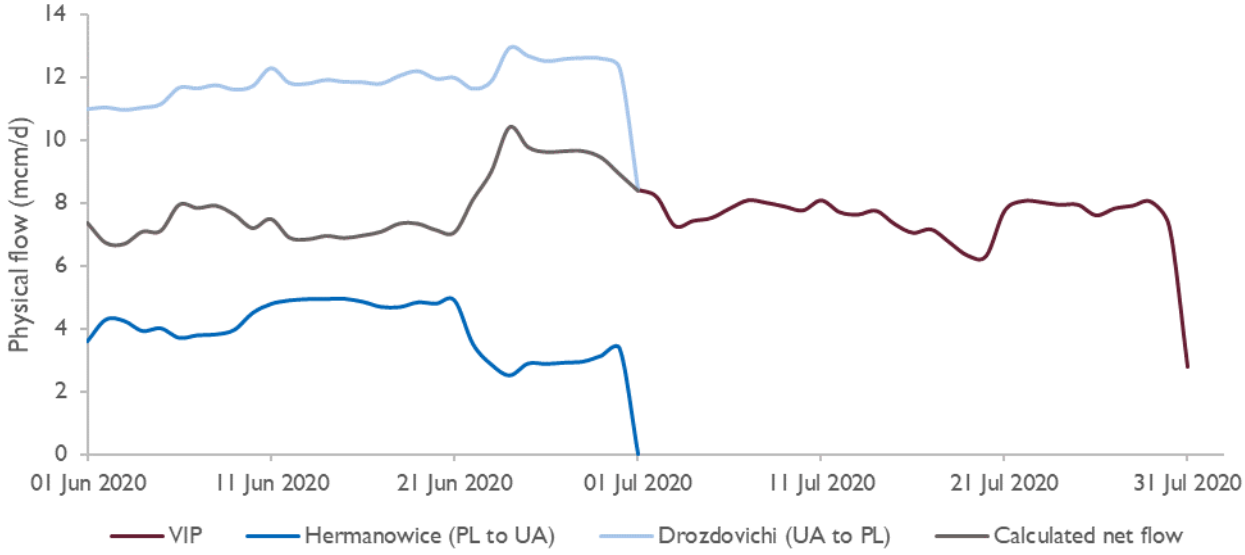
Figure 37 shows physical flows from Poland to Ukraine. Up until January 2020, there was no option for virtual reverse, and the trendline from January 2016 to the end of 2019 shows that, on average, these flows have been rising. UA GTSO stated that, prior to 2020, very minimal flows were injected into storage via this route and so this rise is likely due to the increase in Ukrainian imports from this direction. From January 2020, the volumes fell drastically, which was caused by the new interconnection agreement that allowed volumes to be retained by backhaul rather than physically flowing from Ukraine to Poland. This is also visible in Figure 38, which shows that physical flows from Ukraine to Poland fell in January 2020 as virtual reverse volumes were retained in Ukraine. Since the July 1 initiation of the VIP, physical flow only passes from Ukraine to Poland via Drozdovichi. This is explained graphically in Figure 39, which shows how the physical flow is calculated based on the net of the two flow directions.

Figure 38: Daily physical flows from Ukraine to Poland via Drozdovichi up to initiation of the VIP in July 2020



Source: ENTSOG / ESP Analysis

Figure 39: Physical flows at Hermanowice and Drozdovichi becoming virtual flows in a single direction from Ukraine to Poland

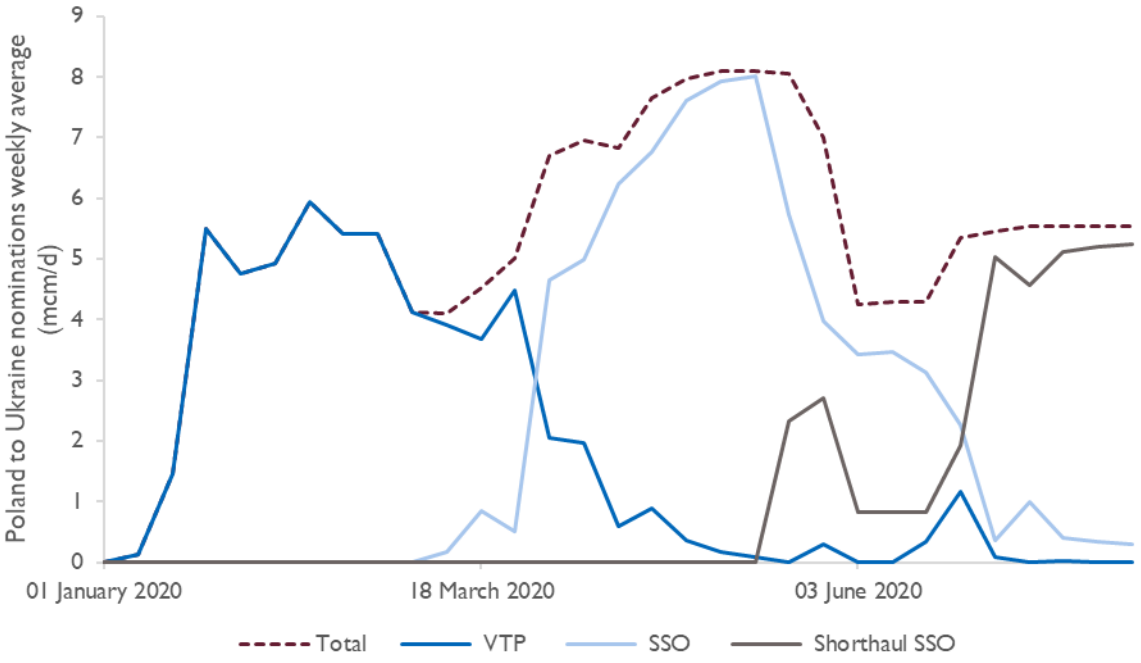


Source: ENTSOG / ESP Analysis

Figure 40 shows the nominations by traders to deliver gas from Poland to Ukraine. VTP is assumed to represent imports to Ukrainian customers, primarily for domestic consumption. "SSO" and "Short-haul SSO" are both deliveries to Ukrainian UGS: "Short-haul SSO" are those flows that have been booked under the short-haul service offered by UA GTSO whereby shippers receive a reduced transportation tariff across the GTS. In the first few months of the year, bookings for imports to Ukraine continued to be slightly higher than in previous years. Imports then drop off significantly from mid-March 2020 and have been very low throughout the summer.

For the first time, this has been replaced by significant booking for storage use by Polish shippers. Initially, these bookings for storage were not allocated using the short-haul service but still peaked at approximately 8 mcm/d, higher than any of the physical flows at Hermanowice in the last five years. From July 1, the daily bookings for the short-haul service surpassed standard transit to storage and throughout July the flows averaged 5 mcm/d. This detail clarifies how the two services have been utilized and provides a benchmark for the size of flows into gas storage from Poland in scenarios where the storage capacity is saturated elsewhere. While flow continues to pass from Ukraine to Poland, with transit flow exceeding these bookings to Ukraine, there is the capacity to further expand flows from Poland. However, there are potentially significant technical and regulatory challenges to overcome in the event that transit gas ceases to flow from Ukraine to Poland.

Figure 40: Nominations of gas from Poland to Ukraine by traders for 2020 until July 31, weekly basis for daily average[59]



Source: UA GTSO / ESP Analysis

2.3.6 GAS STORAGE SUMMARY

The figures and trends discussed above show a clear picture of gas storage in the market. Across Europe, gas in storage is at record high levels, with the majority of countries' UGS facilities expected to be full sooner than would normally be expected if injection trends continue. Additionally, all of the countries described here come close to capacity even in "normal" years prior to the summer of 2019, since when gas storage has been consistently above the average due to a combination of the effect of transit fears in 2019 and COVID-19, which has reduced gas demand in Europe.

Table 5 summarizes the capacity in each of the countries described above and compares typical utilization on August 1 to utilization in 2020. With all UGS utilization higher than in previous years, it is clear that if supply and demand trends continue, storage will again reach capacity. Even in these unprecedented market conditions, Ukrainian storage utilization is significantly below the European

[59] Combination of physical flows through Hermanowice IP and virtual reverse/backhaul via Drozdovichi IP up to June 30, 2020. From July 1-31, these flows are virtual reverse/backhaul booked using the GCP GS/UA GTSO VIP.

average and is likely necessary to absorb the risk of entirely full storage in Europe heading into the heating season.

Table 5: Summary of gas storage in Europe / Eastern Europe

Country	Capacity (bcm)	Average Storage Utilization on August 1, (2015-2018) (%)	Storage Utilization on August 1, 2020 (%)
Germany	22.7	66	89
Czech Republic	3.6	74	89
Hungary	6.9	44	86
Poland	3.0	75	84
Slovakia	3.6	54	90
Ukraine	30.9	40	73
Europe	110	65	86

Source: GIE / ESP Analysis

The analysis of each nation's storage facilities highlights Ukraine as the only one that consistently has significant volumes available, even at present when storage is close to full elsewhere. This demonstrates that only Ukraine can offer additional storage capacity both in circumstances where demand rises and in response to short-to-medium-term effects in the market. The incentives offered for European customers to store gas in Ukraine and the increased integration between Ukraine and its neighbors mean that it is increasingly, and certainly in 2020, becoming a more attractive option for traders.

2.4 FORECASTED CHANGE TO SUPPLY AND DEMAND

2.4.1 FORECASTED CHANGES TO THE UKRAINIAN MARKET

2.4.1.1 UKRAINIAN GAS DEMAND FORECASTS

The International Energy Agency (IEA) forecasts gas demand in Ukraine stagnating up to 2024. Following increases in the industrial and power sectors over recent years, further demand growth from these sectors in the medium-term is supported by GDP growth averaging above 3 percent. Consumption in the residential and commercial sector, however, is expected to continue to decline as gas prices rise, incentivizing fuel switching and energy efficiency investment. This will mitigate demand growth from industry and for power generation, with overall Ukrainian gas demand expected to stagnate over the forecast period.

UA GTSO has developed four local natural gas consumption and production scenarios, which are described in its 2020-2029 TYNDP. These represent short- and medium-term projects up to 2030 and are based in part on the ENTSOG scenarios. These scenarios reflect different approaches to assessing gas consumption in Ukraine based on different economic, social, and environmental scenarios for Ukraine's development. In assessing the scenarios, UA GTSO used Ukraine's Energy Strategy until 2035 to forecast the development of the energy market and identify key trends.

Each scenario is based on assumptions about key indicators such as the implementation of energy efficiency measures for each consumer category (population, heat generation and industry, etc.) and the evolution of the share of gas in the overall balance of primary energy consumption. For each scenario, key assumptions are shown in Table 6 below.

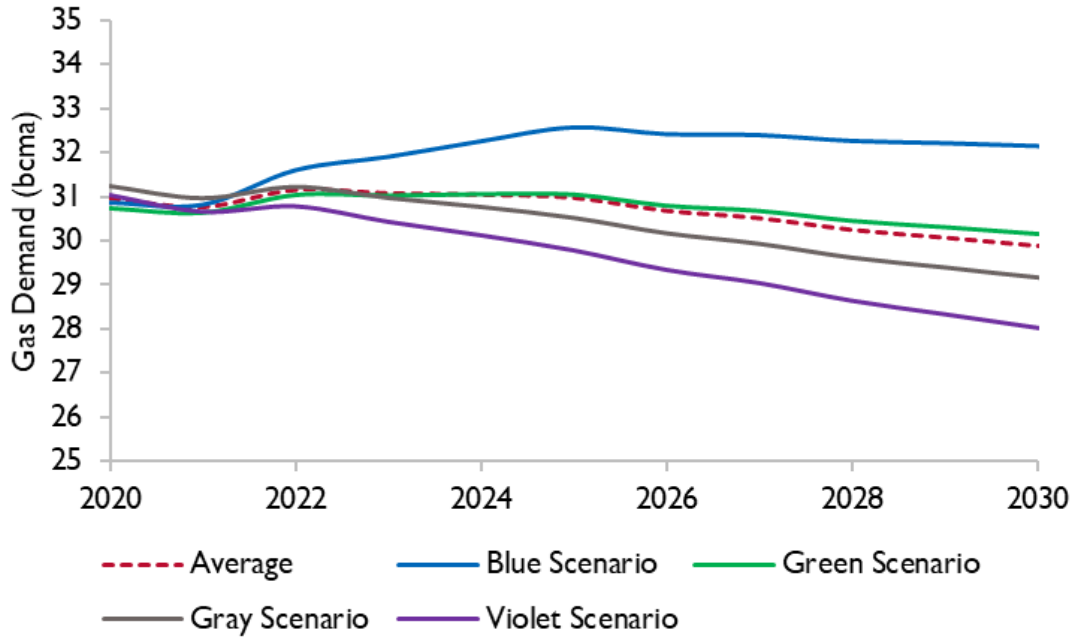
Table 6: UA GTSO TYNDP scenario overview

	Blue	Violet	Green	Gray
Economic Growth	Medium growth	High growth	High growth	Low growth
Energy efficiency measures	Medium growth	High growth	High growth	Low growth
Household gas consumption	Low reduction	High reduction	Significant reduction	Low reduction
Industry gas consumption	Significant growth	Reduction	Stable	Low reduction
Thermal generation	Significant reduction	Significant decrease	High reduction	Significant decrease
Applicable ENTSOG scenario	**National Trends**	**Distributed Energy**	**Global Ambition**	

Source: UA GTSO 2020-2029 TYNDP

According to the four scenarios the natural gas consumption ranges from 29.9 bcma to 32.7 bcma in 2025 and from 26.7 bcma to 31.8 bcma in 2035. The lowest level of consumption is observed under the Violet scenario and the highest under the Blue scenario, as shown in Figure 41 below.

Figure 41: Ukraine gas demand forecasts for each scenario (bcma)



Source: UA GTSO 2020-2029 TYNDP / ESP Analysis

In 2030, the projected annual gas consumption in Ukraine for each scenario is (compared to 30.6 bcma in 2018):

- Blue Scenario – 32.1 bcma
- Green Scenario – 30.2 bcma
- Gray Scenario – 29.2 bcma
- Violet Scenario – 28.0 bcma

In 2017, KPMG forecast that natural gas consumption will decrease by CAGR 0.3 percent up to 2035 due to increasing energy efficiency across all sectors, population decrease, and switch to alternative fuels such as biomass, countered by GDP growth.[60] Applying this rate to the 30.6 bcma consumed in 2018 would suggest approximately 29.5 bcma of consumption in 2030. This value is within the range proposed by the four scenarios, between the median scenarios (Green and Gray).

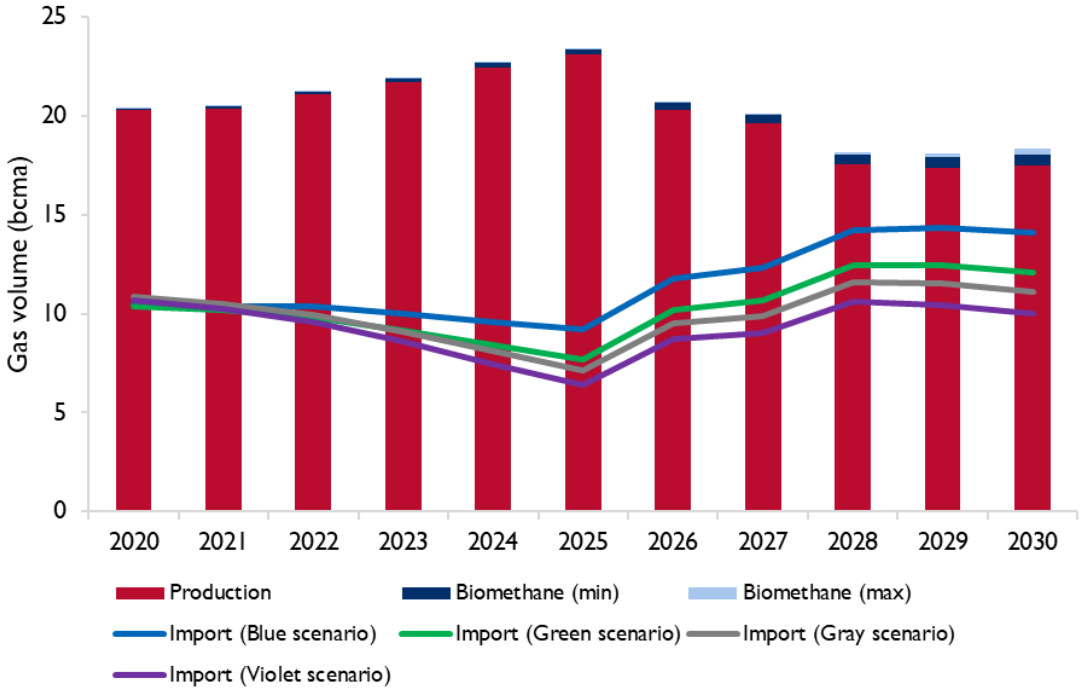
2.4.1.2 UKRAINIAN GAS SUPPLY FORECASTS

Gas production is one of the most strategically important elements of the Ukrainian economy. UA GTSO has developed projections for natural gas production on the basis of information provided by gas companies on their plans and projections for natural gas production by 2035. Figure 42 shows the gas production forecasts for Ukraine, as well as the import requirements based on the demand scenarios presented above. Production is forecasted to grow annually up to a peak in 2025, but never to exceed 23.5 bcma. After 2025, it is expected to decline to below 18.5 bcma for the rest of the period, including biomethane production.

Therefore, as has been the case historically, the volumes of natural gas production will not cover Ukraine's gas needs, so the existing deficit will be covered by imports (over one-third of gas demand in 2018 was supplied by imports). The import requirement varies over the forecasted period as both demand and production change somewhat independently. Depending on the scenario, the need for imported gas ranges across the decade from a minimum of 6.4 bcma in 2025 under the low-demand Violet scenario up to a maximum of 14.3 bcma in 2029 under the high-demand Blue scenario.

[60] 'Situation of the Ukrainian natural gas market and transit system', KPMG, April 10, 2017.

Figure 42: Gas supply to Ukraine (bcma)



Source: UA GTSO TYNDP 2020-2029

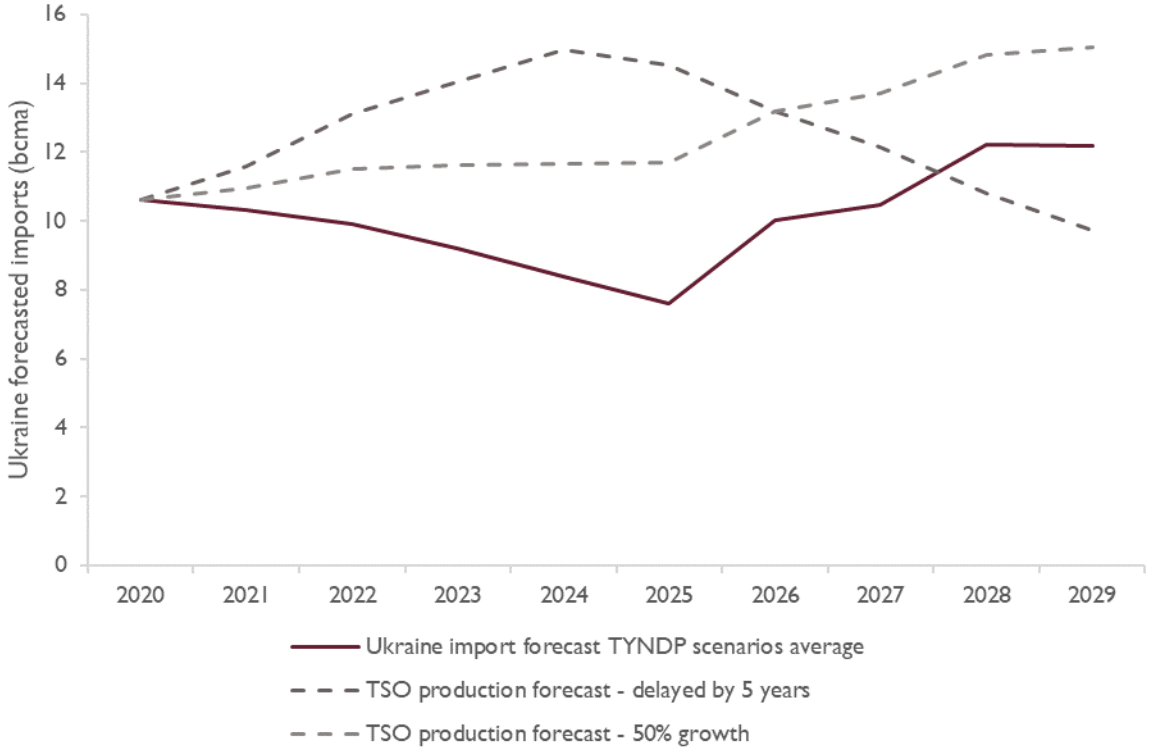
The production forecast profiles are provided by the gas producers in Ukraine and are adopted by UA GTSO for forecasting. While these forecasts are the basis for further analysis in this report, the growth in annual production between 2020 and 2025 is dependent on significant investment by the producers each year. Therefore, it is worth considering the potential impact if this forecasted production investment and growth is not realized.

Two additional production cases are compared to the four models shown in Figure 42 (which are based on a single production forecast). Assuming production from existing wells declines by 6 percent per year, a case is developed for a five-year delay in the growth of production, followed by a case where the growth is 50 percent of the value stipulated in the original production forecast. Figure 43 shows the result of this analysis.

The most significant observation is that if production does not rise as forecasted in 2020-2025, then there is the potential for a significant rise in total import requirements to Ukraine in these years. In these scenarios, the need for imports could reach around 15 bcma by 2024 in the case of delayed investment and growth of production, or 2029 if growth in production is 50 percent of what is forecasted.

The significance of this is that Ukraine may need to increase its imports from all sources and so the relative importance of import sources from an energy security perspective would grow. Additionally, as is shown in the delayed production growth case, the rise in imports in the latter half of the decade in the baseline import forecast may be pushed forward. Ukraine relies on EU imports, particularly from its border with Slovakia as well as volumes from Hungary, with a lower proportion from Poland. While transit of Russian gas via Ukraine to these countries and the enabling of virtual reverse flows provides increased import capacity, in the case of low or zero transit, with the upcoming expiration of the current transit agreement at the end of 2024, security of supply from the key import points on the Slovakian and Hungarian borders would be of increasing importance in addition to the interest in diversification of supply sources by imports via Poland.

Figure 43: Ukraine import forecasts - additional scenarios



Source: UA GTSO TYNDP / ESP Analysis

2.4.2 FORECASTED CHANGES TO THE POLISH MARKET

2.4.2.1 POLISH GAS DEMAND FORECASTS

The source of data for the Polish gas demand forecasts is the Gaz-System TYNDP for 2020-2029. The forecasts prepared by Gaz-System are for the period 2018-2040 and were developed for three scenarios: Moderate Growth, Optimal Growth, and Market Saturation. The basis factors identified as having the greatest impact on future demand for transmission gas will include production of electricity and heat from gas, GDP growth, and gas price.

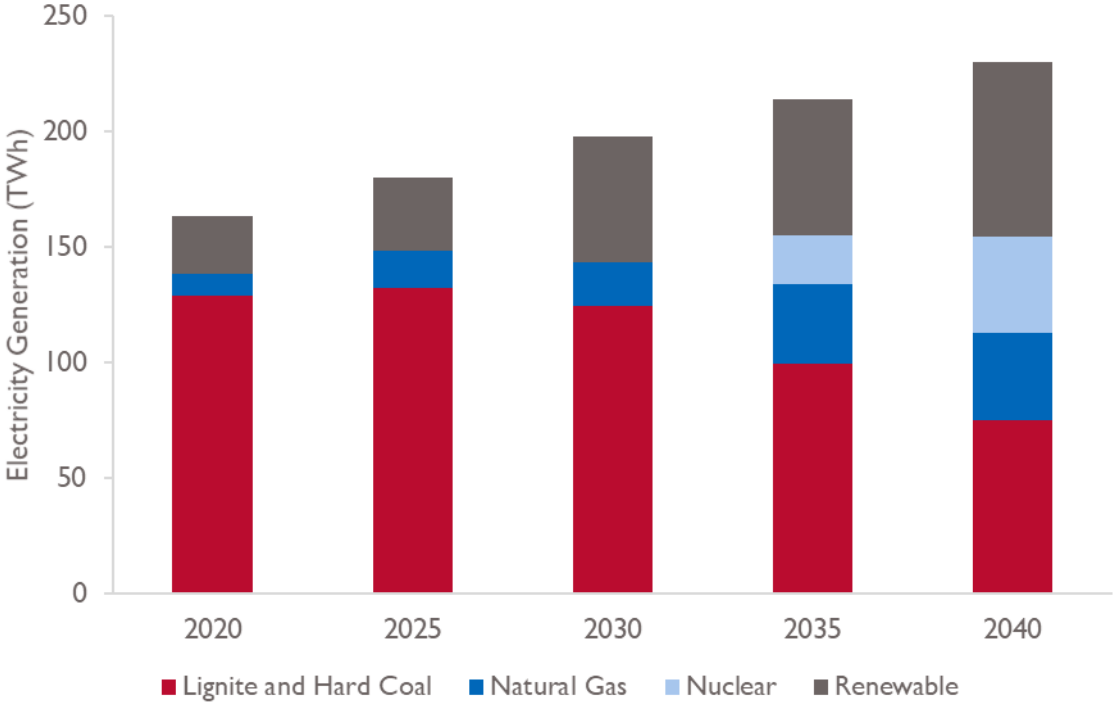
Table 7: Poland's gas demand forecast scenarios developed by Gaz-System

	Moderate Growth	Optimal Development	Market Saturation
Energy Production (Electricity and Heat)	Increase at the level arising from signed contracts and actually conducted investments	Increase at the level arising from signed contracts and most probable investments	Increase at the level arising from signed contracts and outcome of non-binding questionnaires
GDP	Low growth, a possible recession	Moderate growth, no recession	Moderate growth, no recession
Gas Price	Large increase due to high demand in EU (import from Russia)	Moderate increase, associated with wider access to common EU market and global LNG market	Moderate increase, associated with wider access to common EU market and global LNG market

Source: Gaz-System TYNDP 2020-2029

A key aspect of the forecasts developed in Poland is the potential for large growth in industrial customers using gas to produce electricity and heat. The use of gas for electricity is low compared to coal. The EU's ambitions for decarbonization and the development of energy police are therefore a significant potential driver for gas market growth in Poland. Natural gas has better environmental credentials than hard and brown coal, with lower carbon emissions. Figure 44 below shows the forecast for electricity generation in Poland from 2020 to 2040 and the share of each production source. Electricity production is forecasted to rise from approximately 165 TWh in 2020 to over 230 TWh in 2040. The share of natural gas consumption for electricity generation rises from 6 percent in 2020 to 10 percent in 2030 and 17 percent in 2040. The share of coal declines from 2020, or from 2025 in total generation size, from 79 percent in 2020 to just 32 percent in 2040.

Figure 44: Electricity generation forecast for Poland



Source: Gaz-System TYNDP 2020-2029 / ESP Analysis

The Market Growth scenario is treated as conservative while the Optimal Development scenario is treated as optimistic. Meanwhile, Gaz-System indicates that the Market Saturation scenario is deemed unlikely and so is not subject to detailed technical or economic analysis.

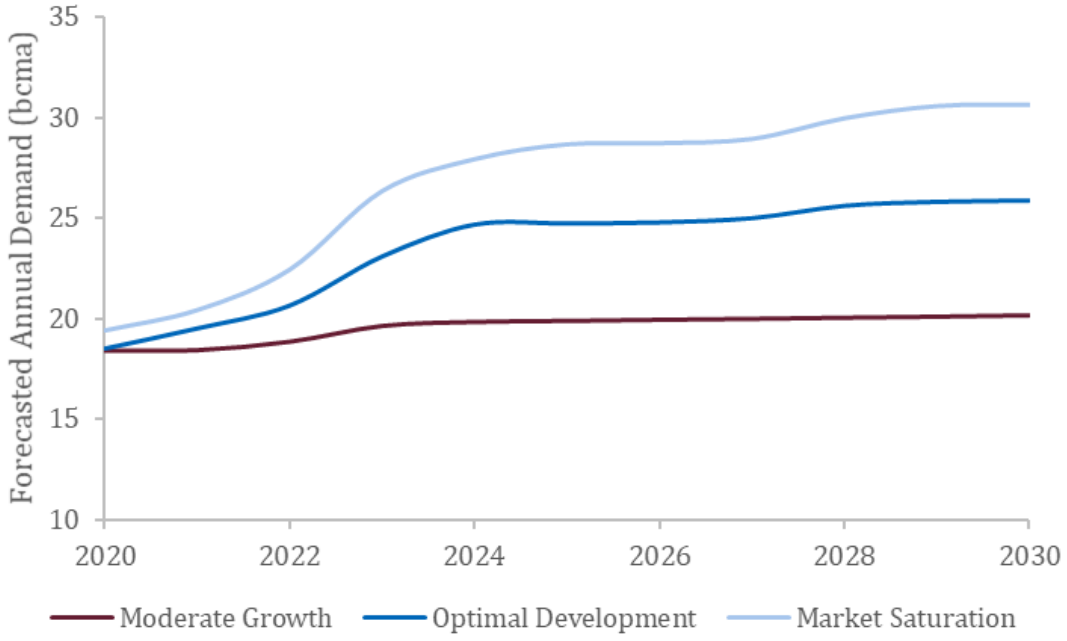
The largest increase in demand for gas transmission is expected in the development of electricity. The commissioning of these facilities to utilize gas for power may increase the demand for gas up to 2040 by a minimum of about 1.5 bcma in the Moderate Growth forecast and a maximum of about 6.3 bcma in the Optimal Growth forecast.

Gaz-System has signed a number of contracts for the connection of electrical power facilities, which if implemented may result in a significant annual increase in gas demand. "It is estimated that not all objects will be completed, or at least not in the near term. This is due to the fact that the greater part of concluded connection agreements is conditional agreements, and some of those previously

concluded agreements have recently been terminated due to the lack of an investment decision on the part of investors."[61]

The graphs below show the annual demand forecasts for the three scenarios up to 2030. Under the Moderate Growth scenario, demand grows by under 2 bcma from 2020 to 2030, while it grows by over 7 bcma in the Optimal Development scenario. The Market Saturation scenario has been identified by Gaz-System as being the least likely scenario and probably vastly overestimates the growth in demand with a rise of more than 11 bcma from 2020, an increase of almost 60 percent over the period. For this reason, this scenario is not considered in this study's detailed analyses.

Figure 45: Forecasted Polish gas demand under three scenarios



Source: Gaz-System TYNDP 2020-2029

Moderate Growth Scenario

The Moderate Growth scenario includes mainly gas consumers based on signed transmission contracts. The basis for estimating the level of demand from these customers was data on quantities purchased in previous years and new customers with whom connection agreements had been signed, or those most likely to begin gas consumption at the stated dates and quantities.

Optimal Development Scenario

In addition to the electricity customers included in the Moderate Growth scenario and the public consumers in industry and distribution, the Optimal Development scenario also includes potential customers who are at an advanced stage of gas unit design and investment in the process. These customers are still likely to be receiving gas from transmission within the considered time period.

Market Saturation Scenario

In addition to the consumers included in the other two scenarios, the Market Saturation scenario also includes a group of recipients of gas for electricity who are not verified in terms of the

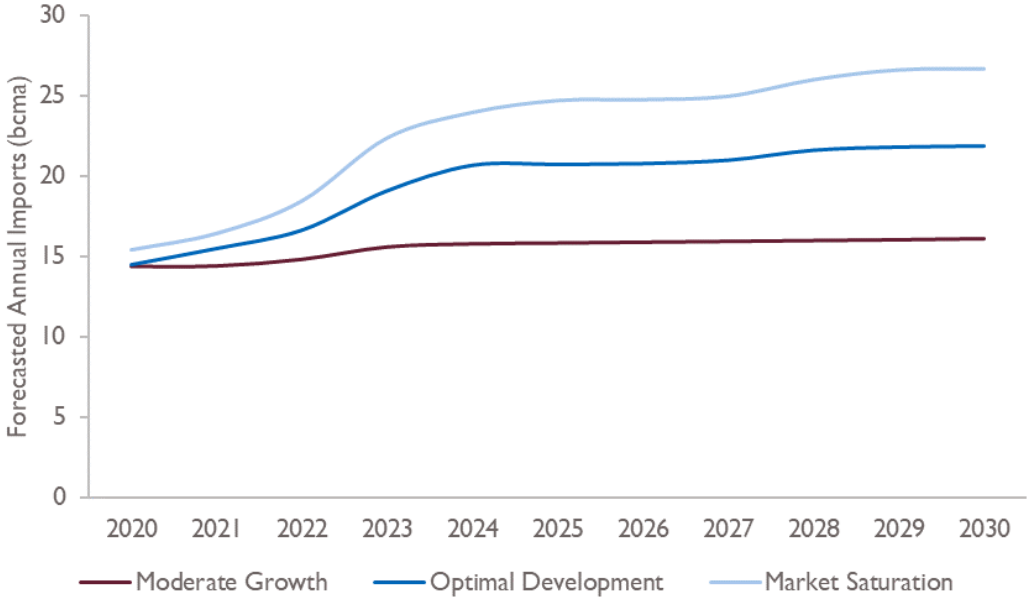
[61] Gaz-System TYNDP 2020-2029

likelihood of gas off-take within the declared range. This means that this scenario represents the highest forecast of consumption of domestic gas in Poland.

2.4.2.2 POLISH GAS SUPPLY FORECASTS

Polish gas production has been declining gradually over the last decade and stagnating toward the end of the decade. Starting at 4.3 bcma of gas production in 2010, local production of gas peaked at 4.5 bcma in 2011 and 2012 and ultimately fell to 4.0 bcma in 2017, 2018, and 2019.[62] Gas production in Poland between 2008-2018 was seen to be declining at a rate of 0.7 percent per annum. However, despite the previous decade's slight decline, indigenous supply of natural gas has stabilized at 4 bcma, with a 2019 growth rate equal to 0.1 percent, and is expected to be stagnant for the foreseeable future.[63] Poland's total gas reserves are currently around 0.072 trillion cubic meters, with a reserve-to-production ratio of 18.1, which is above the European average of 14.2. Due to the stable indigenous gas supply, it is assumed that the Polish gas production will likely remain constant around 4 bcma for the period of 2020-2030. Therefore, changes in Polish annual gas imports will be dependent on national consumption and Polish net gas imports can be determined from the demand forecast scenarios discussed in Section 2.4.2.1, which yields Figure 46.

Figure 46: Forecasted Polish annual gas imports



Source: Gaz-System TYNDP 2020-2029 / ESP Analysis

2.4.3 SUMMARY OF FORECASTED SUPPLY AND DEMAND

While gas consumption is expected to remain stable overall, the gap between European gas production and consumption continues to widen due to a significant decline in domestic supply. This means that European demand for gas imports will increase. This gap is bridged by a combination of the traditional suppliers (Russia and North Africa) and some new ones, such as Azerbaijan. Driven by European efforts for diversification of imports, the proportion of Russian pipeline gas in total consumption is expected to decline through the forecast period thanks to an increasing role for

[62] BP Statistical Review 2020.
[63] 'Russia – Poland gas relationship: risks and uncertainties of the ever after.' Oxford Institute for Energy Studies, June 2020.

LNG in Europe's import portfolio. The United States in particular is expected to continue its leading position in LNG supply to Europe.

The same deficit between gas consumption and domestic production in Ukraine will persist and will be covered by imports. In Poland, under the Moderate Growth scenario, demand will grow by under 2 bcma from 2020 to 2030 while it is forecast to grow by over 7 bcma in the Optimal Development scenario. These forecasts highlight the significance of ensuring that sufficient gas import sources and capacity are available in the coming decade.

2.5 IMPACT ON UKRAINIAN STORAGE AND IMPORTS

2.5.1 UKRAINIAN STORAGE

The roles of Ukraine and Poland in the Eastern European market have been discussed earlier in this report and this section gives some quantitative consideration to the potential opportunities for Ukrainian gas storage given this changing market in Poland. The objective of this analysis is to generate possible scenarios for Poland's gas storage needs over the period and then compare them with the available storage capacity in Poland to determine a possible excess volume that cannot currently be accommodated within the country itself. These excess volumes are then quantified and used to determine possible flows between Poland and Ukraine for injection and withdrawal should Ukrainian storage attract these volumes.

2.5.1.1 POTENTIAL IMPACTS ON UKRAINIAN GAS STORAGE – STORAGE ANALYSIS RESULTS

In this analysis, only the potential flows between Ukraine and Poland for the purpose of storing gas for Polish consumption in Ukrainian facilities are considered. The analysis combines historical trends and relationships to provide an indication of potential future flows. The seasonality of storage utilization, the relationship between demand and storage, and the typical injection and withdrawal profiles are used to generate two scenarios based upon Gaz-System's demand forecasts for Poland: Moderate Growth and Optimal Development (see Section 2.4.2.1 for information on these forecasts). Presented below are the results of the two models.

