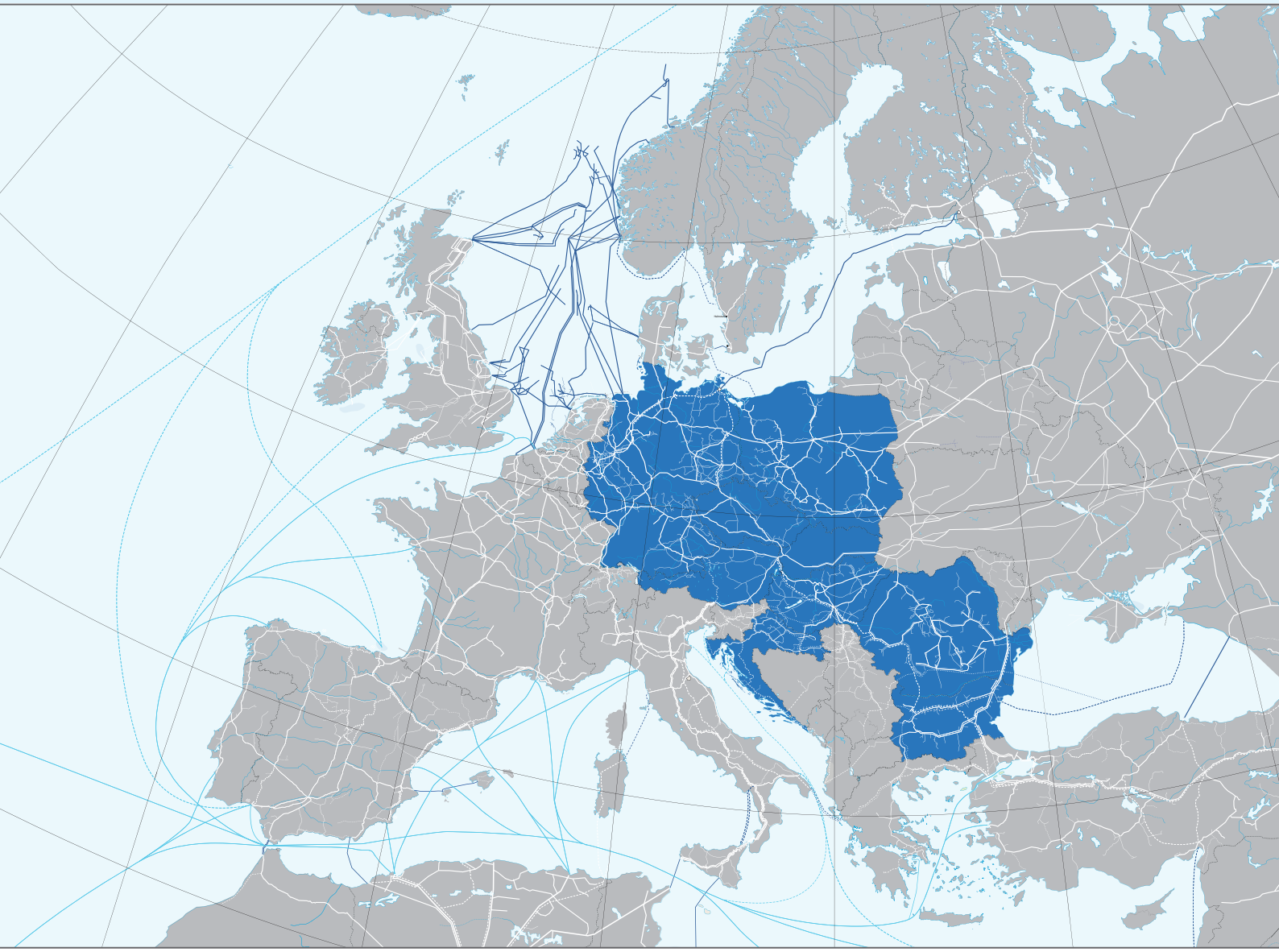

Gas Regional Investment Plan
Central-Eastern Europe
2012 - 2021

January 2012

entsog
european network of transmission system operators for gas

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Foreword

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The European Union is now importing a major part of its gas demand, 62% in 2011 and forecast to rise to 78% in 2021. The importation of gas from outside the EU has been occurring for many years, and as such Transmissions System Operators (TSOs) have been cooperating for decades in order to ensure there is sufficient cross border capacity available. The close interaction and cooperation between European TSOs has been crucial for supporting market integration and developing the security of supply of all Member States.

At a European level the TSOs have worked together in order to fulfil the European Network of Transmission System Operators for Gas (ENTSOG) obligation to produce the Community-wide Ten-Year Network Development Plan (TYNDP) for the period 2011-2020; this TYNDP was published on 17th February 2011 and is available on the ENTSOG website[1].

The requirement to promote regional cooperation has now been enshrined in European law through the European Directive 2009/73/EC in its Article 7 and further detailed by the European Regulation EC/715/2009 in its Article 12. TSOs will now publish every two years, a Gas Regional Investment Plan (GRIP) based on regional co-operation, which will contribute towards the fulfilment of their tasks listed in Regulation EC/715/2009.

The Central - Eastern Europe Gas Regional Investment Plan (CEE GRIP) serves to fulfil the requirements of Regulation EC/715/2009 and its primary objectives are to create an awareness of infrastructure developments within the Central - Eastern region of Europe and to provide a sound basis for subsequent CEE GRIPs. With this document the TSOs of the CEE region would like to provide useful information to stakeholders and to support informed discussion in assessing the ability of investment projects to answer regional market needs.

This is the first edition of the CEE GRIP and as such it should be acknowledged that this first publication is intended to present a foundation upon which subsequent reports can be developed. It is anticipated that the format and content of the GRIP will change over time.

[1] Available at : www.entsog.eu/publications/index_g_investment.html

Executive Summary

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This first edition of the CEE GRIP concentrates on three areas which are

- a regional gas infrastructure outlook assessing and identifying potential future infrastructure investments,
- a resilience assessment of the gas transmission systems in the CEE region against the background of the supply and demand development in the next 10 years,
- an assessment of the Security of Supply infrastructure standard on a regional level.

Taking into consideration the capacities of existing and future - FID as well as non-FID - gas infrastructure in the region, the CEE TSOs conclude that the overall supply demand balance improves over the 10-year range owing to the FID projects to be implemented, however there are still two regions that will not have enough capacity (including all FID projects) to achieve full supply demand balance under Peak Daily Demand conditions, which are:

- Poland without disruption, and under Belarus and Ukraine route disruption,
- Hungary, Croatia, Romania and Bulgaria under the Ukraine route disruption.

Nevertheless the problems and gaps identified by this assessment could be removed by non-FID projects listed in this GRIP with the exemption of Poland under Belarus disruption and Ukraine disruption mainly occurring in mid-2010s.

The results of the newly developed approach of a Regional N-1 assessment (not to be confused with the calculation of the N-1 formula at regional level under Annex I of REG-SoS) showed that the joint transmission systems in the region currently provide sufficient Security of Supply capacities for the Member States in the region while still leaving supply potential also for adjacent regions, except for Poland under a Belarus supply disruption scenario and Bulgaria and Romania under a Ukraine supply disruption scenario. Possible measures to mitigate these risks are suggested in the respective chapter.

Introduction

© Image courtesy of Eustream, a.s.

This CEE Gas Regional Investment Plan provides a specific regional view of supply, demand and capacity development in the CEE region from the perspective of the CEE gas transmission network operators, also taking into account the role of CEE region as major transit corridor towards Western Europe.

The aim of this Plan is to show a regional gas infrastructure outlook, consistent with the Community-wide TYNDP, assessing and identifying potential future infrastructure investments. It also endeavours to capture the wider gas market dynamics by looking at aspects such as supply scenarios, market integration and especially Security of Supply (SoS) on a regional level.

The following areas were therefore identified as key priorities and formed the main focus:

- Future development of gas transmission infrastructure in the CEE region
- Development of a regional approach to SoS demand and supply scenarios
- Close involvement of all relevant project sponsors

The CEE region comprises most of the gas supply corridors from Russian sources to Europe and therefore the transmission systems in the region were built and are optimized for the transit of gas from the East to the West. As a consequence, the demand of the Member States in the region is covered to a high extent by supply from one source. The TSOs are aware of the need for the development of new interconnections to diversify the gas sources and to increase the security of supply for their Member States in the CEE region. Therefore the TSOs are actively working on appropriate solutions of which the large number of final investment decision (FID), but also non-FID projects listed in this plan is the best evidence.

Future projects like new liquefied natural gas (LNG) terminals and projects such as Nabucco or South Stream will contribute to the diversification of the supply sources or corridors not only in the CEE region, but also for the rest of the EU Member States. After completion of the North-South interconnection within the region also the market integration will be enhanced. The CEE region will thereby also become even less vulnerable to a supply disruption of the Ukraine or Belarus route than it already is through the reverse flow measures implemented by the CEE TSOs after the 2009 supply disruption.

Originally, the CEE region comprised Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania and Slovakia.

However, after an initial assessment of the interdependencies of gas flows and the respective transmission systems, the CEE region was enlarged by Germany and Austria (as shown in the following table) as transmission systems in the Czech Republic, Poland, Slovakia and Hungary are directly connected to Germany or Austria.

This decision expresses a clear commitment of the CEE TSOs to tackle the regional challenges and to create a robust, well-functioning internal gas market.

Members:	
Country:	**TSO:**
Austria	BOG GmbH
Bulgaria	Bulgartransgaz EAD
Croatia	Plinacro d.o.o.
Czech Republic	NET4GAS, s.r.o.
Hungary	FGSZ Natural Gas Transmission
Poland	GAZ-SYSTEM S.A.
Romania	Transgaz SA
Slovak Republic	eustream, a.s.

Observing members:	
Austria	Trans Austria Gasleitung GmbH
	Gas Connect Austria GmbH
	Tauerngasleitung GmbH
Germany	GRTgaz Deutschland GmbH
	Ontras - VNG Gastransport GmbH
	Open Grid Europe GmbH
	WINGAS TRANSPORT GmbH

Infrastructure Projects

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To provide an outlook on the development of the future gas infrastructures in each of the countries of the CEE region and in the associated countries Austria and Germany in the following ten years the CEE TSOs have adopted an open approach and decided to collect data not only from their own but also from third-party project sponsors that are sponsors of a gas infrastructure project and believe their project should be included in the CEE GRIP.

To collect all necessary data for the GRIP 2012-2021 the CEE TSOs prepared an Infrastructure questionnaire based on the ENTSOG TYNDP Infrastructure project questionnaire aiming at collecting the same relevant information about such projects. It covers FID projects as well as those at a less advanced stage of development (non-FID project). The Infrastructure questionnaire was launched in July 2011 and it was directly distributed to all TSOs. Third-party project sponsors were addressed through ENTSOG. All parties were asked to provide an update of information used for the ENTSOG TYNDP 2011-2020 and, as appropriate, to add new projects. If no answer was received, the CEE TSOs decided to use the data from the last edition of the ENTSOG TYNDP.

Even though the coordinating TSO did not receive all information from the project sponsors as requested, the CEE TSOs decided to include all projects where sufficient information was provided. All TSOs' projects are provided as a summary per TSO rather than a separate entry for each project reported due to the large extent of information.

In the following sub-chapters there are lists of all infrastructure projects where information was provided. The projects are presented according to their division into FID and non-FID projects; further they are also divided by the type of infrastructure (transmission, storage, LNG, and others). The lists include only basic project information; the full submissions are available in Annex B: Infrastructure Projects. The capacities listed below show only additional compared to the current state.

The information reflects the situation in September 2011.

FID Projects (TSO and 3rd Party Projects)

Transmission				
Country Code	**Name**	**Capacity** (mcm/d)	**Estimated Go-live**	**Remarks**
AT	WAG Expansion 3	see Annex B[2]	2013	
BG	BG-RO interconnection	Entry / Exit: 0.5-1.5 bcm/y	2012	EEPR project
BG	Dobrich -Silistra		2013	75% financing from the KIDSF
BG	Kozloduy-Oryahovo		2014	70% financing from KIDSF
CZ	GAZELLE pipeline	Entry: 33.9	2013	TPA exemption
CZ	Connection to power plant Počerady (Bečov)	Exit: 4.3	2012	
CZ	UGS Tvrdonice connection	Exit: 2.3 Entry: 0.6	2013	EEPR project
DE	OGE: Open Season 2008 Projects	Entry: 1.1 / Exit: 10	2012-2013	
DE	Extension of the WINGAS group grid in the context of the Nord Stream (on-shore) project.	see Annex B[2]	2014	Part of TEN-E as part of the Nord Stream project "axis NG1", project of European interest
DE	OPAL	95.6	2011	
PL	Gustorzyn node		2014	Project is under the OPIE (Cohesion fund)
PL	Gustorzyn - Odolanów		2014	Project is under the OPIE (Cohesion fund)
PL	Hermanowice MS		2012	
PL	Odolanów node		2014	Project is under the OPIE (Cohesion fund)
PL	Polkowice – Żary		2014	Project is under the OPIE (Cohesion fund)
PL	Rembelszczyzna - Gustorzyn		2014	Project is under the OPIE (Cohesion fund)
PL	Rembelszczyzna node (modernisation)		2014	Project is under the OPIE (Cohesion fund)
PL	Reszki - Kosakowo		2012	
PL	Świnoujście - Szczecin		2013	EEPR project
PL	Szczecin - Gdańsk		2013	Project is under the OPIE (Cohesion fund)
PL	Szczecin - Lwówek		2014	Project is under the OPIE (Cohesion fund)
RO	RO-BG Interconnection	1.4 – 4.1	2012	EEPR project
RO	GMS Negru Voda Reverse-flow		2012	
SK	Slovakia - Hungary interconnector	13.8	2015	EEPR project

[2] Detailed capacity information is available in Annex B

Storage					
Country Code	**Name**	**Deliverability** (in mcm/d)	**WGV** (in mcm)	**Estimated Go-live**	**Remarks**
AT	7 Fields	20	1,608	2014	Also connected to the German network
CZ	Tvrdonice	1.7	195	2016 (parts from 2012)	EEPR project
CZ	Třanovice	3.9	290	2012	EEPR Project
DE	Etzel EGS	38.4	1,358	2012-2014	
PL	Kosakowo	9.6	100	2015	
PL	Mogilno	20.64	492	2015	
PL	Strachocina	3.864	330	2012	
PL	Wierzchowice	14.4	1,200	2014	

LNG terminals					
Country Code	**Name**	**Annual Capacity** (in bcm/y)	**Daily Send-out** (in mcm/d)	**Estimated Go-live**	**Remarks**
PL	LNG terminal in Świnoujście	5	13,680	2014	EEPR Project, Project is under the OPIE (Cohesion fund), TEN-E (Priority project)

LNG terminal in Świnoujście

Non-FID Projects (TSO and 3rd Party Projects)

Transmission				
Country Code	**Name**	**Capacity** (mcm/d)	**Estimated Go-live**	**Remarks**
AT	Nabucco	84.9	2015	EEPR project, TEN-E project Affected countries: TK/BG/RO/HU/AT
AT	South Stream	160.8	2015	Affected countries: BG/RS/HU/SI/AT/HR/GR/RO
AT	Tauerngasleitung (TGL)	31.6	2017	Affected countries: AT/DE/IT
BG	BG-RS interconnection (Dimitrovgrad-Sofia)	Entry / Exit: 1.8-5	2014	
BG	BG - TK Interconnection (ITB)	I. phase 8.3 II. phase 15.2-25	I. phase 2013 II. phase 2017	
BG	Increase the Transmission Capacity of the Existing Pipelines to GR	13.8	2016	
BG	Construction of gas pipeline branches of the presently existing national gas transmission network		2013 – 2016	
CZ	Moravia pipeline	Exit: 9 – 12 Entry: 7	2017	partly under TEN-E
CZ	LBL (CZ-AT Interconnection)	Exit: 21-28	2019-2020	
CZ, PL	Stork II. (extension of CZ-PL connection)	Exit: 13.7 Entry: 13.7	2017	partly under TEN-E
CZ	UGS Břeclav connection	Exit: 0.87 Entry: 0.87	2016	
CZ	Connection to Oberkappel		2018	
HU	Városföld-Pusztavacs-Százhalombatta pipeline	19.4 - 30.5	2014-2017	
HU	Vecsés-Pusztavacs pipeline	13.8	2017	
HU	Vecsés-Balassagyarmat pipeline	13.8	2015	EERP European Energy Plan for Recovery
HU	Reverse flow on the Romanian-Hungarian interconnection pipeline	4.8	2015	Compressor at Algyő node

[3] Detailed capacity information is available in Annex B

Transmission (continued)				
Country Code	**Name**	**Capacity** (mcm/d)	**Estimated Go-live**	**Remarks**
HR	Regional Project Ionian Adriatic Pipeline (IAP)	13.8		
HR	Main Transit Gas Pipeline Zlobin-Bosiljevo-Sisak-Kozarac-Slobodnica	see Annex B[4]		
HR	LNG Evacuation Gas Pipelines Omišalj-Zlobin-Rupa (Slovenia)	41.6		
PL	Czeszów – Wierzchowice		2015	Project is under the OPIE - Cohesion fund (complementary list), TEN-E (Project of common interest)
PL	Gałów – Kiełczów		2015	Project is under the OPIE - Cohesion fund (complementary list), TEN-E (Project of common interest)
PL	Hermanowice – Jarosław		2018	
PL	Hermanowice – Strachocina		2015	Project is under the OPIE - Cohesion fund (complementary list)
PL	Jarosław – Rozwadów		2020	
PL	Jeleniów – Taczalin		2020	
PL	Lasów – Jeleniów		2015	Project is under the OPIE - Cohesion fund (complementary list), TEN-E (Project of common interest)
PL	Lasów MS (extension)		2015	
PL	Lwówek – Odolanów		2020	
PL	Niechorze – Płoty		2020	TEN-E (Project of common interest)
PL	Odolanów – Tworzeń		2020	
PL	PL - DK interconnection (Baltic Pipe)	approx. 8.2	2020	TEN-E (Project of common interest), TEN-E 2008, TEN-E 2009
PL	PL - LT interconnection	approx. 6.3	2020	TEN-E (Project of common interest)

