CENTRAL-EASTERN EUROPE
GAS REGIONAL INVESTMENT PLAN
2014 - 2023

PIOTR KUŚ, GAZ-SYSTEM S.A.
BERNHARD DIERMAIER, BOG GmbH

ENTSOG WORKSHOP
VIENNA, 26 JUNE 2014

Agenda

1. CEE GRIP – general information
2. Barriers to gas investments in the CEE region
3. Modelling results
4. Regional N-1 analysis
5. Conclusions

CEE GRIP
Composition of the region

Countries and TSOs involved:	
Austria	BOG GmbH
	TAG GmbH
	GAS CONNECT AUSTRIA GmbH
Bulgaria	Bulgartransgaz EAD
Croatia	Plinacro d.o.o.
Czech Republic	NET4GAS, s.r.o.
Germany	Gasunie Deutschland Transport Services GmbH
	Gasunie Ostseeanbindungsleitung GmbH
	GRTgaz Deutschland GmbH
	ONTRAS Gastransport GmbH
	Open Grid Europe GmbH
	GASCADE Gastransport GmbH
	terranets bw GmbH
Hungary	FGSZ Ltd.
Poland	GAZ-SYSTEM S.A.
Romania	Transgaz SA.
Slovenia	PLINOVODI d.o.o.
Slovakia	eustream, a.s.

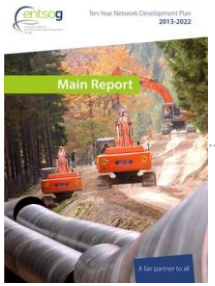
CEE GRIP 2014-2023 jointly coordinated by BOG GmbH and GAZ-SYSTEM S.A.