2.5.1.1.1 Model 1

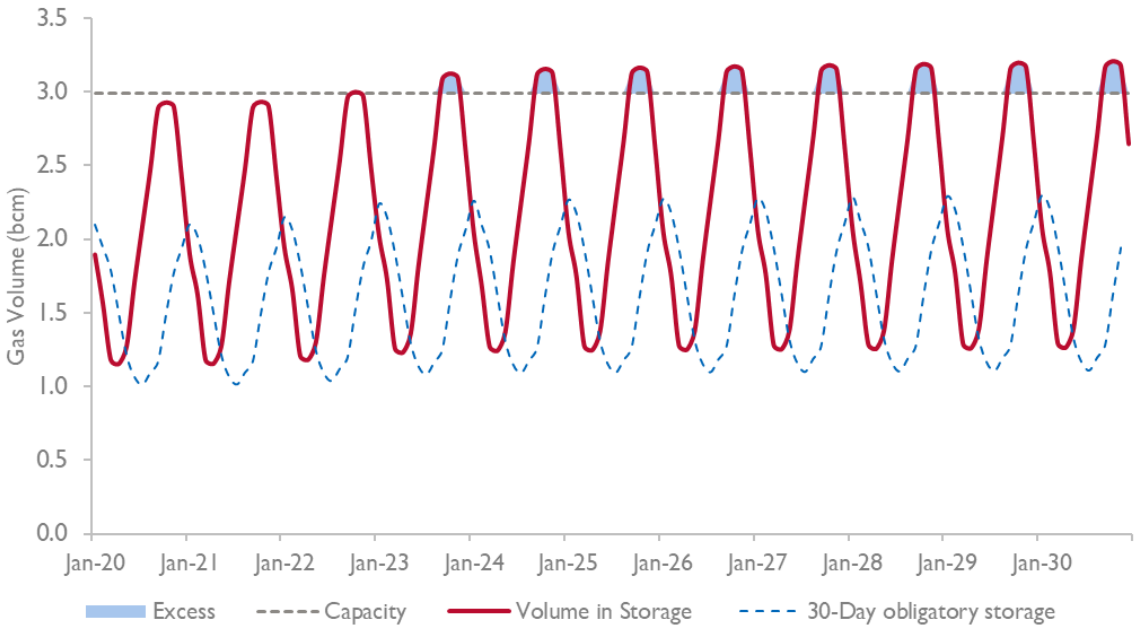
Model 1 corresponds to the demand forecasts under the Moderate Growth scenario. Figure 47 shows that under these modeling inputs, the storage requirement in Poland does not exceed the nation's internal UGS facilities capacity until the beginning of the heating season in 2022, although this is a very small excess (approximately 0.01 bcm). At the beginning of winter 2023, this excess reaches a peak value of 0.14 bcm, which then grows steadily up to over 0.2 bcm in 2030.

As was somewhat expected, under this demand scenario (which sees approximately 1 percent annual growth in national consumption) the growth in storage demand is small. Under this sort of demand growth, it is possible that given planned UGS expansion works in Poland which would expand capacity by more than 200 mcm, the country's storage demand in external UGS facilities may not grow. Instead, competition with Poland's existing gas storage held in other countries may be Ukraine's best option for attracting storage volumes.

The graph also shows the 30-day minimum storage requirement for stocks within Poland. The analysis includes a check to ensure volumes assumed available for Ukrainian storage are not potentially included in obligatory gas volumes that cannot be stored in Ukraine at this time (see

Section 3.3). In this case, excess volumes do not overlap with the minimum stocks to be held in Poland and so do not contradict the result.

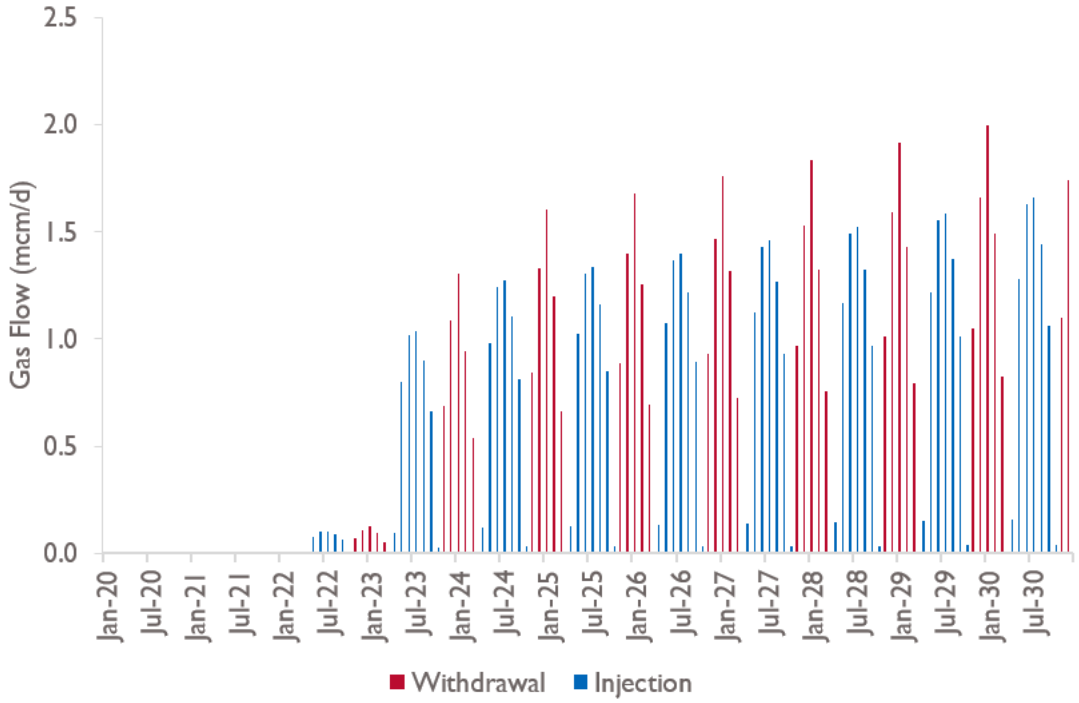
Figure 47: Model 1 Polish storage results



Source: ESP Analysis

Figure 48 shows how this sort of demand profile and volumes in excess would likely manifest themselves in terms of daily injection and withdrawal volumes. At the peak storage volumes in 2030, the average injection rate would peak in July 2030 at approximately 1.7 mcm/d. This flowrate would be cross-border flows from Poland to Ukraine and, given the likelihood that Poland will stop eastern imports at the end of 2022, there may need to be physical flow in this direction. During the winter months, withdrawal would peak in this model in January 2030 at approximately 2 mcm/d and would flow from Ukraine to Poland. If Ukraine is also importing gas from Poland then this may be accommodated at least in part by virtual flows (entirely virtual if Ukrainian imports from Poland exceed this value).

Figure 48: Injection and withdrawal profile under Model 1



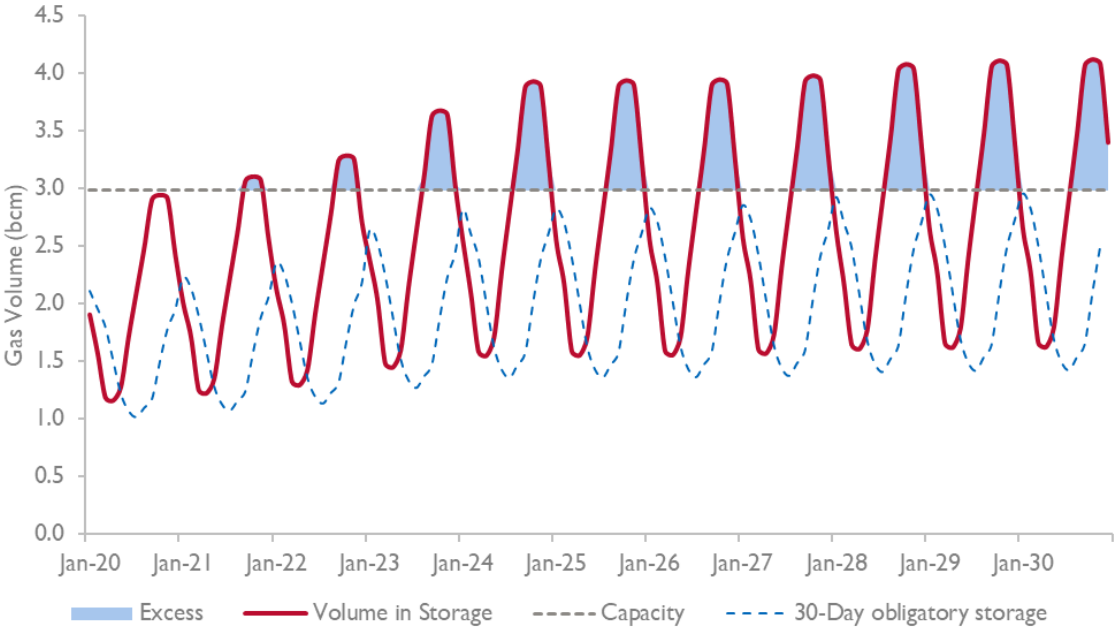
Source: ESP Analysis

2.5.1.1.2 Model 2

Model 2 represents a possible storage profile based on the Optimal Development demand growth forecast in Poland. This demand profile sees much more rapid growth in the Polish gas market and this manifests itself in a scenario where Polish storage cannot keep up with the growth. This scenario would present a significant opportunity for Ukrainian UGS, which has far greater storage capacity and could offer a necessary service to the Polish gas market. Figure 49 shows a sustained and significant growth in the excess volumes of gas that could be available for Ukrainian storage.

Excess storage is first identified in 2021 under the inputs to Model 2, at just over 0.1 bcm. This rises each year, reaching a peak of over 1.1 bcm in 2030. This is a significant volume, and even if some expansion work is completed for Polish UGS facilities, it would be unlikely that all of these volumes would be accommodated. In this scenario of rapid, sustained growth in the Polish gas market, Ukrainian storage is likely to be an attractive proposition for the Polish market. As discussed, the analysis checks to ensure volumes assumed available for Ukrainian storage are not potentially included in obligatory gas volumes that cannot be stored in Ukraine at this time.

Figure 49: Model 2 Polish storage results

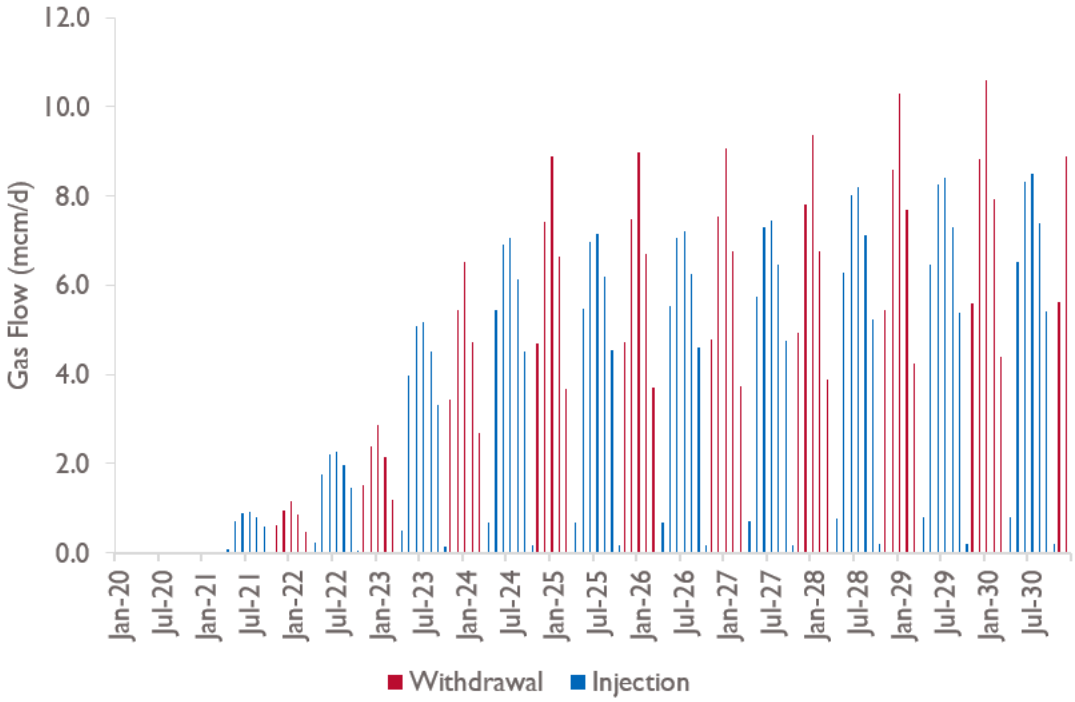


Source: ESP Analysis

Figure 50 demonstrates the magnitude of flows to be expected in the event that the excess volumes discussed above are stored in Ukrainian UGS. These daily flow rates are significantly higher than those experienced in Model 1, with peak injection over five times higher (July 2030) than the equivalent peak in Model 1, reaching 8.5 mcm/d. In June 2023, the injection rate reaches approximately 5 mcm/d. Historically, the physical capacity at Hermanowice from Poland to Ukraine has been 4.3 mcm/d in June.

This is the first time that this capacity is exceeded, and it is then exceeded in all subsequent summers. While the interconnection points between Poland and Ukraine have been combined into a VIP, the flows from Poland to Ukraine are only conditionally firm on the basis that there are sufficient flows from Ukraine to Poland. Therefore, while it is likely that the withdrawal capacities resulting from this analysis will not be an area of concern because the cross-border technical capacities from Ukraine to Poland could facilitate these volumes thanks to the transit infrastructure, it is necessary to consider how the injection flows from Poland to Ukraine might be facilitated.

Figure 50: Injection and withdrawal profile in Model 2



Source: ESP Analysis

2.5.2 PRICING ANALYSIS

In order to further understand the value of storing gas in Ukraine for Poland, pricing analysis is conducted to assess and validate the competitiveness of Ukrainian UGS for Polish traders/shippers. Ukrainian storage will be competing with other storage facilities in Europe and this is where the discussions on commercial and regulatory aspects such as storage pricing, products, and incentives that are available to Polish traders and shippers become important.

So far, in order to attract Western customers, there have been some initiatives taken by UTG, which manages storage in Ukraine, and the UA GTSO. By offering discounted transportation tariffs and a 'customs warehouse' arrangement, stored gas has been exempted from customs duties. Virtual reverse agreements have been put in place on many of the cross-border points, which enabled the movement of gas from Europe to Ukraine even more effectively. In addition, the 'short-haul service, introduced in Q1 2020, enables traders to access a discounted transmission rate between dedicated interconnection points between adjacent countries. More often foreign traders use short-haul service for gas transportation to Ukrainian UGS facilities.

2.5.2.1 ASSUMPTIONS & APPROACH

As mentioned, even in the case of increasing natural gas demand in Poland where domestic storage is not enough, Ukrainian UGS will still have to compete with the other European facilities in order to capture this excess demand for storage. For this exercise, it has been decided to consider Germany as a potential alternative for gas storage compared with Poland itself and Ukraine. It is important to note that this is only a high-level assessment and comparison based on public domain information and real transactions may differ depending on effective market conditions.

The options considered are as follow:

- The first option is to keep it at home, within the Polish UGS. Poland's gas storage facilities are operated by Gas Storage Poland (GSP) which is a 100 percent subsidiary of PGNiG, the Polish TSO. Poland has 7 UGS facilities and currently, a customer can book in 3 of those facilities: GSF Sanok, GSF Kawerna, and UGS Wierzchowice. Not only are their booking procedures the same, but also the tariffs and fees are unchanged.

- The next option is the export it to Germany and keeps it in the Astora gas storage facilities, which is an SSO independent from the TSO and operated by Gazprom Germany. Germany has the largest UGS assets in the European Union, and 94 percent of this capacity is full as of October 2020. UGS facilities in Germany are fully independent of the TSO and operated by various companies in a decentralized manner, which is quite different from both Poland and Ukraine. This decentralization means that different storage facilities can offer different products at different fees and tariffs to the customers. ESP understands that the wider range of products offered by the German UGS offers personalized experiences for traders who are willing to pay for the 'German premium', the price differential between storing in Germany versus other European storage facilities. In the ESP scenario, the UGS in Jemgum, Northern Germany, is taken as the destination for the trader to store gas in the second option.

- The remaining two options are both to Ukraine, where the shipper exports natural gas from Polish TSO to Ukraine TSO and then the Ukraine SSO and brings it back after 40 days, without and with the short-haul product that is offered. Short-haul services are designed to avoid multiple entry-exit tariff build-up (tariff-pancaking). Ukrainian UGS operator, Naftogaz-UkrTransGaz states that 'the short-haul product is up to two times cheaper than the alternative storage services in Europe'.

This study evaluated and compared these four alternative paths for storing the Polish natural gas based on the data available on public domains with regards to costing, fees and tariffs, and the necessary set of assumptions.

2.5.2.2 RESULTS

The below figure illustrates the comparative advantage Ukraine can have for storing the Polish natural gas against storing in Poland or Germany. The gas price is quoted the same in all three scenarios since it was assumed that buying it will take place on the same commodity exchange platform.

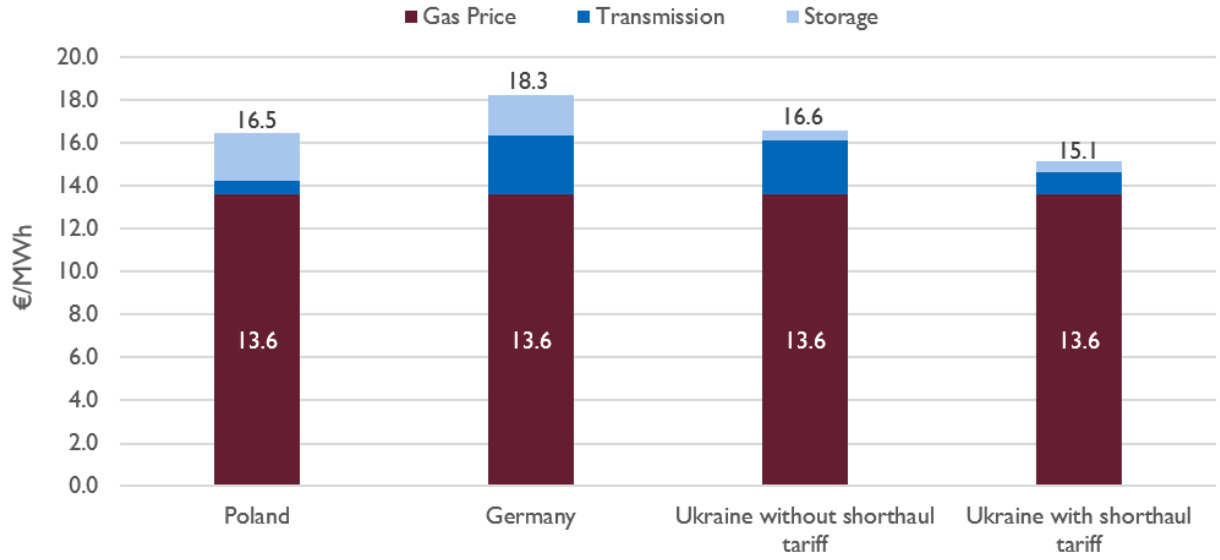
Analyzing the cost of storing natural gas stocks of Poland domestically, in Germany, or in Ukraine aimed to conclude whether the further integration between Poland and Ukraine would be an economically sound strategy based on the cost of storage in Ukraine. Comparing the prices between the four scenarios allows evaluation of whether the Ukrainian gas storage would be competitive for the traders who buy gas at the Polish commodity exchange (assuming no regulatory or technical barrier).

Figure 51 shows how these prices differ from each other, based on the critical cost items such as transmission and storage costs (spot gas price is identical for the four options). Based on the outlined assumptions and the information that was publicly available, results show that Germany is the most expensive option both for transmission and storage. In total it costs €18.3/MWh to store Polish gas in Germany, however, Germany can also be considered competitive on a non-economic basis (e.g. product customization, access routes, and regulatory advantages with the possibility to store security stock for Poland, liquidity, etc.).

Poland has the lowest transmission costs, since there is no cross border to keep the Polish natural gas in Poland UGS, it makes sense that transmission is the cheapest.

The two Ukraine cases differ from each other as their offerings are not identical. While it costs €16.6/MWh to store in Ukraine with no short-haul product, it costs only €15.1/MWh with a short-haul product. Even without the short-haul discount, Ukraine appears as potentially attractive as a UGS center for Polish gas. It is expected that with the rapid advances towards meeting the EU regulation requirement and expanding the service offering the country will be able to tap into its huge competitive advantage for being a storage hub in Europe.

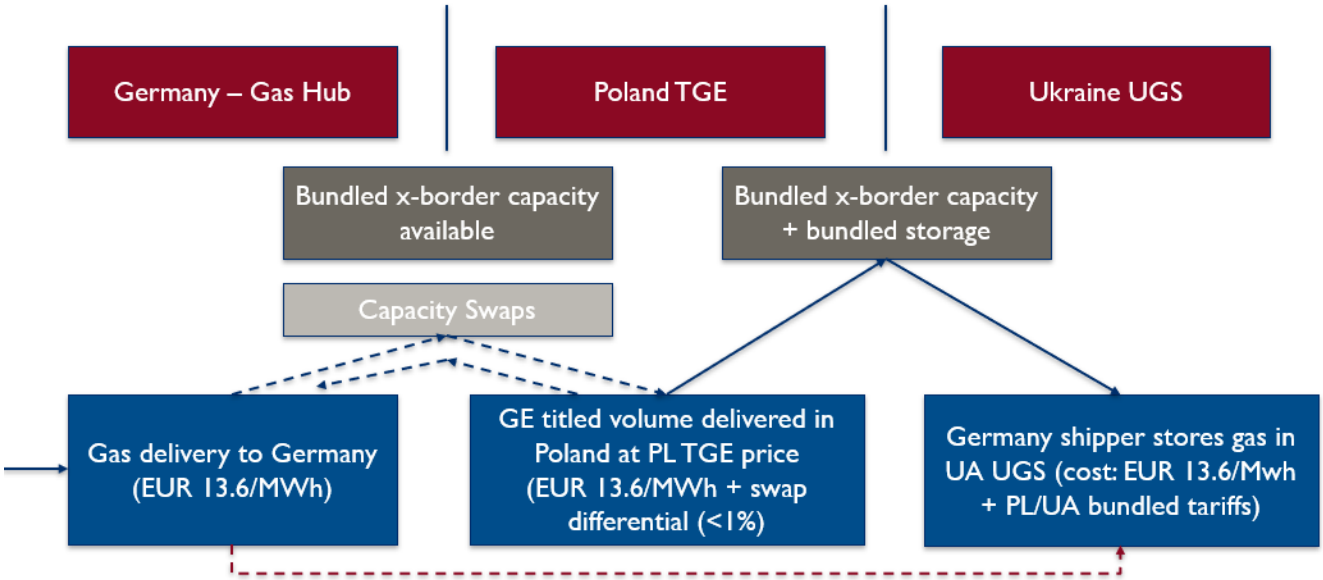
Figure 51: Comparison of alternatives for gas storage



Source: ESP

Figure 52 illustrates all three scenarios that have been analyzed in this section. Through the use of bundled cross-border capacity between Germany and Poland, the trader is able to engage in a swap trade between Poland and Germany. This allows the trader to effectively receive the gas that was agreed upon and intended in Germany, and in Poland at the TGE spot price. After this swap, the German trader then would have their gas allocation in Poland at Polish TGE price and hence, if a bundled cross-border capacity is available in the future between Poland and Ukraine, even the German trader can send the gas to Ukraine and keep it in the Ukrainian storage, through one single.

Figure 52: Three routes for gas storage



Source: ESP

2.5.2.3 CONCLUSIONS

This analysis demonstrates the potential volumes for Polish utilization of foreign gas storage facilities. The approach presents a range across two scenarios for potential storage demand that could be facilitated by the vast storage resources in Ukraine. The extent to which Ukraine can harness these volumes of gas by converting into flows into the UGS will depend on the competitiveness of Ukrainian storage against other European options for Poland and the regulatory landscape enabling the use of Ukrainian storage products by traders.

The main focus of flow analysis should be injection rates because these would depend on the considerably limited capacity from Poland to Ukraine. Although the injection rates are lower than the withdrawal rates because the volumes are transferred over seven months, the current technical and marketable capacities between Ukraine and Poland are significantly larger in the traditional direction of flow or east-to-west transit gas via Ukraine.

Ukraine has the largest storage facilities in Europe – approximately 10 times the volume of Polish storage capacity – and now offers incentives for customers to store gas in the country. It is already experiencing success as customers look for new capacities while stocks in Europe approach capacity. Analysis indicates that in the case of the scenario with low growth in Polish demand, the rise in storage demand would also be low and would likely be accommodated by the expansion of Polish UGS facilities. By contrast, with higher gas demand forecasts, excess storage is first identified in 2021 at just over 0.1 bcm and rises each year to a peak of over 1.1 bcm ahead of the winter in 2030. This is a significant volume, which the Polish UGS facilities would be unlikely to fully accommodate even if some expansion work is completed and would make Ukrainian storage an attractive proposition. In this case, the average injection in July would reach 8.5 mcm/d by 2030. This would suggest that the flows experienced in the summer of 2020 of over 5 mcm/d for storage may not be unique and unachievable in the future.

ESP's comparative study on the cost of storing natural gas stocks of Poland domestically, in Germany, or in Ukraine aimed to conclude whether the further integration between Poland and

Ukraine would be an economically sound strategy based on the cost of storage in Ukraine. Even without the short-haul discount, Ukraine appears as potentially attractive as a UGS center for Polish gas. It is expected that with the rapid advances towards meeting the EU regulation requirement and expanding the service offering the country will be able to tap into its huge competitive advantage for being a storage hub in Europe.

2.5.3 UKRAINIAN IMPORTS

2.5.3.1 ANALYSIS OF IMPORT VOLUME POTENTIAL FROM POLAND TO UKRAINE

In addition to the potential opportunities available for the Ukraine gas storage market in light of the evolving gas market dynamic in Poland and Eastern Europe, there is also likely to be increased interest in opportunities for importing volumes from Poland for consumption in Ukraine. Not only would greater imports from Poland contribute to the security of supply and diversification of import sources, but it may also give Ukraine the opportunity to import on the global market.

While the possibility of an LNG import terminal for Ukraine itself is unlikely in the medium term given Turkish refusal to allow LNG tankers through the Bosporus, the country still may be able to import LNG indirectly through the Polish Świnoujście terminal. This gives the country access to U.S., Qatari, and Norwegian (especially when Baltic Pipe imports are also considered) gas. The import does not necessarily have to be physical given the virtual reverse arrangements now available at the Polish-Ukrainian border.

The analysis carried out for this study considered the various import developments in Poland – commissioning a new pipeline and LNG import projects and ceasing Russian gas consumption – to develop scenarios for these future import volumes. By incorporating forecasted demand in Poland, the analysis determined scenarios for the potential size of Poland's exports. Consideration of Poland's import volumes and hence available volumes for re-export after meeting domestic demand applied three cases:

- Best case scenario: all import projects are completed on schedule and available capacity is fully utilized.
- Middle case scenario: all commissioning dates are delayed by one year and import projects are utilized at 80 percent of available capacity.
- Low case scenario: project timescales are unchanged, but utilization of the LNG terminals is 60 percent and the FSRU is not constructed. The Baltic Pipe is utilized at 80 percent of the available capacity.

This enables analysis of what volumes of Polish gas might be available for Ukraine and, by considering two cases for Ukraine's desire to import this gas from Poland, calculates the magnitude of flowrates (physical or virtual) from Poland to Ukraine.

Once the excess exportable volumes had been estimated, the report considers two cases to provide a range of possibilities. In 2018, Ukraine imported approximately 0.7 bcm of gas from Poland and approximately 1.3 bcm in 2019. The import share from Poland over these two years as a proportion of Ukraine's total imports serves as the status quo case (approximately 8 percent). Meanwhile, a second case where Ukraine's import share from Poland rises to 30 percent is considered. These are applied to Ukraine's import forecasts for comparison with available exports from Poland. In this analysis, the main focus is the size, or volume, of the available market.

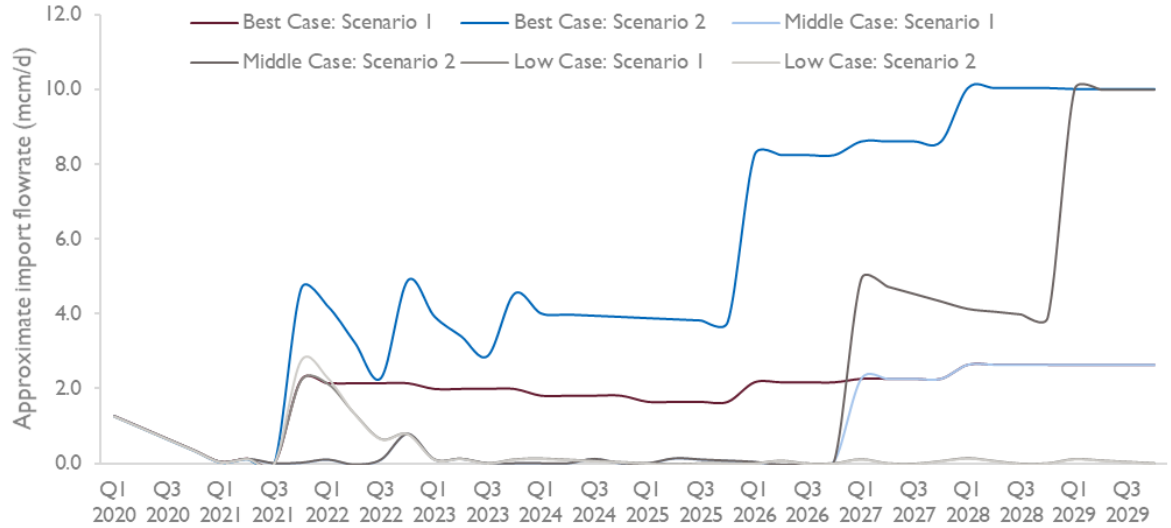
Ukraine's motivation to import from Poland will ultimately depend heavily on Poland's price competitiveness as a supplier as well as other key factors such as security of supply and diversification. Price comparison of gas import sources and sensitivity of LNG versus pipeline gas is discussed in Section 2.5.3.3.

2.5.3.2 RESULTS AND POTENTIAL FLOW SCENARIOS

Combining the analysis of the Polish import capacity models and the assumed demand from Ukraine, it is interesting to consider the resulting profile of import flows over the next decade. The export potential calculated for Poland is compared to the import demand from Poland to Ukraine; where the former is larger than the latter, the import is equal to the assumed import demand, whereas if Poland's export potential cannot meet the import demand (more likely in the 30 percent import case), then the flow is capped at the export potential. In practice, if Poland's potential to become a gas hub and re-export gas to its neighbors is limited, it is possible that flows from Poland may be even lower because there may also be competition from other neighboring countries, for example to the Baltics via Lithuania.

Figure 53 shows the culmination of this analysis. Scenarios 1 and 2 refer to the percentage of Ukraine's import demand which is targeted for Polish imports, at 8 and 30 percent respectively. The rise in all scenarios in the last quarter of 2021 is due to the first stage of the Świnoujście terminal expansion, while the demand in Poland has not yet risen significantly according to the forecasts used, with Poland still assumed to import the minimum take-or-pay level from Russia. In the low case, imports from Poland are minimal because the replacement of Russian gas and rising demand result in little remaining excess available for direct export to Ukraine.

Figure 53: Summary of calculated import flowrates from Poland to Ukraine under the various scenarios



Source: ESP Analysis

The cause of the fluctuations for the best case scenario flows (in the case of 30 percent Polish imports) is caused by two competing factors. Demand in Poland is rising fairly significantly in this period, according to the forecasts – by 2 bcma from the first quarter of 2021 to the final quarter of 2022 – meanwhile, two key projects (the first stage of the Świnoujście terminal expansion and commissioning of the Baltic Pipe) are expected. The first peak is caused by the former factor and the second by the latter. In the case of the Baltic Pipe, this is concurrent with the end of the Russian gas supply, and as these three sources come on- and offline there is some fluctuation in the importable

volumes and hence some oscillation in the initial years of the period before leveling out and only increasing as new projects come into play.

In the high case for Polish import projects, scenario 1 is never limited by the export potential modeling from the end of 2021 once the LNG import capacity is increased, although the second case is limited until the first quarter of 2026. This suggests that the 30 percent target assigned for imports, even in the case when all projects are completed on time and very highly utilized, would be higher than what is available until the FSRU (which has been highlighted as an LNG import source for foreign countries) becomes available.

From the third quarter of 2022, when Polish imports are limited by the country's export potential and match the 8 percent case, the proportion of imports provided by Polish gas rises to 19 percent before achieving the 30 percent target from 2026. Meanwhile, the 8 percent target can be maintained from the end of 2021, using the expansion of Świnoujście LNG.

In the low case scenario, the growth in Polish demand forecasted means that the lack of LNG infrastructure and its utilization would severely hamper Poland's ability to export significant volumes to Ukraine. The imports calculated and shown in Figure 53 also peak in the fourth quarter of 2021 with the Świnoujście first stage expansion and imports of Russian gas to Poland still maintained. Under the 30 percent target, Ukraine's import share from Poland is calculated to reached 10 percent, but cannot meet the target directly through its new import sources. The lack of an FSRU in Poland would make Ukraine unable to source significant volumes of LNG from Poland unless the country meaningfully increased its pipeline imports from Germany or its other cross-border interconnection projects.

On the basis of a constant import rate, as assumed in the estimation of flow rates in Figure 53, the average import rate across the border at Hermanowice from 2016-2019 is approximately 2.8 mcm/d. This analysis demonstrates that these figures can likely be maintained despite Poland ending imports from the east, and in the latter half of the decade these flows could grow significantly if Ukrainian companies wish to import an increasing proportion of gas from Poland. It is likely that, if technically feasible, the drop in imports calculated in the initial years could still be met if importers were to demand gas via this route by increasing flows either from the western and southern border of Poland into its GTS or even from eastern imports because re-exporting these volumes to Ukraine would align with the regulations in Poland on diversification of supply. However, these imports would be dependent on the technical capacity for flows from Poland to Ukraine in the event of low forward flow in the opposite direction.

The immediate intention in Poland is to first diversify supply sources, particularly by the end of 2022 once the supply contract expires. As shown in this analysis, it is in the latter years that the most significant growth in exports from Poland will occur. These results highlight and confirm the sensitivity of a significant increase in Polish exports to Ukraine to the availability of sufficient LNG import capacity to supplement the Baltic Pipe and other European pipeline sources as well as the ability of Polish TSO to ensure firm capacities from Poland towards Ukraine after 2022. Poland must first replace Russian imports before the hope of exporting to neighboring countries as a hub can begin.

2.5.3.3 NATURAL GAS PRICING ANALYSIS FOR IMPORTS TO UKRAINE

This section will complement the analysis on flows by looking at the potential range of prices for natural gas imported into Ukraine. This section presents the pricing assessment with a focus on LNG, using the following assumptions:

- All the values were presented in $/mmbtu [64];
- No inflation or escalation was considered (real prices);
- Conversion factors were based upon the IGU (International Gas Union) guide. Conversion of mmbtu to '000m³ is 0.02436 '000m³/mmbtu (equivalent to 41.06 mmbtu/'000m³ [65];
- No taxes (such as VAT[66]) were included because of the uncertainty around their deductibility; and
- Other minor costs associated with the transaction such as terms of payment (difference between prepayment and payment term), currency, risk insurance, or participation in the procurement were not included.[67]

The underlying drivers for pricing are dynamic and could change based on a series of factors: market trends in the respective gas hub, transmission costs, regasification costs, liquefaction costs, shipping costs, and price indexation.

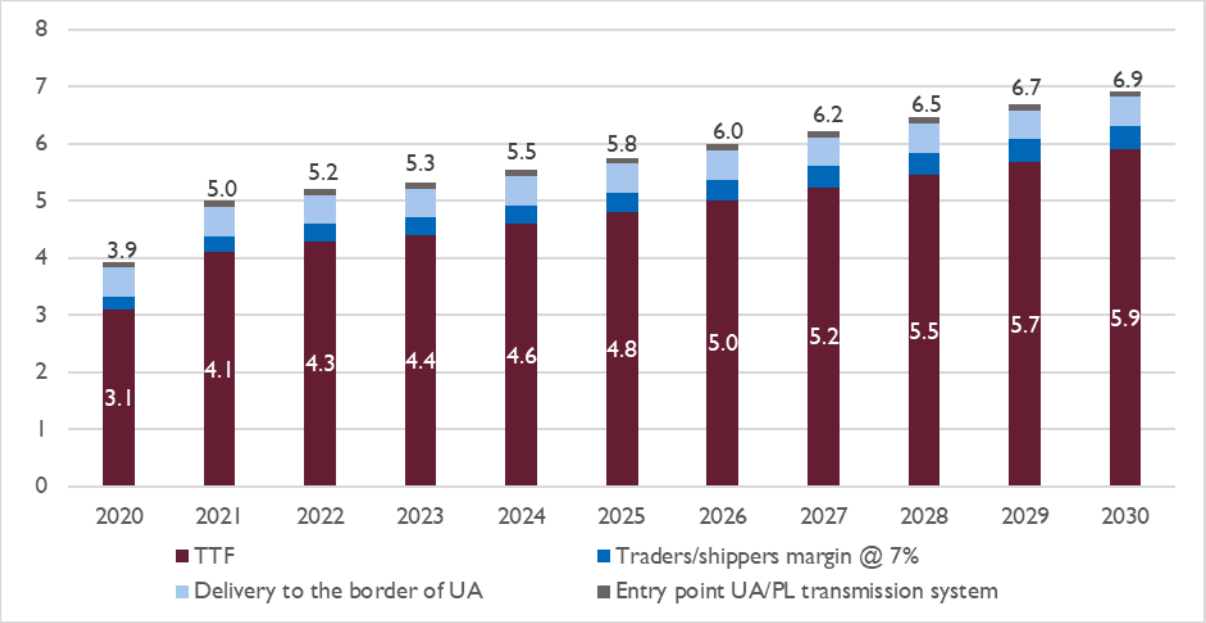
Therefore, to allow a level of flexibility, the competitiveness of the imported LNG from Poland versus pipeline imports under three pricing scenarios (low, base, and high) has been assessed. This analysis shows that LNG imports via Poland could still remain competitive in Ukraine if gas prices in Europe returned to a higher level. In the case of U.S. LNG, this differential will have to cover elements such as gas index, variable costs, shipping, and part of the fixed liquefaction fee.

2.5.3.3.1 Imports from Europe to Ukraine (as-is situation – Title Transfer Facility indexation)

Figure 54 shows the price forecasts for the natural gas imported into Ukraine under the base case as-is scenario (assuming the current commercial terms for the EU piped gas imported and using a Title Transfer Facility, or TTF, indexation).