[4] Detailed capacity information is available in Annex B

Transmission (continued)				
Country Code	**Name**	**Capacity** (mcm/d)	**Estimated Go-live**	**Remarks**
PL	Płoty node		2020	TEN-E (Project of common interest)
PL	Pogórska Wola – Tworzeń		2016	
PL	Rozwadów - Końskowola – Wronów		2020	
PL	Skoczów - Komorowice – Oświęcim		2015	Project is under the OPIE - Cohesion fund (complementary list), TEN-E (Project of common interest)
PL	Strachocina - Pogórska Wola		2015	Project is under the OPIE - Cohesion fund (complementary list)
PL, SK	PL - SK interconnection	approx. 13.7	2017	TEN-E (Project of common interest)
PL	Tworzeń – Oświęcim		2018	
PL	Wronów - Rembelszczyzna		2020	
PL	Wronów node extension		2020	
PL	Zdzieszowice – Wrocław		2015	Project is under the OPIE - Cohesion fund (complementary list), TEN-E (Project of common interest)
RO	Connecting the Constanța LNG terminal to the Gas Transmission System of Romania		2015	depending on the construction of LNG terminal Constanta
RO	Integration of the transmission and transit systems – reverse flow Isaccea	14.6	not established	
RO	East – West Pipeline	22.2	2015	depending on the construction of LNG terminal Constanta
RO	Reverse flow on the Romanian-Hungarian interconnection pipeline	4.86	2013	
SR	Interconnector Bulgaria Serbia (Serbian part)	5 – 13.8	2015	

Storage					
Country Code	**Name**	**Deliverability** (in mcm/d)	**WGV** (in mcm)	**Estimated Go-live**	**Remarks**
BG	UGS Chiren	10	1,000	2017	Expansion
BG	Construction of new gas storage facility	9	600	2018	
CZ	Expansion of the virtual storage operated by RWE Gas Storage	18.7	875	2016-2021	
CZ	UGS Břeclav	0.87	350	2016	
HR	UGS Beničanci	8.256	510	2017 (I. phase)	
DE	Behringen	14	1,000	2015	
DE	Ohrensen	22	440	2015	
DE	Peckensen (Phase III)	9	180	2014	

LNG terminals					
Country Code	**Name**	**Annual Capacity** (in bcm/y)	**Daily Send-out** (in mcm/d)	**Estimated Go-live**	**Remarks**
HR	LNGRV	I. phase 1-2 II. phase2-4 III. phase 4-6	19.53		
PL	Extension of LNG terminal Świnoujście	7.5	20.544	2020	

Others				
Country Code	**Name**	**Capacity** (in mcm/d)	**Estimated Go-live**	**Remarks**
BG	Rehabilitation, Modernization and Expansion of the National Transmission System.		2017	Project includes modernization and rehabilitation of compressor stations, intelligent pig inspections, expansion and replacement of some sections of the existing transmission system.
BG	Varna CNG import terminal		2014-2017	CNG project will be developed in 3 phases
PL	Jeleniów CS (extension)		2015	EEPR project
PL	Odolanów CS		2016	
PL	Rembelszczyzna CS (modernisation)		2015	Project is under the OPIE (Cohesion fund)

Network Modeling and Resilience Assessment

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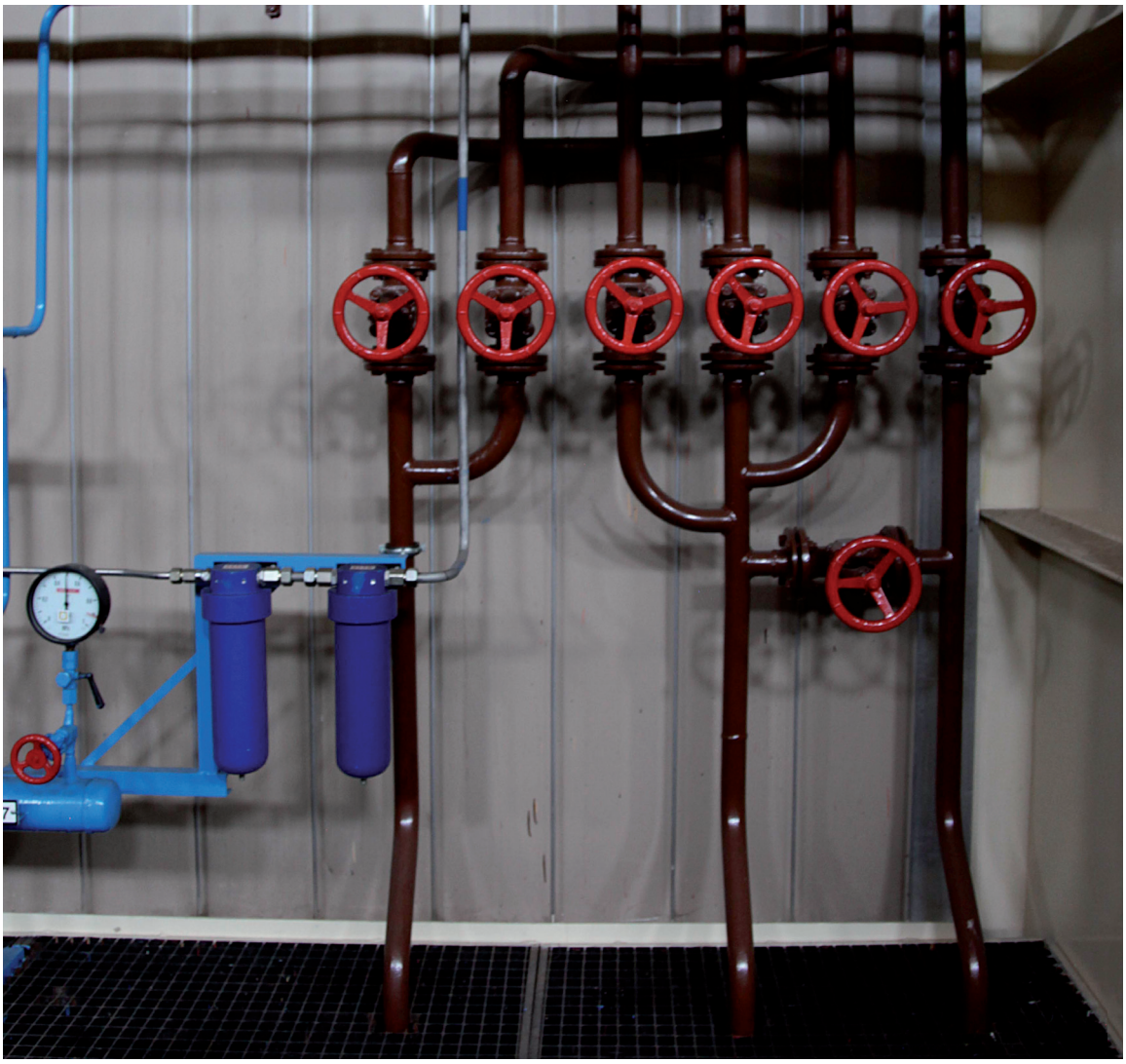
Network model

In order to achieve the consistency with the last edition of the ENTSOG TYNDP 2011-2020, the ENTSOG simulation tool was used to model all scenarios described in the CEE GRIP.

The ENTSOG model applies a top-down approach using countries as basic blocks interlinked by cross-border capacity. Such capacity is the sum of technical capacity at Interconnection Points between two adjacent countries having applied the lesser-of-rule to the values of the capacity at both sides of the border for each Interconnection Point. National production, LNG terminals and storage facilities enter the model within the respective countries[7] and are considered on aggregate basis per infrastructure type.

In order to be able to run a high number of scenarios, the model assumes that each country is a single decoupled entry/exit zone (not considering interconnection within a country). The European approach does not consider potential internal bottlenecks, gas quality issues and adaptation of national infrastructure to disruption situations.

[7] According to their system connection NOT territorial location



© Image courtesy of NET4GAS, s.r.o.

Scenarios

The modelling was performed for two types of supply scenarios, modelled according to the following infrastructure configurations:

- existing infrastructures plus those for which FID has been taken,
- the same infrastructures as above plus non-FID projects.

In both configurations, all projects submitted by TSOs and third party sponsors were considered according to the submission process. In order to ensure that new infrastructure is available under Peak (High) Daily Demand conditions that are assumed to occur in January, all projects were considered in operation for modelling in the year following the start-up date, except for those with a start-up date on 1 January, which are included in the respective year.

For the purposes of the CEE GRIP only three years were modelled, i.e. 2012, 2016 and 2021. The results for these years sufficiently cover the whole period 2012-2021.

Scenarios have been divided into three categories:

- Reference Scenarios (standard supplies, no disruptions),
- Disruption Scenarios (security of supply),
- Market Integration Scenarios.

Under Peak Daily Demand/Supply, no limitation to UGS deliverability was considered for the Reference Scenario. The LNG terminal deliverability stays at 80% keeping the ability to send out gas at a peak rate on a single day.

Under Average Daily Demand/Supply, the ENTSOG model does not consider any withdrawal or injection, as such simulations stand for the simulations of the whole year assuming storage neutrality.

Reference Scenario

An initial scenario was defined as the Reference Scenario based on historical values in order to ease comparison with other possible scenarios. The Reference Scenario does not take into account any differential evolution on the supply side.

In order to evaluate the effects of disruptions and market integration, series of Reference Scenarios were defined. These scenarios are the combinations of different levels of demand (average/peak), supply (average/peak) and infrastructural capacity (FID / FID + Non-FID).

When modelling the gas network, two different climatic conditions were considered to define supply and demand. It is to be noted that the ENTSOG model makes the assumption that the respective conditions occur simultaneously all over the region.

The following two climatic condition settings were defined:

- Average day consumption (i.e. annually demand divided by 365 days),
- Peak (high) day consumption (1 in 20 as defined in the REG-SoS).

Disruption Scenarios

For network resilience purposes several Disruption Scenarios (security of supply scenarios) under Peak Daily Demand conditions in a one-day period have been modelled.

Three different disruption scenarios have been defined:

- Transit disruption of Russian imports via Ukraine,
- Transit disruption of Russian imports via Belarus[8],
- Transit disruption of Russian imports via Ukraine and Belarus simultaneously.

[8] In case of Poland disrupted supplies over Yamal-Europe pipeline, IPs Wysokoje and Tietierówka.

Market Integration Scenarios

Modelling of Market integration aims at assessing how far gas coming from each supply source can flow into the gas network of the CEE region. Market integration scenarios illustrate different possible evolutions of the supply mix impacted by factors such as reserves, their accessibility, the evolution of national demand of exporting countries and the existence of alternative markets competing with Europe.

For Market Integration scenarios, different supply source shares were used. Under the Reference Scenario such shares were derived from historical data as defined above.

Three different supply source scenarios were defined:[9]

- **No predominance:** as defined under the Reference Scenario supply sources are preferred only in dependency on the distance from original source,
- **Supply predominance (Caspian + LNG + Norway = Min RU):** the supply source is set to the level of technical capacity while the others are decreased accordingly,
- **Supply predominance (Russia = Max RU):** the supply source is set to the level of technical capacity while the others are decreased accordingly.

[9] As Russia is the most dominant supply source for the CEE region the sensitivity analysis refers to its supply share.

Results

The modelling carried out highlights a number of insufficient entries and investments as potential remedies for closing these gaps. Before the identification of actual investments, the detailed modelling of each individual system and supply contract considerations also need to be taken into consideration.

The modelling results for this GRIP indicate investment gaps consistent with those identified in the last edition of ENTSOG TYNDP 2011-2020. In case of disruption through Belarus, Poland does not meet its demand and the Ukraine Disruption Scenario showed the insufficient entry capacities in Hungary, Croatia, Romania and Bulgaria.

By analyzing the modelling results, the CEE GRIP TSOs do not intend to provide any priority list of projects to be implemented. This report provides the market with information that has to be further investigated before the FID is taken.

Although the overall situation improves over the 10-year range owing to the FID projects to be implemented in the future, there are still two regions that will not have enough capacity (including all FID projects) to achieve full supply demand balance under Peak Daily Demand conditions in year 2016 or 2021. Such member states are:

- Poland without disruption (2016, 2021), and under Belarus (2012, 2016, 2021) and Ukraine disruption as well (2016, 2021),
- Hungary[10], Croatia, Romania and Bulgaria under the Ukraine disruption (2012, 2016, 2021).

The problems and gaps identified by modelling could be removed by non-FID projects listed in this GRIP with the exemption of Poland under Belarus disruption in 2016 and 2021 and Ukraine disruption in 2016.

The individual results are given in the following sub-chapters split by scenarios modelled.

The modelling results are presented graphically providing information on remaining flexibility. Remaining flexibility is defined as the unused part of the technical capacity under a given scenario. Such flexibility may be used to cope with additional needs or enable shippers to better optimize their supply or transits.

In case of disruption scenarios, capacity of entering flows coming from the disrupted area are not considered in order to take into account the impact of disruptions on flexibility.

[10] According to FGSZ national modelling results in case of non-FID scenario only 2014 results indicate insufficient supplies for Hungary.

Reference Scenario

The following maps show that in the year 2012 all CEE GRIP member states will have remaining flexibility above twenty percent. Most of the states will meet this ratio also in the future years. There is only one country that will not have enough capacity to achieve full supply demand balance under Peak Daily Demand conditions in the year 2016 and 2021 which is Poland.

If only FID projects are considered, Poland will not have enough capacity in the year 2016 and 2021. However, the problem of Poland lacking capacity in these years could be removed by non-FID projects listed in this GRIP.

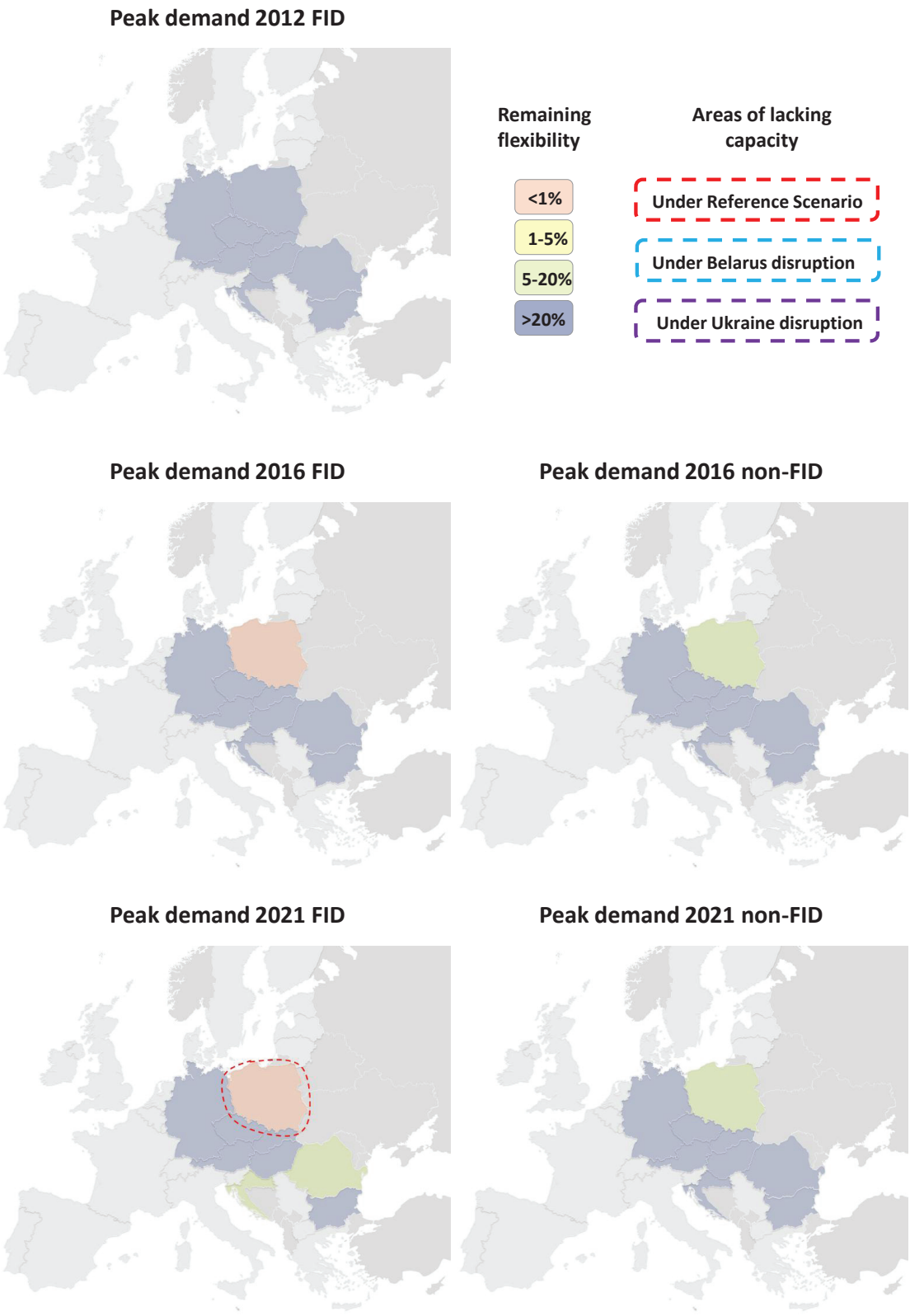


Figure 1: Reference Scenario

Disruption Scenarios

Transit disruption of Russian imports via Ukraine

Under the Ukraine Disruption Scenario, Croatia, Bulgaria, Hungary[11] and Romania, will not have enough capacity in the year 2012, 2016 and 2021. Also Poland will have insufficient entry capacities in the year 2016 and 2021.