CEE GRIP 2014-2023
Main improvements

INPUT

CEE GRIP 2012-2021

Stakeholder feedback



TYNDP 2013-2022

OUTPUT

Enhanced network analysis

More focus on MKT INT, SoS

Barriers chapter

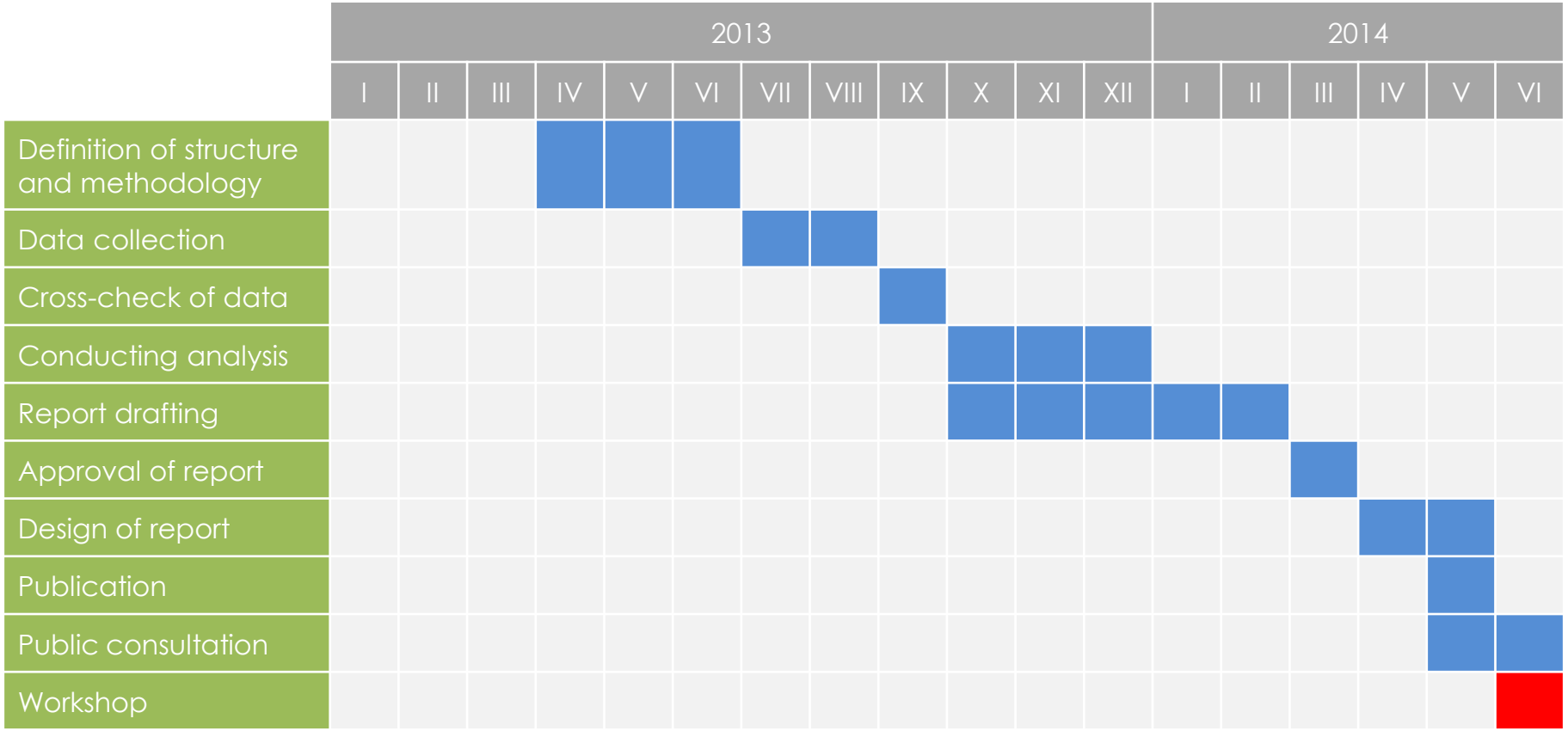
PRECONDITIONS

- Importance of the CEE transmission networks in transporting significant volumes of gas towards the downstream markets in Western Europe
- Planned investments in the CEE region focused on contributing to the long term goal of creating a fully integrated and competitive European gas market

MAIN TOPICS COVERED IN THE CEE GRIP 2014-2023

- In-depth analysis of market integration and security of supply aspects related to the functioning of the regional gas network
- Comprehensive outlook of the evolution of the gas infrastructure in the CEE region during the next ten years
- Closer look into the infrastructure currently in place, as well as to the projects planned for implementation in the near future (FID and non-FID projects)
- Regional N-1 analysis extended to a ten-year period
- Investment barriers to infrastructure development in the CEE region

CEE GRIP 2014-2023
Timeline



CEE GRIP 2014-2023
Structure

1. Foreword
2. Executive summary
3. Introduction
4. Infrastructure projects
5. Methodology
6. Assessment results
7. Regional N-1 analysis
8. Barriers to infrastructure investments
9. Conclusions

- Annex A - Country/TSO Profiles
- Annex B - Infrastructure Projects
- Annex C - Data Tables: Demand & NP
- Annex D - IPs Capacity
- Annex E - Matrix of Cases
- Annex F - PCI projects in the CEE GRIP region

CEE GRIP 2014-2023
Barriers to investments

1 National regulatory framework

2 Permit granting

3 Market

4 Financial

5 Political

CEE GRIP 2014-2023
Barriers to investments

NATIONAL REGULATORY FRAMEWORK

- Unstable and unpredictable regulatory framework
- Low cost recovery and rate of return
- Short term view focusing on revenue reduction

PERMITT GRANTING

- Changes and contradictions in national legislations
- Delays in implementation of EU regulations into national legislations
- Administrative bureaucracy
- Difficulties in obtaining the access to land
- Lack of binding time limits for administrative
- Workflows which have the potential to delay the process of permission granting
- Blocking of procedures (e.g. tender results)
- Excessive legal and administrative requirements regarding early stages of project plan development
- Long duration of court proceedings
- *Legal actions aimed at streamlining the permitting process should be promoted*

MARKET

- Need of SoS investments, which in certain cases may not be fully market-based, to further interconnect the gas networks in the region
- Bigger share of shorter (or very short) booking commitments
- Market conditions influencing low utilisation of UGS facilities

FINANCIAL

- Economic crisis
- Availability of financial support schemes (direct support, e.g. EU grants, innovative financial mechanisms)

POLITICAL

- Inconsistent or partially contradictory political signals on the role of natural gas in the long-term perspective

CEE GRIP 2014-2023
Infrastructure projects

DATA COLLECTION

Project questionnaire based on ENTSOG's TYNDP questionnaire

Call for data organised by ENTSOG to reach broadest range of stakeholders

RESULTS

Chapter on infrastructure projects

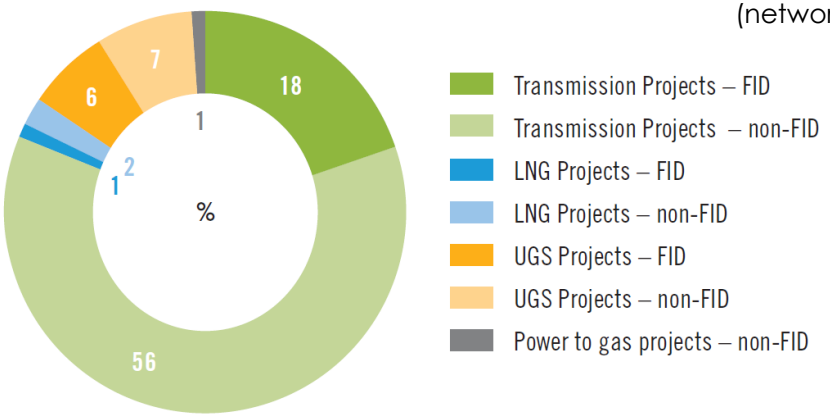
Annex B

Assessment results

Regional N-1 analysis

DATA PROCESSING

Input to all assessments conducted in the CEE GRIP (network modelling, regional N-1)



NETWORK MODEL

- Application of ENTSOG Modelling Tool
  - Further differentiation of demand cases
    - Introduction of summer / winter average demand
- More detailed implementation of UGS utilization in the model
  - Different utilization schemes for different types of analysis
- Three years were modelled, i.e. 2014, 2018 and 2023
- Sources of data: ENTSOG TSOs and Project Promoters