[64] To convert the price to €/MWh, that has been used in this study the following steps were used: $/mmbtu * 3.41 mmbtu/MWh / 1.15 $/€ = EUR/MWh.
[65] 'Natural Gas Conversion Pocketbook', International Gas Union (IGU)

Figure 54: Gas price forecast – as-is scenario/base case ($/mmbtu [68])

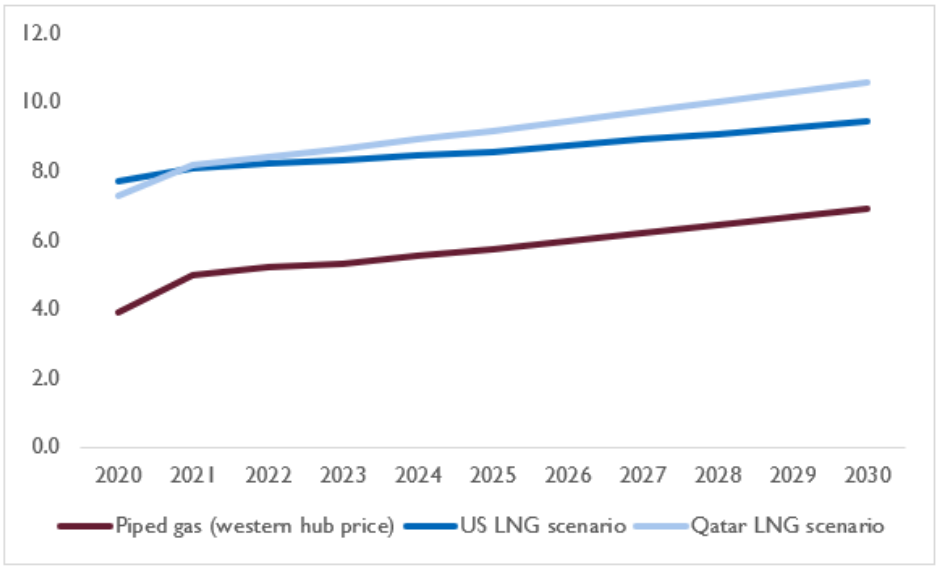


Source: ESP analysis

2.5.3.3.2 Imports from Europe to Ukraine (U.S. and Qatar LNG)

Under the pricing assessment, gas imported in LNG from Poland into Ukraine is more expensive than under the current arrangement with other European countries (pipeline imports). This differential could remain at circa $2.5/mmbtu or circa €7.5 /MWh (see Figure 55).

Figure 55: Natural gas projections for the gas imported into Ukraine for base case ($/mmbtu [69])



Source: ESP analysis

[68] To convert the price to €/MWh, that has been used in this study the following steps were used: $/mmbtu * 3.41 mmbtu/MWh / 1.15 $/€ = EUR/MWh.
[69] To convert the price to €/MWh, that has been used in this study the following steps were used: $/mmbtu * 3.41 mmbtu/MWh / 1.15 $/€ = EUR/MWh.

As shown in Figure 55, based on the pricing assessment, it is estimated that:

- The price range for the gas imported into Ukraine from U.S. LNG could be between $7-12/mmbtu (€22–35/MWh) by 2030, with a reasonable midpoint at circa $9.5/mmbtu (€28/MWh).
- The price range for the gas imported into Ukraine from Qatar LNG could be between $7.5-14.5/mmbtu (€22.5–43/MWh) by 2030, with a midpoint at circa $10.5/mmbtu (€31.5/MWh).
- The price range for the as-is situation (with the current pricing for EU piped gas based on TTF indexation) could be between $6-8/mmbtu (€17.5-23.5/MWh) by 2030, with a midpoint at circa $7/mmbtu (€20.5/MWh).

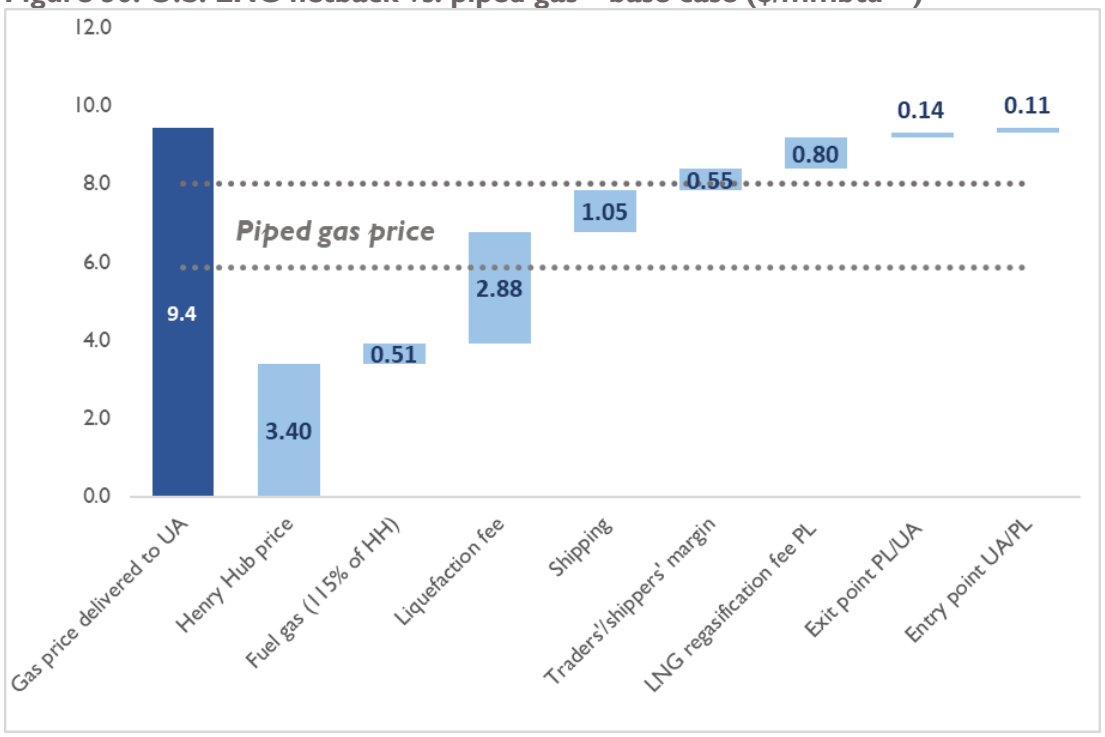
2.5.3.3.3 Final considerations regarding the competitiveness of U.S. LNG

This section presents additional considerations regarding the attractiveness of U.S. LNG as a source of gas supply in Ukraine.

Netback analysis of U.S. LNG delivered into Ukraine

The attractiveness of U.S. LNG imports is heavily reliant on the spread of the European hub price (e.g., TTF, NBP, GASPOOL) versus the Henry Hub. This differential has been a key driver for imports of U.S. LNG, as it creates an opportunity for arbitrage for U.S. producers. Figure 56 summarizes the netback analysis for U.S. LNG against piped gas for the base case.

Figure 56: U.S. LNG netback vs. piped gas – base case ($/mmbtu [70])



Source: ESP analysis

[70] To convert the price to €/MWh, that has been used in this study the following steps were used: $/mmbtu * 3.41 mmbtu/MWh / 1.15 $/€ = EUR/MWh.

The competitiveness of LNG could be improved by reducing tariff pancaking, a situation when multiple tariffs accumulate and a supply source that must cross several zones becomes too expensive. By applying decreased entry tariffs at the LNG terminals to ease the transmission cost, Poland is already easing the pancaking of tariffs to some extent.

However, the level of fee applied for regasification services is also a key element. As seen in Figure 57, the entry tariffs from LNG terminals to the transmission network (the actual total cost paid to introduce LNG into the gas system) vary from €0.15 - 4.64/MWh. Based on this benchmarking analysis, the Polskie LNG terminal tariff is seen as reasonable although some other terminals and TSOs are also seen as more competitive.

Figure 57: Benchmark of LNG bundled service[71]/ entry system tariffs in Europe (€/MWh)

Country	Terminal	€/MWh
BELGIUM	Zeebrugge	0.90
FRANCE	Fos Cavaou	1.71
	Fos Tonkin	1.47
	Montoir	1.09
GREECE	Revithoussa	n.a.
ITALY	Panigaglia	1.22
	Rovigo	4.64
	Toscana	3.78
LITHUANIA	SC Klaipėdos Nafta	0.15
POLAND	Świnoujście	2.24
PORTUGAL	Sines	1.53
SPAIN	Huelva, Cartagena and Sagunto	1.49
	Barcelona, Bilbao and Mugardos	1.44

Source: CEER 2017

New links and interconnection could also help establish an eastern vertical corridor to enhance regional price convergence and competition in natural gas (see, for instance, Section 2.2.2.2).

Over the long run, the importance of the liquefaction fee (estimated at around 35-50 percent of the delivered LNG price) will also change as U.S. LNG exporters will most likely treat these fixed fees as a sunk cost. Unlike future costs such as OPEX, sunk costs (such as capital costs) have already been incurred and thus cannot be recovered. This implies that these sunk costs are expected to have less

bearing on flow decisions in the long run than variable costs. This also means that U.S. LNG indexed at the Henry Hub will be in a better position to compete with Europe's prices.

Non-economic benefits for Ukraine as a buyer of U.S. LNG

In addition to its pricing, U.S. LNG offers several non-economic benefits for potential buyers.

- U.S. LNG contracts allows generally for more flexibility in the off-take of gas because the existing U.S. LNG commercial model is based upon a passthrough of the infrastructure fees in the LNG prices. This allows the buyer to cancel cargoes as long as the fixed liquefaction fee is paid (allowing the recovery of the project's capital costs). Over time, the liquefaction fee is also expected to go down as a result of the sunk cost.
- U.S. LNG SPAs offer volume and destination flexibility as supply is typically contracted on a FOB basis and the owners of the liquefaction facilities tend not to market it on a DES basis.
- There is no global geopolitical price premium associated with the Henry Hub prices (compared to oil prices).
- U.S. LNG increases the security of supply by allowing greater diversification of gas sources by the importing countries (supplier of last resort).
- The indexation in the U.S. LNG contract is generally seen as more stable because only the feed gas price is subject to potential volatility (feed gas and delivered LNG prices, therefore, reflect the marginal cost of U.S. natural gas production).
- It is possible to import sophisticated gas trading and risk management business models along with U.S. LNG.

2.5.3.4 SUMMARY OF IMPACT ON UKRAINIAN IMPORTS

As Poland expands its capacity to import gas from alternative sources, Ukraine may also take an interest in importing increasing volumes from this direction, with a particular focus on access to LNG. Scenarios are developed to analyze the potential volumes available from Poland over a 10-year period with varying levels of LNG utilization and infrastructure completion. Cases are applied to these profiles from a Ukrainian perspective based on Ukraine's forecasted import demand. This analysis finds that significant volumes will be available to Ukraine if desired, other than in the case where LNG utilization is low and the FSRU in Poland is not constructed.

The profile of imports suggests that the FSRU would be key to delivering Poland's aim of being a gas hub in Eastern Europe and that the volumes from such a project would likely be available to neighboring countries given that other available import capacities in Poland will suffice to deliver independence from Russian gas. Importing approximately 3 bcma of gas from Poland from 2026 onward would not be unachievable based on the Polish gas balance alone if such volumes, particularly of LNG, are of interest to the relevant Ukrainian parties (in practice would be contingent on the technical capability to deliver such volumes).

U.S. LNG offers several non-economic benefits for potential buyers: increasing flexibility, no global geopolitical price premium, and increased security of supply by diversifying the source of gas for importing countries. However, from a pricing perspective, the LNG delivered in Poland will only be competitive assuming an increase in European prices. The attractiveness of U.S. LNG imports is heavily reliant on the spread of the European hub price (e.g., TTF, NBP, GASPOOL) against the U.S. Henry Hub. This differential has been a key driver for the imports of U.S. LNG, creating arbitrage opportunities for U.S. producers. The ESP assessment shows that under a certain set of assumptions, U.S. LNG could be competitive as an import source for Ukraine.

The competitiveness of LNG and resulting cross-border flows could also be improved by reducing tariff pancaking when multiple tariffs accumulate and a gas supply source that must cross several zones becomes too expensive. New links and interconnection could also help establish an eastern vertical corridor to enhance regional price convergence and competition in natural gas. Over the long run, the importance of the liquefaction fee (estimated at around 35-50 percent of the delivered LNG price) will also change as U.S. LNG exporters will most likely treat these fixed fees as a sunk cost. This also means that U.S. LNG indexed at the Henry Hub will be potentially in a better position to compete with Europe's prices over the long term.

2.5.4 OVERALL FLOW DEMANDS FROM ANALYSIS

To understand the potential flows of gas between Poland and Ukraine, the above analysis considered potential scenarios separately for storage utilization and for imports. Two scenarios were considered for the size of the storage opportunity to provide an indicative range and similarly for imports a number of cases were developed for imports into Ukraine via Poland. To provide consideration of potential demand in either direction these two elements can be combined into an annual demand. It is worth noting that the peak flows, particularly in the case of storage demand which operates in a seasonal manner for injection and withdrawal, will be higher than the equivalent constant flow rate assumed from these annual volumes. These figures are based upon the analysis described earlier in this section. It is worth noting that these are the demand figures in both directions and that with virtual flows these demands would net in the direction of the larger flow (contingent upon the technical capability to transport such volumes).

The expiration of the PGNiG/Gazprom supply agreement at the end of 2022 is assumed to result in transit flows from Ukraine ceasing and so there is no import to Poland from Ukraine other than for withdrawal from Ukraine's UGS facilities in these figures. Transit flows from Ukraine to Poland have typically been up to 4 bcma and imports from Poland to Ukraine in 2019 were approximately 1.3 bcma.

The analysis indicates that from 2023 if transit to Poland ceases, the demand in that direction would comprise of withdrawals from Ukrainian storage and transport back into Poland only and so would likely fall to close to zero or up to approximately 0.5 bcma in the higher case for storage. In the opposite direction in 2023, the analysis results indicate demand from Poland to Ukraine (for storage and domestic imports) maybe be up to approximately 2 bcma in the high case for imports, but would be contingent on the successful implementation of import projects in Poland and the market demand in Ukraine so is 0-0.5 bcma in the lowest cases.

Beyond 2023, considering up to the end of the decade, it is possible that the demands in both directions would increase. As more gas is re-exported from Poland to Ukraine and in the case of increased utilization of storage facilities, the high case scenarios result in demands to Ukraine of almost 5 bcma. Additionally, as withdrawal grows with increased injection then demand to Poland could be over 1 bcma. However, in the low storage and import scenarios are shown previously it would be possible this could remain low, close to zero. Ultimately these flows will depend on the size of the interest from the market and enabling market activity by addressing key issues discussed in this report.

2.6 CONCLUSIONS FROM THE MARKET SURVEYS AND INTERVIEWS

Market surveys and interviews were conducted with field experts and market participants which was necessary to capture sentiments about the future of integration in the region, and whether or not the traders were interested in using the Ukrainian products and facilities. The findings indicated a bright outlook for gas storage utilization in Ukraine.

ESP's market validation study demonstrates that Ukrainian UGS is competitive for Poland's natural gas storage needs. With its ambition to be integrated further with Western Europe, Ukraine is eager not only to bring its commercial and regulatory frameworks closer to those of Europe but also to develop new products that will increase the liquidity of the UGS capabilities.

Ukraine already offers incentives for European customers to store gas in the country and is experiencing great success as customers look for new storage capacities while stocks across Europe approach full capacity. However, the future of its success as a hub for natural gas storage will depend on successful integration with Poland and offerings of bundled products, as well as compliance with Polish and European legislation for compulsory gas stocks. Further information and analysis of bundled products are available in Section 4. The risk of introduction of bundled products before softening the licensing requirements within Poland that a trader must have a branch in the country is also of concern and more information on this is available in Section 3.

2.7 MARKET SCREENING CONCLUSIONS AND ENABLERS

Key changes in the dynamic of gas flows between PI-UA may present some significant challenges preventing traders from accessing the full potential of these new and developing opportunities.

The new interconnection agreements, first to enable reverse flow and then to initiate the virtual interconnection point between Ukraine and Poland, have enabled more flexibility and transparency for shippers as well as generally increased integration between Ukraine and the European market. Enabling virtual flows has increased the capacity at the border, which was previously limited by the physical technical capabilities to flow gas to and from the Drozdovichi and Hermanowice IPs. However, while for the moment this has been highly conducive to increased utilization of Ukrainian UGS by Polish customers, key milestones over the next few years may present risks and challenges to maintaining this cooperation.

Firstly, with Poland's intention to remove Russian gas from its import profile, flows from Ukraine to Poland (via Drozdovichi) are likely to be low or zero from the start of 2023. Another key milestone may also be 2025, once the current transit agreement between Naftogaz and Gazprom has ended. While transit gas also flows to Ukraine's other European borders, there may be some flexibility to balance bookings given the lack of forwarding flows to Poland.

However, in a scenario where transit via Ukraine falls to zero after 2024, the reality would be that forward flows become west-to-east. While it may be possible to technically conduct physical flow from Poland to Ukraine, depending on the hydraulics of the Polish GTS, the level of such capacity is now very low. This means that capacities from Poland to Ukraine are interruptible if there is no flow from Ukraine and as such, there is a high probability that it will not be possible to guarantee flows in such a situation. Although the fact that Polish companies are injecting gas into Ukrainian UGS in the summer will also mean that withdrawal in the reverse direction in the winter would provide some forward flow to Poland, this would not be a stable and firm enabler of virtual reverse given the seasonality and fluctuational nature of storage injection and withdrawal profiles.

US LNG imports provide considerable non-economic benefits to gas users as it allows for more flexibility, diversification of the source of supply, and stability in the indexation. However, from a pricing perspective, the LNG delivered in Poland will only be really competitive assuming an increase in European prices. For instance, using the example of the U.S. LNG imports, the spread between the European price and the Henry Hub price needs to be high enough to cover some elements such as the variable cost of the LNG producer, the shipping costs, and part of the liquefaction fee. Other

market enablers such as a competitive price indexation and a reduction in tariff pancaking will also support the cross-border flows.

With these issues in mind, there are multiple potential solutions that might be required to enable access to the markets identified in this report, which flows to Ukraine for both import and storage. Firstly, the technical capabilities, limitations, and risks associated with the volumes and directions of flows given the currently available infrastructure may hinder the physical transportation of enough gas. It has been suggested that bottlenecks within the systems, particularly on the Polish side, may significantly restrict booking capacity below what is currently available, especially if physical Poland-to-Ukraine flow is required. Firm capacity for bookings from Poland to Ukraine would be required to enable integration of the markets in the future.

Any regulatory limitations to traders may hinder their ability to capture the developing relationship across the border and so it should be considered whether any amendments would be required to enable deployment of the flows presented in this analysis. While regulation in Poland prevents companies from storing obligatory strategic stocks in Ukraine, there is still a potential market for the storage of commercial volumes in the country. Flows from European customers to Ukrainian UGS, including from Poland, are already taking place and further growth may be possible in the future given Poland's expected growth in demand.

Provided that traders are able to utilize the opportunities in Ukraine from a technical and regulatory standpoint, it will be up to the commercial competitiveness of the market to encourage traders to fully engage with them. Information on products is available in Section 4.

3 LEGAL AND REGULATORY ASSESSMENT

The objective of this section of the report is to understand and highlight the status of the legal and regulatory framework in Poland and Ukraine. Aspects of licensing, step-by-step guidance, and the regulatory framework for the gas market in Poland and Ukraine are considered based on the legislation and official documents adopted and published by the state authorities.

In addition, the possibility of using Ukrainian gas storage for storing compulsory gas stock as per Polish regulations is also considered in this section. This includes a review of the main features of the Polish compulsory gas storage regulations, an assessment of the possibility to maintain compulsory gas stocks within Ukrainian UGS, and any contemplated amendments to the Stock Acts.

The analysis of these areas depicts current gaps in both Polish and Ukrainian regulations and provides recommendations for facilitating gas flows between Poland and Ukraine.

3.1 EU REGULATIONS THAT PROVIDE FOR FREE ACCESS TO THE CAPACITIES OF CROSS-BORDER INTERCONNECTION POINTS BETWEEN THE EU AND ENERGY COMMUNITY CONTRACTING PARTIES

EU legislation specifies the number of rules and principles aimed at the development of the liberalized natural gas market, i.e., securing and facilitating access to the transmission services within the EU Member States, including at the entry/exit points to/from the Polish gas transmission system at the borders with Ukraine. By way of the Energy Community framework, the same regulations apply either directly or with modifications to the gas transmission system in Ukraine, thus facilitating cross-border gas exchanges between Poland and Ukraine.

As the applicability of the EU *acquis Communautaire* in Poland and Ukraine differ (some items of the EU *acquis Communautaire* applies with modifications), the relevant EU regulations providing for free access to the cross-border capacities at the Polish-Ukrainian border will be presented as applicable within the Polish natural gas market (including OGP Gaz-System's entry/exit point at the Polish-Ukrainian border) together with information on modalities with respect to the Ukrainian entry-exit points (i.e., whether a given rule applies to Ukraine in its entirety or with modification or does not apply at all as per decisions of the Ministerial Council or the Energy Community).

3.1.1 APPLICABILITY OF THE EU DIRECTIVES AND REGULATIONS IN POLAND

EU directives (including the 2009/73 Directive and the Security Directive) are binding on the Polish state and – in order to be enforced in Poland vis-à-vis individuals/entrepreneurs – must be implemented under the national legislation (i.e., subject to certain exceptions, application of the EU directives requires prior transposition into the Polish legal system by way of the local legislation).

Therefore, most of the rules specified in the directives have their equivalents in Polish legislation. On the other hand, EU regulations, including 715/2009 Regulation, Security Regulation, REMIT, Statistics Regulation, NC INT, NC TAR, NC CAM, NC BAL, are applicable directly (in general, enforcement of these regulations in Poland does not require prior transposition into the Polish legal system by way of local legislation). Under Polish law, if the national laws are contrary to the EU laws, the EU laws prevail (are applied with priority over the national legislation).

3.1.2 APPLICABILITY OF THE EU DIRECTIVES AND REGULATIONS IN UKRAINE

According to the Treaty establishing the Energy Community and the Association Agreement between Ukraine and the EU, the European Atomic Energy Community and their members (the "Association Agreement"), Ukraine has undertaken the obligations to ensure the transposition and implementation of EU energy legislation.

In accordance with Article 273 of the Agreement, the Parties will adapt their legislation, as provided in Annex XXVII to the Agreement, to ensure that all conditions for the transportation of electricity and gas are objective, reasonable, transparent, and non-discriminatory.

The Ukrainian Parliament ratified the updated *Annex XXVII Energy Cooperation including Nuclear Issues* to the *EU-Ukraine Association Agreement* on June 6, 2019. The annex aims at increasing market integration and bringing energy sector regulations in line with key parts of the EU *acquis* or body of law. Ukraine must bring its own laws in compliance with EU law. Any changes in EU law must be reflected in Ukrainian legislation. Ukraine must report on its progress in adapting its laws to EU standards and its compliance with European Commission feedback on any of its draft laws.

3.1.3 MAIN EU RULES AND PRINCIPLES SECURING FREE ACCESS TO CROSS-BORDER TRANSMISSION SERVICES

The EU legislation provides for a number of rules and principles securing free access to cross-border transmission services within the EU, including at the entry/exit points to/from the Polish gas transmission system at the borders with Ukraine (although some of the EU rules are not deemed to be applicable to the Polish-Ukrainian border, which is qualified as a border between the EU and a third country).

The detailed rules specified below refer to access to the transmission system, interconnectivity, regional cooperation, and reduction of the authorization-related market-entry barriers for shippers, traders, and suppliers.

Figure 58. Overview of the key rules and status

Description	Poland	Ukraine
Third-party access to the transmission system	Implemented	Implemented
Unbundling	Implemented	Implemented
Harmonization of access to transmission services and network codes	Implemented	Implemented
TSOs' obligations in terms of non-discrimination between system users	Implemented	Implemented
Terms and conditions for transmission services	Implemented	Implemented
Tariffs	Implemented	Implemented
Balancing schemes	Implemented	Partially implemented
Capacity allocation	Implemented	Implemented
Trading of capacity rights	Implemented	Implemented
Transparency obligations	Implemented	Implemented

Source: ESP

3.2 CONCLUSIONS FROM REVIEW AND ASSESSMENT OF EXISTING LEGAL DOCUMENTS

The results following a high-level study examining the development of natural gas imports from Poland to Ukraine and associated pipeline infrastructure, including the legal and regulatory environments, are outlined below.

Note: the study included a review of the Network codes of the Ukrainian and Polish TSOs, storage code of the Ukrainian SSO, licensing requirements for gas traders and suppliers in both Poland and Ukraine, custom and tax codes in both Poland and Ukraine, tariff regulations in both Poland and Ukraine for transmission and storage, Polish regulations on gas storing security stock and other relevant Polish, Ukrainian or EU legislation.

- **UA regulatory framework:** Natural gas market of Ukraine is functioning based on the number of Laws of Ukraine, in particular, the Law of Ukraine "On Natural Gas Market," where the majority of Third Energy Package provisions relevant for the gas sector were transposed, and secondary legislative acts, i.e., the Resolutions of the NEURC – Ukrainian energy Regulator, by which the GTS Code, the GDS Code, the Gas Storages Code, and a number of other acts are approved.

  Ukraine became a Contracting Party of the Energy Community on February 1, 2011, and the above acts which were adopted for implementation on the gas market in accordance with the provisions of the Third Energy Package are part of contractual obligations within the Energy Community.

  Challenges:
  - Use of different measurement units in Ukraine and in the EU gas market. However, from January 1, 2021, Drozdovichi GMS on the border with Poland will measure in energy units. (Such obstacles may be easily fixed and the Government of Ukraine has initiated a number of actions to eliminate them.)

- **PL regulatory framework:** The gas market in Poland constitutes part of the EU-wide internal market for natural gas with decreasing dependency on the natural gas supplies from Russia and increasing connectivity with neighboring gas markets and the international LNG market, including U.S.-sourced LNG. The Polish regulations on natural gas markets are to a large extent either harmonized or uniformed with the EU-wide gas market regulations, specifically in terms of unbundling of transmission system operators as well as general functioning of the transmission systems (including allocation of capacities, tariffs, and balancing as well as interoperability between interconnected transmission systems) which secures third-party access and facilitates gas exchanges between Poland and neighboring countries, including Ukraine as a contracting party to the Energy Community.

  Challenges:
  - limited transmission capacities toward Ukraine (in the direction from Poland to Ukraine), Lithuania, Slovakia, and the Czech Republic arising in particular from such historical factors as the dependence of Poland on gas supplies from the East rendered under the long-term contracts with territorial restriction clauses and hardly any necessity/possibility to exchange gas with other neighbors in the past; as well as
  - various administrative market entry barriers, including:
    - bureaucratic and time-consuming licensing procedures applicable to virtually every companies wishing to trade in natural gas in Poland whether at the wholesale or retail market, and
    - strict compulsory gas stocks obligations which are perceived by the gas traders as a measure restricting competitive gas imports into Poland and strengthen the position of PGNiG as an entity bound by long-term gas import contracts and indirect owner and developer of Polish UGS (directly owned and controlled by Gas Storage Poland Sp. z o.o. as the subsidiary of PGNiG).

  In this context, it should be underlined that exemptions from the licensing requirements under the Polish law are very limited and the Polish law does not allow for granting a license

for trade in natural gas to Ukraine-based companies. It means that the Ukrainian companies wishing to source natural gas in Poland are generally required to establish a subsidiary in Poland or another EEA country and complete a relatively bureaucratic and time-consuming licensing procedure which might be perceived as a burdensome market entry barrier for Ukrainian traders wishing to enter Polish gas market. The alternative scenario for sourcing natural gas in Poland by Ukrainian gas traders, which is to buy gas from Polish gas traders active in Ukraine, may be perceived as not entirely beneficial as it would make the sourcing dependent on Polish gas traders active in Ukraine and deprive arbitrage opportunities based on the short term transactions concluded in Poland.

Besides, Polish UGS have limited gas storage capacities (ca. 3 bcm) in comparison to large and not fully utilized gas storage capacities existing in Ukraine (ca. 30 bcm). This gives Polish traders an opportunity to use Ukrainian UGS for the purpose of commercial gas stocks. This opportunity has been already explored in 2020 when Ukrainian UGS was already utilized by PGNiG due to lower demand for gas in Poland and limited availability of Polish storage capacities for commercial purposes. On the other hand, Ukrainian UGS cannot be utilized for the purpose of the compulsory gas stocks to be maintained under Polish law.

- **UA regulatory authorities and market participants:** Ukrainian law allocates the main duties and powers on the Ukrainian gas market to the following state authorities: Ministry of Energy of Ukraine and energy Regulator – NEURC. The Ukrainian gas market participants include a GTS operator, GDS operators, an SSO, LNG Facility Operator, which has not been established yet, a wholesale seller, a wholesale buyer, a supplier, which purchases natural gas on the market and supplies it to customers (household and non-household), and a customer.

- **PL regulatory authorities and market participants:** The main duties and powers over the gas market in Poland are vested in the President of ERO which is authorized to license and supervise gas market participants (including TSO, DSOs, SSO, LNGT operator, and gas traders) as well as enforce regulations adopted by the Polish Parliament and the Ministry of Climate.

- **UA licensing requirements:** The following activities on the Ukrainian natural gas market are subject to licensing requirements under Ukrainian law: supply of natural gas, distribution of natural gas, the transmission of natural gas, storage (injection, withdrawal) of natural gas. Wholesale natural gas trading by wholesale sellers and wholesale buyers does not require obtainment of the specific license, only supply of natural gas to end-consumers requires a license.

- **PL licensing requirements:** Trading in gaseous fuels within the territory of Poland, including foreign trade in natural gas, requires prior obtaining of a license from the President of the ERO. Obtaining the license for foreign trade in natural gas (a license necessary for cross-border trade in natural gas) requires prior obtaining of the license for trading in gaseous fuels which means that the traders/shippers engaged in cross-border trade in natural gas must obtain two separate licenses for (a) trading in gaseous fuels and (b) foreign trade in natural gas.

- **UA gas storage:** Ukraine has a large network of underground gas storage facilities in Europe. At the same time, Ukrainian regulations allow foreign natural gas traders to use short-haul services or customs warehouse services, whereby companies can inject gas without needing customs clearance for three years.

- **PL gas storages:** The working volume of Polish UGS amounts to ca. 3 bcm, about 40 percent of which is currently utilized for the purpose of the compulsory gas stocks. Polish

UGS are operated by the Gas Storage Poland Sp. z o.o. and subject to regulated TPA regime.

- **UA access to the GTS:** Access to Ukrainian GTS is granted based on the transmission agreement concluded with UA GTSO, which includes the provision of the following services: using the GTS within allocated capacity at entry and exit points; transportation of natural gas within the contractual capacity and based on approved nominations; fixing daily balancing.

- **PL access to the GTS:** Access to Polish GTS is possible under the transmission agreement concluded with Polish TSO (OGP Gaz-System S.A.) and subject to tariff revised and approved by the President of ERO on yearly basis.

- **UA-PL interconnection:** As regards the Poland-Ukraine border, the gas transmission networks operated by OGP Gaz-System and UA GTSO are currently interconnected with the virtual interconnection point named "GCP Gaz-System/UA GTSO." The capacity at the entry point UA>PL is available under the firm and interruptible product. The capacity at the exit point PL>UA is available under interruptible conditionally firm product. There is also virtual reverse flow possible involving contractual gas flow direction PL>UA.

  Access to the entry and exit points on the border is available to the system users holding active gas transmission contracts with OGP Gaz-System via auctions carried out in accordance with the NC CAM at the GSA platform operated by the Polish TSO.

  Polish and Ukrainian TSOs concluded the interconnection agreement in 2020 according to NC INT regarding the determination of actual technical/commercial capacities and operation of Drozdovichi-Hermanowice virtual interconnection point, coordination of nomination, and allocation procedures as well as the possible development of bundled products.

3.3 POSSIBILITY OF USING UKRAINIAN STORAGE FOR STORING COMPULSORY GAS STOCK AS REQUIRED BY POLISH LEGISLATION

3.3.1 MAIN FEATURES OF POLISH COMPULSORY GAS STOCKS REGULATION

The Polish regulation on compulsory gas stocks is specified in the Stocks Act. Under the said legislation, an obligation to maintain compulsory gas stocks is imposed on entities engaged in foreign trade in natural gas as well as entities bringing natural gas into Poland from abroad – irrespective of whether such entities bring natural gas into Poland through import or intra-community acquisition of goods from another EU Member State and without any *de minimis* exemption.[72] However, the obligations related to compulsory gas stocks would be limited for entities having the status of net gas exporters in Poland in the respective reference periods, such entities being generally burdened mainly with reporting obligations. This is because compulsory gas stocks are calculated based on the net volume of gas brought into Poland and such compulsory gas stocks would be equal to 0 MWh in given gas year (i.e., the year starting on October 1 of year (n)) in each case where the volume of gas exported from Poland was higher than the volume of gas brought into Poland within the respective

[72] By September 2, 2016, there was an exemption from the compulsory gas stock obligation that was applicable to entities importing not more than 100,000 mcm/a. However, the said exemption was repealed as many market participants sold natural gas at the border to minor importers and then re-purchased the same gas within virtual trading point in order to avoid the obligation. After the repeal of the exemption the number of market participants active in foreign trade in natural gas dropped and the price spreads between Polish and German gas markets increased.

reference period (generally this is period between April 1 of the year (n-1) until March 31 of the year (n)).

With regard to the import of natural gas in the form of LNG via the LNG Terminal in Świnoujście, the obligation is imposed on the entity contracting regasification/trans-shipment services within the terminal (an obligation to maintain the compulsory gas stocks is not imposed in relation to mere delivery of the LNG to the terminal or storing LNG within the terminal but would be otherwise applicable to LNG re-gasified/trans-shipped via the liquefied natural gas terminal, or LNGT).

The said regulation is questioned by the EC, which resulted in the instigation of a procedure against Poland for breach of the Treaty on functioning of the EU (in this respect the EC issued a reasoned opinion in November 2019 and might submit a complaint to the Court of Justice against Poland for breach of the Treaty on functioning of the EU).[73]

The storage capacities (working volume) currently needed to discharge the compulsory gas stocks obligations under Polish law (based on compulsory gas stock volumes to be maintained within the 2019-2020 gas year) correspond to ca. 13.34 TWh (ca. 1.2 bcm) and almost all compulsory gas stocks are maintained in Poland.

The main features of the Polish compulsory gas stock obligations are as follows:

- ***Obligated entities***. The obligation is imposed on every entity bringing natural gas into Poland either through import or intra-community acquisition of goods, irrespective of whether such gas is to be resold (entities bringing gas into Poland based on the license for foreign trade in natural gas) or used for own purposes (entities bringing gas into Poland as end users).

- ***Calculation of annual compulsory stock volumes***. The volume of compulsory stock to be maintained by given entity in the period between October 1, of given year (n) until September 30, of the next year (n+1) is calculated as the average 30-day volume of natural gas brought into Poland. The volume is determined as follows:

    - in the case of entities already acting on the market: based on the volumes brought into Poland by the obligated entity within the period between April 1, of the preceding year (n-1) to March 31, of the given year (n); or
    - in the case of entities intending to begin bringing natural gas into Poland based on an already granted license for foreign trade in natural gas or applying for such license:
        - the compulsory gas stocks to be maintained from the date on which the obligated entity starts bringing gas into Poland until the September 30 after the start of imports – based on volumes of natural gas planned to be brought into Poland by the obliged entity until March 31 of the next year;
        - the compulsory gas stocks to be maintained from October 1, following the start of bringing gas into Poland – based on actual volumes brought into Poland and specified by the President of ERO in the decision issued by September 15.[74]
    - The actual volumes of compulsory gas stocks are either verified (in case of entities already acting on the market) or determined by the President of ERO (in case of entities starting activities related to bringing gas into Poland). In each case, the volume of natural gas brought into Poland is calculated as the difference between the gas brought into Poland and that exported within the same period (compulsory gas stocks

[73] See press release available here https://ec.europa.eu/info/news/november-infringements-package-commission-takes-further-steps-ensure-member-states-respect-eu-energy-rules-2019-nov-27_en.
[74] Art. 25 Sec. 2 and 5 of Stocks Act

are not calculated on volumes brought into Poland and re-exported within the same period, which means that compulsory stock shall be 0 MWh in a given gas year if the obligated entity was a net exporter during the reference period).

- ***Obligation to maintain compulsory gas stocks throughout the entire gas year despite withdrawal/expiration of license***. The compulsory gas stocks must be maintained in volumes and within the periods specified above irrespective of withdrawal/expiration of the license for foreign trade in natural gas or end of activity in bringing natural gas into Poland.

- ***Permitted location of compulsory gas stocks.*** The compulsory gas stocks must be maintained in gas storage facilities located within the territory of Poland and allowing for injection of gas stocks into the system within the maximum period of 40 days. Alternatively, the compulsory gas stocks might be maintained in gas storage facilities located in the EU/EEA Member States if both:

    (i) technical parameters of gas storage facilities and gas networks connecting such gas storage facilities with Polish transmission system and
    (ii) storage and transmission services contracts concluded by the obligated entity with the SSOs and TSOs allow for injection of the entire volume of compulsory gas stocks into Polish gas networks within the maximum period of 40 days in each condition on a continuous basis.[75] Firm transmission capacity booked for that purpose cannot be used for commercial purposes other than bringing compulsory gas stocks into Poland in case of a decision to use such stocks.[76] The technical and contractual abilities to inject compulsory gas stocks into the Polish system are verified by the Polish TSO based on documents provided by the obligated entity.[77]

- ***Compulsory stock as service.*** Compulsory gas stocks might be maintained and the related obligation might be performed on behalf of the obligated entity by a third party holding a license for foreign trade in natural gas or trade in gaseous fuels under the agreement ("ticket agreement") and upon consent of the President of ERO.[78]

- ***Basic rules for use of compulsory stocks.*** The compulsory gas stocks are at the disposal of the minister competent to energy affairs (currently the Minister of Climate) and might be utilized by the TSO upon prior consent of the said minister, it being specified that such utilized volumes of compulsory stocks are settled by the TSO with both owners and users of compulsory gas stocks within the balancing settlements at the price corresponding to the daily weighted-average natural gas price quoted at the within-day market.[79] In case the compulsory gas stocks are used, the entities obligated to maintain the compulsory gas stocks must supplement the stocks not later than four months after the end of the month in which use of the compulsory gas stocks was initiated (the minister competent to energy affairs may extend this deadline by an additional four months by way of a decision).