The lacking capacity in the countries mentioned above could be removed by non-FID projects in 2021. Other CEE GRIP member states will have sufficient remaining flexibility in the years 2012, 2016 and 2021.

[11] According to FGSZ national modelling results in case of non-FID scenario only 2014 results indicate insufficient supplies for Hungary.

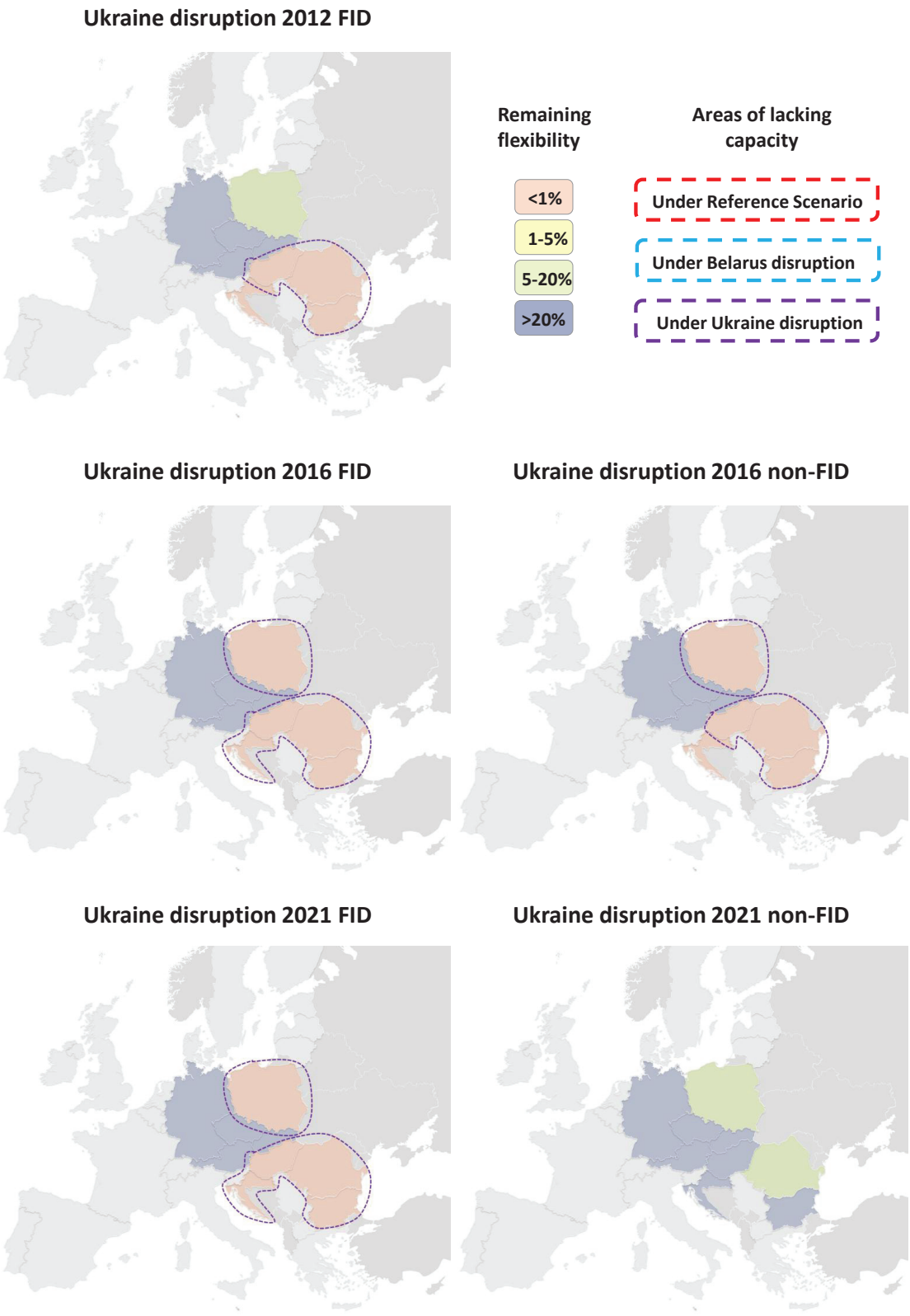


Figure 2: Ukraine Disruption

Transit disruption of Russian imports via Belarus

Belarus disruption scenario shows that all countries except Poland will have enough capacity to achieve full supply-demand balance and that their remaining flexibility in the year 2012, 2016 and 2021. Under this disruption scenario Poland would not meet its demand in the year 2012, 2016 and 2021. The maps show that Poland's lacking flexibility in these years could not even be removed by non-FID projects listed in this GRIP.

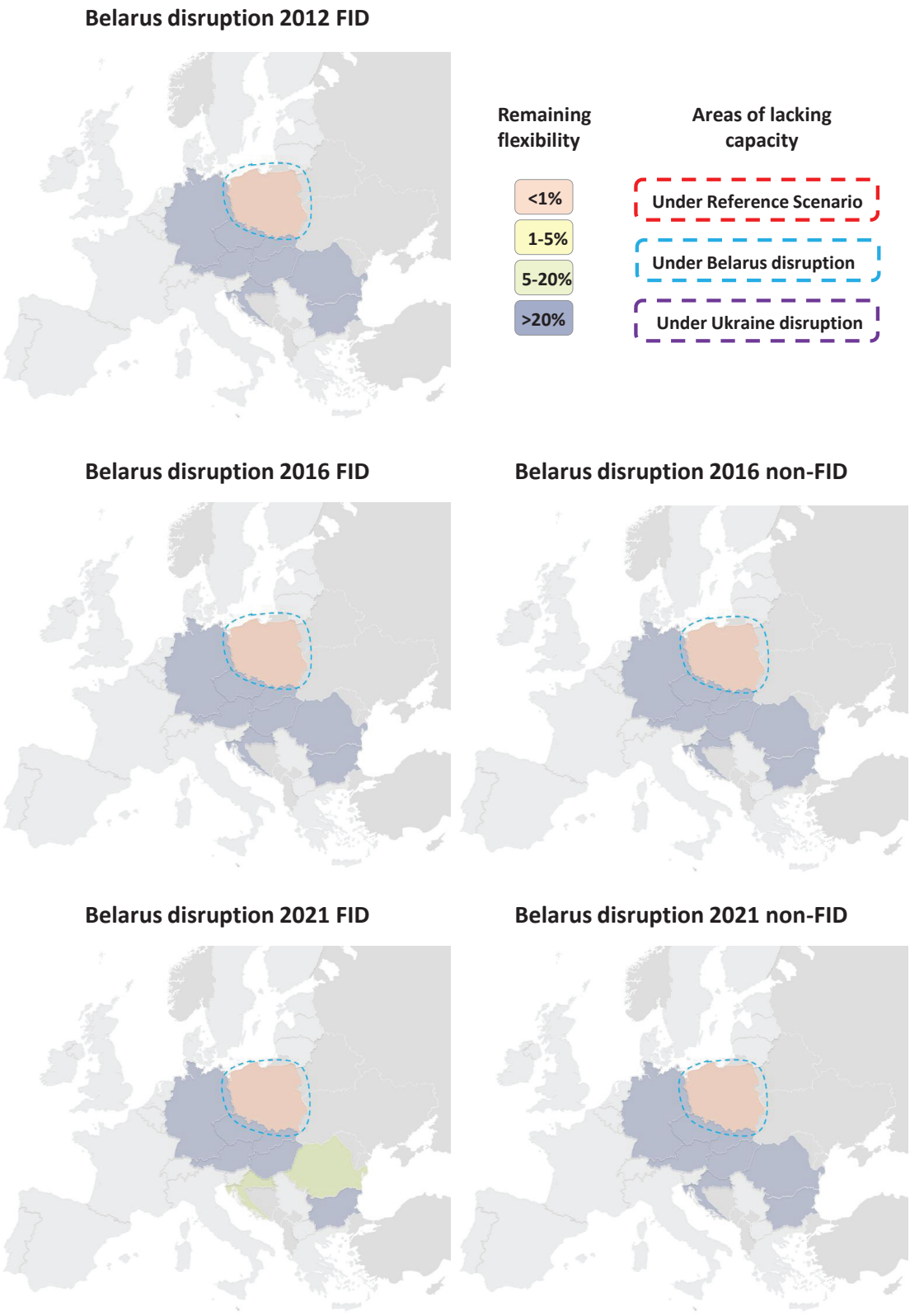


Figure 3: Belarus Disruption

Transit disruption of Russian imports via Ukraine and Belarus simultaneously

As the results shown in the previous disruption scenarios indicate also, under this scenario Hungary, Croatia, Romania and Bulgaria and Poland will not be able to achieve full supply demand balance. If only FID projects are considered, Croatia, Bulgaria, Hungary, Romania and Poland will have insufficient remaining flexibility in the year 2012, 2016 and 2021.

The lacking flexibility in Hungary, Croatia, Romania and Bulgaria could be removed by non-FID projects in the year 2021. In Poland the insufficient remaining flexibility will persist even if the non-FID projects are included. Other CEE GRIP countries will have sufficient remaining flexibility in the year 2012, 2016 and 2021.

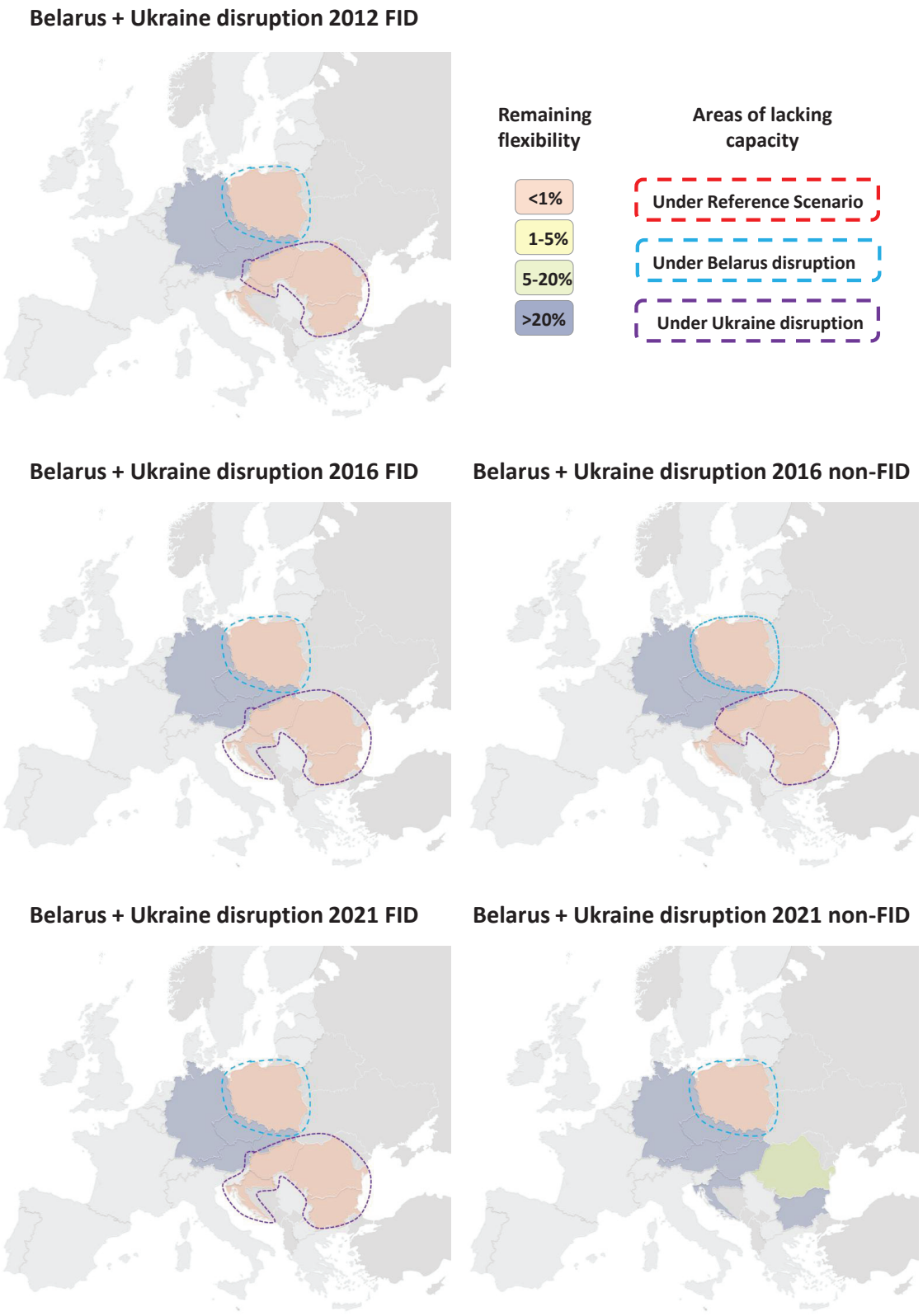


Figure 4: Belarus and Ukraine Disruption

Market Integration Scenarios

Modelling results of Market integration scenarios in the CEE region show that there are increasing possibilities of changing the supply mix for national demand. This means that FID projects, but to an even higher extent non-FID projects listed in this GRIP decrease the dependency of CEE countries on Russian sources by 2021. Graphs below show for each scenario (Reference, Maximum and Minimum Russia) the distribution of supply share of each source. The sum of supplies from national production (NP), Russia (RU), Norway (NO), Caspian (CA), LNG and UGS is equal to 100% of the covered demand. The last column then shows the deviation between supply potential and actual demand.

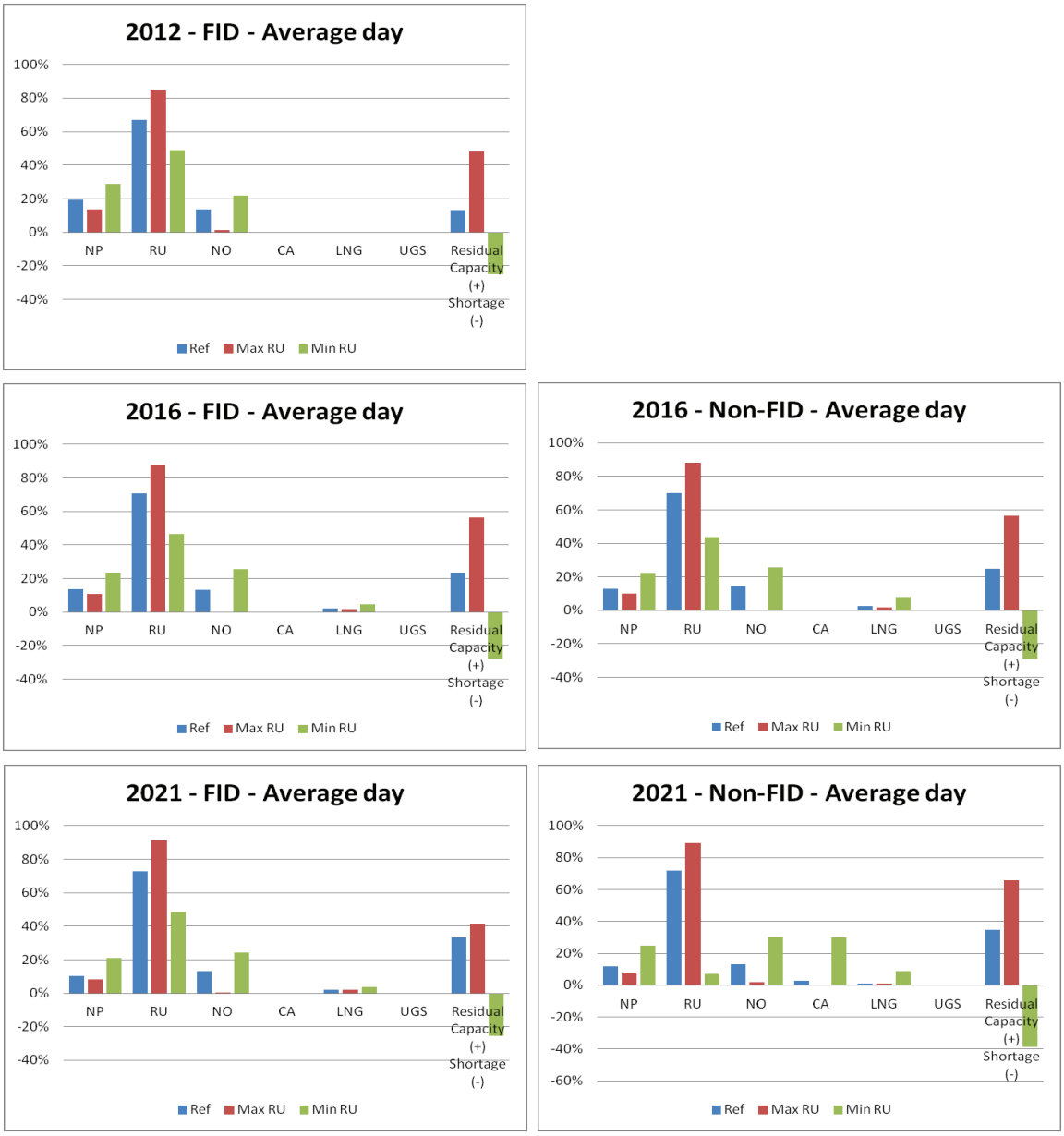


Figure 5: Market Integration Scenario

Demand and Supply

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Demand

Average Demand

As in the overall European Union, the demand for natural gas is expected to increase continuously over the next years. Accordingly, the total amount of annual demand for the CEE region has been approximately 1,521 TWh/y in 2011, and is going to be 1,867 TWh/y by 2021, which is an increase of 22.8% or on average 2.1% p.a. The demand growth within the region is not spread evenly across the CEE region, as there are on the one hand countries like Germany, which is the biggest consumer in the region, but with rather stable demand (growth rates of on average 0.2% p.a.), and on the other hand Poland, the 2nd biggest consumer, with an expected growth rate of 7% p.a. on average, which is a total increase of 93% by 2021[5]. In the charts below, the average daily demand as well as the relative change of demand per country is shown.