Analysis of physical capacities of existing and planned infrastructure, not of its in-fact utilisation

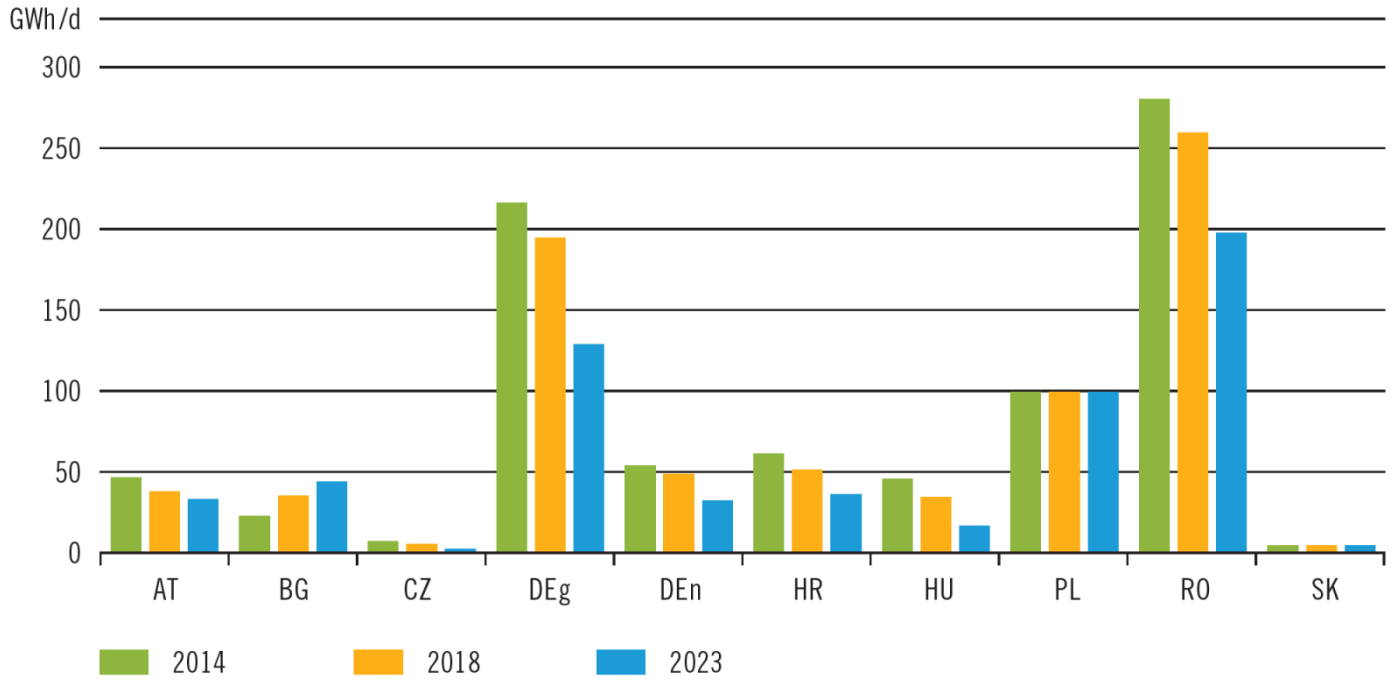
SCENARIOS

- Reference Scenarios (average day, average summer day, average winter day, design case, single uniform risk day in the CEE, two-week uniform risk in whole CEE)
- Market Integration Scenarios (no disruption, average day: Max RU, Max NO, Max DZ, Max LY, Max LNG, Min RU, Min LNG)
- Disruption Scenarios (security of supply - transit disruption of Russian imports via Ukraine, via Belarus and simultaneously via Ukraine and Belarus)

- Regional N-1 Evolution analysis
  - Winter and summer analysis
  - Evolution of N-1 analysis from status quo "snapshot" to a 10-year horizon
- Supply & Demand Analysis
  - Analysis under various climatic conditions
  - Analysis of network resilience -> disruption scenarios
  - Analysis of supply source dependence and supply source mix
- Output
  - Identification of capacity gaps
  - Level of SoS
  - Degree of Market Integration
  - Supply source dependence and supply source mix
- Strong interdependencies of analysed parameters

CEE GRIP 2014-2023
Assessment results – National Production

- Production of natural gas in the CEE region expected to decrease in a 10-year horizon
- Major producers in the CEE region (2014): Romania: 280 GWh/d, Germany (GASPOOL): 217 GWh/d, Poland: 100 GWh/d