In practice, there are a number of practical difficulties related to compliance with the storage obligation, including risk of insufficient storage capacities in Poland, time-schedule for booking of

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[75] For 2019-2020 gas period it is 13.338 TWh (ca. 1.2 bcm of high-methane gas at 0 deg. Celsius)
[76] Art. 24.3 and Art. 24a of Stocks Act.
[77] As for the time being, there is information that TSO positively verified possibility to maintain compulsory gas stocks outside Poland with respect to 4 entities using gas storage facilities located in Germany. See the 2020 Report on monitoring of security of gas supplies in 2019, which is available here. https://www.gov.pl/web/klimat/ministerstwo-klimatu-przygotowalo-sprawozdanie-dot-bezpieczenstwa-dostaw-paliw-gazowych-za-2019-rok
[78] Art. 24b of the Stocks Act.
[79] Section 21.3.3 of the Transmission Network Code.

storage capacities in Poland not sufficiently coordinated with decisions of the regulator on scope of storage obligation (time between issuance of the decision and the starting point for maintaining the compulsory gas stocks is not always sufficient to inject gas into the gas storage facility based on the offered storage injection parameters), and significant difficulties fulfilling the obligation using foreign storage facilities due to the fact that the Polish TSO has to issue a positive opinion confirming foreign storage capacities reliable for the purpose of performance of the storage obligation.

Although Polish regulation allows for maintaining the compulsory gas stocks abroad, this scenario is difficult in practice as it requires firm annual cross-border transmission capacity allocated for the purpose of the natural gas stock. Such capacity cannot be used by the shipper seeking storage abroad, thereby increasing the cost of maintaining the compulsory gas stocks (the cost of cross-border firm capacity is the additional cost for maintaining compulsory stocks abroad not applicable in case of compulsory stocks maintained in Poland where the cost would typically include only the price of gas, transmission to the Polish UGS available at a special 20 percent discount on the transmission rate and the cost of storage services).

3.3.2 ASSESSMENT OF THE POSSIBILITY OF MAINTAINING COMPULSORY GAS STOCKS UNDER POLISH REGULATION WITHIN UKRAINIAN UGS

3.3.2.1 ACTION NEEDED TO SPECIFY UKRAINIAN UGS AS A PERMITTED LOCATION FOR COMPULSORY GAS STOCKS UNDER POLISH LAW

The compulsory gas stocks under Polish law cannot be in any way maintained outside the EEA countries, which means that Ukrainian UGS cannot be used for the purpose of maintaining compulsory gas stocks under the Stocks Act (current volume of compulsory stocks maintained under Polish law corresponds to ca. 1.2 bcm).

Using Ukrainian UGS for the purpose of compulsory gas stocks required under the Polish law would require an amendment to the Polish Stocks Act adopted by the Polish Parliament (Sejm and Senat) and signed by the President. The amendment would need to extend the permitted countries where the compulsory gas stocks might be physically maintained by allowing for the maintenance of compulsory gas stocks within the territory of the Contracting Parties to the Energy Community Treaty.

3.3.2.2 FACILITATING LOCATION OF POLISH COMPULSORY GAS ABROAD

Furthermore, if amendments are made in applicable Polish Law to allow compulsory gas stocks to be maintained in Ukrainian UGS, maintaining compulsory stocks in Ukraine by a given entity would in each individual case require a positive opinion of the Polish TSO confirming that:

- technical parameters of relevant Ukrainian UGS where the compulsory gas stocks are to be maintained as well as the gas networks connecting such gas storage facilities with Polish transmission system (including Ukrainian gas transmission system and the Poland-Ukraine interconnection point), and

- storage and transmission services contracts concluded by the obligated entity (i.e., the specific entity seeking to maintain compulsory storage in Ukraine) with the relevant SSOs and TSOs (i.e., UTG JSC, UA GTSO and OGP Gaz-System) allow for injection of the entire volume of compulsory gas stocks into Polish gas networks within the maximum period of 40 days in each conditions on continuous basis, it being also specified that firm transmission capacity booked for that purpose cannot be used for commercial purposes other than bringing compulsory gas stocks into Poland in case of a decision to use such

stocks (positive TSO opinion on both technical and contractual feasibility to import the compulsory stock within 40 days).[80]

In the above context, one may consider relieving requirements currently applicable to maintaining compulsory stocks abroad by at least allowing the obliged entity to utilize the transmission capacity at cross-border interconnectors between foreign UGS and the Polish GTS for commercial purposes.

3.3.2.3 DOUBLE TRANSMISSION CHARGES PAYABLE FOR USE OF UKRAINIAN UGS TO STORE GAS ORIGINALLY LOCATED IN POLAND

Using Ukrainian UGS for the purpose of storing gas originally located within the Polish GTS (i.e., not imported from the east) is hindered by the need to book and pay full transmission rates applicable to, first, gas transmission from Poland to Ukraine and then gas transmission from Ukraine to Poland.

Storing gas for commercial purposes in Ukrainian UGS would involve use of more expensive short-term services for the purpose of injection and withdrawal of gas to/from Ukrainian UGS (short-term transmission capacity to Ukraine in the low-demand period and then short-term transmission capacity to Poland in the high-demand period). As a result, cross-border transmission charges add significant cost to the overall cost of maintaining gas stocks in Ukrainian UGS comparing to (a) use of Polish UGS (in which case storage of gas already located in Poland shall not be burdened with full transmission fees as the transmission rates at entry-exit points with Polish UGS are at ca. 80 percent discount), or – in another scenario – (b) creating commercial stocks in Ukrainian UGS based on gas "transmitted" to Ukraine within the virtual reverse service (in which case the 80 percent discount may apply to regular transmission rates).

Therefore, one may consider introduction of discounts on transmission rates if at the same time the shipper books both exit and re-entry capacity to the opposite direction underlying injection and withdrawal of natural gas to/from the foreign UGS. However, on the Ukrainian side, transmission charges for EU traders have been reduced with the introduction of short-haul tariffs.

3.3.2.4 UKRAINIAN UGS USED FOR PURPOSE OF COMMERCIAL GAS STOCKS

The above assessment relating to the use of Ukrainian UGS for the purpose of compulsory gas stocks does not exclude the possibility of using Ukrainian UGS for the purpose of commercial gas stocks. Based on the 2020 report on monitoring of security of gas supplies in 2019,[81] such cooperation between a Polish trader (PGNiG S.A.) and UTG JSC had already commenced, and the commercial gas stocks were already created by PGNiG S.A. in Ukrainian UGS (0.7 bcm by end of July 2020). As PGNiG controls Polish UGS via its subsidiary and thus would typically tend to give priority to utilize available working volume in Polish UGS, the said transaction and its scope were likely to be underpinned by specific factors, including:

- insufficient Polish UGS capacities (ca. 33.2 TWh out of which up to ca. 40 percent was utilized for the purpose of compulsory gas stocks and the remaining working volume utilized throughout 2020 occupied with gas purchased for the 2019/2020 winter and not used due to warm winter as well as a significant decrease of gas consumption within the COVID-19 pandemic); and

- PGNiG's intention to expand its gas trading and supply activities in Ukraine and decrease reliance on gas imported from Russia (gas supplies from Russia to be partially replaced with

[80] Art. 24.3 and Art. 24a of Stocks Act.

[81] See page 83 of the 2020 Report on security of gas supplies monitoring in 2019 which is available here. https://www.gov.pl/web/klimat/ministerstwo-klimatu-przygotowalo-sprawozdanie-dot-bezpieczenstwa-dostaw-paliw-gazowych-za-2019-rok

imports from German and LNG markets with the contracted volumes of Russian gas placed in Ukraine).

Use of Ukrainian UGS to create gas stocks based on gas imported from Russia might be particularly beneficial in 2020 when the short-term drop in demand together with the almost full Polish UGS and low gas prices on Western markets negatively affect the economics of importing gas from Russia on a take-or-pay basis. In such circumstances, Russian gas purchased under long-term contract with Gazprom might be temporarily stored in Ukraine (without prior physical entering into the Polish market) and imported/sold by PGNiG in winter when gas demand and prices are higher while pending summer demand might be serviced with gas imported via the Yamal-Europe pipeline, long-term LNG contracts, local production and gas purchased at Western spot markets at lower prices. For this purpose, it would beneficial to use short-haul services offered by UA GTSO.

3.3.3 CONTEMPLATED AMENDMENTS TO THE STOCK ACTS AS ANNOUNCED BY THE POLISH COUNCIL OF MINISTERS IN AUGUST 2020

The Polish Council of Ministers announced that it will pass the draft bill of amendments to the Stocks Act to Parliament by the end of September 2020.[82] The actual wording of the new provisions is not yet disclosed but there are assumptions of the legislative initiative presenting the main amendments to be introduced.

The Polish Government claims that the new initiative will address the European Commission's concerns with respect to the Stocks Act as presented in the reasoned opinion sent to the Polish government in November 2019, whereby the EC claimed that the compulsory gas stocks obligation is deemed to be unjustified, discriminatory and not proportionate, as well as contrary to the Security Regulation in terms of regional solidarity rules, and thus deemed to be a barrier to the Polish gas market as well as barrier for gas flows at the regional level. The details and argumentation raised by the EC to support the claim are not publicly available as the reasoned opinions sent to EU Member States are typically not published in their entirety.

The measure covered by the proposed amendments (and claimed to address the European Commission's concerns set forth in the reasonable opinion of November 2019) is limited to exemption of LNG imports from the compulsory stock obligations, i.e., gas imports/intra-Community acquisition via pipelines would still be fully subject to the compulsory gas stocks obligations while the traders/shippers would be exempt from the compulsory stock obligation with respect to the LNG regasified/trans-shipped via LNGT, with such exemption being introduced gradually.

As of October 1, 2021, only a third of LNG regasified/trans-shipped via LNGT would be exempt from the obligation; as of October 1, 2022, two-thirds of LNG regasified/trans-shipped via LNGT would be exempt from the obligation; and as of October 1, 2023 all LNG regasified/trans-shipped via LNGT would be exempt from the compulsory gas stocks.

The new law should also:

- adjust traders' reporting obligations to facilitate timely delivery by the TSO of the opinion on the technical and commercial possibility to withdraw and transport compulsory gas stocks from foreign UGS to Poland within 40 days;

- facilitate conclusion of agreements covering maintaining compulsory gas stocks on behalf of third parties ("ticket agreements"); and

[82] Draft bill available here. https://legislacja.rcl.gov.pl/projekt/12337651

- introduce certain other amendments not directly related to gas exchanges between Poland and Ukraine (adjusted implementation of the Security Directive and Security Regulation in terms of the definition of the "protected customers" that are protected against restrictions of gas supplies, repeal of the provision exempting gas entities from liability in case of gas supply restrictions as well as additional adjustment of procedure for development of the individual gas supply restriction plans prepared for administrative gas supply restrictions occurrences).

So far, there is no information on any plan to extend the possible location of compulsory gas stocks to Energy Community countries (including Ukraine) or relax the obligation to maintain firm IP capacity allowing for delivery of compulsory gas stocks to the Polish system from abroad within 40 days.

Furthermore, taking into account the realities of booking Świnoujście LNGT (whose entire capacity is booked by PGNiG under a long-term agreement) and consequences of the changes, the traders' association criticized the above legislative initiative and stated that it does not duly address objections raised by the European Commission with respect to the Stock Act, and further, that the adoption of the bill might be even more discriminatory as it would be exclusively PGNiG that would be partly exempted from the compulsory stocks obligations.[83]

Taking into consideration the increasing LNG imports (the LNGT in Świnoujście is expected to achieve capacity of 8.3 bcma by 2024, the initiative may release significant storage capacities in Poland (up to 0.6 bcm) and decrease the overall cost of LNG imports to Poland (LNG imports would not be burdened with compulsory gas stocks obligation). This may indirectly decrease demand for use of Ukrainian UGS by Polish traders, especially PGNiG, which is the sole shareholder of the Polish SSO.

The scope of entities relying on the contemplated "LNG import" exemption from the stock obligation may be wider if the Polish government decides to introduce a scheme for release of LNGT capacity, possibly supported with a scheme for socialization of LNGT costs (similar to that discussed in the past and mentioned in the press news available here).

3.4 STEP-BY-STEP GUIDELINES FOR A SHIPPER WHO IS WILLING TO TRANSPORT GAS FROM POLAND TO UKRAINE, STORE GAS IN UKRAINIAN STORAGE AND THEN TRANSPORT GAS BACK TO EU COUNTRIES INCLUDING A DETAILED DESCRIPTION OF ALL ACTIONS THAT MUST BE UNDERTAKEN BY THE SHIPPER

Given the regulatory, commercial and technical conditions, it is assumed that:

- Natural gas to be stored in Ukrainian UGS shall be acquired in the Polish virtual trading point (either through an over-the-counter transaction or at the commodity exchange) and transmitted to Ukrainian UGS subject to the condition that there is required gas flow from Ukraine to Poland via GCP Gaz-System/UA GTSO entry point enabling use of the interruptible conditionally firm capacity available at the via GCP Gaz-System/UA GTSO exit point84 (as the UA/PL IP does not operate in bi-directional mode, the natural gas currently transported from Poland to Ukraine might be physically sourced mainly from gas

[83] See EFET statement available here.
https://www.efet.org/Files/Documents/Gas%20Market/Security%20of%20Supply,%20Storage%20and%20LNG/EFET%20statement%20on%20storage%20obligations%20revision_24082020.pdf
[84] See conditions for use of capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO available here.
https://en.gaz-system.pl/fileadmin/pliki/system_przesylowy/en/Informacje_dotyczace_przepustowosci_przerywanej_warunkowo_ciaglej_EN.pdf

flows transmitted to Poland from the east via Ukraine's gas transmission system as, in principle, there is limited possibility to transmit to Ukraine via the Hermanowice exit point any volumes of gas sourced from other directions, such as LNGT, Yamal-Europe pipeline, GCP Gaz-System/ONTRAS, Mallnow reverse or local production in Poland).

- Even if it is technically possible to transmit to Ukraine – via GCP Gaz-System/UA GTSO exit point – the natural gas sourced through the LNGT, 100 percent of the current regasification capacity of the LNGT (ca. 5 bcma) is booked by PGNiG S.A. for the period until at least 2034,85 while the expected additional capacity resulting from the pending extension of the LNGT (ca. 8.3 bcma) has been also already booked by PGNiG S.A. until 203886 and thus actual available regasification capacity corresponds to 0 Ncm.87 At the same time, the available capacity at the entry point from the LNGT might be allocated exclusively to the entity that entered into the regasification agreement with the LNGT operator and the LNGT operator notified OGP Gaz-System of the allocation of regasification capacity to given entity (point 7.1.11 of the OGP Gaz-System Transmission Network Code). Thus, within the guideline the steps related to booking the services within the LNGT are not presented.

- If natural gas is acquired in Poland, the relevant licenses for trading in gaseous fuels and foreign trade in natural gas are required. In this context it is also assumed that the shipper/trader shall have its registered office (in case of individuals – place of residence) within the territory of Poland (alternatively, it may have registered office in other EEA country, Swiss Confederation or Turkey88). For storing natural gas within the territory of Ukraine, no license is required for either foreign or local traders/shippers (unless the traders would further clear customs of natural gas and supply the gas to end users). Moreover, there is currently no need for a foreign company intending to store the natural gas under the Ukrainian customs warehouse regime with its further re-export to European market to register with Ukrainian tax authorities.

- This section does not cover the obligations of the shipper/trader related to standard (including periodic) actions required by generally binding laws (including corporate, environmental and tax) or contracts, such as registration of the company, notifications, submitting of tax/customs forms, maintaining records, reporting to the national regulators, settlement of fees, etc. Such standard actions are not perceived as a significant additional barrier to regulated market.

- The section is prepared under the assumption that a Polish shipper/trader is not required to open a branch (representative office) or subsidiary in Ukraine to use Ukrainian gas storages. The step-by-step guidance does not cover a situation when a Ukrainian trader buys gas from the foreign trader at the UA-PL border, transfers it to the UGS and then sells it to the EU buyers. According to the above, there is no technical and regulatory possibility of a Ukrainian gas market participant importing natural gas from the LNGT located in Poland to Ukraine. A Ukrainian market participant may only acquire natural gas through the standard procedure at the IP according to the general rules.

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[85] See LNTO transparency announcement available here.
[86] See LNTO press release available here.
[87] See LNTO transparency announcement available here. Data as of August 22, 2020.
[88] In case of an entity registered in Ukraine or the United States, prior establishment of a subsidiary within the European Economic Zone country, Swiss Confederation or Turkey would be required.

3.4.1 POLISH REGULATIONS AND PROCESS FOR PURCHASE OF GAS AND TRANSPORT TO THE UKRAINIAN BORDER AND RE-EXPORT TO POLAND

A detailed step by step guide is provided in the annex. The guide illustrates a total of 21 steps, summarized below, taking approximately 7 months.

Figure 59 Overview of Polish Steps

STEP-BY-STEP GUIDELINES FOR SHIPPERS	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
POLAND							
Step 0: Incorporation of company in Poland	2-3 weeks						
Step 1: Obtaining of the Polish tax identification number (NIP)	2-3 weeks						
Step 2: Registration for VAT purposes	2-3 weeks						
Step 3: Obtaining of the EU VAT number	2-3 weeks						
Step 4: Obtaining of the required licenses for (1) trading in gaseous fuels and (2) foreign trade in natural gas		3-4 Months					
Step 5: Determination of volume of compulsory gas stocks to be maintained							
Step 6: Registration with the registry of Market Participants					2-4 days		
Step 7: Obtaining EIC					7 days		
Step 8: Conclusion of agreement with operator of chosen Registered Reporting Mechanism (RRM)					2-4 days		
Step 9: Development and notification of disruption procedure					2-4 days		
Step 10: Registration within the OGP Gaz-System's Information Exchange System					1-2 days		
Step 11: Conclusion of transmission contract with TSO and establishment of collateral					2-3 weeks		
Step 12: Notification of commencement of activity as an intermediary gas entity					1 day		
Step 13: Optional – status of the participant of the Polish Power Exchange						1 week	

STEP-BY-STEP GUIDELINES FOR SHIPPERS	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
Step 14: Registration within the GSA and acquisition of rights to exit capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO						Within scheduled auctions	
Step 15: Acquisition of natural gas to be exported to Ukraine for storage and submitting nominations to OGP Gaz-System						Daily	
Step 16: Allocation of gas flows and settlement for imbalances with OGP Gaz-System						Daily	
Step 17: Securing compulsory gas stocks					1-2 months		
Step 18: Notification to OGP Gaz-System on maintaining compulsory gas stocks	Annually, independent of other steps						
Step 19: Acquisition of rights to entry capacity from Ukraine to Poland at the GCP Gaz-System/UA GTSO						Within scheduled auctions	
Step 20: Submitting nominations to OGP Gaz-System						Daily	
Step 21: Allocation of gas flows and settlement for imbalances with OGP Gaz-System							Daily

Source: ESP

3.4.2 UKRAINIAN REGULATIONS FOR PLACEMENT OF THE GAS IN GAS STORAGE AND RE-EXPORT

A detailed step by step guide is provided in the annex. The guide illustrates a total of 15 steps, summarized below, taking approximately 1 month.

Figure 60: Overview of Ukrainian Steps

STEPS BY STEP GUIDELINES FOR SHIPPERS	1 Month			
	Week 1	Week 2	Week 3	Week 4
UKRAINE				
Step 1: Obtaining EIC	2 days			
Step 2: Entering into the gas transmission agreement with UA GTSO	5-10 days			
Step 3: Registering on the Informational Platform of UA GTSO	5-10 days			
Step 4: Entering into the gas storage agreement with the Ukrainian SSO	5-10 days			
Step 5: Registering on the Informational Platform of the Ukrainian SSO	5-10 days			
Step 6: Receiving shipper code	1 day			
Step 7: Registering as a shipper on the GSA auction platform for capacity allocation		3-5 days		
Step 8: Taking part in an auction for capacity allocation			ENTSOG auctions calendar	
Step 9: Paying for allocated capacity according to tariffs set by the NEURC				5 days
Step 10: Downloading a scanned copy of periodical customs declaration to the Informational Platform of UA GTSO		1 day		
Step 11: Ordering customs warehouse service from Ukrainian SSO		7 days		
Step 12: Providing financial security				Daily
Step 13 Submit a nomination via the Informational Platform for transmission of natural gas				Daily

Step 14: Re-export of natural gas; submission of a nomination via the Informational Platform for transmission of natural gas	Daily
Step 15: Re-export of natural gas; taking part in an auction for capacity allocation	Within scheduled auctions

Source: ESP

3.5 GAP ANALYSIS OF THE BARRIERS TO MARKET INTEGRATION AND COMPATIBILITY OF LEGAL RECOMMENDATIONS FOLLOWING THE ANALYSIS OF THE CURRENT FRAMEWORK IN PLACE

3.5.1 POLISH REGULATORY GAP ANALYSIS

The following gap have been identified with respect to where Polish law would need to be further harmonized and/or developed. A more detailed breakdown which covers challenges, recommendations, responsible parties and compliance with EU law can be found in Annex 4.

Challenge	Recommendation
1. Development of bi-directional interconnection capacity between Poland and Ukraine (basic technical market barrier)	
There is no firm capacity available for gas flows in the PL>UA direction (in practice, gas flows from Poland to Ukraine are currently made by way of virtual reverse flow with availability of physical flow on interruptible, conditionally firm basis). This hinders gas flows from Poland to Ukraine and poses a risk of limited gas flow in the PL>UA direction after December 31, 2022, when the long-term gas supply agreement between PGNiG and Gazprom expires and PGNiG decides not to acquire gas from Russia at all, or at least decides not to purchase gas from Russia via Ukraine (the latter might be underpinned by PGNiG's shareholding in SGT EuRoPolGaz, which owns the Polish section of the Yamal-Europe pipeline – as well as an intention to decrease transmission rates in the Yamal-Europe pipeline that may be used to transmit gas to Poland from German market via Mallnow point). Bi-directional interconnectors have been developed within the last 10 years on the borders between Poland and Germany and Czech Republic with pending investments in bi-directional interconnectors at the borders between Poland and Slovakia and Lithuania.	In order to facilitate gas flows from Poland to Ukraine (for the purposes of either gas imports to Ukraine or keeping gas stocks in Ukrainian UGS) it would be recommended to develop bi-directional interconnection capacity between Ukraine and Poland on a firm basis. In that case, gas flows from Poland to Ukraine would not be dependent on corresponding gas flows from Ukraine to Poland and therefore it would facilitate gas exports from Poland to Ukraine irrespective of gas transmission in UA>PL direction. On the Ukrainian side,the infrastructure is ready physically offtake gas into the system up to 5 bcma. Following reconstructions, the maximum volumes will increase to higher level depending on the pressure from Polish side.
2. Facilitating access of Ukraine-based entities to the Polish trading market	

Challenge	Recommendation
Trading in gaseous fuels or foreign trade in natural gas within the territory of Poland requires a license, which is granted exclusively to entities with a registered office (in case of individuals – place of residence) within the territory of a EU Member State, Swiss Confederation or a Member State of the European Free Trade Agreement (EFTA) – a party to the European Economic Area agreement, or Turkey. Ukraine-based entities have to incorporate a subsidiary within an EEA country / Swiss Confederation / Turkey in order to be licensed and thus authorized to purchase/sell gas within the territory of Poland.	In order to facilitate cross-border trades in gas between Poland and Ukraine, it would be recommended to extend the list of companies that may be granted license for trading in gaseous fuels or foreign trade in natural gas to Ukraine-based companies.
3. Facilitating licensing procedures in Poland	
The licensing procedure in Poland is time-consuming (3-4 months) and requires procurement and submission of a vast scope of documentation. It significantly delays the start of trading activities in Poland for new entrants in comparison to other EU jurisdictions. It is also typically carried out in written form (even if submission of the application is possible via electronic means with electronic signature). Excessive timelines in the procedure are partly related to an insufficient number of case-handlers employed by the regulator, which is often raised by the President of ERO. Besides, there is no clear regulation on what financial resources (amounts) should be secured by the applicant to be granted a license for trading in gaseous fuels or foreign trade in natural gas as it is assessed case by case based on the scope of activity planned by the applicant. This results in uncertainty as to what amount of financial resources should be secured by the applicant before the licensing procedure.	In order to facilitate cross-border trades and new entrants' access to the Polish market, it would be recommended to facilitate licensing procedures by, among other options: (a) reducing the scope of documentation to be provided to the regulator within the licensing proceedings (including such as at least documents confirming data existing in other public registries, that can be made accessible online to the regulator's officials, which would allow removing the requirement to deliver tax, social security and criminal certificates); (b) introducing shorter deadlines to be replaced with direct access for the regulator to handle the license application as well as respective registries; and (c) allocating additional budget and hiring additional staff to handle licensing applications. Additionally, there is scope to improve regulatory practice by developing and announcing the uniform rules as to the level of financial resources expected by the regulator within the licensing proceedings to be proved in order to obtain a license (e.g., minimum amounts / algorithm allowing for calculation of financial resources based on expected level of turnover within initial 12 months of activity) and allowing for submission of application supporting documentation in electronic form only (no requirement to provide documentation in hard copies).
4. Bundled capacity	
Transmission capacity at the Polish-Ukrainian border must be booked separately for each side of the border (no bundled products offered), which hinders transmission of natural gas between Polish and Ukrainian virtual trading points or UGS and poses a risk of having booked capacity on one side of the border without having capacity booked on the other side of the border.	In order to facilitate gas exchanges between Polish and Ukrainian markets, it is recommended to develop and offer bundled transmission capacity at the GCP Gaz-System/UA GTSO (in principle, this should arguably be preceded by implementation of recommendation specified in point 2 above in order to allow the same shipper/company to act on both Polish and Ukrainian market).

Challenge	Recommendation
5. Allowing for maintenance of compulsory gas stocks in Ukraine	
Under Polish law, compulsory gas stocks must be maintained in gas storage facilities located within the territory of Poland and/or EU/EEA Member States. This prevents using Ukrainian UGS for the purpose of maintaining compulsory gas stocks under Polish law (market opportunity based on current volume of compulsory stocks maintained under Polish law corresponds to ca. 1.2 bcm). Even if Ukrainian UGS were a permitted location for compulsory gas stocks under Polish law (if the amendment to the Polish Stocks Act is adopted), maintaining gas stocks in Ukrainian UGS would be possible if both (a) technical parameters of gas storage facilities and gas networks connecting such gas storage facilities with Polish transmission system, as well as (b) storage and transmission services contracts concluded by the obligated entity with the SSOs and TSOs allow for injection of the entire volume of compulsory gas stocks into Polish gas networks within the maximum period of 40 days in each condition on a continuous basis, it being also specified that firm transmission capacity booked for that purpose cannot be used for commercial purposes other than bringing compulsory gas stocks into Poland in case of a decision to use such stocks by the obligated entity, the said conditions being subject to verification of the Polish TSO. This regulation in each case result in increased costs of compulsory stocks maintained abroad due to the need to book long-term firm capacity at the Polish-Ukrainian border in the UA>PL direction.	Maintaining Polish compulsory gas stocks in Ukrainian UGS requires extending the permitted locations of compulsory gas stocks under the Polish Stocks Act to at least Ukraine or the Energy Community Contracting Parties. Further simplification shall be to remove the requirement that firm capacity for the purpose of importing compulsory gas stocks into Poland cannot be used for commercial purposes. In each of the abovementioned cases, amendments to the Stocks Act would be required to implement the solutions. The draft bill of amendments to the Polish Stocks Act as published by the Polish Council of Ministers in September 2020 does not address either of the abovementioned issues. To the contrary, it may result in significant decrease in demand for storage capacity for the purpose of Polish compulsory gas stocks (even up to 0.6 bcm by 2024), which may also decrease demand for use of Ukrainian UGS by Polish gas traders – even with respect to the commercial gas stocks.
6. Discounts on double Transmission Charges at Gcp Gaz-System/UA GTSO in case of storing Poland-originating gas in Ukrainian UGS	
Use of Ukrainian UGS for the purpose of gas stocks requires payment of full transmission rates applicable to, firstly, gas transmission from Poland to Ukraine and then gas transmission from Ukraine to Poland. Taking into account the use of more expensive short-term services for the purpose of injection and withdrawal of gas to/from Ukrainian UGS, it adds significantly to the overall cost of maintaining gas stocks in Ukrainian UGS (comparing to e.g., use of Polish UGS, in which case storage of gas already located in Poland shall not be burdened with full transmission fees as the transmission rates at entry-exit points with Polish UGS are at a ca. 80% discount).	In order to ease use of Ukrainian UGS for storing gas originally located in Poland, one could consider introducing discounts on transmission fees applicable to the Polish-Ukrainian border with respect to capacity utilized for the purpose of gas storage in Ukrainian UGS (i.e., discounts applicable to capacity booked in PL>UA direction when capacity is booked in the opposite direction at the same time). Such step could be implemented in the course of adoption of the new reference price methodology and transmission tariff. However, on the Ukrainian side a reduction of the transmission charges has been achieved with the introduction of short-haul tariffs.

Source: ESP

Table 8: Updated Polish Steps after improving the licensing regime

STEP-BY-STEP GUIDELINES FOR SHIPPERS	Month 1	Month 2	Month 3	Month 4
POLAND				
Step 0: Incorporation of company in Poland	2-3 weeks			
Step 1: Obtaining of the Polish tax identification number (NIP)	2-3 weeks			
Step 2: Registration for VAT purposes	2-3 weeks			
Step 3: Obtaining of the EU VAT number	2-3 weeks			
Step 4: Obtaining of the required licenses for (1) trading in gaseous fuels and (2) foreign trade in natural gas	3-4 weeks			
Step 5: Determination of volume of compulsory gas stocks to be maintained				
Step 6: Registration with the registry of Market Participants		2-4 days		
Step 7: Obtaining EIC		7 days		
Step 8: Conclusion of agreement with operator of chosen Registered Reporting Mechanism (RRM)		2-4 days		
Step 9: Development and notification of disruption procedure		2-4 days		
Step 10: Registration within the OGP Gaz-System's Information Exchange System		1-2 days		
Step 11: Conclusion of transmission contract with TSO and establishment of collateral			2-3 weeks	
Step 12: Notification of commencement of activity as an intermediary gas entity		1 day		
Step 13: Optional – status of the participant of the Polish Power Exchange			1 week	
Step 14: Registration within the GSA and acquisition of rights to exit capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO			Within scheduled auctions	
Step 15: Acquisition of natural gas to be exported to Ukraine for storage and submitting nominations to OGP Gaz-System			Daily	
Step 16: Allocation of gas flows and settlement for imbalances with OGP Gaz-System			Daily	
Step 17: Securing compulsory gas stocks				1-2 months

STEP-BY-STEP GUIDELINES FOR SHIPPERS	Month 1	Month 2	Month 3	Month 4
Step 18: Notification to OGP Gaz-System on maintaining compulsory gas stocks	Annually independently of other steps			
Step 19: Acquisition of rights to entry capacity from Ukraine to Poland at the GCP Gaz-System/UA GTSO				Within scheduled auctions
Step 20: Submitting nominations to OGP Gaz-System				Daily
Step 21: Allocation of gas flows and settlement for imbalances with OGP Gaz-System				Daily

Source: ESP

3.5.2 UKRAINIAN REGULATORY GAP ANALYSIS

The following gaps have been identified with respect to where Ukrainian law would need to be further harmonized and/or developed. A more detailed breakdown which covers challenges, recommendations, responsible parties and compliance with EU law can be found in Annex 5.

Challenge	Solution
1. Transition to measurement of gas in energy units	
Currently, natural gas metering is carried out in cubic meters under standard conditions in accordance with "GOST 2939-63" (temperature 20° C and absolute pressure 101.325 kPa). The transition to European standards for gas metering in energy units is dictated by Directive 2006/32/EC of the European Parliament and of the Council of April 5, 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC and Directive 2009/73/EC of the European Parliament and of the Council of July 13, 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC. Thus, in Ukraine and in the countries of the European Union, different standard conditions apply in which the volume of gas is adjusted. In addition, according to European legislation, gas metering must be kept in kilowatt-hours, not cubic meters. The use of energy units will make natural gas metering more objective when purchasing and selling, in particular for cross-border trading and for pricing and tariffing it. The introduction of energy units will simplify the process of compiling the energy balance when enterprises use different sources of energy, allowing them to choose the most cost-effective type of fuel, stimulate consumers to save energy, and make the effectiveness of gas use transparent and comprehensible compared to other sources of energy. Also, the following should be adopted: – Technical Norms and Safety Standards on the Natural Gas Market; – Technical Regulations in the Area of Natural Gas; – Rules on Access to Upstream Pipelines.	Adoption by the Ukrainian Parliament of the Draft Law "On Amendments to Certain Legislative Acts of Ukraine on the Implementation of Metering and Calculations on the Gas Volume in Energy Units on the Natural Gas Market" No. 2553, which has been approved in the in the first reading. It is not possible to predict the timeline for the adoption of the Draft Law as under the Law of Ukraine "On the Rules of Procedure of the Verkhovna Rada of Ukraine" dated February 10, 2010, No. 1861-VI, the Parliament may consider draft laws, as a rule, according to the procedure of three readings, which includes: 1) the first reading - discussion of the basic principles, provisions, criteria, structure of the draft law and its adoption as whole; 2) the second reading - article-by-article discussion and adoption of the draft law; and 3) the third reading - the adoption of the draft law, which generally requires revision and approval. The Verkhovna Rada may make a decision to hold repeated first and second readings of the draft law no more than two times. The Parliament may make a decision to adopt the draft law immediately after the first or second reading. From January 1, 2021 Drozdovichi GMS will measure in energy units and from April 1, 2020, all customs declarations will be provided in energy units.

Challenge	Solution
2. Currency control limitation	
Traditionally, Ukraine has had strict currency control limitations. Recently, most of them were lifted, but some restrictions remain in place. For example, there is a deadline of 365 days for payment under cross-border contracts, otherwise companies will be subject to penalties. In addition, representative offices/branches/local PE of foreign companies are facing certain currency control limitations, which may affect cross-border trading. Local PE (a representative office) of a foreign entity is not suitable for cross-border trading because of the Ukrainian currency control limitations. Pursuant to Ukrainian currency control regulations, representative offices in Ukraine are significantly limited in transfer of funds from Ukraine. A representative office is allowed to purchase foreign currency and transfer such foreign currency funds abroad only if the transfer is made to its head office (i.e., the non-resident company which opened such representative office). No transfer may be made by the representative office to any non-resident third party. To the extent that Ukrainian representative offices are expected to participate in sale and purchase of natural gas to/from non-residents of Ukraine, the aforesaid regulatory change is required. At the same time, and subject to customs regulations, if the representative offices in Ukraine are expected to participate only in storage activities (temporary import and further return of natural gas from/to its head office) and any sale or purchase of natural gas is made between non-residents only (including head office acting directly, not via its Ukrainian representative office), Ukrainian currency control limitations would not apply to transfer of funds between such non-residents made outside of Ukraine.	Relevant changes should be made to the legislation, in particular introducing changes to the National Bank of Ukraine regulation to exclude natural gas from the requirement of a 365-day term for settlements under export and import contracts. Amend the regulatory regime of PE bank accounts to allow transfer of funds abroad to third-parties non-residents.
3. Lack of legislation in English	
Foreign companies shall bear in mind that the Ukrainian legislative and regulatory database does not contain the official English translations of relevant laws and regulations, creating an additional barrier for foreign companies to properly interpret and clearly understand Ukrainian gas market regulation without recourse to Ukrainian legal counsels' assistance. Meanwhile, unofficial translation of some gas market regulations, as well as relevant applications and contractual documents required for gas trading may still be found at the website of UA GTSO or the Ukrainian SSO. However, in most cases, such English texts do not include translation of amendments to the documents. Moreover, websites of both the TSO and SSO refer to helplines or email details for both resident and non-resident companies' support.	To improve cross-border trade between Ukraine, Poland and other EU countries the regulator should keep, disclose and update English versions of the main legislative acts governing the gas market.

Challenge	Solution
The main operational documents applicable in Ukraine (such as guidelines for licensing proceedings, grid codes, tariffs, contract templates and other transparency documents required under the relevant network codes) are generally available in English in up-to-date versions. However, the legislative acts such as statutes and secondary legislation are not publicly available in English in up-to-date versions, which may impede understanding of the gas market regulations and create a practical entry barrier to the Ukrainian gas market.	

Source: Asters, SKS Analysis

3.5.3 CONCLUSIONS

Taking into account the fact that the gas exchanges between Poland and Ukraine might be significantly restricted after 2022 as a result of the end of the Yamal contract, then the enabling of fully bi-directional flows between Poland and Ukraine could be considered essential to increase flows in the medium and long term.

This would require new arrangements between the Polish and Ukrainian TSOs in order to assess which investments are actually needed to provide fully bi-directional flows via GCP OGP Gaz-System/UA GTSO and whether such investments must be supported with long-term transmission agreements concluded within the binding Open Season procedure. The objective would be to enable firm capacity from Poland to Ukraine. On the Ukrainian side, the infrastructure is available to physically offtake gas into the system up to 5 bcma. Following reconstruction works, the maximum volumes will increase to higher level depending on the pressure from Polish side.

As regards to regulatory aspects of gas exchanges between Poland and Ukraine, the licensing requirements in Poland impose significant market entry barriers on Ukrainian gas traders, causing Ukrainian gas traders to establish Polish subsidiaries and complete bureaucratic and time-consuming licensing procedures, negatively affecting gas exchanges between Poland and Ukraine. In order to remove or at least mitigate this barrier, it is recommended to extend license accessibility in Poland to Ukraine-based companies and facilitate licensing proceedings in order to reduce administrative barriers to the presence of gas traders in both markets and provide gas supplies and price arbitrage between Polish and Ukrainian markets. However, these require political will by the Polish government to open the Polish market to Ukraine-based companies and streamline processes and to decrease the level of requirements and bureaucracy currently applicable to gas licenses in Poland.

The additional and more technical action streamlining gas exchanges between Poland and Ukraine would be offering bundled transmission products at the GCP OGP Gaz-System/UA GTSO. As such products generally require firm transmission capacity to be in place, such products could be offered initially in the direction from Ukraine to Poland, but firm capacity is required to provide develop a product in the reverse direction. This will also depend on the resolution of the licensing issues discussed for Poland to enable traders to make use of such bundled products.

Finally, with regards to the possible use of Ukrainian UGS for the purpose of gas stocks for Polish customers' needs, this would require – apart from technical requirements – major regulatory decisions. Stakeholders (including Polish and Ukrainian GTSOs and the regulators) should first consider implementation of discounts on cross-border transmission rates that would be applicable to the transmission services booked for the purpose of storing natural gas in Ukrainian UGS. Additionally, in view of the limited working volume in Polish UGS and spare working volumes in Ukrainian UGS, one can consider allowing maintenance of the compulsory gas stocks in Ukraine under Polish law. Such action would require political will by the Polish government and – taking into consideration Poland's approach to compulsory gas stocks as an instrument of security of gas supply also designed to generate demand for Polish UGS – might be difficult to achieve. The Ukrainian Regulator has already introduced a discounted tariff through short-haul services, which is currently utilized by numerous European gas traders.