[5] According to the demand prognosis assuming the highest potential for market increase in the next 10 years.

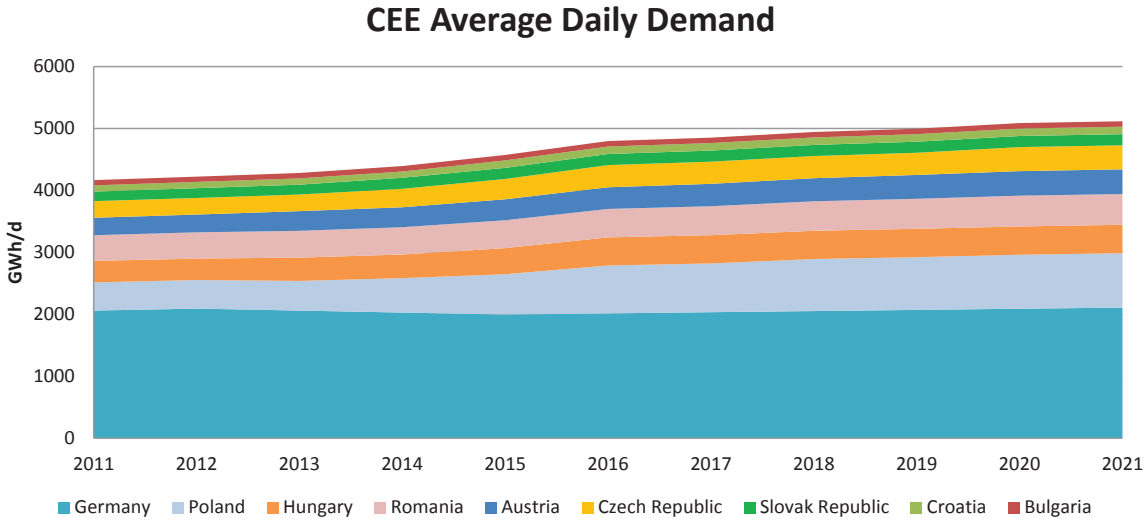

Figure 6: CEE Average Daily Demand

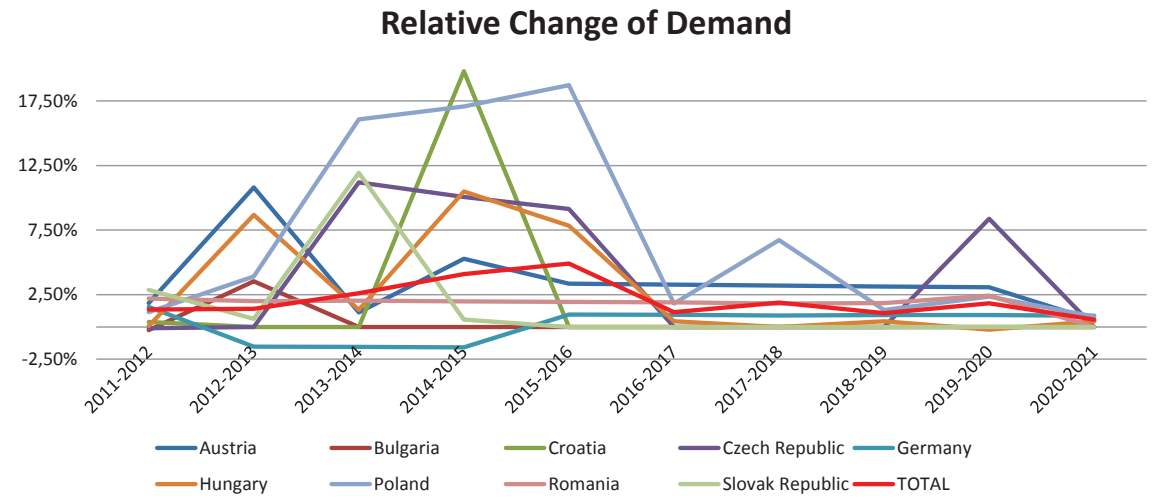

Figure 7: Relative Change of Demand

Under average demand conditions, all countries in the region, except Poland, are able to cover their demand with their respective entry capacities, assumed only FID-projects are being realized. The shortage in Poland is likely to start in 2018, and will increase to 9.5% of its demand share by 2021, as the chart below shows.

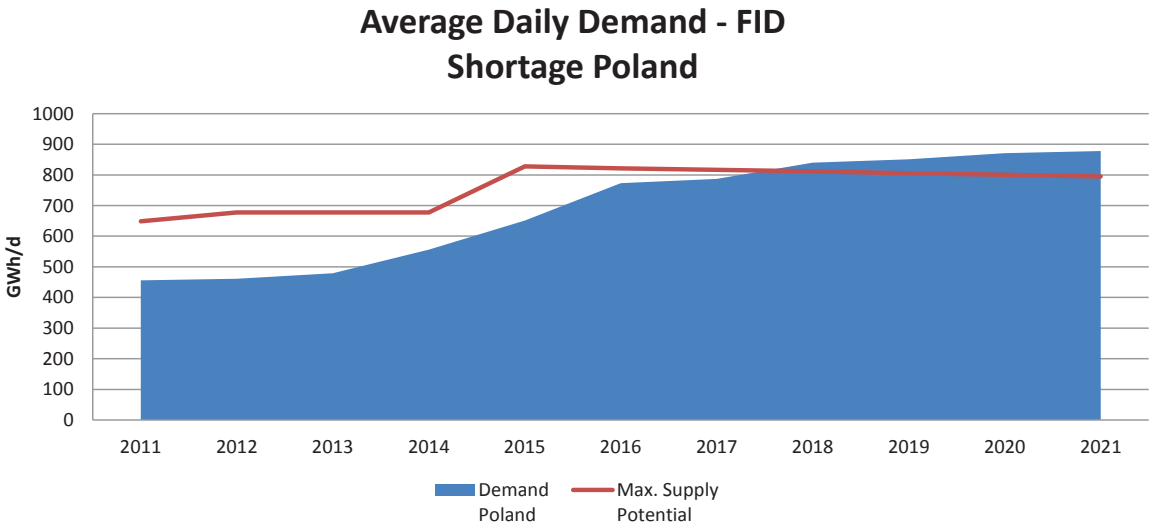

Figure 8: Average Daily Demand – FID Shortage Poland

Peak Demand

Like average demand, also the peak demand is dominated by Germany and Poland as the two major consuming countries in the region. In terms of growth rates, Poland's peak demand will increase by 72% (5.8% p.a. on average) by 2021[6], followed by Austria with an increase of almost 50% (4.2% p.a. on average). In Germany and Croatia, on the other hand, peak demand is expected to decrease by 1.8% (0.2% p.a. on average) respectively 5.4% (0.1% p.a. on average) by 2021. The overall increase of peak demand within the CEE region is expected to be 12% by 2021 (1.23% p.a. on average). The charts below show the peak daily demand as well as the relative change of peak demand per country.

[6] According to the demand prognosis assuming the highest potential for market increase in the next 10 years.

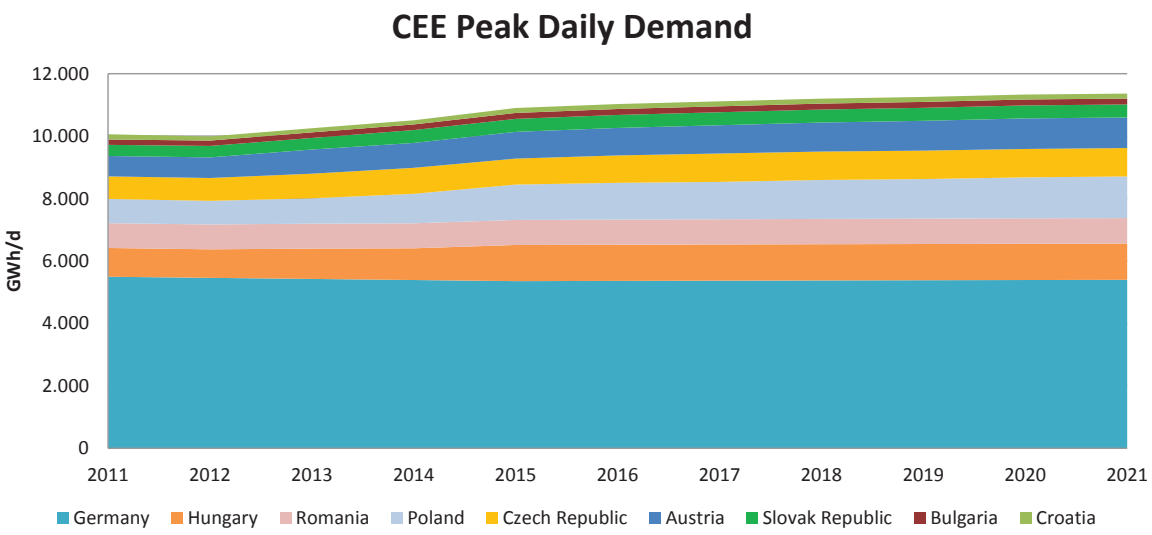

Figure 9: CEE Peak Daily Demand

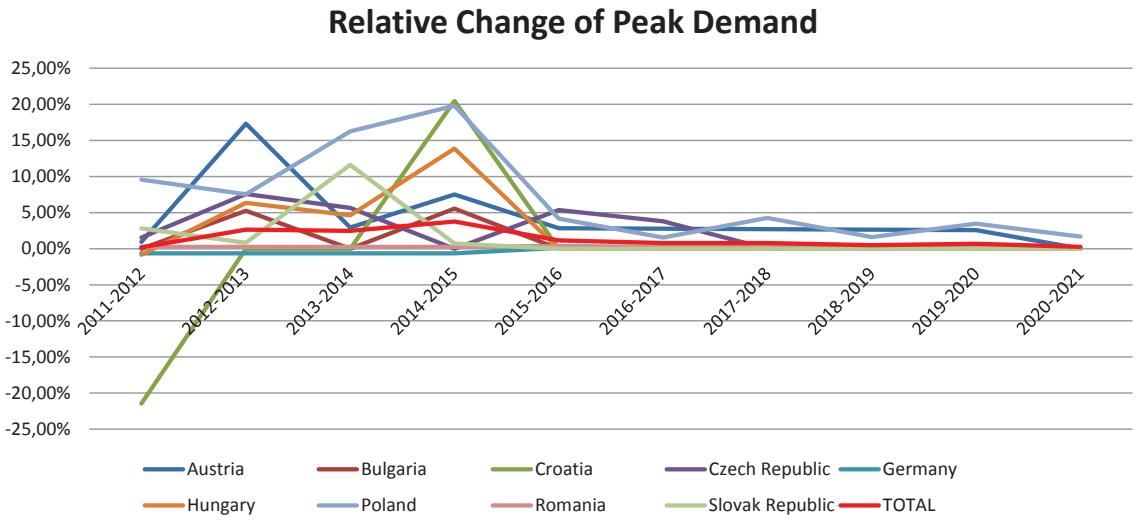

Figure 10: Relative Change of Peak Demand

Other than for average demand, shortages can occur especially in the new member states of the Union within the region in case of supply disruptions. These shortages depend on the disrupted supply corridor(s) as well as on the evolution of infrastructure projects in the affected country.

With FID-Projects realized, Croatia, Romania and Poland are likely to be negatively affected by a full-stop of the gas flow through Ukraine, with an additional effect in case of simultaneously occurring interruption of the Belarus pipelines, whereas Hungary and Bulgaria will only be touched by an interruption on the Ukraine Corridor. Poland suffers from shortages even without interruptions, and will be in the worst supply situation of all CEE countries in case of interruptions, as its major IPs connect to the Ukraine corridor as well as to Belarus.

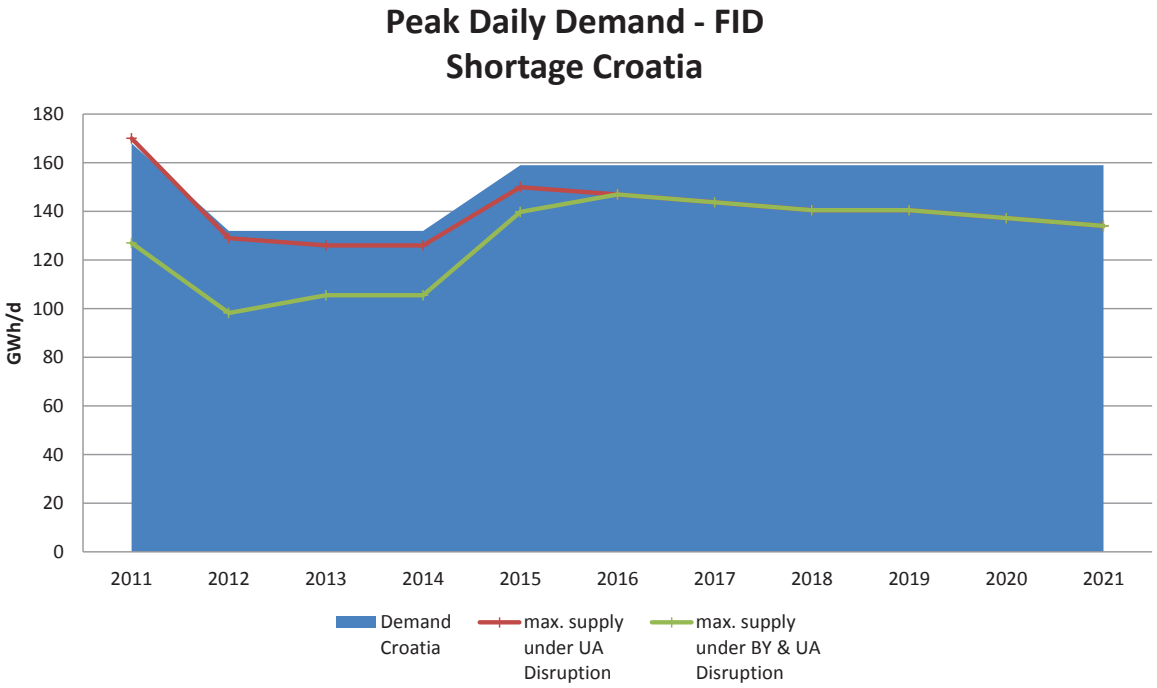

Figure 11: Peak Daily Demand – FID Shortage Croatia

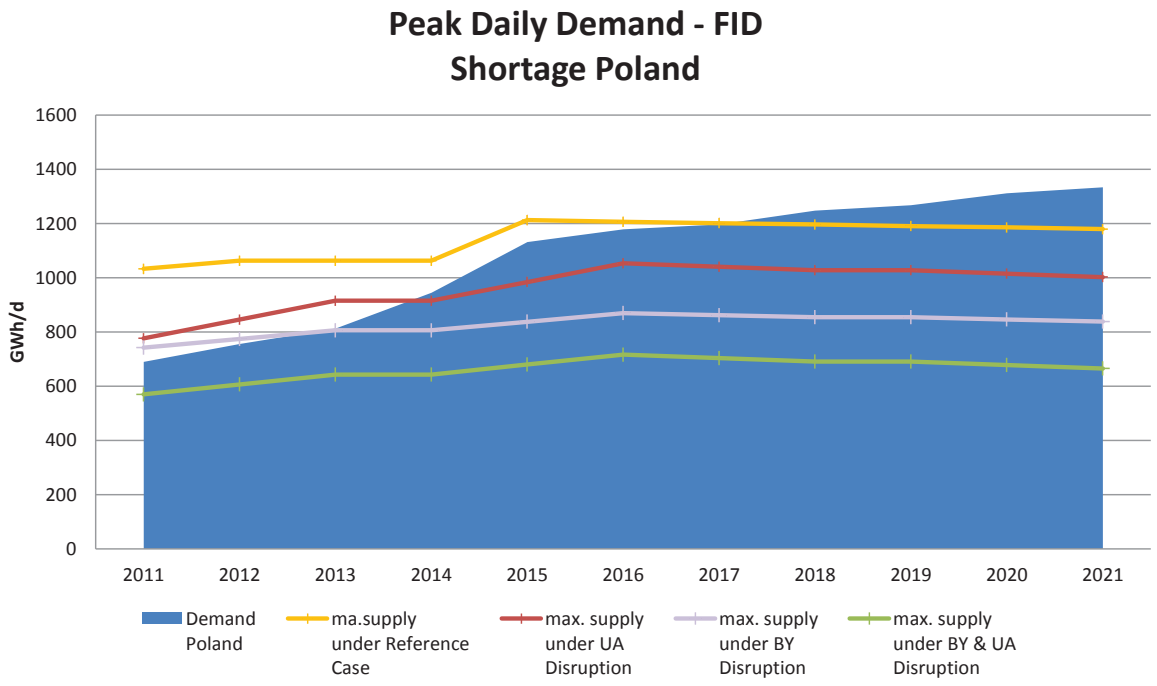

Figure 12: Peak Daily Demand – FID Shortage Poland

In case non-FID projects are realized, Bulgaria, Hungary, Romania and Croatia will no longer be affected by Ukraine Disruption in case of a parallel Belarus crisis at the same time as they will have mitigated the resulting shortages by 2021. In case of Poland, mainly due to the major increase of demand, the situation is more difficult: the realization of non-FID projects will compensate the already existing peak demand shortage. Impacts of a Ukraine full-stop occurring from 2014 on could be compensated by 2021, but a new Belarus route disruption after 2013 or the combination of Belarus and Ukraine route disruptions would still result in major shortages, as shown below.