CEE GRIP 2014-2023
Assessment results – Demand

DEMAND

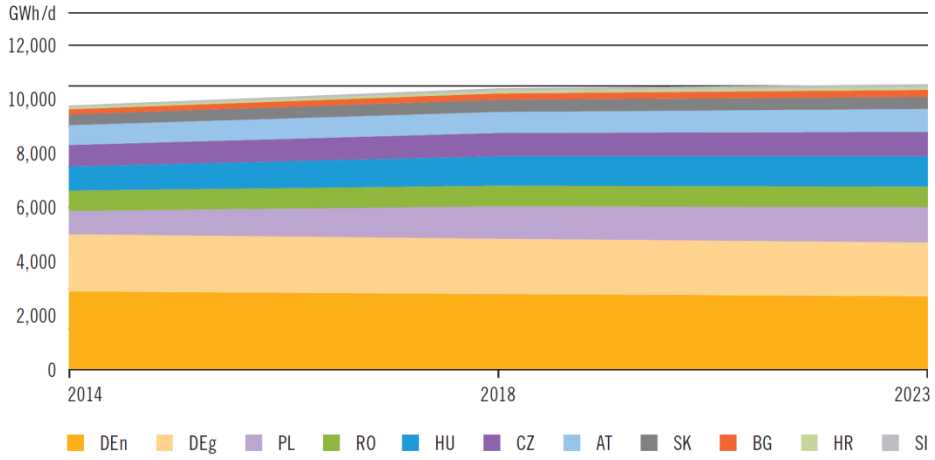
- Depending on the scenario the demand in the CEE region is expected to increase by 2023 by:
  - 8.07% (9773 GWh/d in 2014 → 10561 GWh/d in 2023) - min increase under the design case
  - 12.21% (2940 GWh/d in 2014 → 3299 GWh/d in 2023) – max increase under the average summer demand
- Under all scenarios two major consuming countries in the region are: Germany (approx. -6%) and Poland (approx. +60%)

Supply

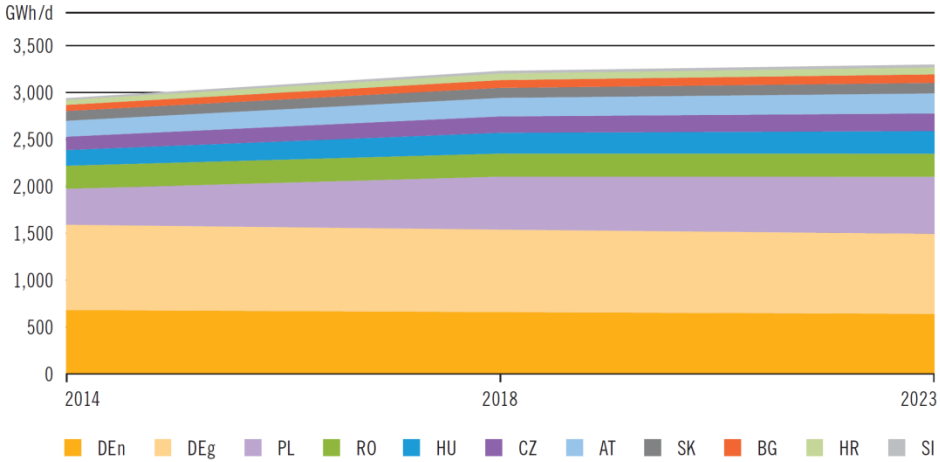
- Each country can cover its demand under the analysed demand scenarios (with the exception of PL under average winter demand and design case in FID 2023 - a shortage of 0.24% and 1.41%, respectively, to be mitigated with implementation of non-FID projects)

Note: Detailed demand outlook are available in Annex C – Data tables: Demand and National production