Additionally, to bring Ukrainian metering regulations in compliance with EU regulations, it is necessary for the Ukrainian Parliament to adopt the Draft Law "On Amendments to Certain Legislative Acts of Ukraine on the Implementation of Metering and Calculations on the Gas Volume in Energy Units on the Natural Gas Market" No. 2553, which was approved in the in the first reading. It is noted that From January 1, 2021 Drozdovichi GMS will measure in energy units and from April 1, 2020, all customs declarations will be provided in energy units.

Finally, it is important for UA GTSO and OGP Gaz System to make additional efforts to provide English translations of the main legislative acts covering cross-border trade and storage issues.

4 ASSESSMENT OF TARIFFS AND BUNDLED PRODUCT SERVICES

This section analyzes the commercial aspects of a higher level of integration between the gas markets in Ukraine and Poland, with particular focus on the bundled service offering for gas transmission and storage. Focusing on cross-border bundled products in Europe, the analysis concludes that there is significant potential for a bundled product to be developed between Poland and Ukraine, which is necessary for further integration between the two countries' natural gas markets, contingent upon successful resolution of the technical and regulatory barriers discussed in this report.

This section will present the ideal product design that can facilitate further integration between Ukraine and Poland as well as a more liquid, modernized, and mature natural gas market in Ukraine. The EU approach of standardization of transmission capacity has been considered and how it can be applied to further integration between Ukraine and Poland.

An overview has been provided of the applicable concepts from the network code and explain how they impact the operating framework for Transmission System Operators (TSOs), particularly in the context of cross-border bundle capacity offering. Considering the less constrained regulatory environment for Storage Systems Operators (SSOs), the role of storage bundled products and services and other product design innovations that can be applied in the Ukraine-Poland market area on the basis of the experience gathered in Europe have been examined. In addition, some guidelines have been provided regarding bundled product design. This section will be concluded with the lessons learned from seven case studies covering both SSO and TSO service offerings.

4.1 APPLICABLE CONCEPTS AND DEFINITION OF PRODUCT BUNDLING

4.1.1 NC CAM AND CAPACITY PRODUCTS STANDARDIZATION

The EU has determined that the standardization of transmission capacity is the first step before any bundling and optimization. The purpose of the standardization is to enable efficient/cost-effective gas flows and to provide the necessary trigger for any incremental interconnection capacity, if required.

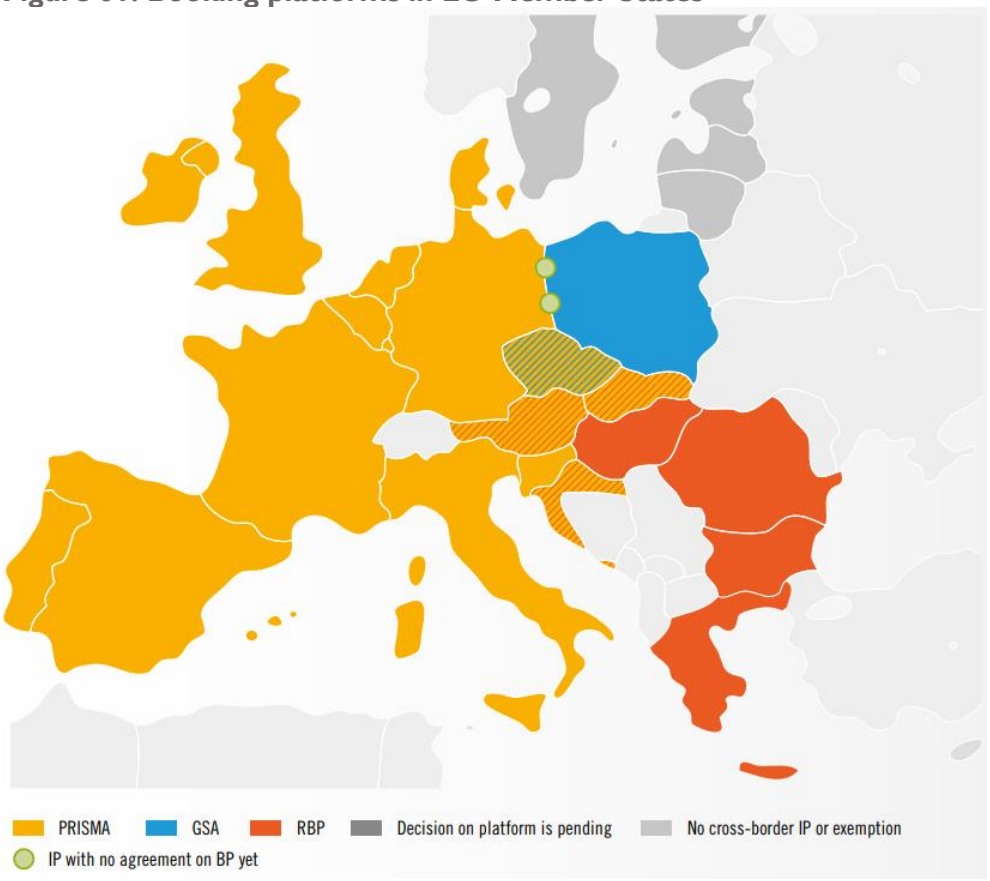
4.1.1.1 BOOKING PLATFORMS

In accordance with the requirements of the European NC CAM, TSOs are required to offer transmission capacity through open, transparent platforms and often using web-based products that are well understood by market participants (shippers/traders). This has been the principal driver of standardized transmission products offered on three open platforms in the EU: PRISMA European Capacity Platform (PRISMA), GSA Platform (GSA) and Regional Booking Platform (RBP). GSA and RBP are operated by single TSOs (Gaz-System and FGSZ, respectively) while PRISMA is a limited company with several TSOs as shareholders.[89]

By far, PRISMA appears to be the most popular platform with the greatest number of market participants and with considerable depth of volume in its product offerings (see Figure 61).

[89] See also this ENTSOG report for more information on booking platforms in EU https://www.entsog.eu/sites/default/files/files-old-website/publications/CAM%20Network%20Code/2014/CAP0505_141104_Booking%20platform%20report_FINAL.pdf

Figure 61: Booking platforms in EU Member States



Source: ENTSOG

4.1.1.2 CAPACITY PRODUCTS

The NC CAM harmonized the rules regarding capacity allocation by establishing auctions as the procedure for the offer and allocation of standard capacity products at the relevant interconnection points (IPs). An IP is defined as a physical or virtual point connecting adjacent entry-exit systems or connecting an entry-exit system with an interconnector.

The NC CAM prescribes five standard capacity products to be offered by the European TSOs at the cross-border (virtual) interconnection points. These products are:

- Annual capacity (gas years)
- Quarterly capacity
- Monthly capacity
- Daily capacity:
    - Day-ahead (DA, next gas day) capacity
    - Within-day (WD, same gas day) capacity

4.1.1.3 AUCTIONS

These capacity products are auctioned according to a pre-published auction calendar set by ENTSOG. Capacity products for the monthly, quarterly and annual auction are published on a booking platform prior to each auction. For each type of product, booking platforms determine, based on the amount of capacity offered by the TSOs, how much capacity will be offered as bundled or unbundled capacity. Firm capacities on both sides of the border are bundled to the maximum.

The remaining capacity, which cannot be bundled, is offered as unbundled capacity. Unbundled capacity is offered in a separate auction that runs parallel to the bundled capacity auction. The issue of unbundled capacity is temporary considering the expiration of the unbundled capacity booked under long-term contracts (LTCs).

The unbundled capacity has been a historic legacy of the EU LTCs, which were contracted across various pipe sections by the incumbent suppliers. Most of these individual unbundled capacities with common ownership and counterparties have already been bundled. This implies that there is a very small number of unbundled capacities[90] that will expire in the next few years as the LTCs they underpin begin to expire.[91]

ACER/ENTSOG guidance on NC CAM states that the longer-term capacities should be auctioned first, followed by the next available term period (quarterly, monthly, day-ahead and within-day). The rationale for this approach is the time required by TSOs to implement daily and within-day balancing services to offer the physical balancing component required to trade these products.

The main characteristics of auctions defined by NC CAM are as follows:

- Auctions have standardized design and timing. Bidding rounds are held between 8:00 a.m. and 5:00 p.m. UTC during wintertime and between 7:00 a.m. and 4:00 p.m. UTC during summertime;
- At least 20 percent of the technical capacity at each IP shall be set aside or the totality of the available capacity, if this is lower than the proportion of technical capacity to be set aside. From this capacity, at least 10 percent is offered no earlier than in the annual quarterly capacity auction during the gas year preceding the start of the relevant gas year, while the remaining capacity set aside (at least 10 percent) is offered no earlier than in the annual yearly capacity auction held in accordance with the auction calendar during the fifth gas year preceding the start of the relevant gas year;
- Capacity shall be offered for at least five years and no longer than 15 years;
- kWh/h or kWh/d are the energy units used for expressing capacity;
- Annual yearly, annual quarterly and rolling monthly capacity auctions use an ascending clock auction algorithm, i.e., volume bids are placed against escalating prices in consecutive bidding rounds; and
- Rolling day-ahead and within-day capacity auctions use a uniform-price auction algorithm, which means that there is only one bidding round in which the network user bids price as well as quantity.

4.1.1.4 FIRM AND INTERRUPTIBLE CAPACITY

In addition to the standard products for firm capacity discussed above, there are also standard capacity products for interruptible capacity that are allocated via auctions according to the auction calendar published by ENTSOG for firm and interruptible capacity.

These interruptible products can be offered if the corresponding monthly, quarterly or yearly standard capacity product for firm capacity sold at an auction premium was sold out or was not offered. Daily capacity products for interruptible capacity shall be offered in both directions of an IP

[90] See also ACER's paper on the issue of capacity mismatch and the capacity conversion mechanisms. https://www.acer.europa.eu/Official_documents/Position_Papers/Position%20papers/ACER%20position%20on%20capacity%20mismatch%20issue.pdf

[91] The NC CAM does not allow extension of the unbundled capacities and these are expected to disappear in the next five to seven years.

when the corresponding standard capacity product for firm capacity is sold out day-ahead or not offered.

The NC CAM guidance explicitly states that TSOs shall not set aside capacity that can be offered as firm capacity in order to offer it as interruptible capacity.

4.1.2 INCREMENTAL CAPACITY PROCEDURE FOR CROSS-BORDER BUNDLED TRANSMISSION PRODUCT

The incremental capacity procedure has been introduced for a streamlined EU-wide process to react to possible market-based capacity requests for an increase or creation in technical capacity. This increase in the technical capacity can be achieved through, for example, the construction of a new pipeline, the introduction of reverse flow or the upgrade of existing physical infrastructure.

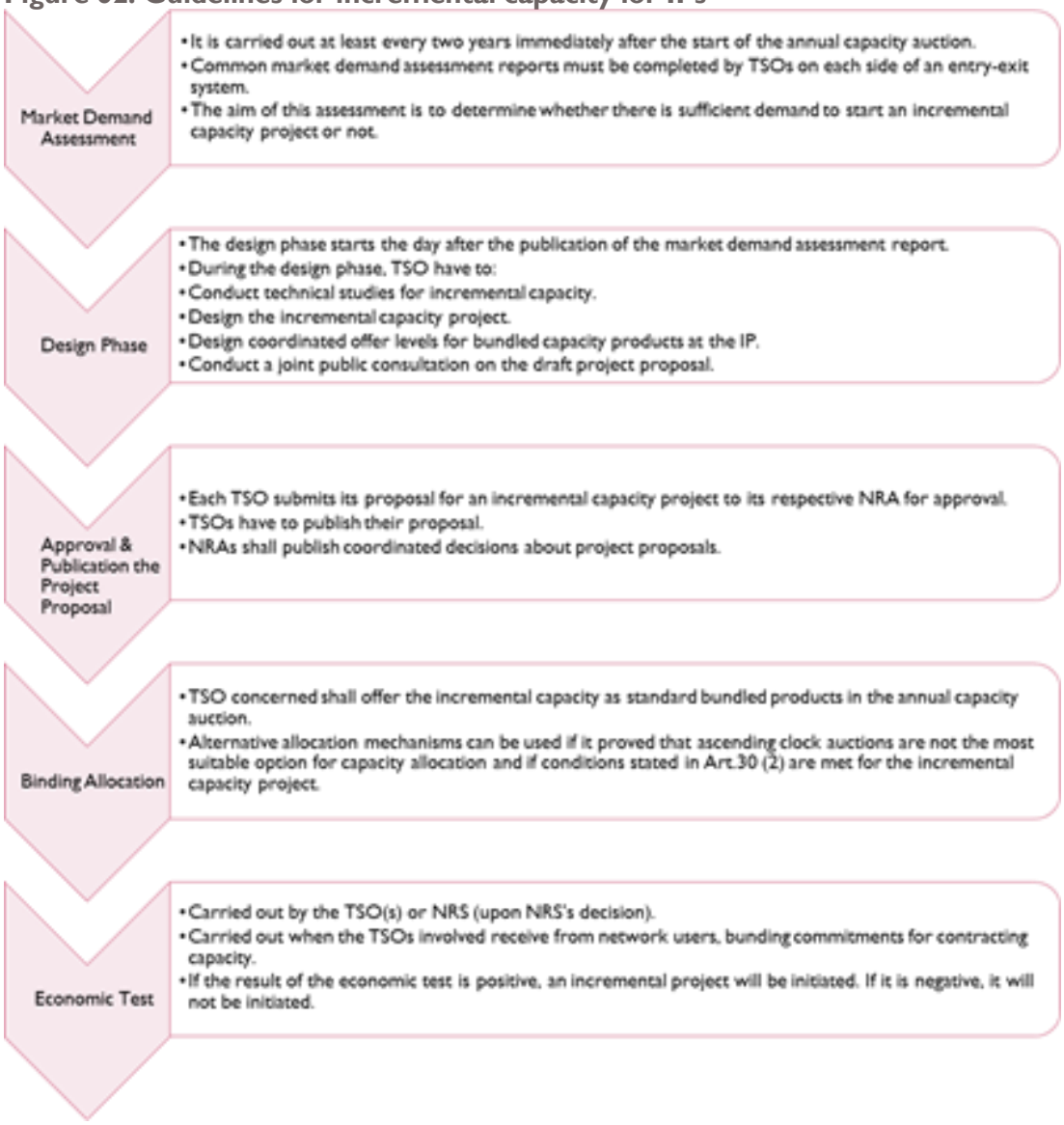
The requested incremental capacity may be offered based on market demand. Building the capacity is therefore based on binding commitments and subject to the positive outcome of an economic test.

The aim of setting rules for incremental capacity was to propose an EU-wide harmonized and market-based approach to identify the need for incremental capacity based on market demand and to allocate both existing and incremental capacity in an integrated way.

The ENTSOG guidance anticipates that the process lasts no more than two years and is divided into two phases: a non-binding phase in which the demand for incremental capacity is assessed and a binding phase wherein network users provide binding commitments for incremental capacity.

Figure 62 captures the ENTSOG incremental capacity procedure. For a proposed incremental capacity addition at the Poland-Ukraine IPs, a structured program of cooperation between the Polish and Ukrainian TSOs will be essential. This will need to be supported by the individual NRAs in the two countries. A high-level joint working group with broad terms of reference to enable greater market area integration is recommended.

Figure 62: Guidelines for incremental capacity for IPs



Source: ENTSOG

It should be noted that besides incremental capacity process, the firm capacity from PL to UA can be created upon the decision of the Polish TSO itself, as is done now by UA GTSO.

4.2 NC TAR AND GUIDANCE FOR PRICES FOR BUNDLED CAPACITY PRODUCTS

The EU network code also covers the way TSOs collect revenues via different tariffs associated with the provision of services at entry and exit points. This section provides a definition of the main concepts that underpin this methodology.

4.2.1 DEFINITIONS AND CONCEPTS FOR TARIFFS

This section will present and introduce key concepts associated with the NC TAR methodology.

Reserve price and reference price methodologies (RPM)

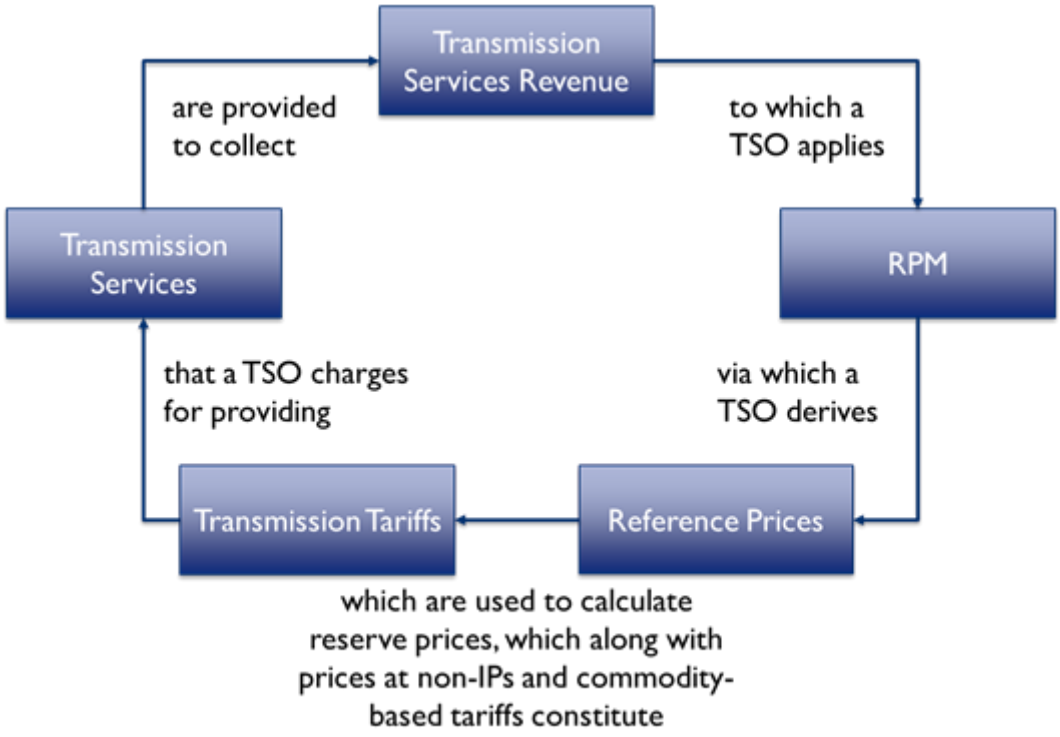
The goal of the reference price methodologies (RPM) presented in the NC TAR is to provide guidance on transmission tariff calculations that ensure both cost reflectivity and predictability, while using predefined cost drivers.

Consistency and transparency are key requirements for all RPMs, and it is obligatory to consult with market participants on the applied RPM.

Figure 63 explains the cycle of revenues and tariffs:

- Applying the RPM;
- Deriving reference prices;
- Setting capacity-based transmission tariffs;
- Charging such tariffs for the transmission services; and
- Providing such services to recover the revenue.

Figure 63: Cycle of transmission services, revenue and tariffs



Source: ESP, ENTSOG

The key aspect of this methodology is that the RPM provides the reference price, which is the revenue for the yearly firm standard capacity product for each entry and exit point of the system. The reserve price is the eligible floor price in an auction for shorter-term, seasonal and interruptible products that can be calculated afterward, based on the reference prices.

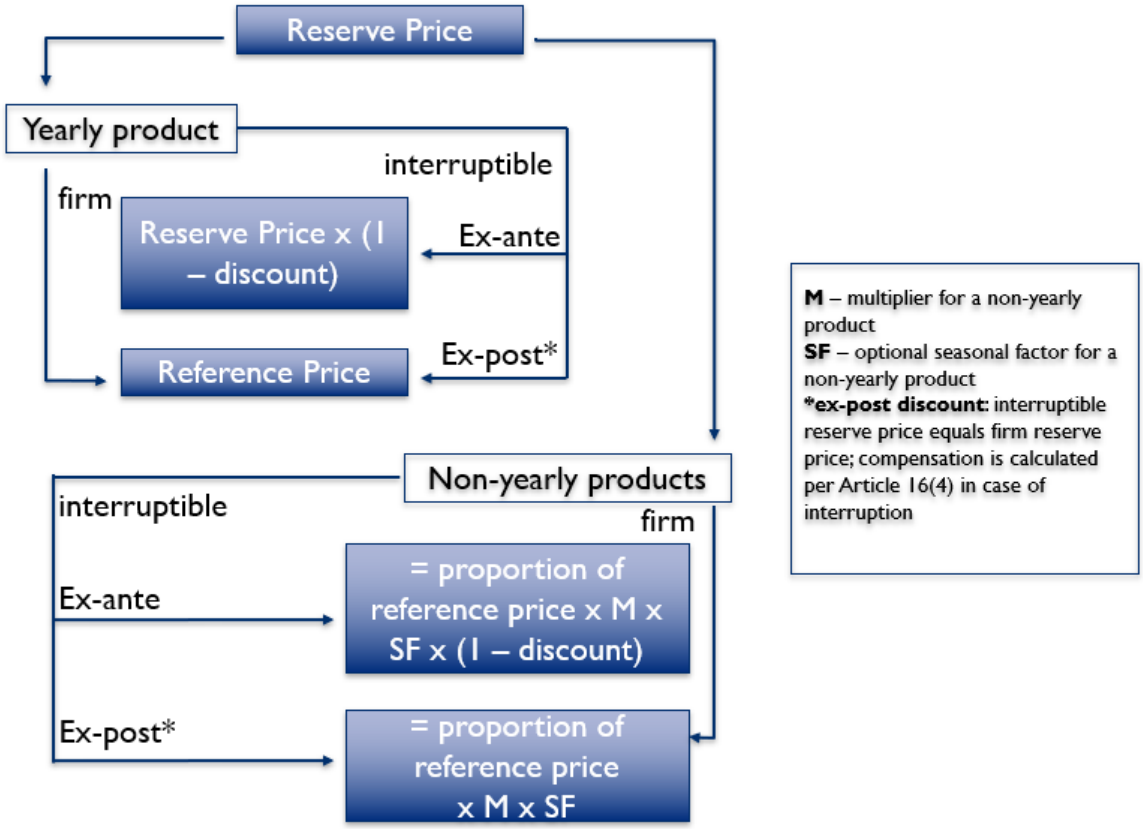
Capacity products

The NC CAM foresees five standard capacity products: yearly, quarterly, monthly, daily and within-day. The reserve price for firm yearly capacity is equal to the reference price.

The reserve prices for firm non-yearly capacity products involve the application of formulas with multipliers based on the reference price and, optionally, seasonal factors as seen in Figure 64 and in the formula below:

Reserve price = time proportion of reference price x multiplier x seasonal factor

Figure 64: Reserve price for yearly and non-yearly products



Source: ESP, ENTSOG

The reserve prices for interruptible capacity products involve discounts to the reserve prices for the corresponding firm capacity products:

- An ex-ante discount is calculated upfront, based on the formula set out in the NC TAR, using the probability of interruption and the estimated economic value of the product.
- An alternative is an ex-post discount, which constitutes compensation paid to network users after the actual interruption has occurred; such a discount is only available if physical congestion did not prompt any interruption in the preceding gas year.

Multipliers and seasonal factors

Multipliers describe the pricing relationship between the short-term product and the yearly product while seasonal factors allow for specific variations in the seasonal value of the same standard capacity products.

Both aim to incentivize shippers to book long-term capacity and foster efficient system use. The higher reserve prices in months with high utilization rates and lower reserve prices in low-utilization months allow for an optimal usage of the infrastructure. As a result, they also increase the security

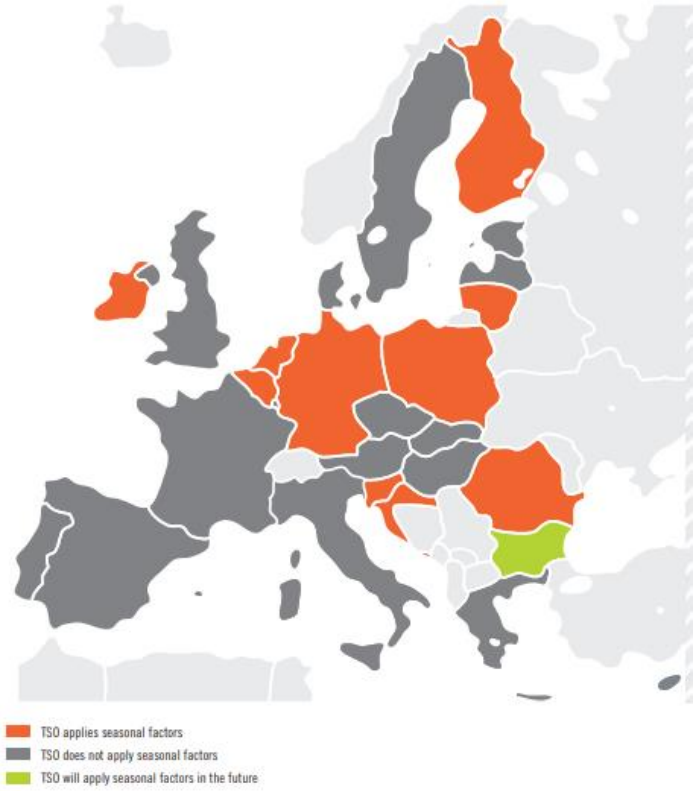
of supply by allowing different reserve prices between the winter and the summer period, encouraging gas supplies well in advance of the peak demand period.

NC TAR defines the ranges for the respective multipliers and a detailed methodology for calculating seasonal factors if the TSO/NRA chooses to apply these components to the tariff.

Multipliers for multi-year contracts and booking tends to be clearly indicated in the capacity booking documents.

As can be seen in Figure 65, seasonal factors and multipliers are not applied by all Member States.

Figure 65: Application of seasonal factors in Member States



Source: ENTSOG

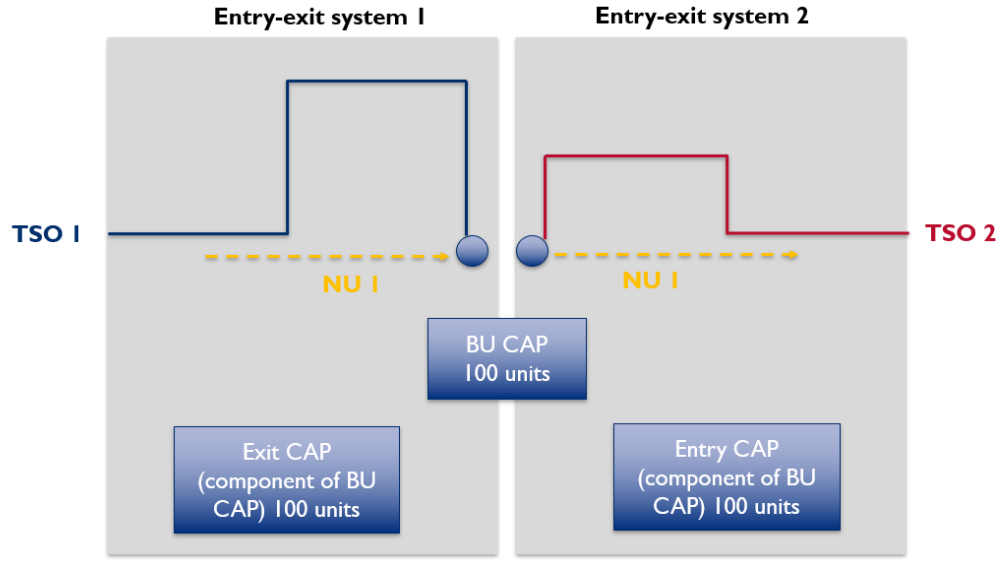
4.2.2 GUIDANCE FOR PRICES FOR BUNDLED CAPACITY PRODUCTS

According to the Amended NC CAM, bundled capacity describes a standard capacity product offered on a firm basis, which consists of corresponding entry and exit capacity at both sides of every IP.

Figure 66 shows a simplified concept for the bundled capacity. The following conditions are needed in order to propose bundled capacity products:

- Each product offered includes the same amount of capacity on both sides of the IP;
- Capacities are contracted through a single allocation procedure via a booking platform;
- Capacities are allocated to the same network user on both sides of the IP; and
- The network user signs two contracts, one with each TSO.

Figure 66: Concept of bundled capacity



Source: ESP, ENTSOG

Under NC TAR, a bundled reserve price is built as the sum of the entry and exit reserve prices of bundled capacity products, which consist of corresponding entry and exit capacity at both sides of every IP. The reserve price for a bundled capacity product shall be equal to the sum of the reserve prices for the capacities contributing to the product.

The reserve prices for corresponding entry and exit capacities shall be made available when the bundled capacity product is offered and allocated by means of a joint booking platform.

The revenue originating from the bundled capacity product sales corresponding to the reserve price for the product shall be attributed to the respective TSOs as follows:

- After each transaction for a bundled capacity product; and
- In proportion to the reserve prices for the capacities contributing to such a product.

Figure 67 shows the components of the reserve price for a bundled standard capacity product. The revenue from the bundled reserve price must be split in proportion to the reserve prices for the capacities contributing to the bundle. Each TSO will receive the revenue from the reserve price for the capacity that each TSO contributes to the bundle.

Figure 67: Component of bundled reserve capacity

Source: ESP, ENTSOG

Figure 68 shows that the revenue originating from the sale of a bundled capacity product is the sum of its bundled reserve price plus the possible auction premium.

Figure 68: Component of bundled reserve capacity

Source: ESP, ENTSOG

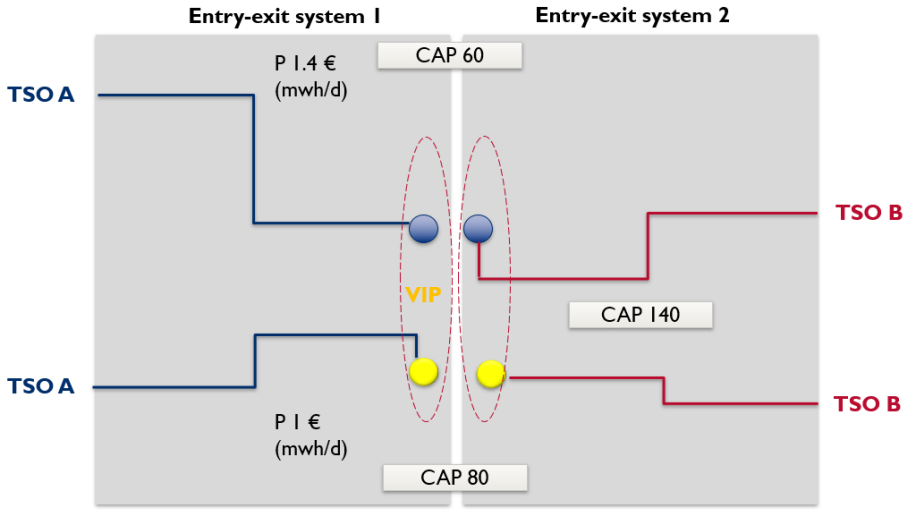
The auction premium originating from the bundled capacity product sales shall be attributed in accordance with the agreement between the respective TSOs.

On that topic, NC TAR also mentions that the agreement of TSOs regarding the split of the auction premium from bundled capacity sales is always subject to the approval of NRAs. There is a default rule for the split of the auction premium from bundled capacity sales to avoid invoicing problems that could arise if auctions occur in the absence of approved agreements (in this very specific case, the TSOs must split the auction premiums equally).

4.2.3 GUIDANCE FOR PRICES FOR CAPACITY PRODUCTS OFFERED AT VIRTUAL POINTS

For Virtual Trading Points (VTPs), sometimes also referred to as Virtual Interconnection Points (VIPs),[92] the network code also offers some guidance relating to the design of tariffs and associated revenues. Figure 69 presents an example of a VIP.

Figure 69: Simplified VIP concept



Source: ESP, ENTSOG

When establishing a VIP, TSOs must ensure that their total technical capacity is equal to or higher than the sum of the technical capacities at each of the IPs contributing to the VIP. Additionally, the VIP must facilitate economic and efficient use of the system.

[92] A VIP or VTP is an entry and/or exit point that results from the aggregation of two or more IPs that connect the same two adjacent entry-exit systems for the purpose of providing a single capacity service.

Two approaches can be used to calculate the reserve prices for unbundled capacity products offered at a VIP:

- If the RPM considers the VIP to be one network point, then the reference price at the VIP is determined by running the model with that RPM, which coincides with the reserve price for the yearly product offered.

- If the RPM does not take into account the VIP as a network point in the model, then the reference price at the VIP must be obtained by combining the reference prices of each of the physical IPs that constitute the VIP, weighted by the corresponding technical or forecasted capacities as is relevant.

4.2.4 IMPLICATIONS OF THE NETWORK CODE FOR GAS STORAGE FACILITY

SSOs have a large degree of freedom to design their tariffs compared with TSOs. They can opt to have capacity booked either through open season auctions or on a first-come, first-served basis (or even both).

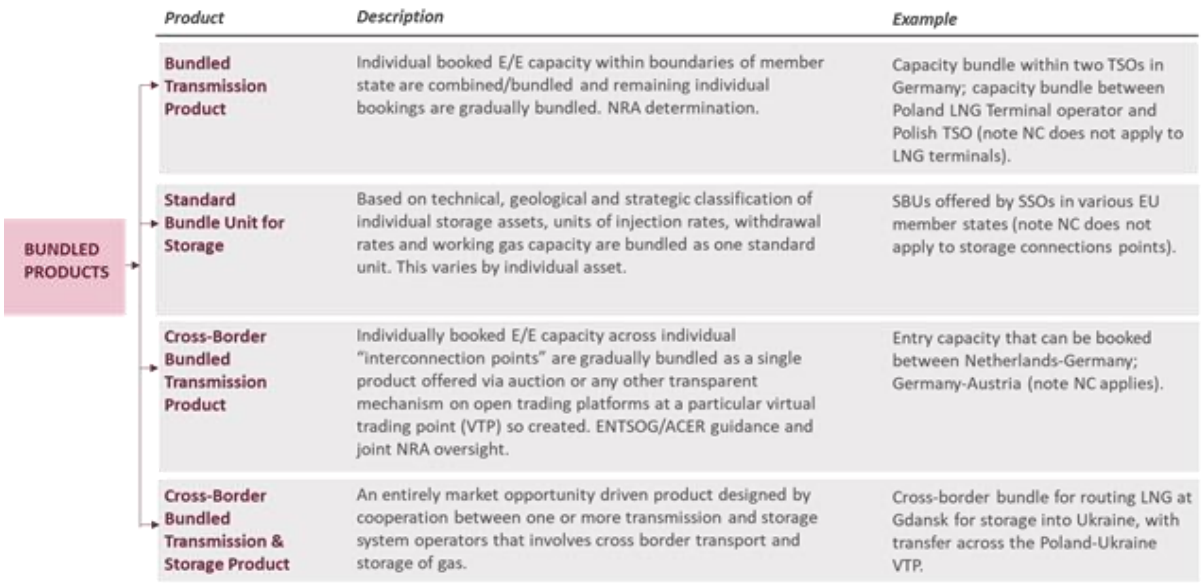
4.2.5 BUNDLED PRODUCTS DESIGN: CONCEPTS AND DEFINITION

In the context of gas transmission and storage, the phrase "bundled product" can sometimes be unclear. The use of the word "bundled/un-bundled" has been prevalent in the regulatory context when storage assets were unbundled from gas transmission systems to create independent SSOs and independent TSOs. In the case of gas transmission, where two TSOs are required to standardize product offerings, the process of combining the capacities of the two TSOs to create a single product is also called "bundling of transmission capacity." When the same concept is applied to international cross-border capacities between adjacent states, the product is also called "cross-border bundled transmission capacity." To complicate matters further, when the storage products were designed, they were offered as a "standardized bundle," meaning that they contained a unit of injection rates, a unit of withdrawal rates and a unit for working gas capacity as one standardized bundle.

In the Ukraine-Poland context, there is an additional component of bundling when it comes to designing a product aimed at serving a market opportunity involving both the transmission system in Poland and the IP with Poland as well as storage system assets in Ukraine.

Figure 70 explains the various types of bundled products with relevant examples in the context of the study to avoid any confusion in definitions and terminologies.

Figure 70: Types of bundled products



	Product	Description	Example
BUNDLED PRODUCTS	Bundled Transmission Product	Individual booked E/E capacity within boundaries of member state are combined/bundled and remaining individual bookings are gradually bundled. NRA determination.	Capacity bundle within two TSOs in Germany; capacity bundle between Poland LNG Terminal operator and Polish TSO (note NC does not apply to LNG terminals).
	Standard Bundle Unit for Storage	Based on technical, geological and strategic classification of individual storage assets, units of injection rates, withdrawal rates and working gas capacity are bundled as one standard unit. This varies by individual asset.	SBUs offered by SSOs in various EU member states (note NC does not apply to storage connections points).
	Cross-Border Bundled Transmission Product	Individually booked E/E capacity across individual "interconnection points" are gradually bundled as a single product offered via auction or any other transparent mechanism on open trading platforms at a particular virtual trading point (VTP) so created. ENTSOG/ACER guidance and joint NRA oversight.	Entry capacity that can be booked between Netherlands-Germany; Germany-Austria (note NC applies).
	Cross-Border Bundled Transmission & Storage Product	An entirely market opportunity driven product designed by cooperation between one or more transmission and storage system operators that involves cross border transport and storage of gas.	Cross-border bundle for routing LNG at Gdansk for storage into Ukraine, with transfer across the Poland-Ukraine VTP.

Source: ESP and ENERSTRAT

In the case of gas storage SBUs, the individual values for injection rates, withdrawal rates and working gas capacities are determined on an asset-specific basis, taking into consideration geological, technical and strategic classification of individual storage assets. Therefore, use of SBUs does not imply standardized values for these parameters (this aspect is further discussed in the case studies).

SSOs in the EU have mainly preferred a nTPA model with open transparent pricing terms, which give a wider opportunity for product differentiation with shippers (customized offering) compared with TSOs that have largely been using a rTPA regime with a standardized entry/exit tariff system for capacity.