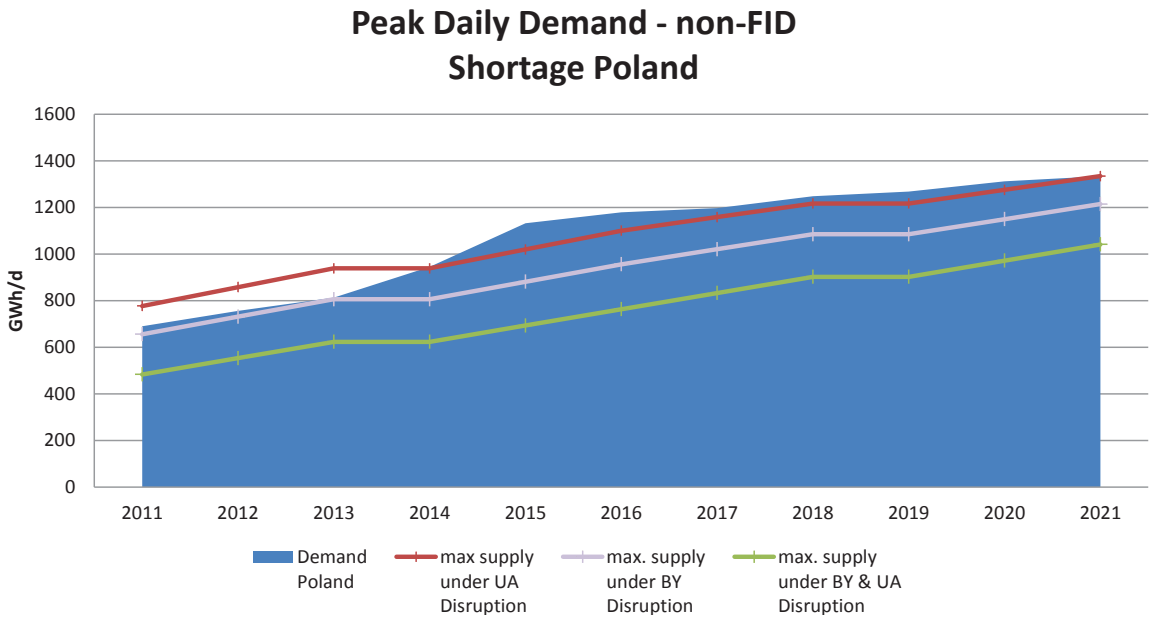

Figure 13: Peak Daily Demand – non-FID Shortage Poland

Supply

National Production

Gas from national production plays a rather important role in the CEE region, especially in Romania (75.4% of avg. demand in 2011, 43.8% expected in 2021), Croatia (66% of avg. demand in 2011, 35.5% expected in 2021) and Poland (22.8% of avg. demand in 2011, 8.1% expected in 2021). In 2011, the share of gas from national production has covered 26% of the overall CEE demand. By 2021, this share will decrease to approximately 13.6%. In absolute numbers, Germany is the major producer in the region (165,000 GWh in 2011), followed by Romania (114,208 GWh) and Poland (37,960 GWh), which still produces almost half as much natural gas as the rest of the CEE countries (∑AT, BG, CZ, HU, SK =78,280 GWh in 2011). The development of national production within the CEE region can be seen in the chart below.

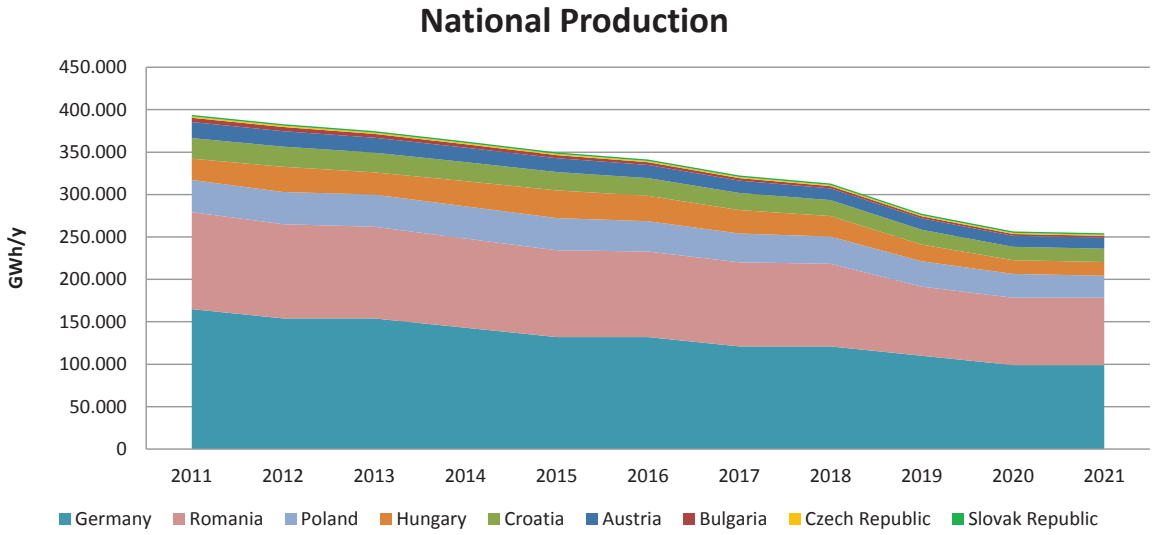

Figure 14: National Production

Supply under Average demand conditions

The supply situation in the region has been analyzed under three different assumptions in terms of supply sources which are:

- Reference Case
- Maximum supply with Russian gas
- Minimum supply with Russian gas

Also the impact of future investments, FID as well as non-FID, has been taken into consideration.

Reference Case

For the reference case, the overall supply potential is approximately 13% higher than the demand in 2011 with only FID investments taken into consideration. This residual capacity, which has to be seen as transit capacity to adjacent regions, will increase to 33% by 2021.

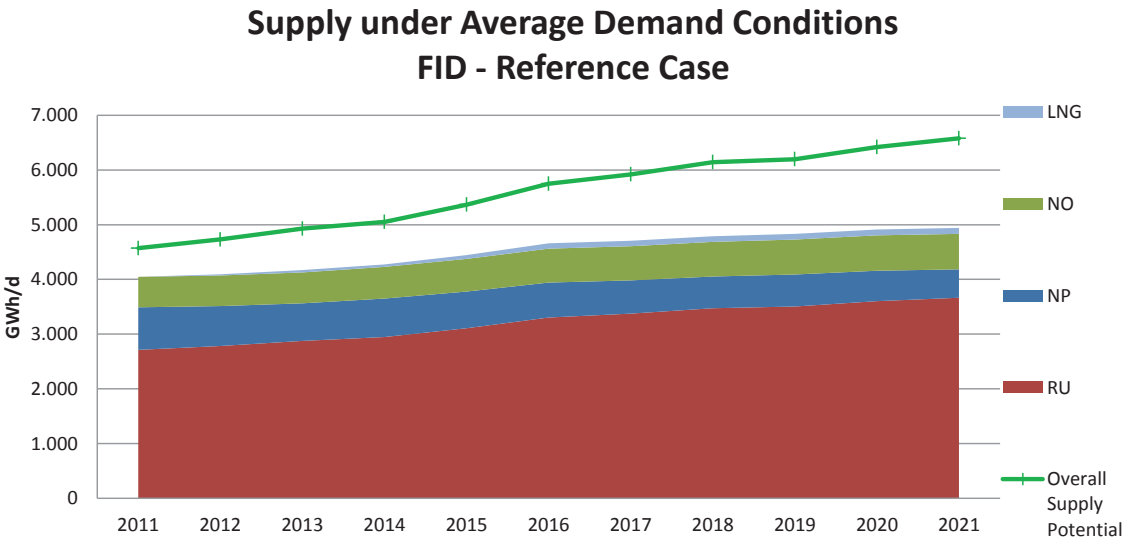

Figure 15: Supply under Average Demand Conditions FID – Reference Case

With non-FID projects realized, the over-capacity will be almost 35% in 2021.

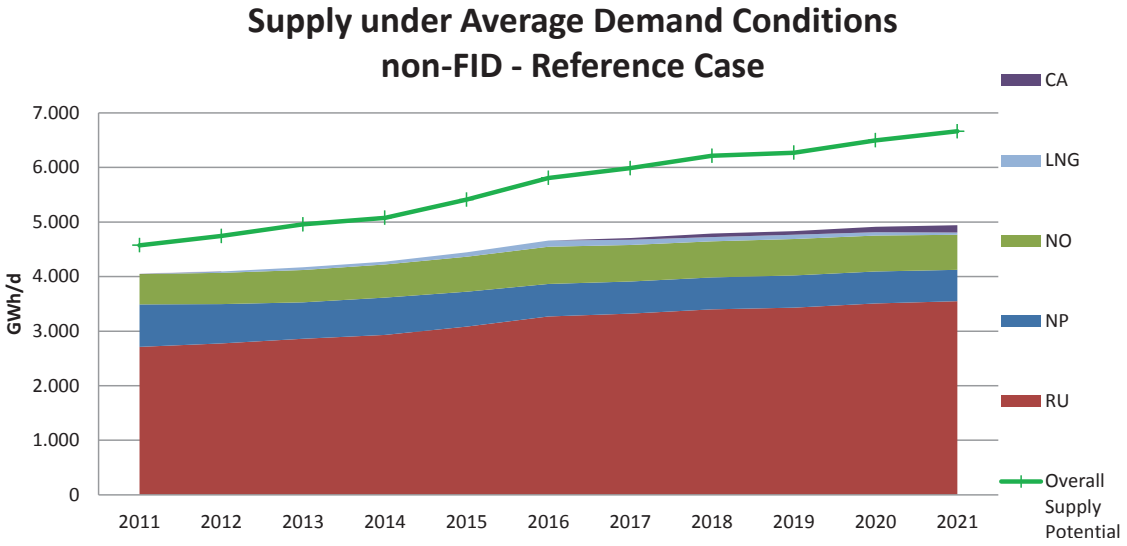

Figure 16: Supply under Average Demand Conditions non-FID – Reference Case

In the reference case, Russian gas is assumed to cover approximately 2/3 of the CEE demand in 2011 and 72% in 2021. The share of gas from Norway and National Production can be regarded as almost stable. It has been 14% respectively 19% in 2011 and is expected to be 13% respectively 11% in 2021. LNG only covers a minor part (0.2% in 2021), whereas Caspian gas, which is dependent on non-FID projects, is not expected to play a role in the FID scenarios. In non-FID scenario, Caspian gas is expected to develop to a share of 3%, partially competing with the LNG share.

Maximum Russian Supply Case

Assumed a maximum supply from Russia, the overall supply potential is approximately 48% above the demand in 2011 with only FID investments taken into consideration. This residual capacity will decrease to 42% by 2021.

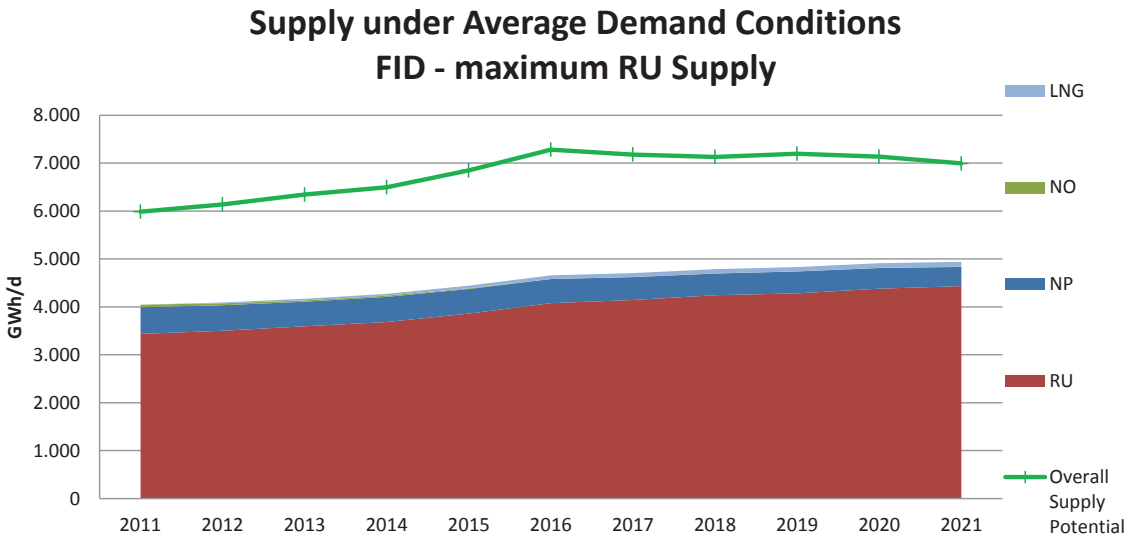

Figure 17: Supply under Average Demand Conditions FID – maximum RU Supply

Non-FID projects taken into consideration, the residual capacity will be almost 66% in 2021.

Only FID investments taken into consideration, Russian gas is assumed to cover approximately 85% of the CEE demand in 2011 and 90% in 2021. The share of gas from Norway is reduced to almost zero, whereas National Production will decrease from 14% to 8%, in absolute numbers from 557 GWh/d to 400 GWh/d in 2021. LNG only covers a minor part (2% in 2021), substituting the rest of the Norwegian share from 2015 onwards, whereas Caspian gas is not expected to play a role, neither in the FID nor in non-FID scenarios.

Taking into consideration non-FID scenarios increases the Russian gas share from 85% in 2011 to 89% in 2021, leaving a 2 % share to Norwegian gas and 1% to LNG in 2021.

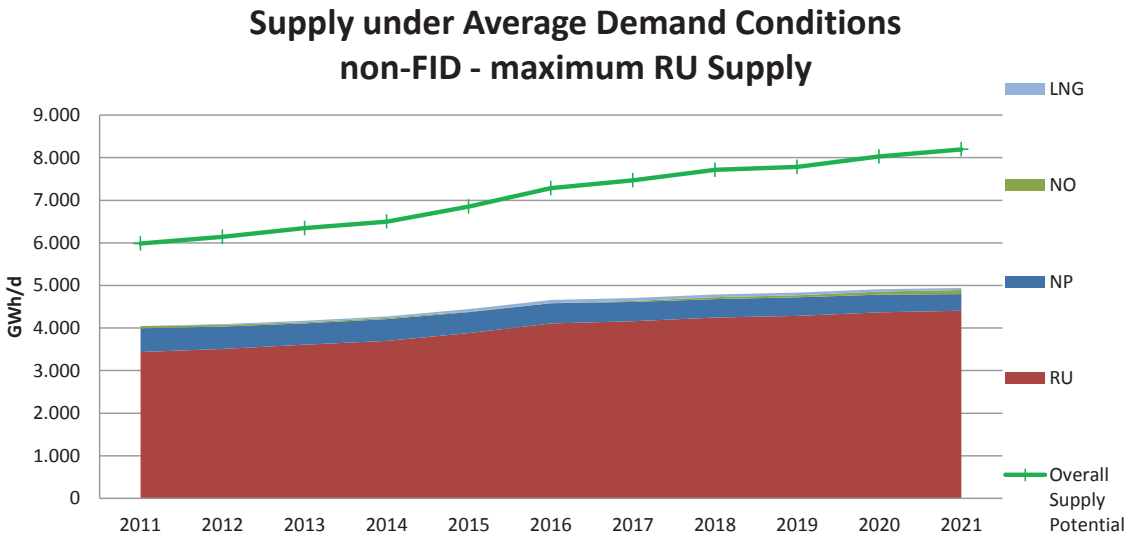

Figure 18: Supply under Average Demand Conditions non FID – maximum RU Supply

Minimum Russian Supply Case

Assumed a minimum supply from Russia, the overall supply potential (import capacity to the CEE region) is approximately 25% (approx. 1,009 GWh/d) below the demand in 2011 with only FID investments taken into consideration. This capacity gap would remain relatively constant by 2021 (approx. 1,250 GWh/d) and is caused by a lack of direct access to alternative gas sources for the CEE region in case gas flows via Belarus and Ukraine are reduced dramatically.