DEMAND FORECAST UNDER DESIGN CASE

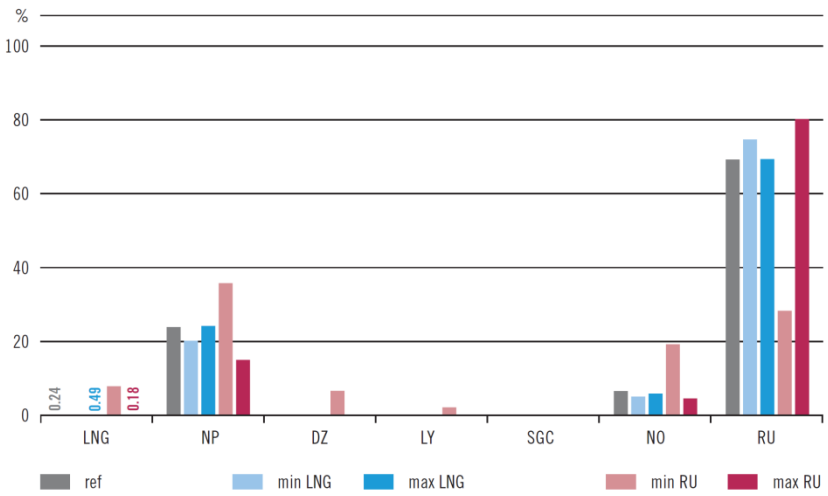


DEMAND FORECAST UNDER AVARAGE SUMMER DEMAND



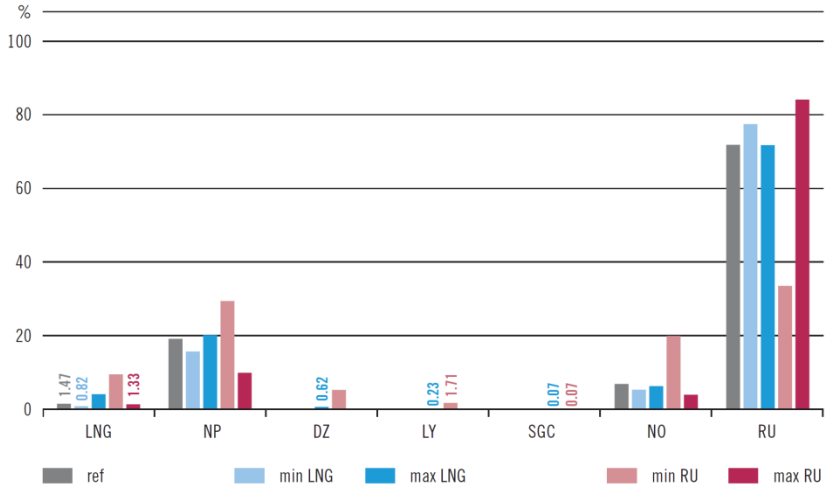
CEE GRIP 2014-2023
Assessment results - Market Integration

2014 FID

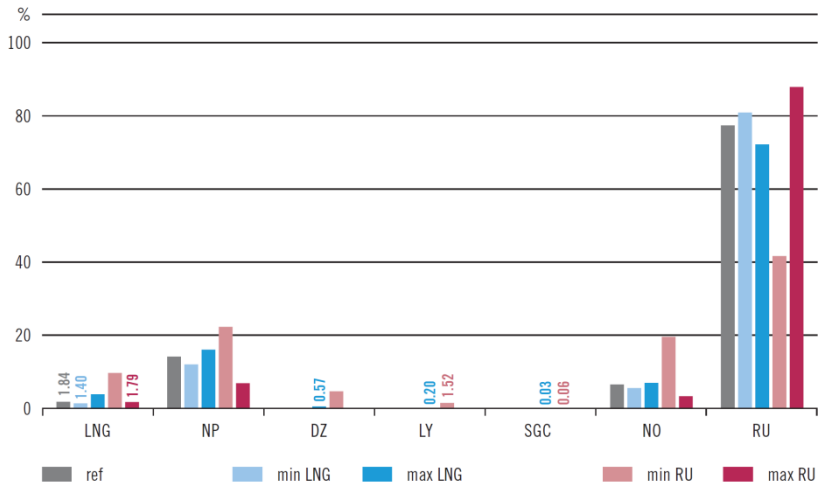


- Russia has been and will remain the main supplier of the region with a minimum share of 50% in all reference scenarios
- Sources from Algeria, Libya, LNG or the SGC region do not play a major role
- Share of LNG and gas from the SGC region are increasing in the next decade