Since the product to be developed should seek to capture emerging business opportunities across Poland and Ukraine, the end goal is a bundled product that can be extended to import LNG from the Poland TSO into Ukrainian storage facilities. To capture this market opportunity, a cross-border bundled transmission product is necessary, and will be reviewed in detail in the next sub-section.

4.2.6 CROSS-BORDER BUNDLED TRANSMISSION PRODUCT

To simplify the transport of gas through Europe, NC CAM introduced the concept of bundled capacity, which refers to standard products of firm capacity offered at both sides of an IP where the capacity contracted at one side matches the capacity contracted at the other side. This means that capacity products are sold in a bundled way, which implies that only one booking is needed for the allocation of capacity from one market area to another.

The NC CAM directs that TSOs shall jointly offer, through a single allocation procedure, all firm capacity available as bundled capacity on both sides of an IP. In case the capacity available at one side is higher than on the other, the TSO may offer its exceeding capacity as an unbundled product, though it may be for a time-limited period as the ENTSOG guidance is quite clear that unbundled capacity is to be an exception rather than a rule.

Network users who are parties to unbundled transport contracts must therefore reach a contractual arrangement ("bundling arrangement") for the bundling of their capacity. This shall be reported to the respective NRA. In any case, the duration of the bundling arrangement shall not exceed the duration of the original transport contracts. Existing transport contracts for unbundled capacity cannot be renewed, prolonged or rolled over after their expiration date. In the Poland-Ukraine context, this means that unbundled products should not continue beyond 2025.

In order to maximize bundling (i.e., minimize the extent of unbundled capacity products), the NC CAM also stresses that from January 1, 2018, TSOs shall offer a free capacity conversion service that helps network users convert contracted unbundled capacity at one side of an IP into bundled capacity.

In order to provide a single capacity service, VIPs have been introduced as the result of integrating two or more IPs that connect the same two adjacent entry-exit systems. For the establishment of a VIP, the following criteria should be met:

- The total technical capacity at the VIP shall be equal to or higher than the sum of the IPs contributing to the VIP.
- The VIP should facilitate the economic and efficient use of the system, adhering to rules including but not limited to those set out in Article 16 of Regulation (EC) No 715/2009.

According to NC CAM, the TSOs shall establish functional VIPs no later than November 1, 2018. A functional VIP is required to launch a cross-border capacity product and is the basis of any further investment in incremental interconnection capacity (which is required to create the VTP).

It is advised that not only should a bundled product between the Ukrainian TSO and Polish TSO be developed, but that the product should also be extended to the Ukrainian SSO to further develop the liquidity of the storage market of Ukraine. Such a product will bring the following benefits:

- The bundled product offers ease of transaction; the booking of a bundled transmission capacity product ensures that entry/exit capacities are matched and set as firm as opposed to interruptible, which ensures that shippers/traders can easily comply with their contractual obligations.
- The bundled product is the instrument through which a market integration between two adjacent market areas is operationalized, leading to an expanded accessible market, improved competition/efficient price discovery and greater market depth and liquidity.
- In most cases, the formation of a firm bundled capacity product stems from existing variable and interruptible capacity volumes. For example, in the August 2020 case of Germany-Poland, about 407 Gwh/d of available interruptible capacity is proposed to be converted to 261 Gwh/d of firm capacity at the existing VTP Mallnow from 2023 onward. This reflects the change in the flow volumes from Poland into Germany. Because market participants prefer firm over "interruptible capacity, this is the tacit advantage cross-border transmission bundles will offer.
- From the perspective of shippers/traders in Poland, the bundled product offers a very significant economic upside by avoiding separate bookings for entry and exit capacities and providing a seamless transaction on an open online platform.

In order to capture all these benefits, the cross-border bundled transmission product can be harvested, it is important to learn from the following seven European case studies. They act as a guideline for what to do and what to avoid when designing and developing a suitable product between Ukraine and Poland.

4.3 CASE STUDY AND LESSONS FOR THE UA/PL GAS MARKET

ESP has reviewed the following case studies:

- Specificity of day-ahead and within-day product (Gasunie in the Netherlands);
- Cross-border gas transmission product/service (Dutch VTP Title Transfer Facility with the German VTPs of NetConnect Germany/GASPOOL);
- Bundled product opportunities for storage assets (Louenhout gas storage);
- Bundled product opportunities for storage assets (Astora gas storage);
- Bundled product opportunities for storage assets (Bergermeer gas storage);
- International transit entry capacity and tariff pancaking (Italy gas market); and
- Change in flow pattern (UK Interconnector).

Following the presentation of each case, the key findings applicable for the implementation of new products in the Ukraine-Poland market area have been included.

4.3.1 SPECIFICITY OF DAY-AHEAD AND WITHIN-DAY PRODUCTS (NETHERLANDS)

This sub-section will describe how the day-ahead (DA) and within-day (WD) products operate using a liquid market such as the Netherlands as an example. This example has been provided to demonstrate the product sophistication in a mature market area such as the Netherlands, which hosts the TTF.

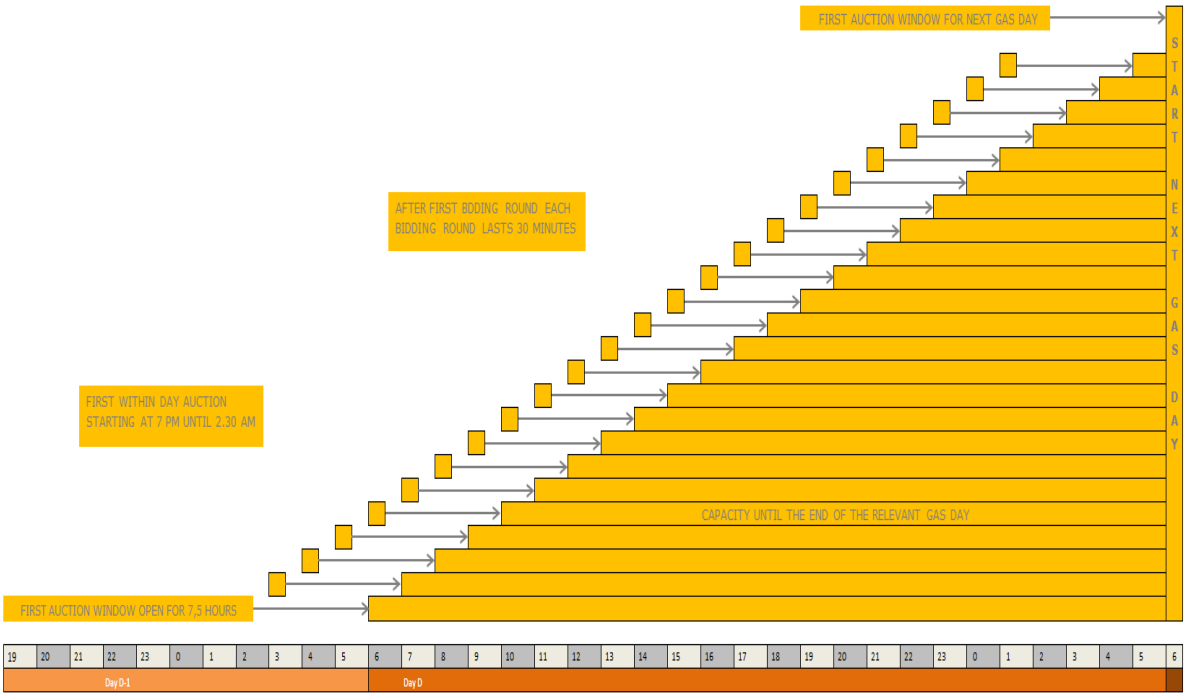
In the context of the Poland-Ukraine cross-border flows, these two types of products would require the availability of efficient balancing services. This forms the basis of the recommendation: initially, Poland-Ukraine bundled products will have to be longer-term (e.g., annual, quarterly and month-ahead products) and this will require joint preparatory work between the two countries' TSOs.

Gasunie, the operator of the national transmission network in the Netherlands, offers DA and WD capacities every day (including weekends and public holidays) through the PRISMA platform. WD capacity consists of the remaining firm capacity from the DA auctions on PRISMA.

The first WD bidding round starts at the previous gas day at 7:00 p.m. (LET). This auction will remain open for 7.5 hours, until 2:30 a.m. (LET). The following auctions start on the hour and remain open for 30 minutes. The capacity of a successful bid can be used from 3.5 hours after the close of the WD auction. The shipper can submit nominations to GTS for this acquired capacity starting 10 minutes after the auction has closed. Therefore, for the first WD auction, the shipper can nominate starting at 2:40 a.m. (LET).

This process is described in the schematic presented in Figure 71.

Figure 71: DA and WD booking procedure



Source: Gasunie

Finally, Gasunie proposes the WD capacity tariff based on the daily capacity tariff and a WD factor. This factor is determined by the number of hours the capacity is available: WD factor = number of hours/24.

FINDINGS

In Ukraine, UA GTSO already provides WD and DA auctions at all IPs on the Western borders. With further integration with Poland, these auctions can also apply to bundled products in the near future.

4.3.2 CROSS-BORDER GAS TRANSMISSION PRODUCTS/SERVICES (NETHERLANDS/GERMANY)

This sub-section gives an example of a bundled cross-border transmission capacity product that has been available on the PRISMA platform since November 2015 and how it was developed.

The following TSOs started to offer bundled capacity at all their cross-border interconnection points in January 2014:

- Dutch TSO Gasunie Transport Services (GTS);
- German TSO Gasunie Deutschland Transport Services (GUD);
- Fluxys TENP;
- GASCADE Gastransport;
- Gastransport Nord (GTG Nord);
- Open Grid Europe (OGE); and
- Thyssengas (TG).

The bundled products connect the Dutch VTP Title Transfer Facility (TTF) with the German VTPs of NetConnect Germany (NCG) and GASPOOL, allowing shippers to book capacity with a single product through the PRISMA platform.

Product development followed a stepwise program that can be instructive in the Poland-Ukraine context. Bundled products were sequentially developed at all network points with the aim of transitioning smoothly to a situation where firm capacity is offered in a fully bundled way.

Following the launch of the firm capacity in January 2014, the stakeholders then moved forward with a plan to launch a day-ahead capacity product as bundled capacity via PRISMA.

The Netherlands-Germany bundled capacity product was unique because it prioritized the DA bundled capacity over monthly and quarterly products due the special conditions prevailing at the time (rapid development of the TTF hub). Interviewees reported that "without the rapidly growing liquidity and depth at the TTF hub, it would have been very likely that the ENTSOG recommended sequence would have been followed."

Quarterly capacity bundled products started in June 2014, the monthly capacity market started in September 2014 and yearly bundled capacity auctions started in March 2015.

This means that since September 2014, bundled capacity product that is fully compliant with the NC CAM has been available for all firm product categories. This has also harmonized the cross-border capacity products between Germany and the Netherlands, further reinforcing the creation of the NW Europe gas market area with the TTF hub at its center.

The collaboration between Fluxys in Belgium and Gasunie in Netherlands meant work progressed in parallel, enabling the harmonization of the LNG and pipeline flows arriving at Zeebrugge all the way to Italy through the Swiss border.

FINDINGS

- A cross-border bundled transmission product is essential to any bundled product configurations involving Ukrainian storage and international LNG.
- A cooperation model involving the Polish and Ukrainian TSOs and NRAs is essential for the incremental capacity addition process to be followed as per ENTSOG guidelines. The assessment indicates that given the single VIP/VTP between the two countries and the underlying regulatory and legal architecture already in place, the product development can be much faster than the two years' guidance that ENTSOG has provided.

4.3.3 BUNDLED PRODUCT OPPORTUNITIES FOR STORAGE ASSETS (NETHERLANDS/GERMANY/BELGIUM)

This section examines three storage products based on case studies that bring potential insights for Ukrainian storage capacity:

- Louenhout Gas Storage is an asset in Belgium operated by Fluxys. It is an example of a single large asset operating in an intensely competitive environment, with high international gas transit and participants seeking arbitrage across a wider range of commodities (gas, electricity, LNG and carbon emissions). Louenhout is one of the very few storage facilities of

its kind (aquifer storage) in Europe that is operated and regulated under a negotiated TPA (third-party access) regime;

- The Astora gas storage is an example of a multi-locational and a multi-technology gas storage asset. It offers a consistent set of well branded products along with a unique model using a combination of regulated and negotiated TPA regimes; and

- Bergermeer is Europe's largest gas storage asset. The facility uses a depleted gas field that operates only on an open season auction basis. The facility is the only storage asset that enables customers to use working gas as collateral (gas injected in the summer would be used as collateral for financing transactions).

For each of these cases, focus has been placed on the product design and the value proposition they offer to their customers. When possible, a description of the various types of innovative services that could complement the proposed gas storage solutions have also been added.

4.3.3.1 LOUENHOUT GAS STORAGE

The Louenhout storage facility is an aquifer storage for high calorific natural gas that provides mainly seasonal storage with high flexibility of usage. The technical characteristics of the storage facility are as follows:

- Storage volume : 680 million m³(n)
- Injection: 325,000 m³(n)/h
- Withdrawal: 625,000 m³(n)/h

The booking process is summarized below:

- All customers subscribe to the "Standard Bundled Unit (SBU)" and can pick and choose options and additional products/services (e.g., interpretability) from a menu available openly through the company platform;
- All allocations are made on a first-come, first-served basis, with service period options ranging from one to 10 years. Priority service is provided for longer-term customers, which implies that SBUs are allocated first, followed by additional/interruptible/customized options; and
- Louenhout has a regulated TPA with three yearly tariffs approved by the regulator and posted on Fluxys' website.

The storage tariff applicable for 2020 and a description of the SBUs are presented in Figure 72.

Figure 72: Tariffs for storage services at Louenhout for 2020

Tariffs for storage services of Fluxys Belgium SA

For year 2020 (†)

LOENHOUT		
Standard Unit	134,05	€/Standard Bundled Unit/year
Firm Injection Capacity	39,65	€/m³(n)/h/year
Firm Storage Capacity	1881,25	€/GWh/year
Conditional Storage Capacity	1881,25	€/GWh/year
Firm Withdrawal Capacity	24,06	€/m³(n)/h/year
Conditional Injection Capacity	15,86	€/m³(n)/h/year
Conditional Withdrawal Capacity	9,62	€/m³(n)/h/year
Interruptible Day Ahead Injection Capacity	39,65	€/m³(n)/h/year
Interruptible Day Ahead Withdrawal capacity	24,06	€/m³(n)/h/year
In Loenhout, Gas in Kind is 1% of the injected quantities and 0,5% of the withdrawn quantities		
Additional support service for the gas stored in Loenhout :	1.847,58	€/day of supplied service
Registration to the Day-Ahead Non Nominated capacity service (Day-Ahead NNS)	3.640,83	€/year
Transfer of capacity and/or gas in storage		
- Transfer of capacity and/or gas in storage (to be paid by both parties) - Transaction OTC	239,09	€/transfer/party
- Transfer of capacity and/or gas in storage (to be paid by the seller) - Transaction realised by Fluxys Belgium on behalf of	3,0%	% total regulated tariff

Source: FLUXYS

The main feature of the Louenhout products is the combination of a regulated tariff model (with no auction and preference for long-term booking customers) with first-come, first-served build-up.

4.3.3.2 ASTORA GAS STORAGE

Astora is one of Europe´s largest operators of natural gas storage facilities. The company markets a natural gas storage volume of nearly 6 billion cubic meters and holds about 25 percent of the total natural gas storage capacity in Germany. Astora has made considerable investments in the development of storage capacities. In 2007, it started to operate one of Central Europe's largest natural gas storage facilities at Haidach (Austria) as a joint venture with Rohöl-Aufsuchungs Aktiengesellschaft (RAG) and Gazprom Export. The company has also constructed a cavern storage facility in Jemgum in the German state of Lower Saxony. The Jemgum cavern storage facility was completed in 2020.

The capacity of the three UGSs operated by the company are presented below:

- The Rehden natural gas storage facility is an underground reservoir storage with about 4 bcm of natural gas capacity;
- The Jemgum natural gas storage facility is an underground cavern storage with about 1 bcm of natural gas capacity;
- The Haidach natural gas storage facility is an underground reservoir storage with about 3 bcm of natural gas capacity.

Astora offers three standard storage products across the different storage sites that differ only based on individual technical characteristic of the facilities. In addition to SBUs, Astora offers cross-border "pooled storage" optimization services.

SBU-based capacity is offered on the PRISMA platform on a first-come, first-served basis along with on-demand data services and optional auctions.

At Rehden, BioGas storage is also offered, implying a gas quality monitoring and blending service (although these details have not been directly confirmed).

Figure 73: Tariffs for storage services at Astora storage facilities for 2020

	REHDEN	HAIDACH	JEMGUM
Annual Firm Storage "Astora Pack"			
Working Gas	17,500.00 KWh	22,000.00 KWh	10.000.00 KWh
Injection	6.56KWh/h	10KWh/h	6.60 KWh/h
Withdrawal	10.0 KWh/h	10.0 KWh/h	10.0 KWh/h
Min Qty	500 Bundles	500 Bundles	500 Bundles
Fees: €112.68/SBU/Year			
Monthly Firm Storage "Astora Part"			
Working Gas	3,000.00KWh	4,000.00KWh	4,000.00KWh
Injection	10KWh/h	10KWh/h	10KWh/h
Withdrawal	10KWh/h	10KWh/h	10KWh/h
Min Qty	100 Bundles	100 Bundles	100 Bundles
Interruptible Service "Astora Add"	All details for Interruptible Service only available to firm capacity bookers and bookable on company's own portal.		

Source: Team analysis based on ASTORA website

Astora deploys a combination of regulated TPA and negotiated TPA in an open, transparent manner (calculation factors and a simulation are available). Up-to-date demand data is also available to capacity holders on a secure platform. Astora is making the best of open public platforms like PRISMA in combination with its own bespoke platform.

4.3.3.3 GAS STORAGE BERGERMEER

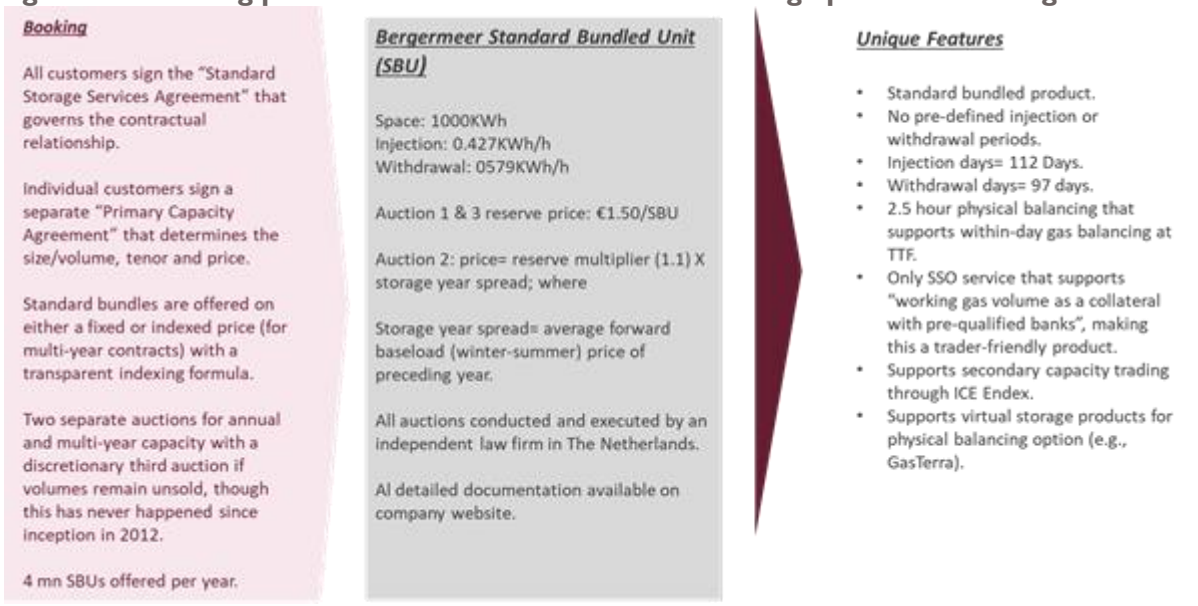
Gas Storage Bergermeer is an independent storage operator with service delivered at the TTF hub. It offers a technically advanced, highly flexible, zero-emission storage product.

The company is using the depleted Bergermeer gas reservoir, which has the following technical characteristics:

- Working gas volume: 4.1 bcm
- Cushion gas volume: 4.3 bcm
- Maximum injection capacity: 19,490 MW
- Maximum withdrawal capacity: 26,437 MW

The Bergermeer reservoir is strategically positioned in relation to the gas transport network, major consumers and the Balgzand Bacton Line (BBL) Pipeline that transports gas between the Netherlands and the UK. The booking process and main features of the product are presented in Figure 74.

Figure 74: Booking process and main features of the storage products at Bergermeer



Source: Team analysis based on ASTORA website

4.3.3.4 SUMMARY OF THE GAS STORAGE CASE STUDIES

The diagram in Figure 75 shows a summary of the key characteristics of the storage assets reviewed in the case studies.

Figure 75: Key characteristics of the storage assets reviewed

Storage Asset	Key Features/Characteristics	Relevance to Ukraine-Poland
Louenhout- Belgium *(Fluxys)*	Single UGS asset serving a mature and highly competitive market with a wide range of speciality services around a well defined bundled product in a primarily international transit function.	**Ukraine's SSO has an opportunity to pursue a "mix & match" strategy using the diversity, size, characteristics and abilities of its own large storage portfolio.** **By pursuing this approach, it can attract a wide diversity of domestic and international customers with targeted/customized products.**
Astora Gas Storage-Germany *(Gazprom Germania)*	Multi-locational, multi-technology asset in a meshed infrastructure with a highly competitive market, offering cross-border storage optimization solutions with well understood, standardized/well branded products.	
Bergermeer Gas Storage-Netherlands *(TAQA)*	Largest depleted UGS asset in Western Europe; offers highly customized solutions including facilitating secondary trading capability. This facility proposes an optional integration with virtual gas storage products using an open season auction that is flexible around client requirements. The SSO offers highly standardized and transparent products without losing customer flexibility.	

Source: ESP and ENERSTRAT

CASE STUDY FINDINGS

- Determining/identifying the types of storage capacity and assets to offer to shippers/traders is the first important step;

- A detailed study defining the technical characteristics and geophysical limitations, including injection and withdrawal constraints, delivery profiles and "safe/assured" working gas volumes, is required to build a storage asset register;
- This asset register data/studies should help identify the type of service and the appropriate target market segment that the specific asset should address;
- The market area assessment/customer surveys should provide clarity on the likely competitive intensity, customer requirements, and future load profile build-up as well as the market area hub price differentials (which are attractive in the Ukraine-Poland market area);
- Annual capacity bookings for 10 years out should be avoided (they worked due to special conditions in the Zeebrugge/Louenhout area), especially in the early years. A transparent mechanism stating a three-to-five-year product review period is highly desired by customers; and
- Finally, the product/pricing information should be simply presented and transparent and should go above and beyond the guidance issued by NRAs (e.g., a price simulation tool is always a great idea, especially in the early years, but it is very important to get it right and keep it simple).

4.3.4 INTERNATIONAL TRANSIT ENTRY CAPACITY AND TARIFF PANCAKING (ITALY)

The Italian gas market price premium is the result of illiquid markets and artificial entry barriers. While EU rules and some changes in Italian gas markets in the past have attempted to rein in dominant participants, this work is far from complete. Lack of liquidity and the control over supply routes are the main factors that kept the premium of the Italian gas spot contract to the TTF at an average of €2.70/MWh in 2019.

This section presents two possible aspects of the tariff pancaking impacting the Italian gas market.

4.3.4.1 GAS SUPPLY AND IMPORT OPTIONS IN ITALY

Large shares of Italy's gas market are in the hands of a few large participant and dominant gas company. Eni, for instance, controls Italy's major importing routes, including the Swiss Transitgas pipeline.

In 2019, Eni was responsible for 47 percent of Italy's gas imports. Most of the gas that Eni supplies to Italy comes from long-term gas supply agreements signed with all of Italy's main suppliers: Russia's Gazprom, Algeria's Sonatrach, Norway's Equinor, and its own Libyan subsidiary Mellitah Oil and Gas.[93]

According to the ARERA report, Italy's PSV gas hub has seen its churn rate increase over the past 10 years (to 3.3 in 2019 from about 2.5 in 2015).[94] ARERA said the 2019 increase was mostly due to increased LNG deliveries at the PSV and the creation of a balancing market in 2016. However, Italy is still far from a churn rate of 10, at which a gas market is considered liquid and mature.

While the rise in LNG flows in recent years may have slightly aided liquidity, gas delivered via pipelines still makes up the lion's share of Italy's supply and is far more important in setting prices.

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[93] Italian demand was estimated at around 72 bcm in 2019. Gas was supplied by the following sources: Austria (28 bcm), LNG (14 bcm), Swiss (11 bcm), Algeria (9 bcm), Libya (6 bcm), domestic production (4 bcm).

[94] Churn rate indicates the number of times a commodity is exchanged on the hub before being physically delivered. The churn rate is used by trader as a snapshot of a market's liquidity; some traders will not participate in markets with a churn of less than 10 and many financial participants will only participate when the churn is above 12.

Italy's biggest import route, the TAG pipeline, which runs from Baumgarten on the Austria-Slovakia border to Tarvisio on the Italian border, is largely controlled by Italy's largest supplier, Russia's Gazprom.

Figure 76: Italy's natural gas system

Source: PLATT'S

The European Union framework for gas transport capacity, the NC CAM, does not exclude the possibility of a single company owning the large majority or even the totality of a gas pipeline's transport capacity. It only requires that no more than 80 percent or 90 percent of the available capacity – depending on specific circumstances – is booked under long-term agreements, with the remaining 10 percent or 20 percent to be kept free for spot bookings.

The same framework obliges long-term capacity holders to resell unused capacity on a spot basis, but there is no obligation to do so for longer periods. With 80 percent of the largest pipeline supply route in the hand of a single participant, little TAG transport capacity is left for companies interested in selling large gas volumes in Italy under a market share strategy.

The fact that Eni and Gazprom control import routes (via Austria and North Africa) resulted in Italy's marginal route determining the price of the PSV spot gas.

4.3.4.2 IMPACT OF THE TRANSITGAS PIPELINE

As in every other gas market, it is the most expensive supply route that sets the day-ahead price of a hub. For Italy, this is the Transitgas pipeline, which crosses Switzerland. Importing even small volumes via this pipeline can cause Italian spot prices to increase to a premium at the reference Dutch TTF gas hub.

The typical route for gas transited through the Transitgas pipeline is as follows:

- Gas is initially sourced from Norway, France or the Netherlands;
- Gas enters the Transitgas pipeline at Oltingue (French-Swiss border) or Wallbach (German-Swiss border); and

- Gas exits at Passo Gries (Swiss-Italian border).

Switzerland does not apply European rules on capacity allocation in its territory, which makes this route expensive when used on a spot basis.

While in Europe, long-term capacity holders are obliged to resell unused firm transport capacity on a spot basis, this "use it or lose it" principle does not apply in Switzerland, creating a shortage of spot transport capacity on Transitgas. Moreover, Switzerland still relies on a contractual method to allocate capacity on its pipelines, as opposed to EU Member States, which switched to an entry-exit system where capacity rights are booked independently at any entry and exit point of the gas system.

Traders wanting to import spot gas via Transitgas have to purchase entry and exit fees at the Oltingue, Wallbach and Passo Gries interconnection points as envisaged under EU rules, but also the pipeline capacity allocated by Transitgas operators: FluxSwiss and Swissgas.

To purchase the small volumes of available Transitgas spot capacity, traders have to contact the TSO's commercial offices directly to obtain information around the price. No regular transparent auctions are held by FluxSwiss or Swissgas, and prices offered by the two TSOs are often very close to the premium of Italian PSV day-ahead gas contracts to the Dutch TTF, minus entry and exit fees and a small margin for the trader, sources said.

A law to introduce European gas market rules in Switzerland is currently being drafted by the Swiss federal energy ministry and is set to be discussed in the Parliament starting in autumn 2020. Due to the length of Swiss democratic processes, the law is not expected to be ready before 2024.

Until then, Transitgas will continue to be one of the price makers for Italian spot gas, impacting the price paid by consumers and the country's economic competitiveness against Northwest Europe.

4.3.4.3 IMPACT OF THE CHANGE IN TARIFF IN GERMANY

Since the beginning of 2018, the German gas authority (Bundesnetzagentur, or BNetzA) has conducted consultations to introduce a new network code on harmonized transmission tariffs for gas, in line with a 2017 EU regulation. The ongoing procedure initiated by the Bonn-based federal agency is meant to establish a new transparent price methodology for gas tariffs within a given market area. In particular, the German reform introduces a new uniform postage stamp tariff as a reference price methodology. This implies equal pricing for access to the market area, irrespective of the network operator. According to the BNetzA, this type of tariff system is more suited to gas networks that are meshed and feature fewer unidirectional flows, like in Germany.[95]

However, Italy complained that the introduction of a postage stamp tariff will lead to price increases in cross-border trade, because it will reward gas exiting Germany more than before. As gas imported from Germany flows directly into Italy, the local agency and some companies[96] have complained that any additional cost associated with this transportation route will affect the Italian gas market as a whole.[97]

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[95] In meshed networks, points are well interconnected among each other and several paths could serve to flow gas to a given point, whereas in an unmeshed network, there is a single path to flow gas from one point to another.
[96] https://www.montelnews.com/en/story/unhelpful-german-gas-tariff-hike-fragments-market--enel-ceo/1012862
[97] According to ARERA, the forecasted increase in transportation costs due to the German tariff reform amounts to 0.387 €/MWh, which represents an additional cost of roughly €300,000,000 per year for Italy's gas supply.

CASE STUDY FINDINGS

Based on the example of Italy, it is understood that dominant positions in transmission capacity tend to exacerbate the pancaking effect and could distort the resulting gas price formation across different EU countries.

4.3.5 CHANGE IN FLOW PATTERN IN THE INTERCONNECTOR (UK)

The Interconnector pipeline was born out of a British government initiative to provide an outlet for excess gas produced from the UK Continental Shelf and a floor under UK gas prices in the wake of the national gas industry privatization and liberalization.

In spite of the initial model, a more diverse group of participants joined together to form the company that would own and operate the bi-directional gas connection linking the gas grids in the UK and Belgium.

4.3.5.1 IMPACT OF THE INTERCONNECTOR

The absence of a natural gas interconnection between the UK and the rest of Europe was a glaring missing link in the European network. Its creation was of regional and pan-European significance, changing both the physical and commercial structure of European gas markets.

It is now clear that the Interconnector serves primarily as a trading, not a bulk transportation, facility. This fact was underscored at an early stage by the transition to reverse flow after only two months of operation. The primary price impact of the Interconnector in the UK has been a return to indirect oil price linkage in UK gas prices. Shorter-term impacts on the UK market are also evident whenever the Interconnector is unable to deliver the flow requirement due to an outage and must change flow direction and fully use available capacity. For instance, the unplanned outages due to liquids contamination during 2002 and 2003 created significant market distortion as shippers were required to flow against the prevailing flow direction to facilitate the cleanup operation.

Despite the limited competition in European markets and inflexibility of supplies, the Interconnector still had an impact on mainland European markets. For the first time, the potential to buy and sell between markets has required Continental participants to pay attention to the NBP prices. The Interconnector has also been essential to the development of the Zeebrugge hub.

4.3.5.2 PROJECT EVALUATION

The UK government created a link aiming to prop up UK prices, stimulate inward investment and increase the speed of liberalization on the Continent. These goals were achieved up to a point, but the use of the line for imports and the resulting oil price linkage were not part of the original plan. Higher UK gas prices have benefited those with gas to sell, but not necessarily the UK economy, which could have benefited from lower energy prices.

Furthermore, the Interconnector has also delivered security of supply for the UK, ensuring a smooth transition from the end of a period of surplus into the current phase of net imports. Without the Interconnector, supplies of gas to the UK would have been constrained during the winters of 2004/5 and 2005/6.

As a business, the Interconnector has always been economically viable as the financial structure provides a low-risk income stream for the shareholders. The original participants have thus achieved a healthy return from their investment; however, this return must be offset against the costly obligation to pay for capacity on a long-term "send or pay" basis. UKCS Producers, initially the

dominant group, has clearly benefited from higher UK gas prices in part created by the Interconnector and achieved their short-term goal of finding a destination for surplus UK gas, thus maximizing the net present value of its UKCS investments.

A clear evolution of ownership and utilization from UK-based producers to predominantly European traders, marketers and producers suggests that those with gas to bring into the UK have the most to gain from Interconnector capacity and shareholding in the long run. For all those involved, the creation of the Interconnector has had a significant impact on the markets in which they operate. The opportunity to influence how the Interconnector works has potentially been as valuable to some as the investment itself.

4.3.5.3 EVOLUTION AND THE FUTURE

The Interconnector has been a useful experiment as the pipeline was connected to gas markets of different sizes and structures from the start. The rules for using the line and observed flow patterns have continually evolved in response to the changing environment created by the line itself.

The Interconnector pipeline has passed through a number of development phases. In the early years, capacity was underutilized as the markets and participants adjusted to the new reality. From 2000, seasonality and market responsiveness increased, and the Interconnector became an important supply and price equalizer. The extensions to the business rules and physical infrastructure between 2001 and 2005 made the system larger and more sophisticated. In the winter of 2005/6, the pipeline was credited with saving the UK gas market, as the recently enhanced import capacity helped bridge the gap between supply and demand. In stark contrast, the scale of ongoing new competing import infrastructure investment is likely to result in the UK becoming a net exporter again.

In conclusion, there is no single way to describe the role of the Interconnector. It has evolved through many different roles in the past and will continue to do so in the future. For now, it is expected that the expiration of the long-term contracts will allow the Interconnector to function as a price harmonizer between the UK and continental gas markets.[98] The introduction of shorter-term capacity products is already structurally changing flow patterns and capacity booking.

4.3.5.4 CHANGING TARIFF STRUCTURES AND COMPETITION

The expiration of the Interconnector's long-term contracts has significant implications for flows and capacity bookings on the pipe. Until Oct 2018, capacity was fully booked under long-term contracts, with shippers treating capacity costs as sunk. This meant relatively low variable costs to flow gas and in turn relatively high UK Interconnector utilization.

As the long-term contracts have expired, the UK Interconnector is selling capacity products on a more dynamic, shorter-term basis (e.g., via annual, quarterly, monthly and daily products). Before purchasing capacity, shippers are now weighing the cost of acquiring it. The winter's decline in the Interconnector import volumes has been impacted by the new cost structure of capacity, but it is also the result of higher UK LNG delivery volumes and milder weather reducing the UK's import requirements.

In addition, the Interconnector is also facing competitive pressure from BBL Company. Following the merger of BBL with the TTF price zone in 2019, BBL commissioned a reverse flow capability (by removing the Julianadorp interconnection point between TTF and the Interconnector), increasing

[98] https://timera-energy.com/the-changing-role-of-uks-gas-interconnectors/

the UK's gas export capacity. This recent move by BBL has contributed to reduce the flow costs from TTF to NBP.

4.3.5.5 WHAT IMPACT WILL INTERCONNECTOR CHANGES HAVE ON MARKET PRICES GOING FORWARD?

The NBP-TTF price spread is the key benchmark for price differences between the UK and Continental Europe. Price spread levels are driven by the marginal cost of flowing gas between markets.

The level of price spreads has a strong relationship to shippers' variable transit costs, which is why the expiration of a large volume of long-term contracts at the UK Interconnector is important.

Historically, UK Interconnector shippers have treated the cost of capacity as sunk (given long-term contracts). With the transition to short-term capacity booking, however, they are including the cost of capacity in their flow decisions. In other words, price spreads are rising to reflect the full costs of transit, both capacity tariff and variable transit charge.

The change in the IUK pipeline's tariff structure (from long-term contracts to shorter-term products) has pushed IUK toward the top of the flexibility merit order. It remains a key piece of UK gas supply infrastructure but has effectively become a peaking provider of flexibility, given the associated increase in marginal flow costs.

An increase in NBP-TTF price spread volatility is good news for the owners of interconnector capacity because it increases the capacity's value. This value increase only accrues to the existing owners of capacity, not the marginal buyer, whose passthrough of costs is raising the price spread.

CASE STUDY FINDINGS

- The UK Interconnector was born out of a UK Government initiative to find an outlet for excess UK gas as a transport link, but today it has true bi-directional capability for trading optimization. As shown by this example, changes in flow patterns are frequent and need to be anticipated and prepared.
- Proposals for new interconnector developments and hub mergers (e.g., Germany) should be carefully considered from a 10-15 year perspective.
- The role of the UK Interconnector has evolved. It has shifted from being an underutilized pipeline underpinned by long-term contracts to an active pipeline that optimizes trade between the UK and the Continent by selling capacity products on a more dynamic short-term basis.
- The separation between ownership and capacity holders has been a successful factor for the project (operations and trading never mix).
- Innovation in products encourage shippers and traders to hold capacity.
- For the UK Interconnector, the rapid buildup of reverse flow capability through marginal (1 percent additional) investments in compression has been key for project adaptability. This shows that targeted investments in compression tend to yield good value for pipeline interconnections.

4.3.6 PRODUCT DESIGN CONSIDERATIONS FOR UKRAINE AND POLAND

4.3.6.1 EVIDENCE OF PRODUCT/SERVICE INNOVATION IN GAS STORAGE

In gas storage services, clients are particularly seeking certain features:

- Superior products or solutions that have a certain degree of customization; and
- Products that maximize value and minimize risk exposure in fast-moving and highly competitive markets.

This context drives the sophistication of these products in many parts of Europe. Figure 77 summarizes the solutions and innovations in gas storage products, a description of how they work and evidence of their application in Europe.