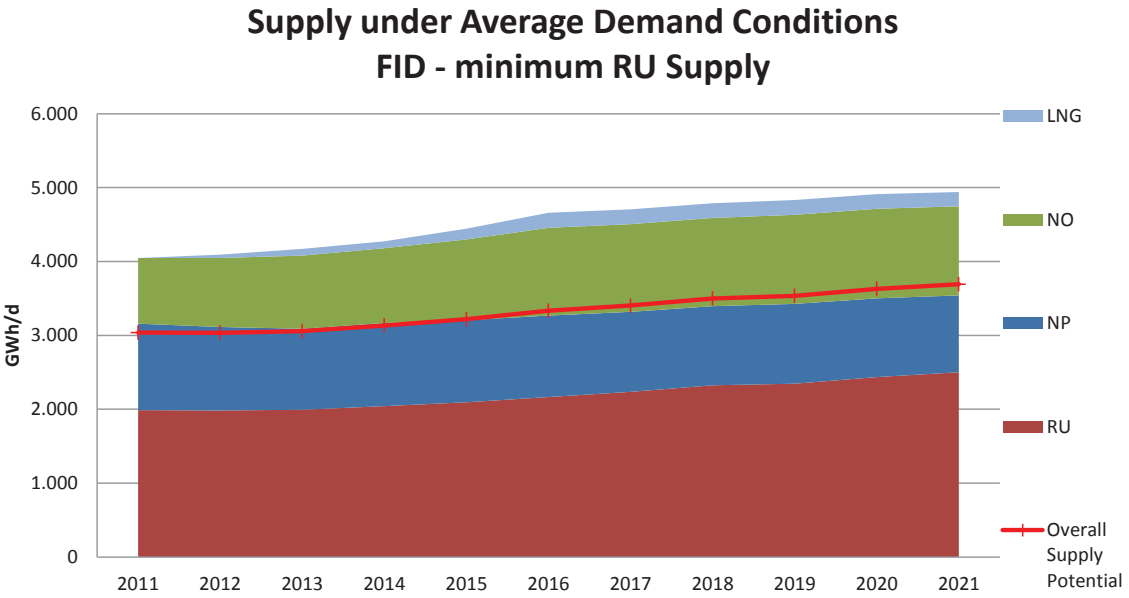

Figure 19: Supply under Average Demand Conditions FID – minimum RU Supply

Only FID investments considered, the share of Russian gas would be 49% in 2011, remaining relatively constant over the next decade. The share of national production has been estimated to 29% in 2011, decreasing to 21% in 2021. Most of the reduction of Russian gas would be compensated with Norwegian gas (22% in 2011, 24% in 2021), but also the share of LNG would increase (4% in 2021). Again, Caspian gas does not play a role due to non-FID status of the therefore needed investments.

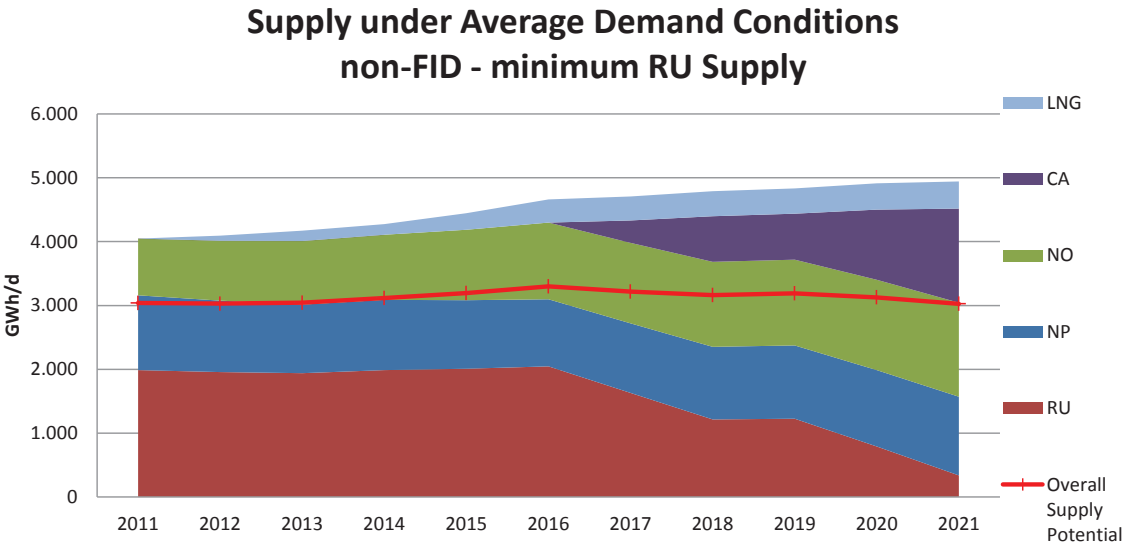

Figure 20: Supply under Average Demand Conditions non-FID – minimum RU Supply

Taking into consideration the non-FID investments, the Russian gas share of 49% in 2011 would decrease to 7% in 2021.Compared to FID scenarios, the share of Norwegian gas would only increase little by 2021 to 30%. The LNG share would increase to 9% by 2021, whereas the share of Caspian gas would increase dramatically from 2016 onwards, to 30% in 2021.

Supply under Peak Demand Conditions

Like supply under average demand conditions, also supply under peak demand conditions is mainly dominated by Russian gas (42% in 2011, increasing to 49% in 2021 for FID scenarios). UGS, the second important source to cover peak demand, has a share of 46% in 2011 which will decrease to 37% in 2021. The shares of gas from national production as well as from Norway are rather small (7% respectively 5% in 2011, 6% respectively 8% in 2021), whereas LNG only covers 1% of the overall peak demand.

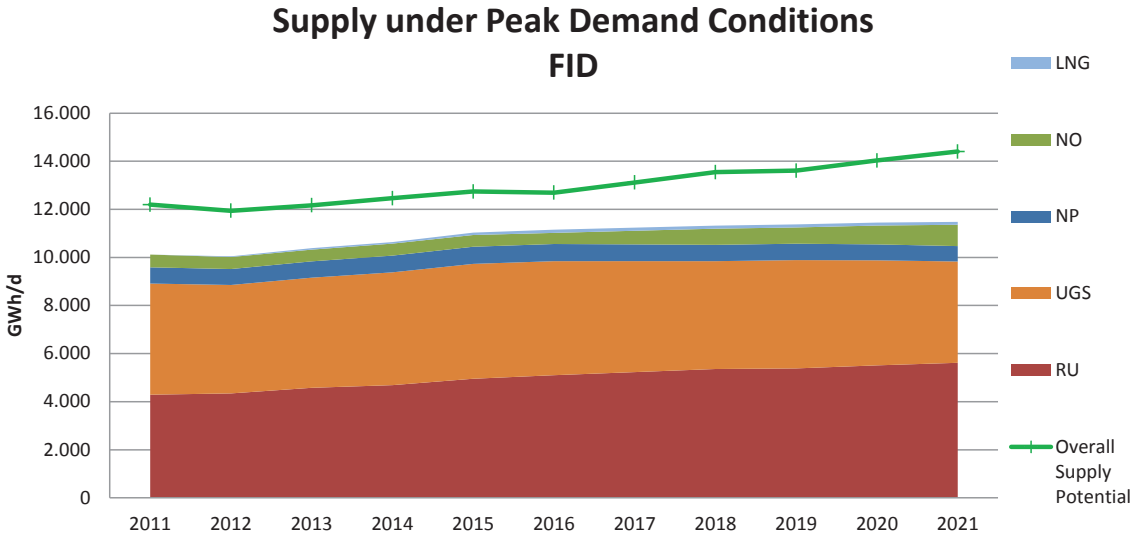

Figure 21: Supply under Peak Demand Conditions FID

Compared to FID scenarios, the main difference if non-FID investments are considered is the share of Caspian gas of 1% from 2018 on. The shares of the other sources (RU, NO, UGS, LNG, NP) remain almost constant.

Concerning the overall supply potential, an over capacity of 21% (2011) has been estimated, developing to 25% for FID scenarios and to 22% for non-FID scenarios.

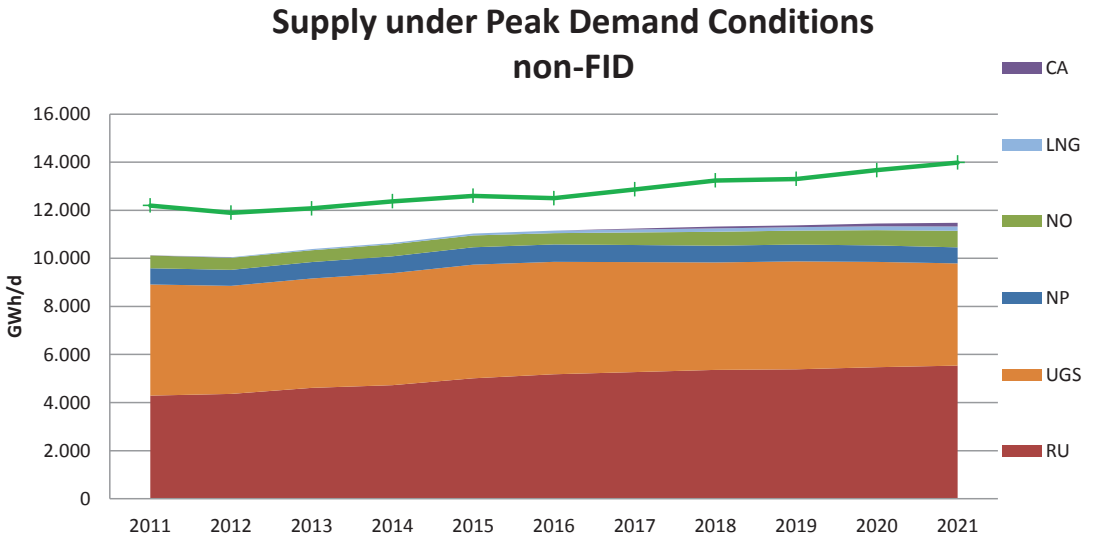

Figure 22: Supply under Peak Demand Conditions non-FID

Regional N-1 analysis for CEE countries

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Because of the large vulnerability of the CEE countries on supply disruption the participating TSOs decided to prepare the Regional N-1 analysis based on the capacities at IPs and resulting residual capacities for neighbouring countries through Supply Corridors within the region. The Supply Corridors and results for each country are described below.

Supply Corridors

Austria

The Supply Corridors on the following picture show the main Supply Corridor for Austria which is under normal condition through Ukraine and Slovakia through the IP Baumgarten (marked as AT1). Other Supply Corridors in case of supply disruption through Ukraine, but also under normal conditions, are through Germany marked as AT2 and through Italy AT3. The remaining capacity that could be used for gas transmission to Slovakia and Hungary in a Ukraine disruption scenario was used as the input for the evaluation of regional N-1 calculation for Slovakia and Hungary correspondingly.

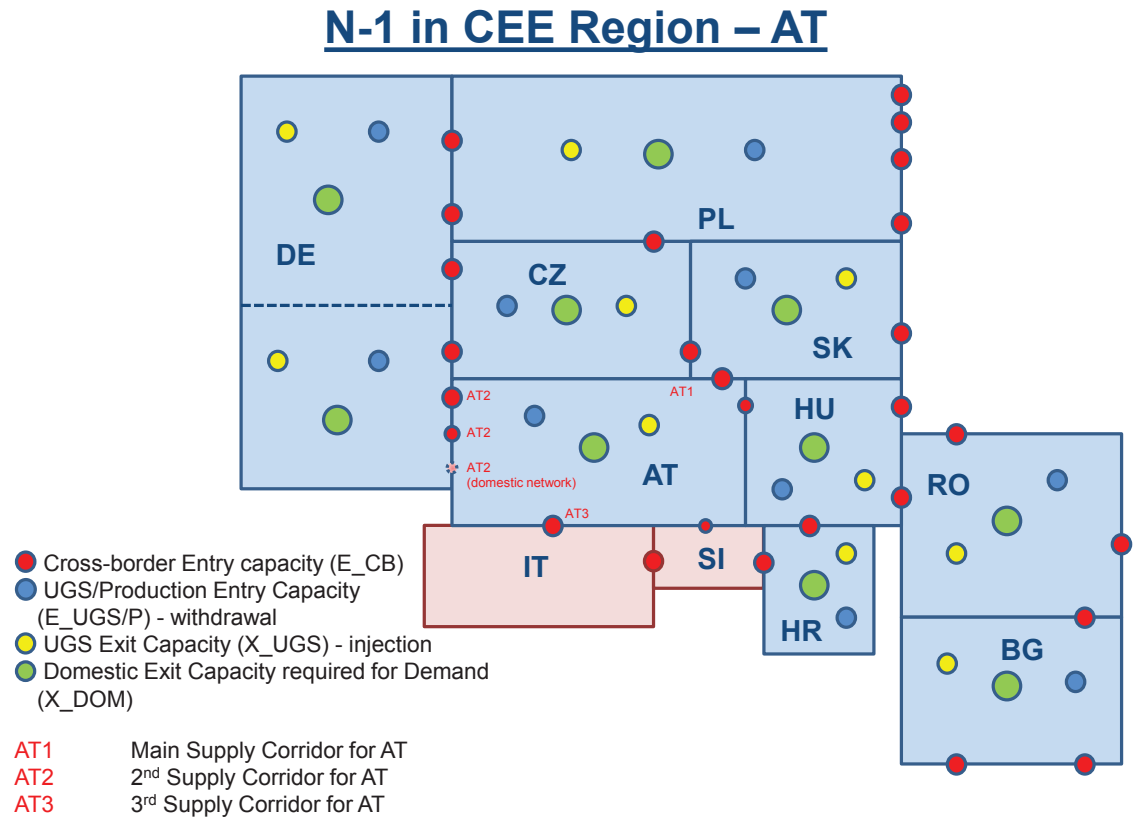


Figure 23: N-1 in CEE REGION - AT

Bulgaria

The Supply Corridor shows the main Supply Corridor for Bulgaria which is under normal condition through Ukraine, Moldova and Romania (marked as BG1). Other Supply sources in case of supply disruption through Ukraine are through the existing IP's with Greece and Turkey marked as BG2 and BG3, that act as reverse flow only in case of full disruption of Russian gas supplies. In Bulgaria there is available UGS Chiren with 4.3 mcm/d withdrawal capacity and national production - 1.3 mcm/d. The other investment projects will be commissioned after 2013 and they are not included in this supply scenario.

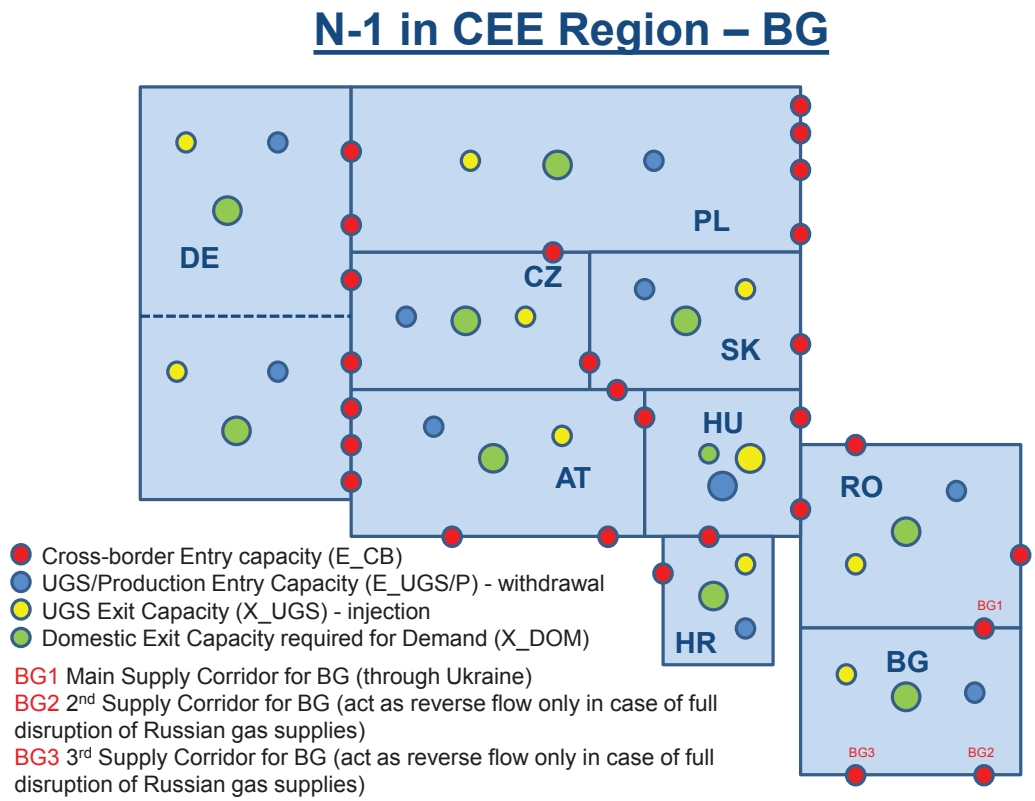


Figure 24: N-1 in CEE REGION - BG

Croatia

The Supply Corridor on the following picture shows the main supply corridors for Croatia which are through Slovenia (HR1) and Hungary (HR2).

Both supply corridors are for domestic demand at the moment. Croatia has its own gas production and the underground gas storage so it is not entirely dependent on import.