2018 FID

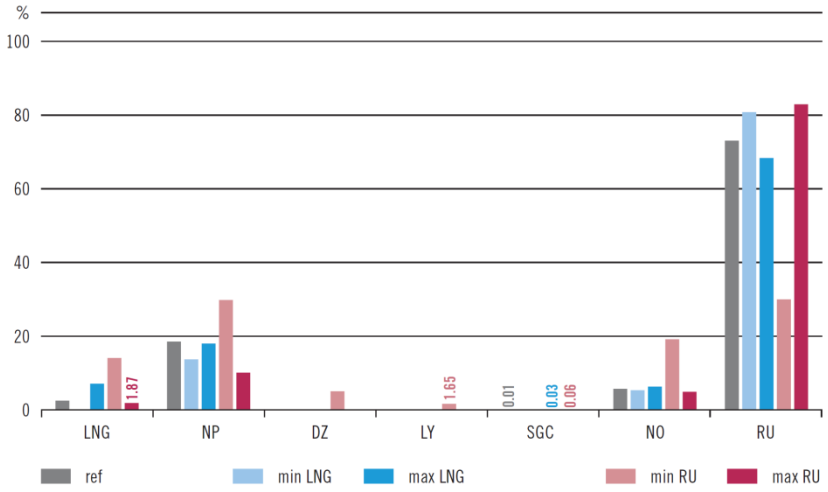


2023 FID

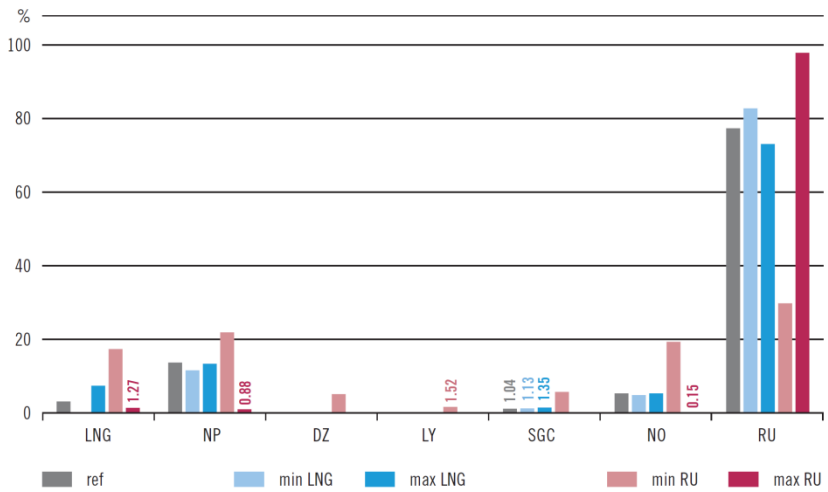


CEE GRIP 2014-2023
Assessment results - Market Integration

2018 non-FID

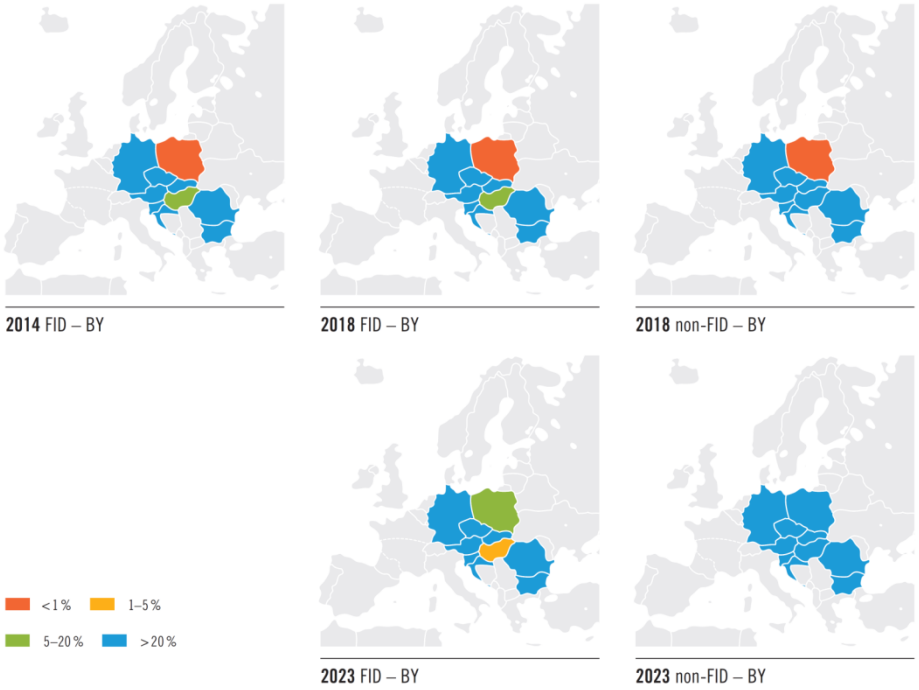


2023 non-FID

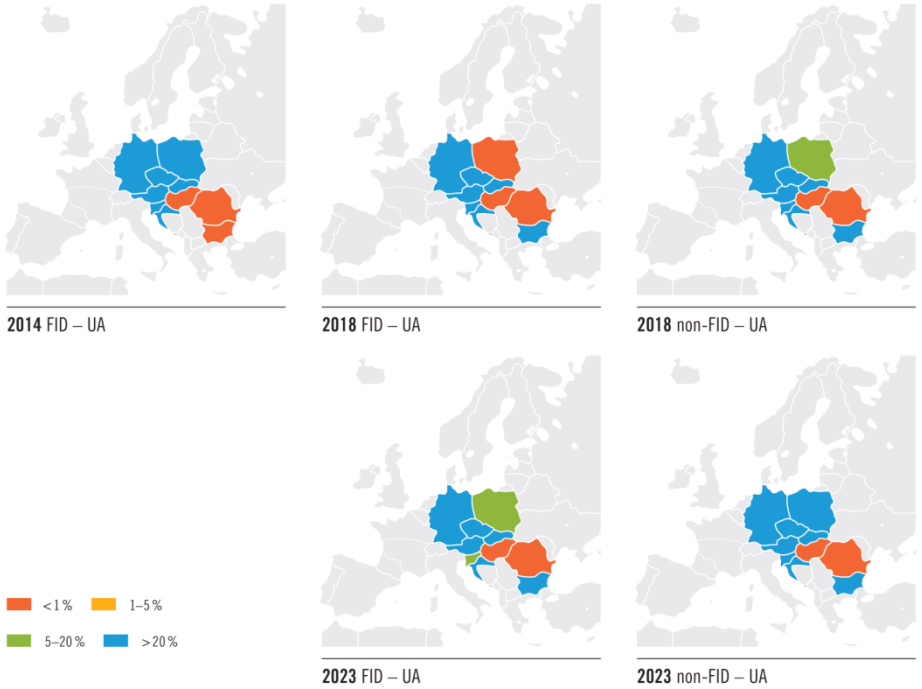


Demand scenario: uniform risk day conditions in the **CEE region** and **average winter day** in the rest of the **EU**