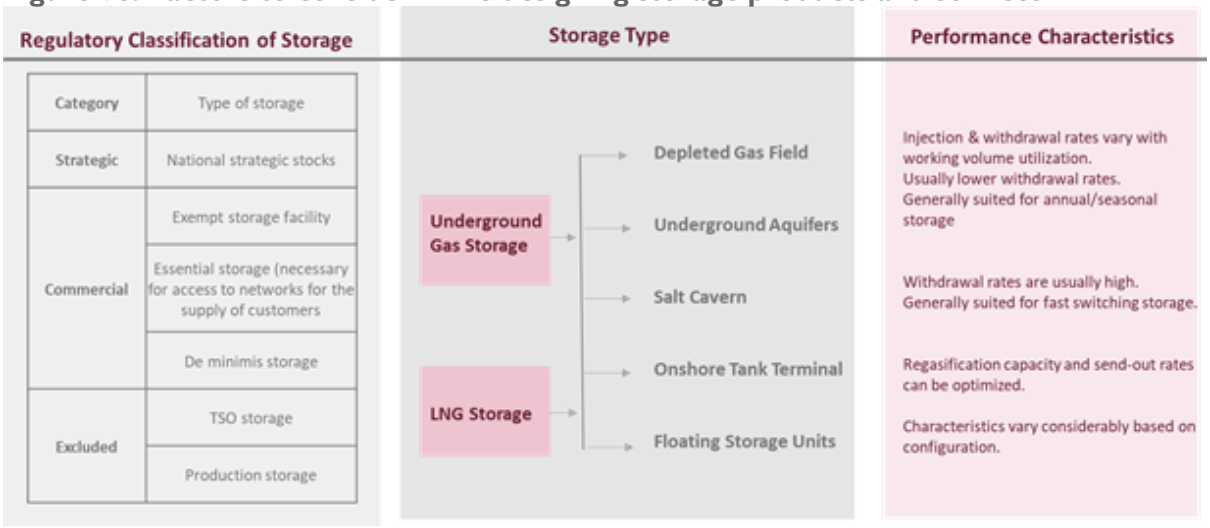
Figure 77: Evidence of innovations for gas storage products

PRODUCT TYPE	DESCRIPTION	SELECTED EXAMPLES
Short-term product with higher withdrawal rate	Standard bundled product with higher (premium rate) withdrawal pricing to allow traders to capture prompt trading upside opportunities.	SSOs in NW Europe offer this with salt cavern facilities.
Storage product delivered at Hub	SSO purchases the capacity rights up to the VTP/Hub on behalf of customers; especially attractive for smaller new entrants and energy-intensive users.	SSOs with mature hub connectivity offer this selectively.
Storage back-up services	SSO provides a performance guarantee for injection/withdrawal for short-term products either by pooling storage agreements or by participating in market trading.	Bergermeer and Uniper Energy Storage offer this; usually SSOs have been prohibited from participating in trading by NRAs.
Swap products	Swap products can vary in range and complexity but are usually bespoke products offered to long tenor capacity holders that allow delivery/injection at different sites; requirement is a physical balancing capability that SSO delivers on behalf of customers.	Astora offers this to multi-year customers as a bespoke/ on-request service.
Park & load/collateral product	SSO establishes master agreements with pre-qualified banks/financial institutions that offer trading collateral against in-storage working gas volumes	Only Bergermeer offers this service.
Virtual storage	Usually not a SSO specialty as wholesale marketers/traders develop contracts that simulate a storage contract. These offer no physical asset backing unless SSO offers to "partner" the wholesaler in the transaction (usually not popular with SSOs for regulatory/license condition concerns).	Storengy UK and France offer this; GasTerra offers this on ICE Endex.
Pooled storage	Different physical sites are treated for commercial purposes as a single commercial facility.	EWE Germany, Storengy France, Stoggit Italy, OSM Poland, Energienet Denmark and HGS Hungary are known to offer this.

Source: ESP and ENERSTRAT

Considering these products, Ukraine's SSO should focus on its own facilities and characteristics in order to design the product to take advantage of its best capabilities. The Ukrainian gas SSO has the opportunity to classify its asset base along the three broad dimensions described in Figure 78.

Figure 78: Factors to consider while designing storage products and services



Source: ESP and ENERSTRAT

Ukraine's TSO and SSO need to undertake this geotechnical assessment and the asset base classification effort before beginning to develop bundled product designs. The broad sketch of what these bundled products could look like is already elaborated in the case studies and the examples of innovative storage product/service offerings identified earlier in this section.

Components that make up any bundled storage capacity product, such as injection and withdrawal rates, will need to be verified before they can be offered as part of the bundled product offering. In the case studies, even standard bundled units (SBUs) differ from each other in terms of the assured flow rates they offer and the working gas capacity offered as part of each bundle. Furthermore, the number of bundles to offer is a function of the external market environment.[99]

The short-haul capacity product offered by UA GTSO[100] is a very good structured product that seeks to optimize the utilization of gas storage assets and to provide an alternative to gas shippers from adjoining markets. The back-haul product introduced by Ukraine is viewed as a response to mitigate the effect of tariff pancaking for shippers seeking access to Ukrainian storage.[101]

Based on the case studies and discussion with experts, it has become clear that a cross-border bundled transmission product across the Poland-Ukraine interconnector is a necessary requirement to execute the integrated bundled products involving LNG in Poland and storage assets in Ukraine (once licensing issues for Ukrainian companies in Poland are resolved).

However, the bundled storage products and related innovations can still be developed and offered internally within Ukraine while incremental capacity across the interconnectors is being developed.

This strategy of developing a cross-border transmission and storage bundle would be the ideal pathway toward a more integrated Ukraine-Poland gas market. First, the cross-border bundled transmission product must be created; then it can be combined with a storage product. In addition to this product to be developed, the Ukrainian TSO and SSO can consider launching other sophisticated products in the future (see Figure 79).

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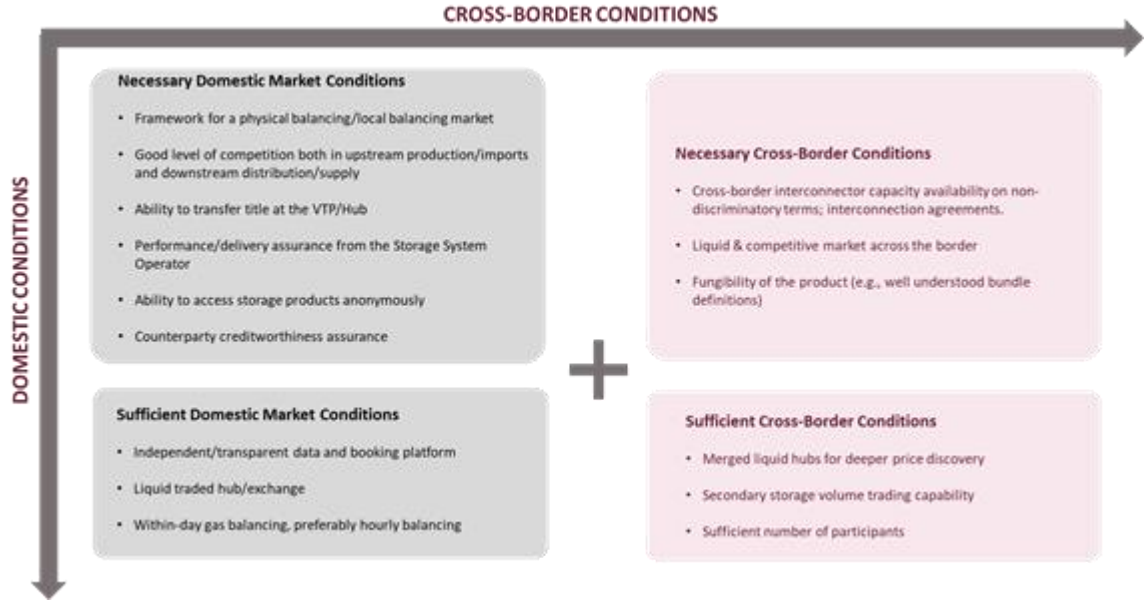
[99] This needs to be tested with actual interest on an open season or a market test as ENTSOG guidance recommends.
[100] https://tsoua.com/wp-content/uploads/2020/02/broshure-short-haul-2020.pdf
[101] While Poland and its TSO have limited freedom in terms of tariff design for import versus internal consumption, the view emerging from interviews is that further market reform/upstream de-concentration and DSO unbundling could further reduce utilization, creating a future risk of higher transport tariffs required to recover infrastructure costs.

Figure 79: Considerations for product/service design



Source: ESP and ENERSTRAT

The conditions along the Y-axis (domestic action) do not require a joint Ukraine-Poland working group, while the conditions along the X-axis require the essential cross-border gas transmission bundled product, necessitating a joint working group with Poland.

4.3.6.2 WHAT WOULD A BUNDLED PRODUCT STRATEGY LOOK LIKE?

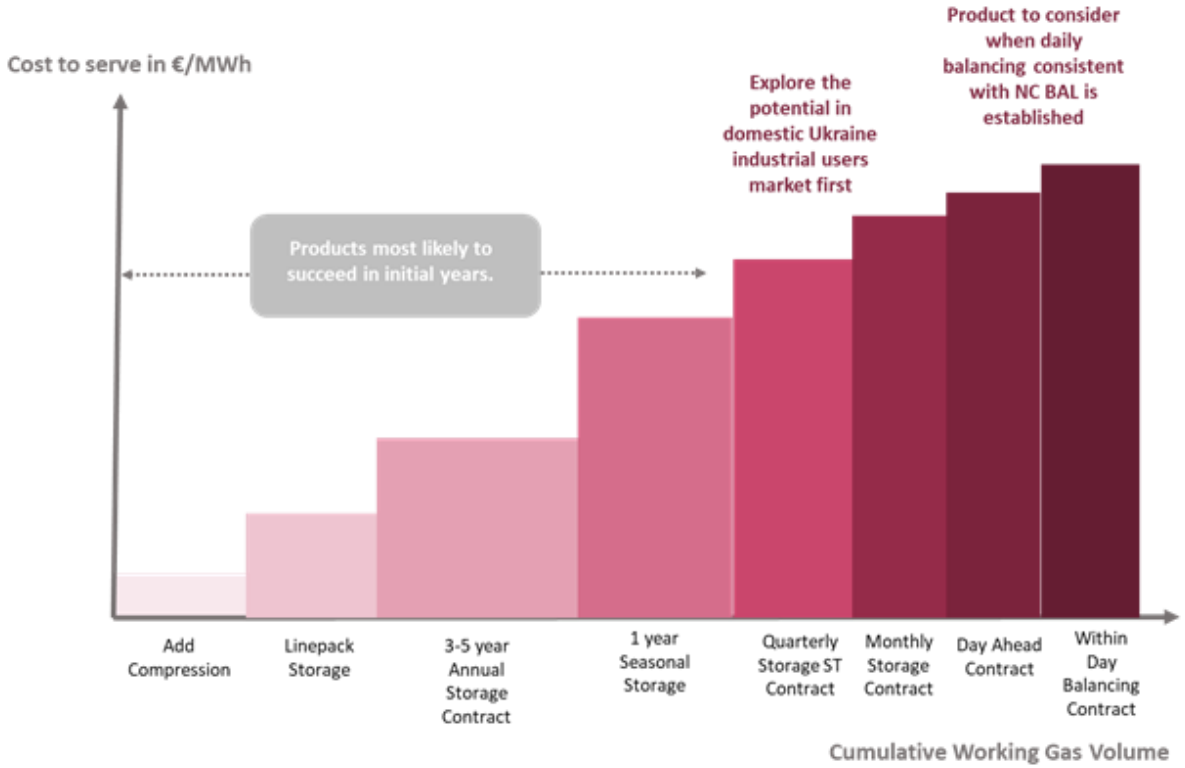
Having established the central need for a bundled gas transmission capacity product to execute the broader range of bundled gas transmission and storage products (as well as composite bundles that include both transmission bundles and storage bundles offered together as bundles), the possible sequence for the launch of the individual bundles (in transmission and storage) that could be offered was examined.

This sequence has been selected based on the case study examples and best practices in Northwest Europe (especially the Netherlands and Germany).[102]

The options/sequence is shown conceptually as a cost-curve and reflects in broad terms the relative costs to serve the typical storage requirement for a typical west European gas shipper.

[102] The Belgian gas storage asset at Louenhout, opted for a regulated TPA model and therefore offers limited application to the situation in Ukraine. Furthermore, the proximity to Zeebrugge in Belgium, which has an important natural physical pipeline/LNG, does not necessarily correspond to the Ukraine/Poland market area.

Figure 80: Indicative sequence of storage product launch in Ukraine



Source: ESP and ENERSTRAT

Figure 80 demonstrates how the more sophisticated products will require a higher level of cost to serve and will take longer to be developed. However, those products are the most likely to leverage the potential in Ukraine's domestic industrial uses market and readily attract more customers. It is expected that only the less sophisticated products may succeed in the initial years, with the more sophisticated products to follow later in a more mature market. As of now, it seems that Ukraine has the simpler products with its compressor, linepack storage capacity, and the three-to-five-year annual storage contract. In fact, the following trends on product launch are found across Europe:

- In the initial years of their respective launches, the three-to-five-year rolling annual storage contract was the most popular storage related product after the relatively cheaper pipeline-based (albeit much smaller volume) options offered by TSOs through linepacking;[103]
- The driver of gas storage capacity value in the early years was the summer-winter arbitrage, which is why the annual contracts (inject in summer and withdraw in winter, then repeat) were in high demand;
- DA and WD contracts typically require hourly or periodic within-day gas balancing services being offered by the TSO in compliance with the NC BAL recommendations.[104]

[103] The activities relating to identifying additional compression opportunities and developing the cost-benefit analyses have already been described in Deliverable 3 and hence this has only been indicated in a conceptual manner.
[104] The understanding is that this activity is currently under development in Ukraine and UA GTSO is not taking part in the UEEX platform. https://www.argusmedia.com/en/news/2137502-ukraine-exchange-launches-shortterm-balancing-products

4.4 CONCLUSIONS ON THE DESIGN OF BUNDLED PRODUCTS

Key concepts surrounding the bundling service offering and the product design for gas storage and transmission operations, have been introduced. It was concluded that there is a necessity of developing a cross-border bundled transmission product between the Ukrainian and Polish TSOs and SSOs.

In order to develop this product, the requirements of EU guidelines on regulatory frameworks were reviewed, summarized as follows:

- In accordance with the requirements of the NC CAM, the EU has determined that the standardization of transmission capacity is the first step before any bundling and optimization. The purpose of the standardization is to enable efficient and cost-effective gas flows and to provide the necessary trigger for any incremental interconnection capacity, if required. To do so, TSOs are required to offer transmission capacity through open and transparent platforms. The NC CAM prescribes items such as type of capacity and the auction process. It also gives guidance in relation to the procedures for incremental capacity (building the capacity should be based on binding commitments and subject to the positive outcome of an economic test). For proposed incremental capacity additions at the Poland-Ukraine IPs, a structured program of cooperation between the Polish and Ukrainian TSOs will be essential. This will need to be supported by the individual NRAs in the two countries. A high-level joint working group with broad terms of reference to enable greater market area integration is recommended.

- It should be noted that besides incremental capacity process, the firm capacity from PL to UA can be created upon the decision of the Polish TSO itself, as is done now by UA GTSO.

- The EU network code also addresses the way TSOs collect revenues via different tariffs associated with the provision of services at entry and exit points through NC TAR. It introduces tools such as the reference price methodologies (RPM), reserve price, multipliers/seasonal factors applicable for bundled products and the tariff allocation between TSOs. The aim is to provide guidance on transmission tariff calculation that ensures both cost reflectivity and predictability.

The analysis has been completed by presenting case studies in this report. The main outcomes are presented below:

- A cross-border bundled transmission product is the first step to develop any product configurations involving Ukrainian storage and international LNG;
- A cooperation model involving the Polish TSO/NRA along with the Ukrainian TSO/NRA is essential for the incremental capacity addition process to be followed as per ENTSOG guidelines;
- There is a wide variety of products and models offered by SSOs across Europe. Ukraine has a unique opportunity to pursue a "mix and match" strategy using the diversity, size, characteristics and abilities of its own large storage portfolio;
- Determining/identifying the types of storage capacity and assets to offer to shippers/traders is the first important step. A detailed study defining the technical characteristics and geophysical limitations, including injection and withdrawal constraints, delivery profiles and "safe/assured" working gas volumes, is required to build a storage asset register;

- Annual capacity bookings for 10 years out should be avoided, especially in the early years. These worked in Zeebrugge/Louenhout because of the special conditions in the area. For Ukraine-Poland, a transparent mechanism stating a three-to-five-year product review period will be highly desired by customers;
- The product/pricing information should be simply presented and transparent and should go above and beyond the guidance issued by NRAs. For instance, a price simulation tool would be helpful, particularly in the early years;
- Based on the example of Italy, it is understood that dominant positions on transmission capacity tend to exacerbate the pancaking effect and could distort the resulting gas price formation across different EU countries;
- Based on the UK Interconnector example, changes in flow patterns are frequent and hence the pipelines should have the flexibility to adapt. Short-term dynamic products would help this flexibility more than long-term agreements;
- The separation between ownership and capacity holders has been a successful factor for the project (operations and trading never mix);
- Innovation in products encourages shippers/traders to hold capacity; and
- For the UK Interconnector, the rapid buildup of reverse flow capability through marginal (1 percent additional) investments in compression has been key for the adaptability of the project. This shows that targeted investments in compression tend to yield good value for pipeline interconnections.

Based on the case studies and discussion with experts, it has become clear that a cross-border transmission and storage product across the Poland-Ukraine interconnector is the ideal product to execute further market integration involving LNG in Poland and storage assets in Ukraine. This is feasible after harmonization of licensing and legal frameworks.

Developing this product, however, requires not only the willingness of Ukraine and Poland to collaborate with one another at a high level as well as harmonizing their regulatory frameworks and ensuring the infrastructure enables such gas flows and firm capacities, but also a business case that demonstrates the competitive advantage of such a product. Additionally, resolving the licensing barriers which may prevent Ukrainian traders from buying such products would be a necessary preliminary step.

5 CONCLUSIONS & RECOMMENDATIONS

The overall study on the integration of Ukrainian and Polish transmission systems and gas markets concluded that there is significant potential for further integration based on the best EU experience. The technical assessment, market study, and legal and regulatory assessments allowed for key recommendations to be made which would enhance the current state of the integration between the two markets and transmission systems. The following details the recommendations, the necessity of each recommendation and the complexity of each recommendation.

The first recommendation is to establish a firm capacity at the cross-border interconnection point between Poland and Ukraine. This is seen to be a critical task as there is a significant risk that the infrastructure will no longer be actively used by the market unless firm capacities in both directions are established. Currently the capacity is limited and only offered on an interruptible bases if there is no flow from Ukraine. The complexity of this recommendation is determined to be 'average', as reconstruction works are currently ongoing Ukrainian side, and internal bottlenecks from the Polish side may be eliminated by 2022.

The second recommendation is to simplify the licensing regime in Poland for Ukrainian companies. Again, this is a critical activity, however it is determined to be a complex activity due to the involvement of multiple stakeholders in Poland. Furthermore, completing this recommendation would require amendments of several acts of national legislation in Poland.

The third recommendation is to allow the use of Ukrainian gas storage facilities for storing compulsory stock required by polish legislation. This is seen to be a required recommendation; however, it is not critical. In addition, this is seen to be a complex and time-consuming activity due to it requiring amendments to the statute to be adopted by Parliament and signed by the President.

The fourth recommendation is to create a bundled product for cross-border interconnection point capacity of the TSOs. This is a required activity that can be achieved in the long term. Again, this is a complex task as the process depends on finalization of recommendations 1 and 2 and involves participation of different stakeholders in Poland and Ukraine.

The fifth recommendation is to create separate regime (reasonable tariff and simple requirements for Ukrainian traders) for transit from Germany and/or LNG facility to the Ukrainian border. This is both a critical and complex task as the process depends on the finalization of the second recommendation. Further this involves participation from different stakeholders in Poland and Ukraine.

The penultimate recommendation is to create a fully-fledged gas exchange within Ukraine. Whilst this is a complex process, it is not seen as essential, and instead is determined to be a desirable recommendation. The complexity of this is due to the participation of multiple stakeholders in Ukraine, however the process is currently ongoing and therefore may allow for the complexity to be reduced as the process becomes more developed.

The final recommendation is the creation of a short-term product from the Polish side, which allows discounted transmission tariff for dedicated use of Ukrainian storage facilities. This recommendation will allow for the increase of utilization of the UGS facilities. As with the previous recommendation, this is seen to be desirable, however not essential. The complexity is seen to be average as the

process is rather quick, takes usually up to 3 months and can be based on the examples in Slovakia[105] or Ukraine.

[105] https://www.eustream.sk/files/docs/eng/Operationalorder_03072020_final.pdf - paragraph 5.5.

6 ANNEX

Annex 1 Capacity of underground gas storage facilities

UGS Facility	Capacity (mcm)
Bilche-Volytsko-Uherske	17,050
Uherske (XIV-XV)	1,900
Oparske	1,920
Dashavske	2,150
Bohorodchanske	2,300
Kehychivske	700
Verhunske	400
Krasnopopivske	420
Proletarske	1,000
Solokhivske	1,300
Chervonopartyzanske	1,500
Olyshivske	310
Total	**30,950**

Source: UA GTSO

Annex 2 Steps for purchase of gas and transport to the Ukrainian border and re-export to Poland (Polish legal side)

Step	Action	Detailed description	Authority	Regulation	Documents required
0	***Incorporation of company in Poland***	In order to start and run a business, it is assumed that the Polish company (subsidiary) will be incorporated (alternatively, it is possible to pursue gas trading activities via a company registered within an EEA country, the Swiss Confederation or Turkey). To that end, one may choose from the following scenarios: (a) incorporation of the tailor-made limited liability company; (b) incorporation of a new limited liability company using the electronic form of the articles of association (S24 limited liability company); or (c) buying an off-the-shelf company (in the latter case, the sale of shares should be notified to the Registry Court but such notification does not prevent further steps). Action would typically take up to: (a) 2-3 weeks in case of incorporation of the tailor-made LLC or (b) 1-2 days in case of incorporation of a new LLC using the electronic form of the articles of association (S24 limited liability company) or acquisition of the off-the-shelf LLC.	Registry Court	Art. 151 and subsequent of the Code of Commercial Companies of National Court Register Act of September 15, 2001.	As regards most time-efficient scenarios: (a) incorporation of S24 limited liability company is made via Internet with use of qualified electronic signature (link to the relevant website is available here.) (b) buying an off-the-shelf company requires execution of the private share purchase agreement with the provider in a form with notarized signatures, making amendments in the share ledger, preparing the list of new shareholders (typically followed by appointment of the new Management Board as well) and notifying the Registry Court of the sale of shares / changes in the Management Board to using the KRS-Z3 form available here.
1	***Obtaining a Polish tax identification number (NIP)***	In order to start and run a business, the shipper/trader is required to obtain a Polish tax identification number and for that purpose provide the authorities with data concerning the company. Action to be typically completed within 2-3 weeks (Steps 0-3 are made in parallel).	Registry Court, which is obliged to send the tax office a notice of the company's registration in the register, which is in itself the basis for assigning a NIP number. NIP-8 application form containing	Art. 5 and subseq. of the act on rules governing registration and identification of taxpayers and certain other acts of October 13, 1995; Art. 20 of the National Court Register Act of August 20, 1997.	The shipper/trader should submit application form NIP-2 (if it is not required to register in the National Court Register (KRS), e.g., carries out business activity in a form of civil partnership) or NIP-8 (if the shipper/trader is required to register in the KRS, i.e., if it acts in a form of partnership or company, which is usual form for conducting the business activity of a gas trader/shipper); the application forms include scope of activity and bank account number. NIP-8 form includes supplementary data not disclosed earlier in the entry in the KRS. The deadline for

Step	Action	Detailed description	Authority	Regulation	Documents required
			supplementary data should be submitted to the Competent Head of the Tax Office.		submitting NIP-8 is 21 days from the date of entry of the entity in the KRS.
2	***Registration for VAT purposes***	The obligation to register VAT in Poland arises when a shipper/trader has to declare a Polish VAT, i.e., when the shipper/trader has its registered office in Poland or – having registered office within the EEA country / Swiss Confederation / Turkey – carries out its business activity in Poland based on the branch (or another "fixed establishment") in Poland. Action to be typically completed within 2-3 weeks (Steps 0-3 are made in parallel). Taxpayers must inform the tax office about the change of data within 7 days from the moment when the specified change occurred. The notification of data change should be made on the VAT-R form (with a note that the notification is submitted in order to update the data).	Competent Head of the Tax Office (i.e., Tax Office competent for registered office or – in case of no registered office within the territory of Poland – fixed; in the case of entities without a registered office or a fixed establishment in Poland, the application form is submitted to the Head of the Second Tax Office in Warsaw-Śródmieście)	Art. 96 of the Polish Law on VAT	Shipper/trader must file registration form VAT-R before the date of the first taxable activity. The scope of the required information and documents depend on whether the taxpayer is established in Poland or abroad. Registration for VAT purposes is free of charge. However, in case one needs confirmation of the registration (which is the case for the purpose of license), one must pay PLN 170.
3	***Obtaining an EU VAT number***	Companies wishing to make intra-Community acquisitions and supplies of goods, to import services and to supply services for which the taxable person is the customer established in another Member State shall be registered for EU VAT. Such registration allows entities to avoid paying foreign VAT, calculated by foreign contractors, or charging these contractors Polish tax. Once registered, the competent tax office will give the "European" NIP – this means that	Competent Head of the Tax Office.	Art. 97 of the Polish Law on VAT	Registration is made on the VAT-R form, in the same way as registration for VAT purposes. If the shipper/trader already has an active VAT status for domestic transactions, it should update the VAT-R declaration accordingly. Shipper/trader should fill in part C.3 of the VAT-R form

Step	Action	Detailed description	Authority	Regulation	Documents required
		one must use a NIP with the prefix "PL" in the transactions mentioned above. If the entity already has active VAT status for domestic transactions, it should update the VAT-R declaration accordingly. Action to be typically completed within 2-3 weeks (Steps 0-3 are made in parallel).			when submitting EU VAT registration application.
4	***Obtaining the required licenses for (1) trading in gaseous fuels and (2) foreign trade in natural gas***	Shipper/trader should apply to the President of the ERO for the two separate licenses for trading in gaseous fuels and foreign trade in natural gas. Action to be typically completed within 3-4 months (to be made after completion of Steps 0-3).	President of ERO	Art. 32 and subseq. of the EL	Scope of application and list of information and documents required are specified in Section 1.3 above.
5	***Determination of volume of compulsory gas stocks to be maintained***	Shipper/trader should apply to the President of the ERO for a decision specifying the volume of compulsory gas stocks to be maintained by the entity applying for a license for foreign trade in natural gas and/or bringing natural gas into Poland. Action to be typically completed within 1 month (Step 5 to be made after completion of Steps 0-3 and in practice it might be carried out parallel with Step 4 but completed not before completion of Step 4).	President of ERO	Art. 25 Sec. 5 of the Stocks Act	Application is submitted with the application for a license for foreign trade in natural gas, the latter application specifying information needed to determine volume of compulsory gas stocks to be maintained by the entity applying for license covering foreign trade in natural gas. Scope of information and documents required for license for foreign trade in natural gas specified in Section 1.3 above.
6	***Registration with the registry of market participants***	Shipper/trader has to register within the registry of market participants (CEREMP) according to REMIT. Action to be typically completed within 2-4 days (Steps 6 and 7 to be made after completion of Steps 0-4 – possibly in parallel with Step 5 if not completed earlier).	President of ERO	Art. 9 of REMIT	Registration of shipper/trader within CEREMP is effected electronically and requires registration within the system of a user (natural person) representing shipper/trader via the website here and then registration of shipper/trader electronically via website platform stating the registry data of the market participant, information on its management and key personnel, associate entities and

Step	Action	Detailed description	Authority	Regulation	Documents required
					beneficiaries, venue used for disclose of inside information as well as the Registered Reporting Mechanism used by the given market participant. Any change in registry data must be notified to the register within 7 days.
7	***Obtaining an Energy Identification Code (EIC)***	Gas market participant should obtain the EIC to be granted by the ENTSO organization. An EIC issued by an authority outside Poland is valid in Poland and will be accepted by the TSO. Therefore, this step may be disregarded if the shipper/trader has already been assigned an EIC by the respective foreign authority. Action to be typically completed within 1 week (Steps 6 and 7 to be made after completion of Steps 0-4 – possibly in parallel with Step 5 if not completed earlier)	Local Issuing Office at OGP Gaz-System		Application form for EIC for traders (class X) is available here.
8	***Conclusion of agreement with operator of chosen Registered Reporting Mechanism (RRM)***	Shipper/trader has to enter into agreement for provision of reporting services under REMIT. Said agreement might be concluded either directly with the operator of the RRM (e.g., Polish Power Exchange operating RRM for both commodity exchange and OTC transactions) or entity having access to such services. Action to be typically completed within 2-4 days (Step 8 to be made after completion of Steps 0-4 and Step 6 – possibly in parallel with Steps 5 and 7 if not completed earlier).	RRM operator or entity having access to reporting services provided by RRM operator	Art. 8 of REMIT	Application forms and rules for services are provided by the respective service providers. For example, the application forms and rules for reporting services rendered by the Polish Power Exchange are available here.
9	***Development and notification of disruption procedure***	Shippers/traders are obliged to develop, agree and provide OGP Gaz-System with a procedure designed for disruptions in gas supplies and/or unforeseen increase in natural gas consumption. Action to be typically completed within 2-4 weeks (to be completed after completion of Steps 0-5 – possibly in parallel with Steps 6-8).	OGP Gaz-System	Art. 49 Sec. 1-2 of the Stocks Act	N/A

Step	Action	Detailed description	Authority	Regulation	Documents required
10	***Registration with the OGP Gaz-System's Information Exchange System***	The shipper/trader intending to contract transmission services from OGP Gaz-System must first register within the OGP Gaz-System's Information Exchange System. Action to be typically completed within 1-2 days (to be made after completion of Steps 0-7 – possibly in parallel with Steps 8-9).	OGP Gaz-System	Section 6.2.1 of the OGP Gaz-System Transmission Network Code	Registration is made with the application form available at the OGP Gaz-System website, which also includes templates of the power of attorney to be granted to persons authorized to represent the shipper/trader within the registration and then to act on behalf of shipper/trader when using functionalities of the Information Exchange System (IES). As a step of registering with the IES, the shipper/trader must accept regulations governing the provision of services by electronic means of IES.
11	***Conclusion of transmission contract with TSO and establishment of collateral***	Upon registration within the Information Exchange System and obtaining of the login / password, the shipper/trader applies for conclusion of the transmission services agreement within the OGP Gaz-System's Information Exchange System, agrees on the terms and conditions of the agreement and signs the agreement. Action to be typically completed within 2-3 weeks (to be made after completion of Steps 0-7 and Step 10 – possibly in parallel with Steps 8-9 and 12).	OGP Gaz-System	Section 6.2 of the OGP Gaz-System Transmission Network Code	Application form for conclusion of the transmission services agreement is submitted to the OGP Gaz-System's IES. Data to be included in the application as well as the required documents are specified in Section 6.2.2 of the OGP Gaz-System Transmission Network Code (available also in the Instruction of the Information Exchange System, p. 43-45). Transmission services agreement is based on the template and the network user must accept Transmission Network Code as well as the general terms and conditions of the transmission services agreement available here. Network user shall be obliged to establish collateral to secure its obligations under the transmission services agreement.
12	***Notification of commencement of activity as an intermediary gas entity***	The shipper/trader intending to operate as an intermediary on the gas market has to notify the commencement of its activity as an intermediary gas entity.	Competent Head of the Tax Office	Art. 16 Sec. 3a of the Polish Law on Excise Duty	The notification is based on the notification form and it must contain: • The name of the gas trader; • Its address;

Step	Action	Detailed description	Authority	Regulation	Documents required
		Action to be typically completed within 1 day (to be completed after completion of Steps 0-5 – possibly in parallel with Steps 6-11).			• The tax identification number (NIP) or other identification number used in the country in which the company is established; and • The type of business conducted (sale, intra-Community supply, intra-Community acquisition, etc.).
13	***Optional – status of the participant of the Polish Power Exchange***	Shipper/trader wishing to enter into transactions in natural gas within the Polish Power Exchange must either (a) conclude an agreement with brokerage house having status of participant to the Polish Power Exchange (list available here) or (b) obtain permission from the Polish Financial Supervision Authority to maintain accounts or commodity registers and then file an application for admission to trading on the Polish Power Exchange. Shipper/trader may alternatively skip this step and enter exclusively into the over-the-counter transactions in natural gas. Action to be typically completed within 1 week (option with brokerage house) - to be made after completion of Steps 0-12.	Brokerage house / Financial Supervision Commission, Polish Power Exchange and Exchange Clearing House	Act of on commodity exchanges	Detailed procedure and application forms required for admission to Polish Power Exchange are available here.
14	***Registration within the GSA and acquisition of rights to exit capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO***	Rights to exit capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO are allocated within auctions organized at the GSA platform, the rules applicable to such auctions being specified in the Ukrainian and Polish Gas Markets Regulatory Overview. Action to be typically completed within scheduled auctions (annual auctions are held once per year while short-term auctions are held more frequently) – to be made after completion of Steps 0-12.	OGP Gaz-System		In order to participate in auctions and be granted rights to exit capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO one has to first register at the GSA platform (link to registration website is available here) and then take part in the auctions organized within this platform (manual for using GSA platform is available here).
15	***Acquisition of natural gas to be exported to Ukraine for storage and submitting nominations to***	Upon completion of key actions specified above, shipper/trader shall acquire (either on commodity exchange or OTC transaction) the relevant volumes of natural gas to be transmitted to Ukraine and provide OGP Gaz-System – not later than on 2pm CET before the gas day on which the transmission service is performed – with actual	OGP Gaz-System	Section 15 of the OGP Gaz-System Transmission Network Code	Nomination shall be effected via Information Exchange System.

Step	Action	Detailed description	Authority	Regulation	Documents required
	OGP Gaz-System	nominations for virtual point (acquisition) and exit point from Poland to Ukraine at the GCP Gaz-System/UA GTSO. Purchases to be completed within commodity exchange or OTC with timing depending on the trader (at least 1 day) and reported via RRM while nominations to be made on daily basis in accordance with the transmission network code – to be made after completion of Steps 0-12.			
16	***Allocation of gas flows and settlement for imbalances with OGP Gaz-System***	Gas flows at every entry/exit point shall be allocated and settled on daily basis according to the balancing rules by OGP Gaz-System – operationally dependent on earlier completion of Steps 0-15.	OGP Gaz-System	Section 16-18 of the OGP Gaz-System Transmission Network Code	Information on allocations and imbalance positions shall be made available via Information Exchange System.
17	***Securing compulsory gas stocks***	Transmission of natural gas from Ukrainian UGS back to Poland would trigger compulsory stocks obligations, including obligation to maintain compulsory gas stocks as of the day on which the shipper/trader starts to import natural gas to Poland from Ukraine. In this context shipper/trader may fulfill its obligations to maintain the compulsory gas stocks by either (a) conclusion of agreement with another entity holding license for foreign trade in natural gas that would maintain the compulsory gas stocks on behalf of the shipper/trader (a ticket agreement), such agreement to be concluded based on prior approval of the President of ERO, or (b) purchase gas to be secured as gas stocks and related transmission/storage capacities necessary to maintain the compulsory gas stocks. In scenario (a), the shipper/trader should negotiate and agree on the ticket agreement with an entity offering services for maintaining compulsory gas stocks, apply to the President of ERO for consent and then enter into the agreement. In scenario (b), the shipper/trader should additionally conclude a storage agreement with Gas Storage Poland Sp. z o.o., contract storage service and purchase the volume of gas needed to establish the compulsory gas stocks by the day of import of natural gas from Ukraine (maintaining compulsory gas stocks outside Poland requires	President of ERO and, in scenario (a), an entity offering services in respect on maintaining compulsory gas stocks for third parties; or in scenario (b), Gas Storage Poland or non-Polish SSO and OGP Gaz-System	Art. 24 and subseq. of the Stocks Act, point 21.8 of OGP Gaz-System Transmission Network Code	As regards scenario (a), there is no binding/recommended template of agreement for maintaining compulsory gas stocks or application for approval of such agreement by the President of ERO. As regards scenario (b), application for conclusion of storage services agreement is available here while the storage agreement with Gas Storage Poland as well as general terms and conditions and the storage services rules are available here.

Step	Action	Detailed description	Authority	Regulation	Documents required
		prior contracting of storage capacity within the EEA country together with firm transmission capacities between from the chosen UGS and the Polish transmission system). In case of using ticket agreement option – 1-2 months. This is done in case of re-export to Poland and in parallel to the steps in the Ukrainian section.			
18	***Notification to OGP Gaz-System on maintaining compulsory gas stocks***	Shipper/trader is obliged to provide OGP Gaz-System with detailed information on storage facilities used to maintain compulsory gas stocks, with such notification to be made before commencement of gas imports and then annually, not later than June 15 of each year. If the compulsory gas stocks are to be maintained outside Poland, OGP Gaz-System would issue – based on this notification and documents attached thereto – an opinion confirming the possibility to withdraw the compulsory gas stocks and inject them into Polish system within not more than 40 days, such opinion being issued within 14 days from submission of required documentation. Action is made annually – independently of the other steps.	OGP Gaz-System	Section 21.8 of the OGP Gaz-System Transmission Network Code	Notification must include data as further specified in section 21.8 of the OGP Gaz-System Transmission Network Code.
19	***Acquisition of rights to entry capacity from Ukraine to Poland at the GCP Gaz-System/UA GTSO***	Rights to entry capacity from Ukraine to Poland at the GCP Gaz-System / UA GTSO are allocated within auctions organized at the GSA platform, the rules applicable to such auctions being specified in Ukrainian and Polish Gas Markets Regulatory Overview. Action to be typically completed within scheduled auctions (annual auctions are held once per year while short-term auctions are held more frequently) – to be made after completion of Steps 0-12. This case is done in case of re-export to Poland and in parallel to the steps in the Ukrainian section.	OGP Gaz-System		In order to participate in auctions and be granted rights to exit capacity from Poland to Ukraine at the GCP Gaz-System/UA GTSO one has to first register at the GSA platform (link to registration website is available here) and then take part in the auctions organized within this platform (manual for using GSA platform is available here).
20	***Submitting nominations to OGP Gaz-System***	Shipper/trader shall provide OGP Gaz-System – not later than 2:00 p.m. CET before the gas day on which the transmission service is performed – with actual nominations for entry point from Ukraine to Poland at the GCP Gaz-System/UA GTSO.	OGP Gaz-System	Section 15 of the OGP Gaz-System Transmission Network Code	Nomination shall be effected via Information Exchange System.