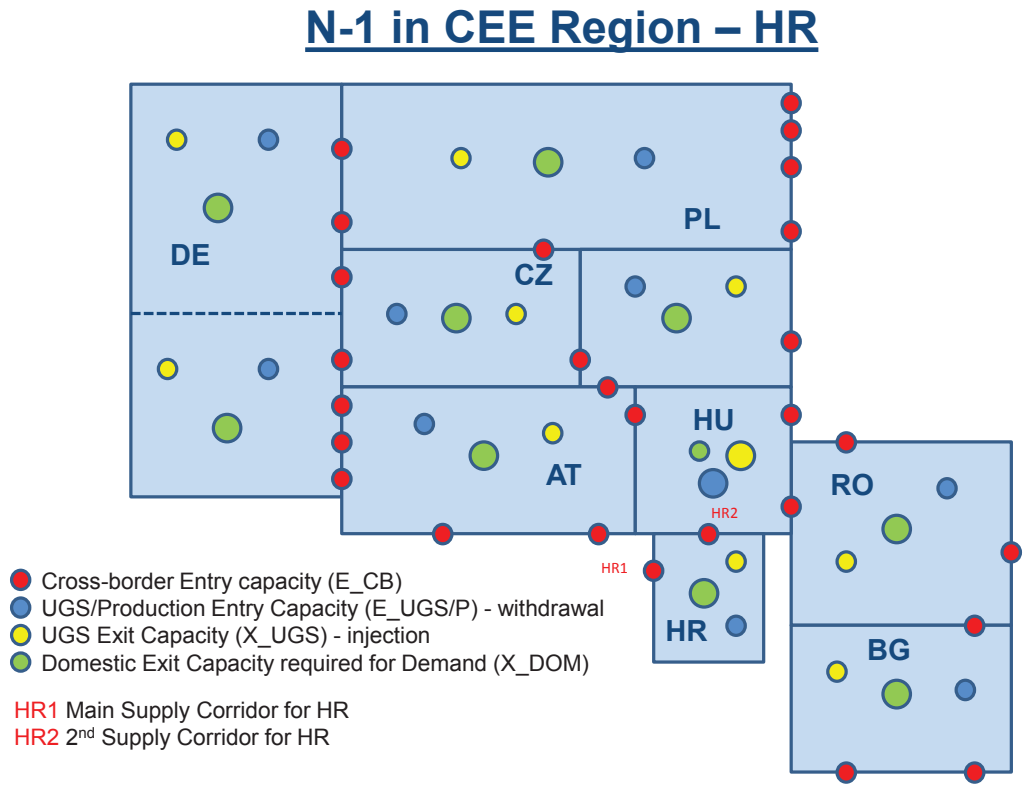


Figure 25: N-1 in CEE REGION - HR

Czech Republic

The Supply Corridor on the following picture shows the main Supply Corridor for the Czech Republic which is under normal condition through Ukraine and Slovakia (marked as CZ1). Other Supply Corridors in case of supply disruption through Ukraine are through Germany marked as CZ2 and CZ3. The remaining capacity that could be used for gas transmission to Slovakia and Poland in such disruption scenario was used as the input for the evaluation of regional N-1 for Slovakia and Poland correspondingly.

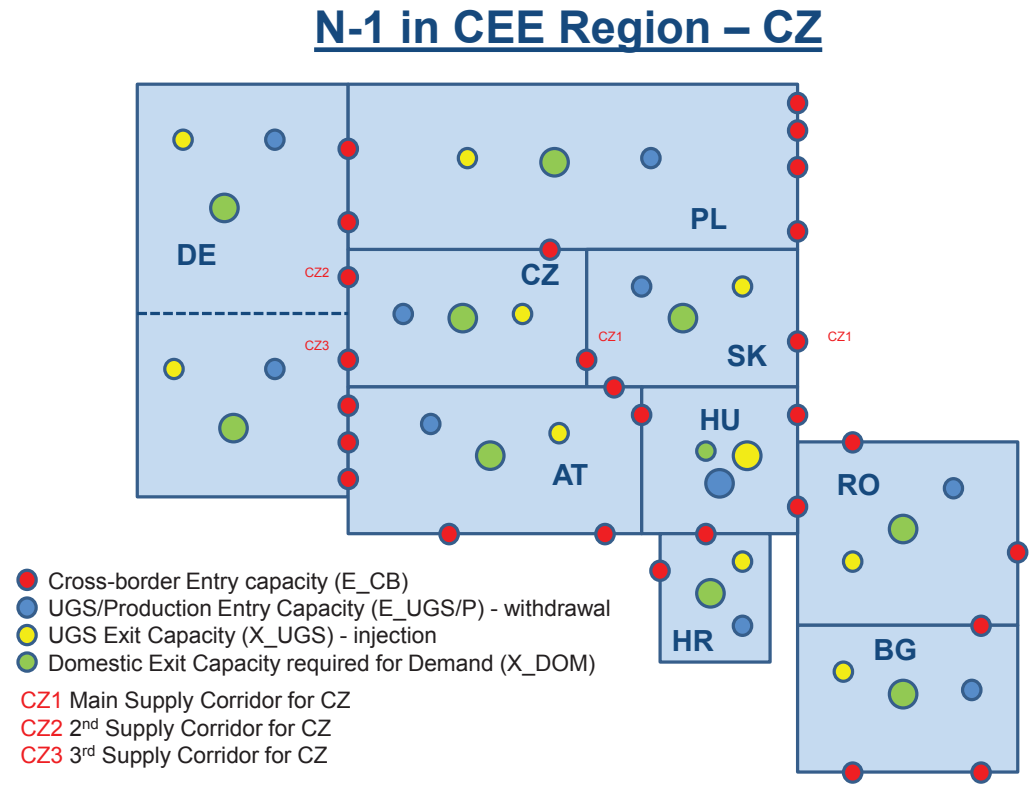


Figure 26: N-1 in CEE REGION - CZ

Hungary

The picture below illustrates the Supply Corridors for Hungary. The main Supply Corridor is from Ukrainian direction, which delivers most of the import gas under normal conditions (marked as HU1). The second Supply Corridor through Austria is marked as HU2, which has also great importance. The third Supply Corridor through Croatia is marked as HU3, which is currently available only in an interruptible way. In case of supply disruption on the Ukrainian/ Hungarian interconnector, the main import supply corridor is the HU2. The remaining capacity that could be used in case of supply disruption (Ukraine) is supply from the Hungarian storages and domestic production points.

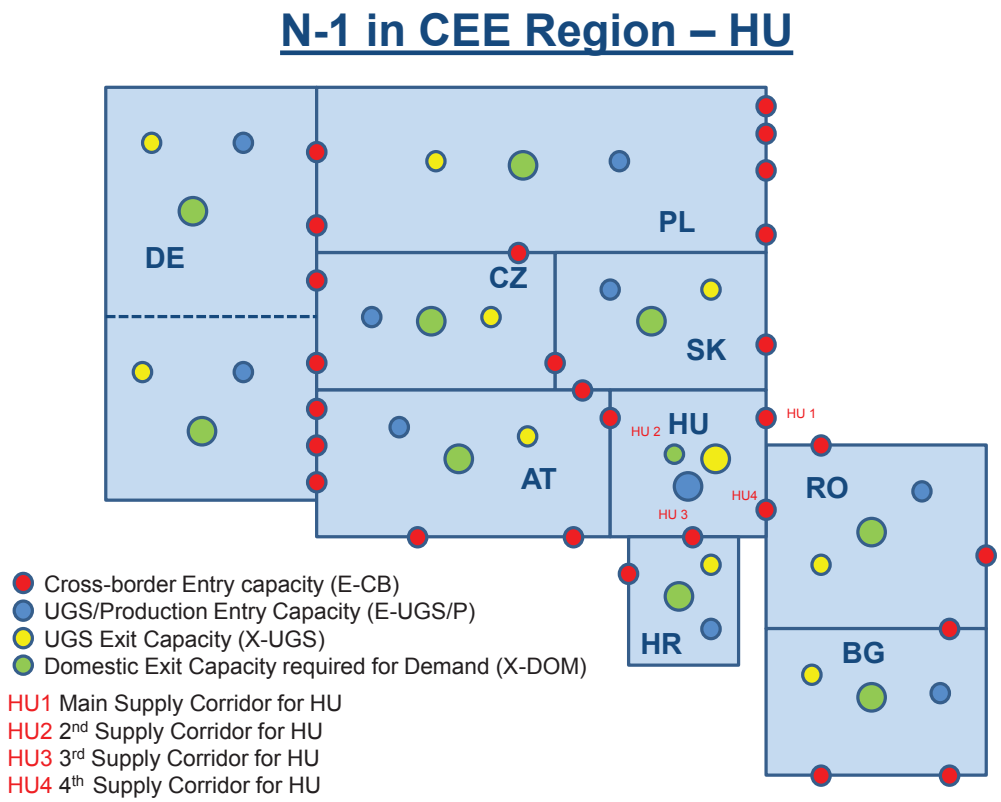


Figure 27: N-1 in CEE REGION - HU

Poland

The picture below illustrates the main Supply Corridors for Poland. Under normal conditions they run through Belarus (marked as PL1) and Ukraine (PL2). Additionally, the gas market in Poland might be supplied by means of interconnections with Germany and the Czech Republic (marked as PL3 and PL4 correspondingly).

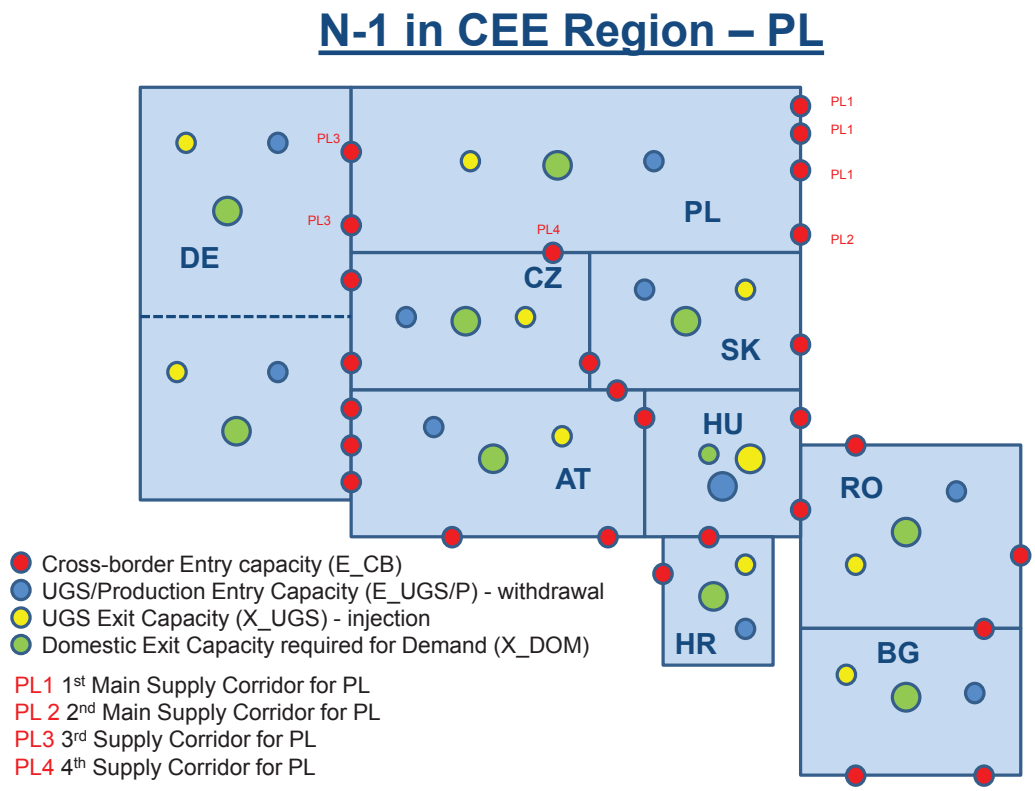


Figure 28: N-1 in CEE REGION - PL

Romania

The following picture shows the main Supply Corridor for Romania which is under normal condition through Ukraine (marked as RO1). In case of total Ukraine disruption, the sole remaining Supply Corridor for Romania is through Hungary (RO2), however Romania has a significant indigenous production of natural gas.

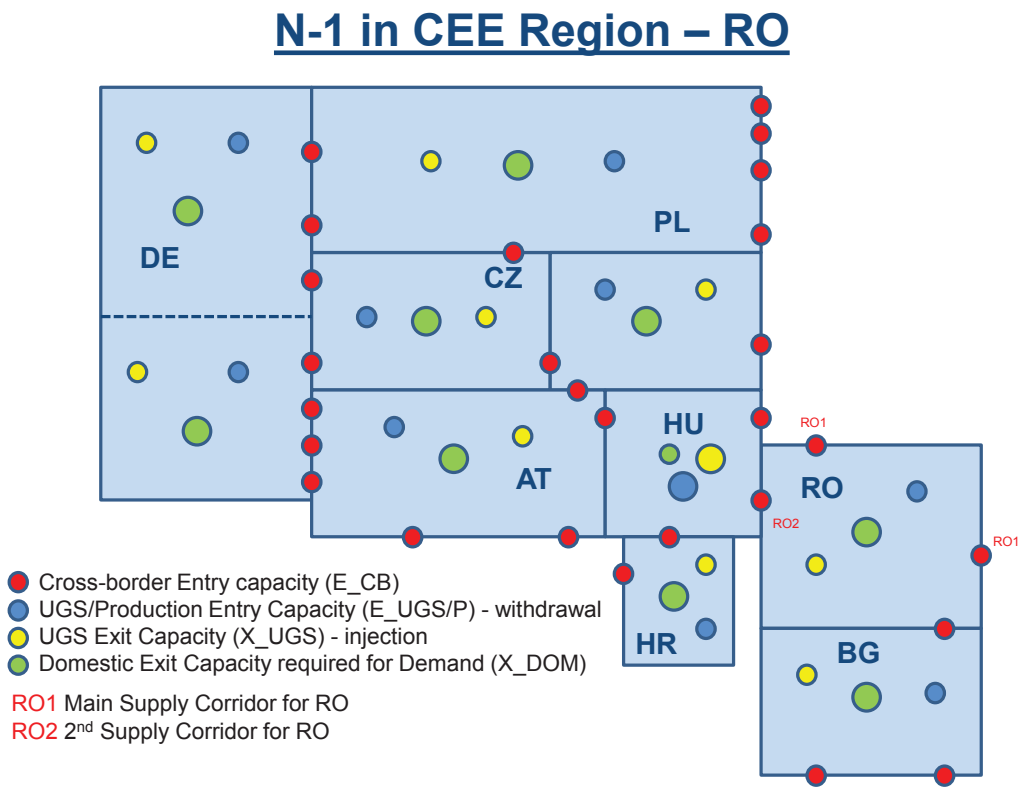


Figure 29: N-1 in CEE REGION - RO

Slovakia

Taking into account the position of Slovakia on the gas route from Russia, it is obvious that the main supply corridor enters the country at the UA/SK border. In the event of a possible Ukraine disruption reverse flows become to play an important role for supplying Slovakia. Other (2nd and 3rd) Supply Corridors in case of supply disruption through Ukraine are through the Czech Republic marked as SK2 and through Austria SK3. However, underground storages can supply the country with more than 60% of its maximal demand.

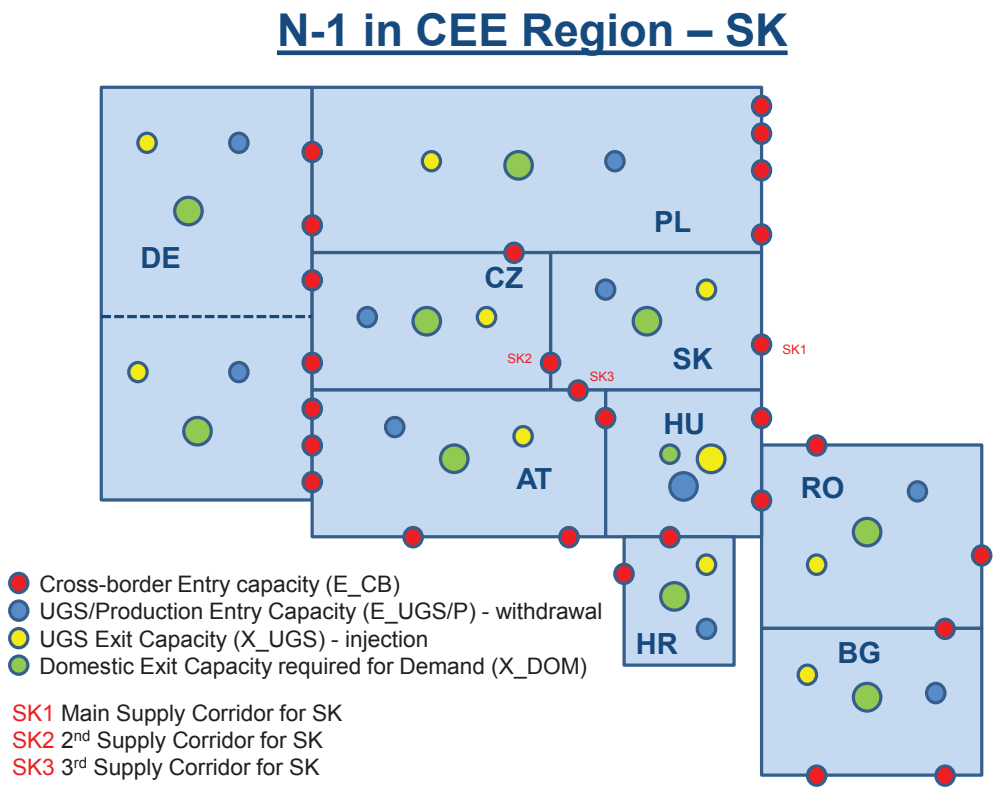


Figure 30: N-1 in CEE REGION - SK

Methodology

Regional N-1 formula

The analysis was prepared for two scenarios of total supply disruption, through Belarus and Ukraine. The Supply Corridors were defined by the route from the source to each country and flows to neighbouring countries were determined as the rest of the gas amount after satisfaction of the country's demand. Each particular analysis was prepared for the winter (1.10.2012 - 31.3.2013) and summer period (1.4.2012 - 30.9.2012). The formulas used together with an explanation of all parameters are stated below. The analysis only takes into consideration the infrastructure capabilities as it assesses only the infrastructure standard, not the supply standard.