Disruption scenario via Belarus

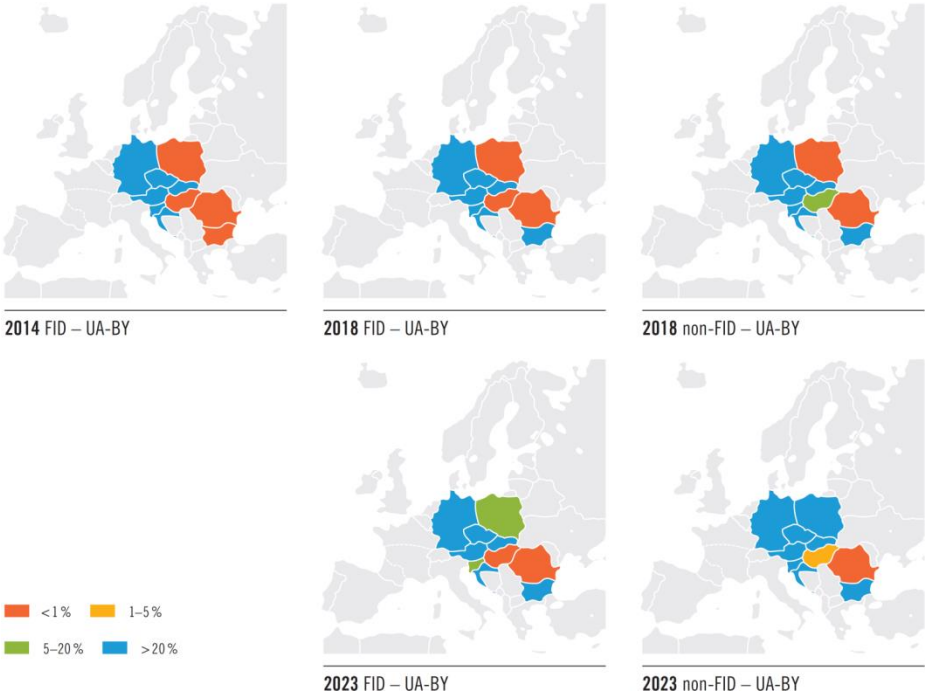


Disruption scenario via Ukraine



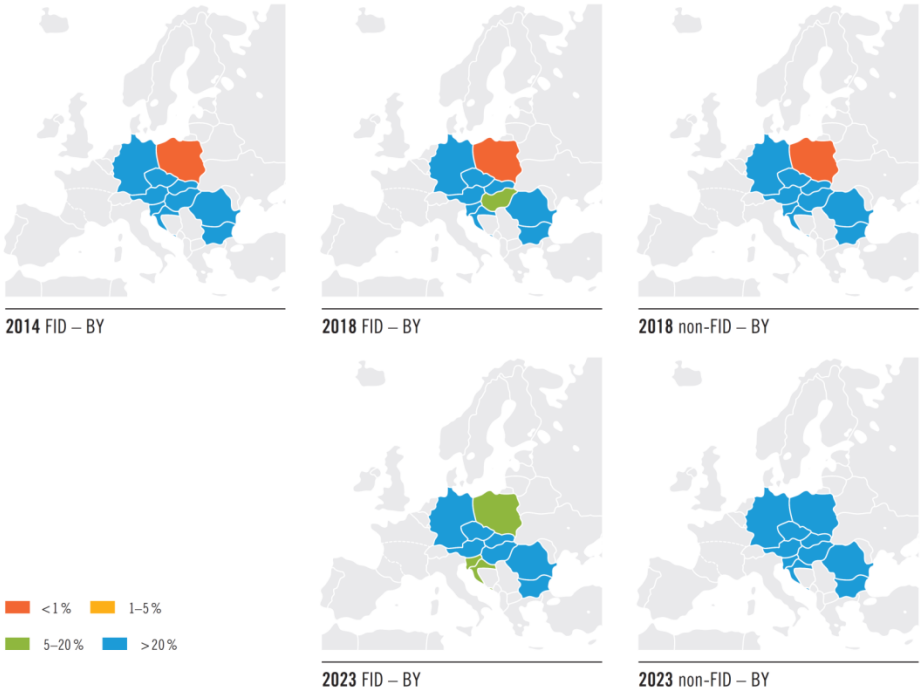
Demand scenario: uniform risk day conditions in the **CEE region** and **average winter day** in the rest of the **EU**