Step	Action	Detailed description	Authority	Regulation	Documents required
		Imports of natural gas from Ukraine in a given year (unless the same volume is exported) must be diversified with purchase of natural gas into Poland within intra-Community acquisition or import from the EEA country. Nominations to be made on a daily basis in accordance with the transmission network code – to be made after completion of Steps 0-12. This case is done in case of re-export to Poland and in parallel to the steps in the Ukrainian section.			
21	***Allocation of gas flows and settlement for imbalances with OGP Gaz-System***	Gas flows at every entry/exit point shall be allocated and settled on a daily basis according to the balancing rules by OGP Gaz-System – operationally dependent on earlier completion of Steps 0-15. This case is done in case of re-export to Poland and in parallel to the steps in the Ukrainian section.	OGP Gaz-System	Section 16-18 of the OGP Gaz-System Transmission Network Code	Information on allocations and imbalances positions shall be made available via Information Exchange System.

Source: ESP

Annex 3 Steps for purchase of gas and transport to storage and re-export (Ukrainian legal side)

Step	Action	Detailed description	Authority	Regulation	Documents required
1	***Receiving EIC (if the code has not been previously obtained)***	Each market participant is allocated a unique EIC by the TSO applied in energy sector for the purposes of coding and identification. An EIC issued by an authority outside of Ukraine is valid in Ukraine and will be accepted by the TSO. Therefore, this step may be disregarded if relevant shipper/trader has already been assigned an EIC by the respective foreign authority. This step is to be completed within 2 working days (provided that all required procedural steps are properly followed). This step is to be made separately and only	Gas TSO or another competent authority outside Ukraine	Gas Transmission System Code, approved by the NEURC Resolution No. 2493, dated September 30, 2015 (the "GTS Code"): Section 2 of Chapter IV	To receive EIC in Ukraine, a shipper/trader provides UA GTSO with: 1. the application for receiving EIC (template is available here); 2. the application for registration of EIC on the Informational Platform of UA GTSO (template is available here); and 3. the application for publishing EIC at the website of ENTSO-E (template is available here).

Step	Action	Detailed description	Authority	Regulation	Documents required
		after its completion may a shipper/trader proceed with the next steps. If a shipper/trader has received an EIC code before, it may skip this step altogether.			
2	***Entering into the gas transmission agreement with UA GTSO***	The transmission agreement is to be entered into based on a model agreement, approved by the NEURC and is available here. It allows a shipper/trader to use the GTS within the distribution of capacities at entry and exit points and natural gas transportation through the GTS within the framework of contractual capacities and confirmed nominations. This step is to be typically completed within 5-10 days after filing all required documents. This step is to be made only after completion of Step No. 1. This step may be made in parallel with Steps No. 3-5.	Gas TSO	Law of Ukraine "*On Natural Gas Market*" No. 329-VIII, dated April 9, 2015 (the "Natural Gas Market Law"): Article 32 GTS Code: Section 1 of Chapter VIII Model Agreement on Transmission of Natural Gas, approved by NEURC Resolution No. 2497, dated September 30, 2015	To enter into a transmission agreement, a shipper/trader provides UA GTSO with: 1. the application for entering into a transmission agreement, in the form established by the TSO, which is public information and is published on its website; 2. the document confirming shipper/trader's registration as a business entity in the country of its permanent residence; and 3. documents confirming the authority of persons to represent a shipper/trader (company's charter, power of attorney, etc.). All documents in a foreign language shall be accompanied by a certified translation into Ukrainian.
3	***Registering on the Informational Platform of UA GTSO***	The natural gas transportation is to be carried out by using the Informational Platform of UA GTSO (the "TSO Informational Platform") in the form of a web application. In order to ensure electronic interaction and document flow between the subjects of the natural gas market, including organization of ordering and maintenance of natural gas transportation services in the conditions of	The platform is operated by the Gas TSO	The GTS Code: Section 3 of Chapter IV	To get an access to the TSO Informational Platform, a shipper/trader provides UA GTSO with: 1. the application for creating an account for shipper/trader's authorized persons (template is available here); 2. Power of Attorney for shipper/trader's authorized persons that would have a right to access the TSO Informational Platform. Power of

Step	Action	Detailed description	Authority	Regulation	Documents required
		daily balancing of the GTS, as well as between the subjects of the natural gas market and operators of trading platforms, the TSO is obliged to create and maintain the TSO Informational Platform. This step is to be typically completed within 5-10 days after filing all required documents. This step is to be made only after completion of Step No. 1. This step may be made in parallel with Steps No. 2 and Steps No. 4 and No. 5.			Attorney for a company's director acting based on a company's charter is not required (template is available here); and Power of Attorney for shipper/trader's authorized persons that would have a right to sign documents to be submitted via the TSO Informational Platform. This Power of Attorney shall contain a specimen of signature of each authorized person and serial number of electronic digital signature (template is available here). To use the TSO Informational Platform, a shipper/trader shall receive electronic digital signature for its authorized persons.
4	***Entering into the gas storage agreement with the Ukrainian SSO***	The gas storage agreement is to be entered into based on a model agreement, approved by the NEURC and is available here. The gas storage agreement regulates the legal relationship between the SSO and a shipper/trader as to storage (injection, withdrawal) of natural gas. This step is to be typically completed within 5-10 days after filing all required documents. This step is to be made only after completion of Step No. 1. This step may be made in parallel with Steps No. 2 and Steps No. 3 and No. 5.	SSO	Gas Storages Code, approved by the NEURC Resolution No. 2495, dated September 30, 2015 (the "Gas Storages Code"): Section I of Chapter VI	To enter into the gas storage agreement, a shipper/trader provides the SSO with: 1. the application for entering into a transmission agreement, in the form established by the SSO (template is available here); 2. the document confirming a shipper/trader's registration as a business entity in the country of its permanent residence; and 3. documents confirming the authority of persons to represent a shipper/trader (company's charter, power of attorney, etc.). All documents in a foreign language shall be accompanied by a certified translation into Ukrainian.
5	***Registering on the Informational Platform of the Ukrainian SSO***	The Informational Platform of the SSO (the "SSO Informational Platform") is operated by the SSO to take account of the transfer of natural gas from/to underground storage facilities of the SSO, and transfer of the right to use the services of storage (injection/withdrawal) of natural gas.	The platform is operated by the SSO	Gas Storages Code: Para. 2 of Section I of Chapter VIII; Para. 4 of Section 2 of Chapter VIII	To get access to the SSO Informational Platform, a shipper/trader provides the Ukrainian SSO with: 1. the application for creating an account for shipper/trader's authorized persons (template is available here);

Step	Action	Detailed description	Authority	Regulation	Documents required
		This step is to be typically completed within 5-10 days after filing all required documents. This step is to be made only after completion of Step No. 1. This step may be made in parallel with Steps No. 2-4.			2. Power of Attorney for shipper/trader's authorized persons that would have a right to access the SSO Informational Platform. Power of Attorney for a company's director acting based on a company's charter is not required (template is available here); 3. Power of Attorney for shipper/trader's authorized persons that would have a right to sign documents to be submitted via the SSO Informational Platform. This Power of Attorney shall contain a specimen of signature of each authorized person and serial number of electronic digital signature (template is available here). To use the SSO Informational Platform, a shipper/trader shall receive electronic digital signature for its authorized persons.
6	***Receiving a shipper code***	A shipper code is an alphanumeric identifier of a shipper/trader, which is used in informational messages during nominations matching procedure and determines the owner of the gas at the cross-border interconnection point. Moreover, a shipper code is an additional identification code used by the shipper/trader and the TSO when providing nominations/re-nominations during the procedure for verifying the conformity of the nominations/re-nominations with the operator of the adjacent GTS for volumes of gas that are transported by ordering capacity with restrictions. This step is to be typically completed within 1 day after filing all required documents. This step is to be made only after completion of Step No. 1. This step may be made in parallel with Steps No. 2-5.	Gas TSO	The GTS Code: Para. 8 of Section 2 of Chapter IV; Para. 4 of Section 8 of Chapter IX	To receive a shipper code, a shipper/trader provides UA GTSO with the application for receiving a shipper code (template is available here). A shipper/trader must fill in the shipper pair registration form and send it to the TSO five days prior to start of gas transmission. To register a shipper pair, shippers provide UA GTSO with the shipper pair registration form (template is available here).

Step	Action	Detailed description	Authority	Regulation	Documents required
7	***Registering as a shipper on the GSA auction platform for capacity allocation***	At interconnection points the capacity is allocated based on auctions. Thus, to get an access to the capacity, a shipper/trader has to register on the auction platform to participate in the auction. So far, there are two auction platforms approved by the Ukrainian Regulator – GSA and RPB. Only the GSA auction platform holds the auctions for allocation of capacity at Ukraine-Poland interconnection point. This step is to be typically completed within 3-5 days after filing all required documents and following all procedural steps. This step is to be made only after completion of Steps No. 1-6.	Gas TSO	The GTS Code: Section I of Chapter XIX	To register as a shipper on the GSA auction platform for capacity allocation, a shipper/trader must: 1. Follow the link and review documents on operation of the auction platform; 2. Submit to aukcje@gsaplatform.eu the following documents: • Scan-copy of signed Power of Attorney for conduction registration action on the GSA platform (template is available here); • Scan-copy of extract from company's register. 3. Register on the GSA Platform.
8	***Taking part in an auction for capacity allocation***	UA GTSO organizes auctions for annual, quarterly, monthly, day ahead and within-day capacity, which can be divided based on firm, interruptible capacity and short-haul. Moreover, UA GTSO may put on auctions the united interconnection capacity (i.e., firm capacity that combines entry and exit points for both neighboring countries). The Ukrainian TSO publishes on its website information on the available capacity at interconnection entry/exit points. Auctions do not take place if there is no available capacity at entry or exit points. Auctions should be organized based on the ENTSOG auctions calendar. This calendar should be published by UA GTSO on its website within three days of its publication by ENTSOG.	Gas TSO	The GTS Code: Section I of Chapter XIX	There are no specific instructions.

Step	Action	Detailed description	Authority	Regulation	Documents required
		If the ENTSOG auctions calendar does not include information on the Ukrainian auctions, UA GTSO should organize auctions based on the following schedule: • Annual capacity – first Monday of July; • First auction quarter (I-IV calendar quarters) – first Monday of August; • Second auction quarter (II-IV calendar quarters) – first Monday of November; • Third auction quarter (III-IV calendar quarters) – first Monday of February; • Fourth auction quarter (IV calendar quarter) – first Monday of May. • Monthly auctions – third Monday of the month preceding the month for the allocated capacity. This step is to be typically completed within scheduled auctions (as noted above). This step is to be made after completion of Steps No. 1-7.			
9	***Paying for allocated capacity according to tariffs set by the NEURC***	Natural gas transmission services are provided by the TSO to a shipper/customer on 100% prepayment in the amount of the cost of allocated capacity for the gas month for services for the gas month, quarter and/or year five banking days before the gas month, in which the transportation of natural gas will take place. This step is to be typically completed five banking days before the gas month, in which the transportation of natural gas will take place. This step is to be made after completion of Steps No. 1-8.	Gas TSO	The GTS Code: Para. 2 of Section 2 of Chapter 8	When paying for the allocated capacity, a shipper/trader must use the templates published by UA GTSO on its website to calculate the payment amount and be sure to specify the following in the purpose of payment: "XXXMMPP Prepayment for ordered services (PERIOD) under the agreement dated _____ No. _____, including VAT _____." The abovementioned payment code mean: XXX - type of service, ESP - ordinal number of the month from 01 to 12 RR - The last two digits of the year from 19 to 99

Step	Action	Detailed description	Authority	Regulation	Documents required
					Period: YEAR, QUARTER, MONTH, DAY
10	***Downloading a scanned copy of periodical customs declaration to the Informational Platform of UA GTSO***	This step is to be typically completed within one day. This step is to be made only after the completion of Steps No. 1-3. This step may be made in parallel with steps No. 4-9.	Gas TSO	The Customs Code of Ukraine No. 4495-VI, dated March 13, 2012 (the "Customs Code"): Article 260	There are no specific instructions.
11	***Ordering customs warehouse service from Ukrainian SSO***	Customs warehouse regime is a special customs regime (customs procedure) that allows foreign and Ukrainian companies to store natural gas in Ukraine under customs control for up to 1,095 days without payment of 20% import VAT ("conditional full exemption from import taxes"). The natural gas can be stored at 10 underground gas storages operated by the SSO, which has the status of the "holder of customs warehouse" and is responsible for filing "customs warehouse" declarations with the Ukrainian customs authority. This step is to be typically completed within one week. This step is to be made only after the completion of Steps No. 1-5. This step may be made in parallel with Steps No. 6-10.	SSO, Gas TSO, Ukrainian customs authorities	The Customs Code: Articles 121-122 Letter of the State Customs Service of Ukraine No 18-02/409 dated April 24, 2020	In order to book the customs warehouse regime, a shipper/trader enters into two agreements with the SSO: (1) gas storage agreement (see Step No. 4), and (2) agreement for declaration of gas for Ukrainian customs purposes. To enter into the agreement for declaration of gas, a shipper/trader provides the SSO with: 1. Application for entering into agreement (template is available here); and 2. Originals of the agreement in 2 copies, completed, signed by a shipper/trader and sealed (if any) (template of agreement is available here). An electronic version of the agreement, completed by the customer, shall be sent to these email addresses: cw@utg.ua and stock-sso@utg.ua Furthermore, the following documents should be filed by the TSO on behalf of a shipper/trader with the Ukrainian customs authority to register internal transit and customs warehouse regimes:

Step	Action	Detailed description	Authority	Regulation	Documents required
					1. A periodic customs declaration type IM 74 (customs warehouse regime); and 2. a periodic customs declaration type TR81 (regime of "internal transit with a guarantee"). TSO provides security (security) to customs authority for payment of import VAT.
12	***Providing financial security***	In order to ensure the fulfillment of a shipper/trader's obligations to pay for the services of the GTS under the gas transmission agreement, a customer is obliged to provide financial security to the TSO. This step is to be completed operationally, depending on a shipper/trader, but in any event not later than three hours before the deadline for nomination or three hours before the re-nomination. This step is to be made after completion of Steps No. 1-3 and Steps No. 6-9, but before Step No. 13. This step may be made in parallel with Steps No. 4-5 and Steps No. 10-11.	Gas TSO	The GTS Code: Section 2 of Chapter 8	There are two alternative forms of financial security: (1) bank guarantee or (2) transfer of money to the TSO based on the gas transmission agreement. As of October 28, 2020, the bank guarantee is not available until the respective amendments to legislation are adopted. Financial security can be provided in UAH, $ and €. If provided in foreign currency, the official exchange rate of the National Bank of Ukraine as of the day of its provision is used to calculate whether the amount of financial security is adequate. Calculator of the amount of security is available here. Template of a bank guarantee is available here. A bank guarantee and/or amendments thereto are provided exclusively with a cover letter, a template for which is available here.
13	***Submit a nomination via the Informational Platform for transmission of natural gas***	A nomination is a preliminary notification to be provided by a shipper/trader to the TSO regarding the volumes of natural gas that are to be transmitted by a shipper/trader during the day to the GTS at entry points. This step is to be made on the daily basis in accordance with the GTS Code. This step is to be made only after the completion of Steps No. 1-3, Steps No. 6-10 and	Gas TSO	The GTS Code: Chapter XI	A shipper/trader submits nominations in energy units. On day D-1, the Informational Platform of the TSO uses the actual (allocation) coefficient of higher heat of combustion * for day D-2 to calculate a similar forecast for day D (day of transportation).

Step	Action	Detailed description	Authority	Regulation	Documents required
		Step No. 12. This step may be made in parallel with Steps No. 4-5 and Step No. 11.			The task of the TSO in processing such a nomination is to confirm the exact volumes in energy units and show the forecast volumes in cubic meters. When an allocation takes place on day D+1 and the TSO receives information on the actual volume in energy units, the Information Platform of the TSO recalculates the allocation in cubic meters. At the end of the month, based on the results of the allocation, UA GTSO and the adjacent TSO sign the acceptance and transfer protocols in both energy units and cubic meters.
14	***Re-export of natural gas*** ***Submission of a nomination via the Informational Platform for transmission of natural gas***	A nomination is a preliminary notification to be provided by a shipper/trader to the TSO regarding the volumes of natural gas that are to be transmitted by a shipper/trader during the day from the GTS at exit points. This step is to be made on a daily basis in accordance with the GTS Code. This step is to be made only after the completion of Steps No. 1-3, 6-10, 11-13.	Gas TSO	The GTS Code: Chapter XI	A shipper/trader submits nominations in energy units. On day D-1, the Informational Platform of the TSO uses the actual (allocation) coefficient of higher heat of combustion * for day D-2 to calculate a similar forecast for day D (day of transportation). The task of the TSO in processing such a nomination is to confirm the exact volumes in energy units and show the forecast volumes in cubic meters. When an allocation takes place on day D+1 and the TSO receives information on the actual volume in energy units, the Information Platform of the TSO recalculates the allocation in cubic meters. At the end of the month, based on the results of the allocation, UA GTSO and the adjacent TSO sign the acceptance and transfer protocols in both energy units and cubic meters.
15	***Re-export of natural gas***	At interstate trading points capacity is allocated through an auction, unless an alternative capacity allocation mechanism or capacity with restrictions is used.	Gas TSO	The GTS Code: Section I of Chapter XIX	There are no specific instructions.

Step	Action	Detailed description	Authority	Regulation	Documents required
	Taking part in an auction for capacity allocation	This step is to be made after completion of Steps No. 1-13.			

Source: ESP

Annex 4 Polish Regulatory Gap Analysis

Challenge	Recommendation	Responsible parties	Assessment of compliance with EU law
1. Development of bi-directional interconnection capacity between Poland and Ukraine (basic technical market barrier)			
There is no firm capacity available for gas flows in the PL>UA direction (in practice, gas flows from Poland to Ukraine are currently made by way of virtual reverse flow with availability of physical flow on interruptible, conditionally firm basis). This hinders gas flows from Poland to Ukraine and poses a risk of limited gas flow in the PL>UA direction after December 31, 2022, when the long-term gas supply agreement between PGNiG and Gazprom expires and PGNiG decides not to acquire gas from Russia at all, or at least decides not to purchase gas from Russia via Ukraine (the latter might be underpinned by PGNiG's shareholding in SGT EuRoPolGaz, which owns the Polish section of the Yamal-Europe pipeline – as well as an intention to decrease transmission rates in the Yamal-Europe pipeline that may be used to transmit gas to Poland from German market via Mallnow point). Bi-directional interconnectors have been developed within the last 10 years on the borders	In order to facilitate gas flows from Poland to Ukraine (for the purposes of either gas imports to Ukraine or keeping gas stocks in Ukrainian UGS) it would be recommended to develop bi-directional interconnection capacity between Ukraine and Poland on a firm basis. In that case, gas flows from Poland to Ukraine would not be dependent on corresponding gas flows from Ukraine to Poland and therefore it would facilitate gas exports from Poland to Ukraine irrespective of gas transmission in UA>PL direction. On the Ukrainian side,the infrastructure is ready physically offtake gas into the system up to 5 bcma. Following reconstructions, the maximum volumes will increase to higher level depending on the pressure from Polish side.	In the case of development of a bi-directional interconnector, would require cooperation between OGP Gaz-System and UA GTSO, including: (a) conclusion of the agreement between Polish and UA GTSO on development of the interconnector (or assignment onto UA GTSO and update of the previous agreement concluded on the same issue between the Polish TSO and UTG JSC on December 6, 2016); (b) possible application of the procedures securing long-term use-or-pay contract covering expanded capacity at the UA/PL IP (e.g., launching of the binding open season process that was suggested by a representative of OGP Gaz-System as a way to reach a final investment decision on construction of the Polish section of the Polish-Ukrainian interconnector); and (c) final investment decisions by Polish TSO.	Implementation of the recommendation would not contravene EU laws (under the Security Regulation, bi-directional interconnectors are required at the borders between the EU Member States – not specifically between the EU Member States and Ukraine; nevertheless, development of the bi-directional interconnector between Poland and Ukraine would be in line with the aims of the Energy Community Treaty).

Challenge	Recommendation	Responsible parties	Assessment of compliance with EU law
between Poland and Germany and Czech Republic with pending investments in bi-directional interconnectors at the borders between Poland and Slovakia and Lithuania.			
2. Facilitating access of Ukraine-based entities to the Polish trading market			
Trading in gaseous fuels or foreign trade in natural gas within the territory of Poland requires a license, which is granted exclusively to entities with a registered office (in case of individuals – place of residence) within the territory of a EU Member State, Swiss Confederation or a Member State of the European Free Trade Agreement (EFTA) – a party to the European Economic Area agreement, or Turkey. Ukraine-based entities have to incorporate a subsidiary within an EEA country / Swiss Confederation / Turkey in order to be licensed and thus authorized to purchase/sell gas within the territory of Poland.	In order to facilitate cross-border trades in gas between Poland and Ukraine, it would be recommended to extend the list of companies that may be granted license for trading in gaseous fuels or foreign trade in natural gas to Ukraine-based companies.	Adjustments to the licensing procedures involving extending the list of entities eligible to obtain the license would require amendments to the Polish Energy Law, which might be achieved by the following procedure: (a) development of the draft bill of amendments and submitting it to the Sejm (lower chamber of the Polish Parliament) by the authorized body (typically either Council of Ministers or a group of 15 members of the Sejm), followed by (b) adoption of the draft bill by the Polish Parliament (i.e., both the Sejm and the Senate), (c) assent of the President, and (d) promulgation in the Journal of Laws. The entire procedure may typically take at least 1-2 months depending on the parliamentary majority and decision of the President.	Implementation of the solution would not contravene the EU laws as it does not harmonize licensing procedures except for a general obligation that the authorization procedures should be proportionate and should not create undue barriers for new market entrants. Extending licenses to Ukraine-based entities might be justified with Association Agreement between the EU and Ukraine, the said agreement setting general aims with respect to mutual opening of various markets, including gas market (subject to certain restrictions which refer mainly to companies controlled by Russia). It should be also mentioned that licensing requirements differ among the EU countries – while some EU countries require licenses for trading in gas, in some other countries mere registration suffices, and in some other there is no licensing or registration requirement at all (such as Austria, Germany, Sweden and Finland).[106] There were also some projects commenced to analyze the possibility of introducing mutual

[106] See Energy Community document "Harmonization of licensing regimes in electricity and gas" available here.

Challenge	Recommendation	Responsible parties	Assessment of compliance with EU law
			recognition of licenses (no implementation phase so far).[107]
3. Facilitating licensing procedures in Poland			
The licensing procedure in Poland is time-consuming (3-4 months) and requires procurement and submission of a vast scope of documentation. It significantly delays the start of trading activities in Poland for new entrants in comparison to other EU jurisdictions. It is also typically carried out in written form (even if submission of the application is possible via electronic means with electronic signature). Excessive timelines in the procedure are partly related to an insufficient number of case-handlers employed by the regulator, which is often raised by the President of ERO. Besides, there is no clear regulation on what financial resources (amounts) should be secured by the applicant to be granted a license for trading in gaseous fuels or foreign trade in natural gas as it is assessed case by case based on the scope of activity planned by the applicant. This results in uncertainty as to what amount of financial resources should be secured by the applicant before the licensing procedure.	In order to facilitate cross-border trades and new entrants' access to the Polish market, it would be recommended to facilitate licensing procedures by, among other options: (a) reducing the scope of documentation to be provided to the regulator within the licensing proceedings (including such as at least documents confirming data existing in other public registries, that can be made accessible online to the regulator's officials, which would allow removing the requirement to deliver tax, social security and criminal certificates); (b) introducing shorter deadlines to be replaced with direct access for the regulator to handle the license application as well as respective registries; and (c) allocating additional budget and hiring additional staff to handle licensing applications. Additionally, there is scope to improve regulatory practice by developing and announcing the uniform rules as to the level of financial resources expected by the regulator within the licensing proceedings to be proved in order to obtain a license (e.g., minimum amounts / algorithm allowing for calculation of	Adjustments to the licensing procedures involving regulator's access to respective registries (in order to remove the applicant's obligation to provide the regulator with excerpts and certificates from such registry) would require: (a) amendments to the Polish Energy Law to authorize the President of ERO to access these registries (in order to avoid unnecessary paperwork requirements currently applicable to applicants) and put more stringent timelines (2-3 weeks) for handling the license applications, as well as (b) allocating budget for hiring additional staff to handle licensing applications. This might be achieved by the following procedure: (a) development of the draft bill of amendments and submitting it to the Sejm (lower chamber of the Polish Parliament) by the authorized body (typically either Council of Ministers or a group of 15 members of the Sejm), followed by (b) adoption of the draft bill by the Polish Parliament (i.e., both the Sejm and the Senate), (c) assent of the President,	Implementation of the solution would not contravene the EU laws as it does not harmonize licensing procedures except for general obligation that the authorization procedures should be proportionate and should not make undue barriers for new market entrants. Besides, there are projects pending within the South South-East Gas Regional Initiative to harmonize and facilitate licensing for wholesale gas trading where the NRAs from Central and Eastern European (CEE) countries identifies possible common approach to licensing[108]. Polish authorities seem to not attend such initiatives in full[109], probably due to the fact that the Polish regulator does not have power to work on harmonization of the licensing procedure as the legislation initiative (needed to propose new regulations based on harmonized rules) lies with the minister competent for energy affairs rather than the President of ERO.

[107] See ACER, Gas Regional Initiative Status Review Report 2016, Section 3.2.5, available here.
[108] See ACER, Gas Regional Initiative Status Review Report 2016 available here.
[109] See the Energy Community presentation Harmonizing of Licensing Regimes available here.

Challenge	Recommendation	Responsible parties	Assessment of compliance with EU law
	financial resources based on expected level of turnover within initial 12 months of activity) and allowing for submission of application supporting documentation in electronic form only (no requirement to provide documentation in hard copies).	and (d) promulgation in the Journal of Laws. The entire procedure may typically take at least 1-2 months depending on the parliamentary majority and decision of the President. On the other hand, announcing the level of financial resources expected by the regulator within the licensing proceedings as well as allowing the submission of supporting documentation in electronic form only (no requirement to provide documentation in hard copies) would involve the officials of the ERO who would have to prepare the new licensing application guidelines, and it would take 1-2 months. Implementation of the abovementioned measures may shorten the licensing procedure to 2-4 weeks. Figure 4 below demonstrates the updated step-by-step guidelines for shippers in case if these changes are implemented.	
4. Bundled capacity			
Transmission capacity at the Polish-Ukrainian border must be booked separately for each side of the border (no bundled products offered), which hinders transmission of natural gas between Polish and Ukrainian virtual trading points or UGS and poses a risk of having booked capacity on one side of the border without having capacity booked on the other side of the border.	In order to facilitate gas exchanges between Polish and Ukrainian markets, it is recommended to develop and offer bundled transmission capacity at the GCP Gaz-System/UA GTSO (in principle, this should arguably be preceded by implementation of recommendation specified in point 2 above in order to allow the same shipper/company to act on both Polish and Ukrainian market).	Offering bundled transmission capacity at the Polish-Ukrainian border would require conclusion of an agreement between Polish and UA GTSOs, which would provide for alignment of the terms and conditions of the transmission services offered by each TSO (to the extent of allowing for bundling of products, including the possibility to transfer bundled products allocated to given network user) and appointment of a	Implementation of the solution would not contravene EU laws and would be in line with the aim of the NC CAM.

Challenge	Recommendation	Responsible parties	Assessment of compliance with EU law
		single booking platform for offering bundled capacities. It should be also stated that bundled capacity typically covers only firm capacity (currently available only with in the UA>PL direction). Implementation of the bundled products would take at least 6-12 months.	
5. Allowing for maintenance of compulsory gas stocks in Ukraine			
Under Polish law, compulsory gas stocks must be maintained in gas storage facilities located within the territory of Poland and/or EU/EEA Member States. This prevents using Ukrainian UGS for the purpose of maintaining compulsory gas stocks under Polish law (market opportunity based on current volume of compulsory stocks maintained under Polish law corresponds to ca. 1.2 bcm). Even if Ukrainian UGS were a permitted location for compulsory gas stocks under Polish law (if the amendment to the Polish Stocks Act is adopted), maintaining gas stocks in Ukrainian UGS would be possible if both (a) technical parameters of gas storage facilities and gas networks connecting such gas storage facilities with Polish transmission system, as well as (b) storage and transmission services contracts concluded by the obligated entity with the SSOs and TSOs allow for injection of the entire volume of compulsory gas stocks into Polish gas networks within the maximum period of 40 days in each condition on a continuous basis, it being also specified that firm transmission capacity booked for that	Maintaining Polish compulsory gas stocks in Ukrainian UGS requires extending the permitted locations of compulsory gas stocks under the Polish Stocks Act to at least Ukraine or the Energy Community Contracting Parties. Further simplification shall be to remove the requirement that firm capacity for the purpose of importing compulsory gas stocks into Poland cannot be used for commercial purposes. In each of the abovementioned cases, amendments to the Stocks Act would be required to implement the solutions. The draft bill of amendments to the Polish Stocks Act as published by the Polish Council of Ministers in September 2020 does not address either of the abovementioned issues. To the contrary, it may result in significant decrease in demand for storage capacity for the purpose of Polish compulsory gas stocks (even up to 0.6 bcm by 2024), which may also decrease demand for use of Ukrainian UGS by Polish gas traders – even with respect to the commercial gas stocks.	Using Ukrainian UGS for the purpose of compulsory gas stocks, as required under Polish law, as well as allowing for commercial use of firm cross-border capacity underlying the compulsory stocks maintained abroad would require amending the Polish Stocks Act to allow (a) maintaining compulsory gas stocks within the territory of the Contracting Parties to the Energy Community Treaty or at least Ukraine as a party to the Association Agreement between Ukraine and the EU and (b) use of firm cross-border capacity underlying the compulsory stocks maintained abroad for commercial purposes. Implementing amendments to the Polish Stocks Act would involve the following steps: (a) development of the draft bill of amendments and submitting it to the Sejm (lower chamber of the Polish Parliament) by the authorized body (typically either Council of Ministers or a group of 15 members of the Sejm), (b) adoption of the draft bill by the Polish Parliament (i.e., both the Sejm and the Senate), (c) assent of the President, and (d) promulgation in the Journal of Laws.	Implementation of the solution would not contravene EU law as it does not dictate the permitted location of compulsory gas stocks or detailed technical requirements to be met by facilities used for the purpose of the compulsory gas stocks.

Challenge	Recommendation	Responsible parties	Assessment of compliance with EU law
purpose cannot be used for commercial purposes other than bringing compulsory gas stocks into Poland in case of a decision to use such stocks by the obligated entity, the said conditions being subject to verification of the Polish TSO. This regulation in each case result in increased costs of compulsory stocks maintained abroad due to the need to book long-term firm capacity at the Polish-Ukrainian border in the UA>PL direction.		The entire procedure may typically take at least 1-2 months depending on the parliamentary majority.	
6. Discounts on double Transmission Charges at Gcp Gaz-System/UA GTSO in case of storing Poland-originating gas in Ukrainian UGS			
Use of Ukrainian UGS for the purpose of gas stocks requires payment of full transmission rates applicable to, firstly, gas transmission from Poland to Ukraine and then gas transmission from Ukraine to Poland. Taking into account the use of more expensive short-term services for the purpose of injection and withdrawal of gas to/from Ukrainian UGS, it adds significantly to the overall cost of maintaining gas stocks in Ukrainian UGS (comparing to e.g., use of Polish UGS, in which case storage of gas already located in Poland shall not be burdened with full transmission fees as the transmission rates at entry-exit points with Polish UGS are at a ca. 80% discount).	In order to ease use of Ukrainian UGS for storing gas originally located in Poland, one could consider introducing discounts on transmission fees applicable to the Polish-Ukrainian border with respect to capacity utilized for the purpose of gas storage in Ukrainian UGS (i.e., discounts applicable to capacity booked in PL>UA direction when capacity is booked in the opposite direction at the same time). Such step could be implemented in the course of adoption of the new reference price methodology and transmission tariff. However, on the Ukrainian side a reduction of the transmission charges has been achieved with the introduction of short-haul tariffs.	Implementation of the discounts on "storage use" of cross-border capacity would require (a) development of the reference price methodology by the Polish TSO and its approval by the President of ERO (upon ACER's opinion) as well as (b) development of the tariff by the Polish TSO and approval by the President of ERO. If approved, the discounted rates might be generally applicable not earlier than January 1, 2023 onward (the first tariff that might be developed under the new reference price methodology).	Implementation of the solution should take into account provisions of the 715/2009 Regulation and NC TAR, including minimizing cross-subsidization between different entry-exit points. This principle would affect both the level of discount available and applicability of the discount on different interconnectors (i.e., the same rules should be generally applied with respect to other interconnectors). However, such discounts are not entirely excluded as they were already implemented in April 2020 by Eustream a.s.[110]

Source: ESP

[110] European Gas Storage: backhaul helps open Ukrainian safety valve, Oxford Institute for Energy Studies, article available here.

Annex 5 Ukrainian regulatory gap analysis

Challenge	Solution	Responsible parties	Assessment of compliance with EU law
2. Transition to measurement of gas in energy units			
Currently, natural gas metering is carried out in cubic meters under standard conditions in accordance with "GOST 2939-63" (temperature 20° C and absolute pressure 101.325 kPa). The transition to European standards for gas metering in energy units is dictated by Directive 2006/32/EC of the European Parliament and of the Council of April 5, 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC and Directive 2009/73/EC of the European Parliament and of the Council of July 13, 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC. Thus, in Ukraine and in the countries of the European Union, different standard conditions apply in which the volume of gas is adjusted. In addition, according to European legislation, gas metering must be kept in kilowatt-hours, not cubic meters. The use of energy units will make natural gas metering more objective when purchasing and selling, in particular for cross-border trading and for pricing and tariffing it. The introduction of energy units will simplify the process of compiling the energy balance when enterprises use different sources of energy, allowing them to choose the most cost-effective type of fuel, stimulate consumers to save energy, and make the effectiveness of gas use transparent and comprehensible compared to other sources of energy. Also, the following should be adopted: – Technical Norms and Safety Standards on the Natural Gas Market; – Technical Regulations in the Area of Natural Gas; – Rules on Access to Upstream Pipelines.	Adoption by the Ukrainian Parliament of the Draft Law "On Amendments to Certain Legislative Acts of Ukraine on the Implementation of Metering and Calculations on the Gas Volume in Energy Units on the Natural Gas Market" No. 2553, which has been approved in the in the first reading. It is not possible to predict the timeline for the adoption of the Draft Law as under the Law of Ukraine "On the Rules of Procedure of the Verkhovna Rada of Ukraine" dated February 10, 2010, No. 1861-VI, the Parliament may consider draft laws, as a rule, according to the procedure of three readings, which includes: 1) the first reading - discussion of the basic principles, provisions, criteria, structure of the draft law and its adoption as whole; 2) the second reading - article-by-article discussion and adoption of the draft law; and 3) the third reading - the adoption of the draft law, which generally requires revision and approval. The Verkhovna Rada may make a decision to hold repeated first and second readings of the draft law no more than two times. The Parliament may make a decision to adopt the draft law immediately after the first or second reading. From January 1, 2021 Drozdovichi GMS will measure in energy units and from April 1,	The Parliament of Ukraine and the NEURC	Implementation of the solution would not contravene the EU laws.

Challenge	Solution	Responsible parties	Assessment of compliance with EU law
	2020, all customs declarations will be provided in energy units.		
2. Currency control limitation			
Traditionally, Ukraine has had strict currency control limitations. Recently, most of them were lifted, but some restrictions remain in place. For example, there is a deadline of 365 days for payment under cross-border contracts, otherwise companies will be subject to penalties. In addition, representative offices/branches/local PE of foreign companies are facing certain currency control limitations, which may affect cross-border trading. Local PE (a representative office) of a foreign entity is not suitable for cross-border trading because of the Ukrainian currency control limitations. Pursuant to Ukrainian currency control regulations, representative offices in Ukraine are significantly limited in transfer of funds from Ukraine. A representative office is allowed to purchase foreign currency and transfer such foreign currency funds abroad only if the transfer is made to its head office (i.e., the non-resident company which opened such representative office). No transfer may be made by the representative office to any non-resident third party. To the extent that Ukrainian representative offices are expected to participate in sale and purchase of natural gas to/from non-residents of Ukraine, the aforesaid regulatory change is required. At the same time, and subject to customs regulations, if the representative offices in Ukraine are expected to participate only in storage activities (temporary import and further return of natural gas from/to its head office) and any sale or purchase of natural gas is made between non-residents only (including head office acting directly, not via its Ukrainian representative office), Ukrainian currency control limitations would not apply to transfer of funds between such non-residents made outside of Ukraine.	Relevant changes should be made to the legislation, in particular introducing changes to the National Bank of Ukraine regulation to exclude natural gas from the requirement of a 365-day term for settlements under export and import contracts. Amend the regulatory regime of PE bank accounts to allow transfer of funds abroad to third-parties non-residents.	National Bank of Ukraine	Implementation of the solution would not contravene the EU laws.

Challenge	Solution	Responsible parties	Assessment of compliance with EU law
3. Lack of legislation in English			
Foreign companies shall bear in mind that the Ukrainian legislative and regulatory database does not contain the official English translations of relevant laws and regulations, creating an additional barrier for foreign companies to properly interpret and clearly understand Ukrainian gas market regulation without recourse to Ukrainian legal counsels' assistance. Meanwhile, unofficial translation of some gas market regulations, as well as relevant applications and contractual documents required for gas trading may still be found at the website of UA GTSO or the Ukrainian SSO. However, in most cases, such English texts do not include translation of amendments to the documents. Moreover, websites of both the TSO and SSO refer to helplines or email details for both resident and non-resident companies' support. The main operational documents applicable in Ukraine (such as guidelines for licensing proceedings, grid codes, tariffs, contract templates and other transparency documents required under the relevant network codes) are generally available in English in up-to-date versions. However, the legislative acts such as statutes and secondary legislation are not publicly available in English in up-to-date versions, which may impede understanding of the gas market regulations and create a practical entry barrier to the Ukrainian gas market.	To improve cross-border trade between Ukraine, Poland and other EU countries the regulator should keep, disclose and update English versions of the main legislative acts governing the gas market.	UA GTSO, OGP Gaz System	Implementation of the solution would not contravene the EU laws.

Source: Asters, SKS Analysis