Winter

From each country, entry capacities at each IP as well as withdrawal capacity of storage facilities, national production, domestic demand and exit capacities to neighbouring countries were used for Regional N-1 calculation. After a matching/correction of entry and exit capacities of each IP (lesser rule) the N-1 value for winter was calculated for each country by setting the IPs of the Main Supply Corridor to zero, and then bringing the remaining entry capacities in relation to the domestic demand. In case the value is equal to or above 1, it means that the respective country is able to fulfil its own demand in case the Main Supply Corridor is interrupted. Under the assumption that UGS facilities are filled during the summer period (as N-1 calculation is assessing the infrastructure not supply standard), in the winter formula the maximum deliverability and not the stock levels of UGS nor the duration of the disruption were taken into consideration.

$$N-1_{WINTER} = \frac{\sum_{i=2}^{n} E\_CB_i + E\_UGS + E\_P}{X\_DOM} \geq 1$$

Summer

In addition to the data for the winter-formula, for the summer also the working gas volumes of each country's UGS were used for Regional N-1 calculation. The quintessence of the formula is how long the disruption can last without endangering the ability to fill the storage facilities. After a matching/correction of entry and exit capacities of each IP (lesser rule) the N-1 value for summer was calculated for each country by setting the IPs of the Main Supply Corridor to zero, and then bringing the remaining entry capacities in relation to the domestic demand and the injection necessary to fill the UGS facilities.

$$\sum \mathrm{E\_OUT}_{X,SUMMER} = \sum_{i=2}^{n} E\_CB_i + E\_P - X\_DOM \geq 0$$

E_CBi	All Cross-border capacities in flow direction on Supply Corridor i without the biggest one (Ukraine/Belarus disruption) – mcm/d
E_P	Production Entry Capacity – mcm/d
E_UGS	UGS Entry Capacity (withdrawal) – mcm/d
X_DOM	Domestic seasonal peak daily demand (1 in 20) – mcm/d
E_OUTx	Remaining sources to fulfil the demand in neighbouring countries – mcm/d
ΣE_OUTx	Remaining sources to fulfil the demand in neighbouring countries and for injection to UGSs – mcm/d

Ukrainian disruption

For Ukrainian disruption during the winter period a problem was identified in Bulgaria and Romania. The other countries have already implemented sufficient measures to mitigate the impact of such a cut-off. The results for particular countries of the CEE region are in the following table.

Country	N-1 WINTER
Austria	2.11
Bulgaria	0.86
Croatia	1.26
Czech Republic	1.52
Hungary	1.15
Poland	1.08
Romania	0.87
Slovak Republic	1.89

The analysis for the summer period resulted in the identification of potential problems to inject into UGS facilities in Austria and Hungary, but only if the disruption will last more than 152 and 106 days respectively, which is highly improbable.

The problems in Bulgaria and Romania can be solved by increased storage capacity, by a new LNG/CNG terminal or as in Austria and Hungary mainly by projects in the Southern corridor, such as Nabucco and/or South Stream, ITB and IGB.

Belarus disruption

Analysis of Belarus disruption (including Yamal-Europe pipeline and IPs Wysokoje and Tietierówka) during the winter period indicated that only Poland is not able to meet the demand requirements. The other countries of the region are not affected at all as their N-1 for this case is significantly above 1. The results for particular countries of the CEE region are presented in the following table.

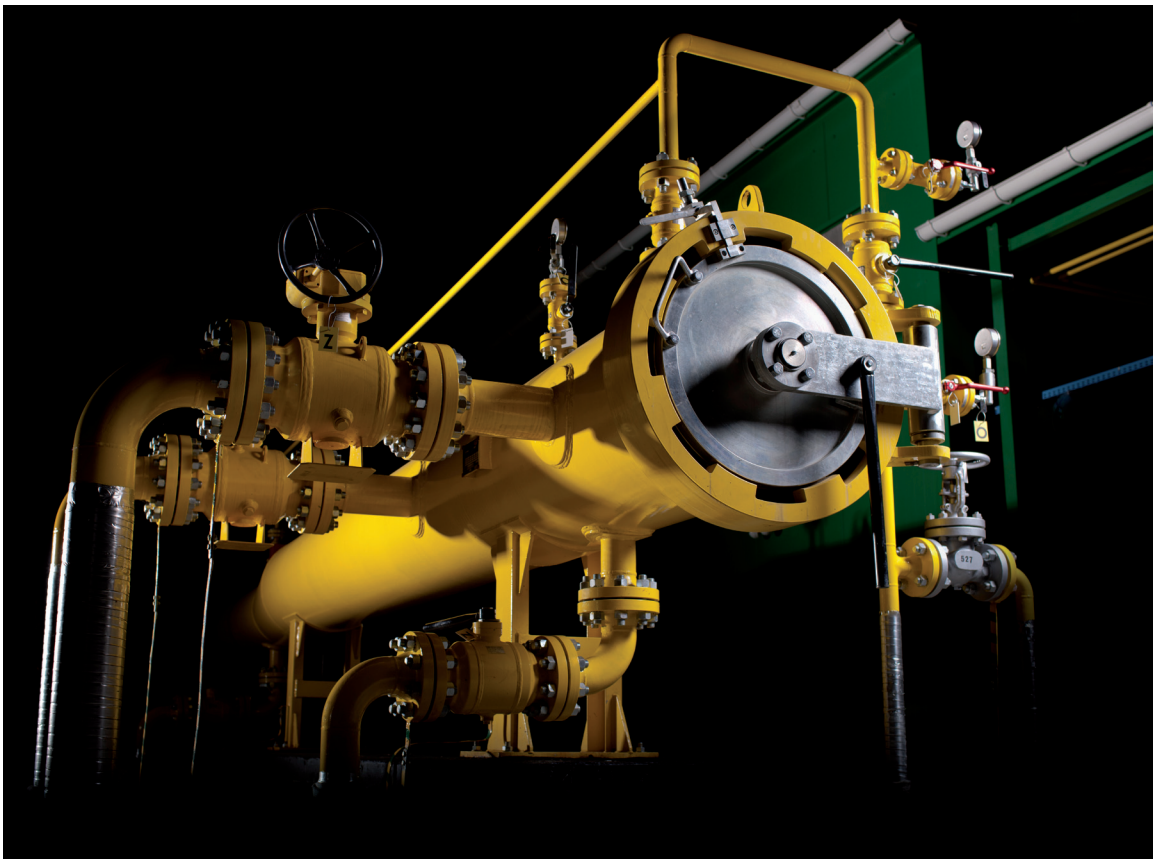
Country	N-1 WINTER
Austria	5.08
Bulgaria	no effect
Croatia	1.89
Czech Republic	2.54
Hungary	1.77
Poland	0.89
Romania	no effect
Slovak Republic	1.32

The result for the winter period showed that Poland cannot cover the peak demand through the currently existing IPs Lasów (from Germany), Drozdowicze (from Ukraine), Cieszyn (from the Czech Republic), indigenous production and UGS facilities as N-1 amounts for 0.89.

The above mentioned problem could be solved by several measures. In line with the parameters used in the formula, the security of supply could be ensured by an increase of entry capacities to Poland that are not dependent on the Belarusian source (such as the use of LNG terminal in Świnoujście that will come on stream in 2014, upgrade of currently existing cross-border capacities from the Czech Republic, Germany or construction of new interconnections with Slovakia and Denmark), by increased withdrawal capacity from UGS facilities or by new indigenous production sites (e.g. shale gas reservoirs).

During the summer period, after covering its demand, Poland has a low remaining amount of gas capacity to cover the injection requirements of UGS facilities, but only if the disruption period is longer than 117 days, which is highly improbable.

Conclusions and the Way Forward



© Image courtesy of GAZ-SYSTEM : Metering station in Cieszyn

The gas transmission network in Central and Eastern Europe is mostly characterized by transit-orientated infrastructure that is used to transport the bulk of Russian gas export to the EU Member States. This implies that gas markets in the region are largely dependent on one external supplier that provides the majority of gas consumed. All in all, the aforementioned circumstances make gas infrastructure development in the CEE region even more indispensable than in other European regions.

The CEE GRIP provides an extensive list of proposed infrastructure projects that offer a possibility to integrate national markets and make them more competitive, liquid and, consequently, attractive for upstream players and traders.

The results of the supply and demand analysis, network modeling and resilience assessment, as well as Regional N-1 analysis (methodology developed by CEE GRIP members) contained in this regional investment plan indicate that the current economic downturn has not had a dampening effect on the gas demand and future demand outlooks, as the daily demand is expected to increase significantly by 2021 (by 22.8% in the average demand scenario and by 72% in the peak demand scenario).

Most of the CEE countries are expected to have stable demand rates, while Poland will record a high increase of both average and peak daily demand (amounting to an increase of 93% and 72% respectively by 2021) and Austria's peak daily demand will also grow significantly (by 50%). In case of Poland, further investments in cross-border capacities are necessary to cover demand in normal circumstances as of 2018 (currently existing interconnection points and FID projects may not assure this).

The gas supplies are currently mainly covered by Russia that will provide at least 49% of gas for the CEE region according to each scenario. Norway and national production also constitute an important element of portfolio (each amounting to approx. 14-19% of overall supplies). LNG is expected to become a new source of supply, while the importance of Caspian gas will be entirely dependent on implementation of the proposed non-FID projects in South-East Europe.

Taking into consideration the capacities of existing and future - FID as well as non-FID - gas infrastructure in the region, the CEE TSOs conclude that the overall supply demand balance improves over the 10-year range owing to the FID projects to be implemented, however there are still two regions that will not have enough capacity (including all FID projects) to achieve full supply demand balance under Peak Daily Demand conditions, which are:

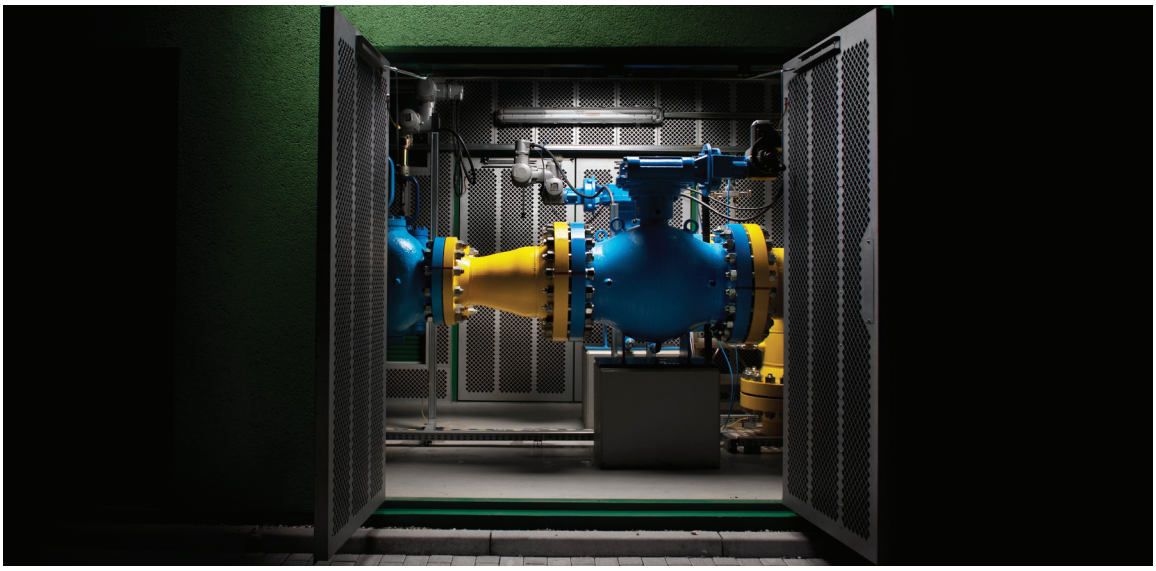
- Poland without disruption, and under Belarus and Ukraine disruption,
- Hungary, Croatia, Romania and Bulgaria under the Ukraine disruption.

Nevertheless the problems and gaps identified by this assessment could be removed by non-FID projects listed in this GRIP with the exemption of Poland under Belarus disruption and Ukraine disruption mainly occurring in mid-2010s.

The results of analysis made in CEE GRIP confirm the conclusion that development of gas infrastructure in the CEE region is of paramount interest not only for the participating countries, but also for other European regions. Development of cross-border interconnections within the North-South corridor in the CEE countries and investments in internal grid will together contribute to creation of a true regional market with adequate basis to guarantee safe and uninterrupted gas flow in normal circumstances and in case of disruptions.

The CEE GRIP 2012-2021 can be regarded as a pilot version of this GRIP. The CEE GRIP TSOs would like to warmly encourage all interested stakeholders to participate in the public consultation that is going to be held in February 2012 and at the dedicated workshop scheduled for the beginning of March 2012 in Prague. The CEE GRIP TSOs will appreciate all feedback, opinions and comments that will help to further improve following editions of CEE GRIP, as well as to adjust it both to market needs and challenges the CEE region is going to face in the future.

Definitions



© Image courtesy of GAZ-SYSTEM : metering station in Lasów

Term	Definitions
Average Daily Demand	means the daily gas demand on an average day and is calculated as the annual demand (ENTSOG scenario) divided by 365
Average Daily Supply	means a mix of gas supply sources that ensures the supply demand balance under the Average Daily Demand conditions ; the Average Daily Supply is equal to the Annual Supply divided by 365
Annual Supply	means a mix of gas supply sources that ensures the supply demand balance on annual basis; storage is considered as neutral in the Annual Supply (equal to zero)
Annual Supply Potential	means the ability of a supply source to deliver the identified volume of gas on annual basis
Peak (High) Daily Demand	means the daily gas demand under 1in20 climatic conditions
Peak (High) Daily Supply	means a mix of gas supply sources that ensures the supply demand balance under Peak (High) Daily Demand conditions
Main Supply Corridor	means the Supply Corridor over which the respective target area/country is predominantly supplied with gas
Supply Corridor	means a route consisting of transmission capacities necessary to connect a physical gas source with the target area/country to be supplied with gas
Technical capacity	means the maximum firm capacity that the transmission system operator can offer to the network users, taking account of system integrity and the operational requirements of the transmission network (Art. 2 paragraph 1, subparagraph 18) of REG-715)
Transmission	means the transport of natural gas through a network, which mainly contains high-pressure pipelines, other than an upstream pipeline network and other than the part of high-pressure pipelines primarily used in the context of local distribution of natural gas, with a view to its delivery to customers, but not including supply (Art. 2 paragraph 1, subparagraph 1) of REG-715)

Abbreviations

Abbreviation	Full Name
AGGM	Austrian Gas Grid Management
bcm	Billion normal cubic meters (normal cubic meter (Nm^3) refers to m^3 at 0°C and 1.01325 bar)
BiH	Bosnia and Herzegovina
BTS	Border Transfer Station
CA	Caspian
CE	Central Europe
CEE	Central Eastern Europe
CNG	Compressed natural gas
CS	Compressor Station
d	day
DN	Diameter nominal
DS	Distribution System
DSO	Distribution System Operator
E_CB_i	All Cross-border capacities in flow direction on Supply Corridor i without the biggest one
EGS	E.ON Gas Storage
E_OUTx	Remaining sources to fulfil the demand in neighbouring countries
E_P	Production Entry Capacity
E_UGS	UGS Entry Capacity (withdrawal)
E_UGS/P	UGS/ Production Entry Capacity
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECA	Export Credit Agency
EEPR	European Economic Programme for Recovery
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ENTSOG	European Network of Transmissions System Operators for Gas
EU	European Union
FID	Final Investment Decision
FS	Feasibility Study
GDN	Gas Distribution Node
GMS	Gas metering station
GRIP	Gas Regional Investment Plan
GWh	Gigawatt hour
h	hour
IAP	Ionian Adriatic Pipeline
IBR	Interconnection Bulgaria-Romania
IBS	Interconnection Bulgaria-Serbia

Abbreviation	Full Name
IFI	International Finance Institution
IFC	International Finance Corporation
IGA	Intergovernmental Agreement
IGB	Interconnection Greece-Bulgaria
ITGI	Interconnector Turkey-Greece-Italy
ITO	Independent Transmission Operator
ITB	Interconnection Turkey-Bulgaria
IP	Interconnection Point
LBL	Lanžhot-Baumgarten-Line
LNG	Liquefied Natural Gas
KIDSF	Kozloduy International Decommissioning Support Fund
km	kilometre
kWh	kilowatt hour
m³ (n)/Nm³	cubic metre (normal)
Max.	maximum
mcm	Million normal cubic meters (normal cubic meter (Nm^3) refers to m3 at 0°C and 1.01325 bar)
Min.	minimum
mm	milimetre
MOUC	Memorandum of Understanding and Cooperation
MPa	megapascal
MW	Megawatt
N/A	Not Available, Not Applicable
NP	National production
NRA	National Regulatory Authority
NTS	National Transmission System
OPAL	Ostsee Pipeline Anbindungsleitung
OPIE	Operational Programme Infrastructure and Environment
OVIT	Országos Villamostávvezeték Zrt.
PGNiG	Polskie Górnictwo Naftowe i Gazownictwo (eng. Polish Oil and Gas Company)
Ref	Reference Case
PFS	Pre-feasibility study
REG-715	Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks
REG-SoS	Regulation (EU) No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/EC
RV	Regasification Vessels

Abbreviation	Full Name
SEE	South East Europe
SF	Structural funds
SO	System Operator
SoS	Security of Supply
TAP	Trans Adriatic Pipeline
TEN-E	Trans European Energy Networks - Energy
TGL	Tauerngasleitung
TPA	Third Party Access
TS	Transmission System
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan
UGS	Underground storage (facility)
UGSS	Unified Gas Supply System
WAG	West-Austria-Gasleitung
WBIF	Western Balkans Investment Framework
WGV	Working gas volume
X_DOM	Domestic winter peak daily demand (1 in 20)
X_UGS	UGS exit capacity
y	year

Country Codes

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Country Code	Full Name	Country Code	Full Name
AL	Albania	**LT**	Lithuania
AT	Austria	**MK**	FYROM
BG	Bulgaria	**NL**	Netherlands
BY	Belarus	**NO**	Norway
CZ	Czech Republic	**PL**	Poland
DE	Germany	**RO**	Romania
DK	Denmark	**RS**	Serbia
FR	France	**RU**	Russia
GR	Greece	**SI**	Slovenia
HR	Croatia	**SK**	Slovakia
HU	Hungary	**TK**	Turkey
IT	Italy	**UA**	Ukraine

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Gas dehydration station in Mackowice

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