Disruption scenario via Ukraine and Belarus

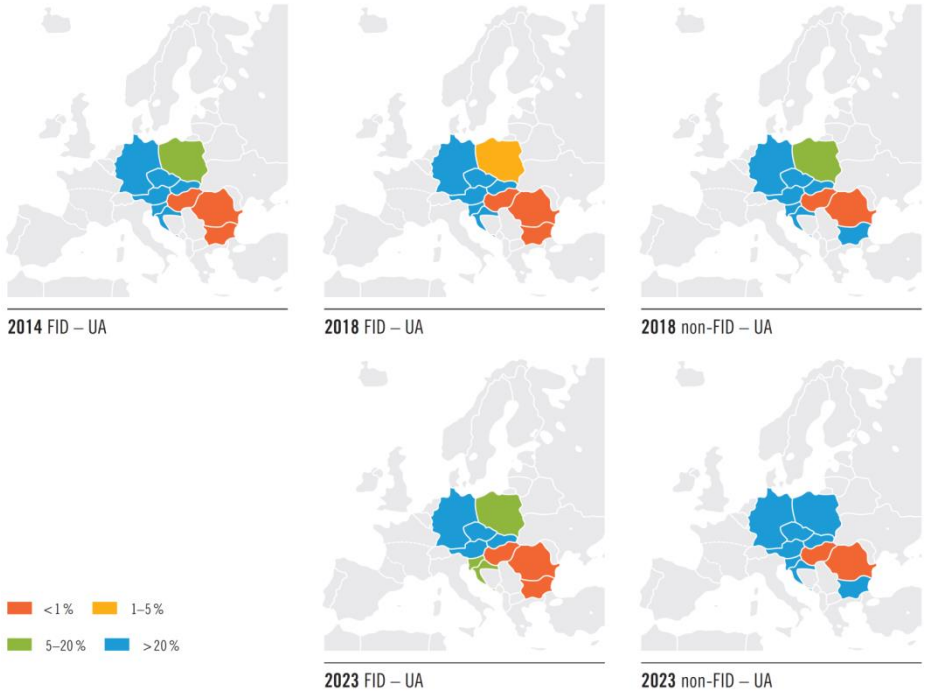


Demand scenario: 2-week uniform risk day conditions in the **CEE region** and **average winter day** in the rest of the **EU**

Disruption scenario via Belarus

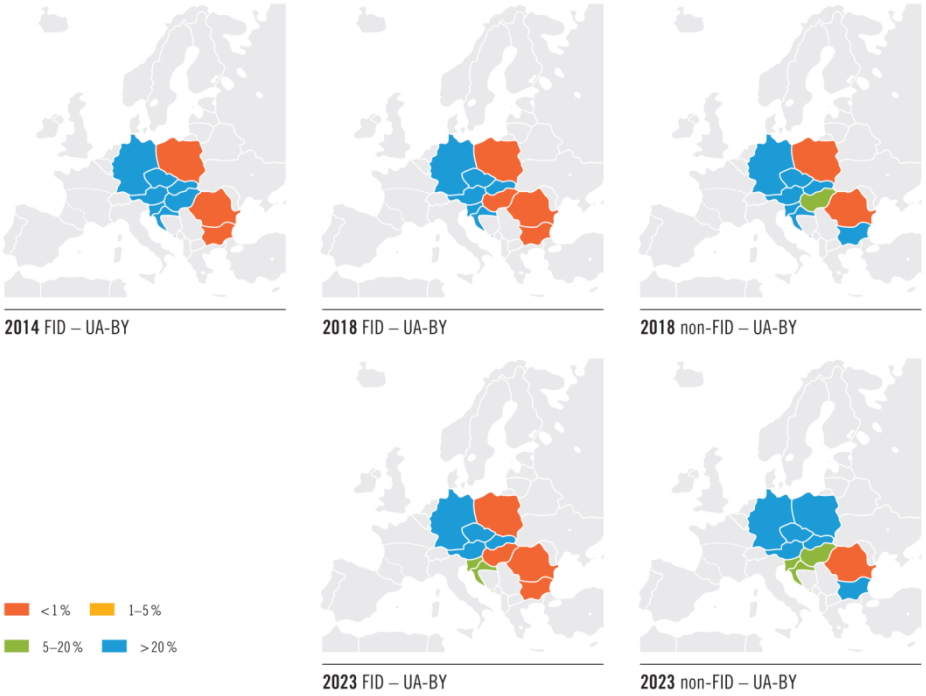


Disruption scenario via Ukraine



Demand scenario: 2-week uniform risk day conditions in the **CEE region** and **average winter day** in the rest of the **EU**

Disruption scenario via Ukraine and Belarus



OBJECTIVE

To assess the security of supply of the gas networks in the CEE region

SCENARIOS

Two scenarios taken into consideration – disruption via Ukraine and Belarus

The formula calculated for each country

Compared to the last CEE GRIP the analysis was extended to a ten-year period

The analysis was prepared for the winter periods 2014/2015, 2018/2019, 2022/2023 and summer periods 2014, 2018, 2023

STAKEHOLDER FEEDBACK

The methodology was appreciated by the stakeholders

FORMULA

The N-1 formula calculated separately for winter and summer periods

SUMMER

$$\sum \mathrm{E\_OUTx}_{SUMMER} = \sum_{i=4}^{n} E\_CB_{CZ,i} + E\_P_{CZ} - X\_DOM_{CZ} \geq 0$$

WINTER

$$N-1_{WINTER} = \frac{\sum_{i=4}^{n} E\_CB_{CZ,i} + E\_UGS_{CZ} + E\_P_{CZ}}{X\_DOM_{CZ}} \geq 1$$

IP capacities and resulting residual capacities as input data

Results above 1 prove that a country has a positive value of the regional N-1 formula

ABBREVIATION	EXPLENATION
E_CBi	All cross-border capacities in flow direction on supply corridor i without or with reduced 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

DISRUPTION VIA UKRAINE - RESULTS

COUNTRY	N-1 WINTER FORMULA		
	1.10.2014 - 31.3.2015	1.10.2018 - 31.3.2019	1.10.2022 - 31.3.2023
Austria	2,6327	2,7364	3,0200
Bulgaria	0,4840	1,8684	1,7430
Croatia	1,0000	0,9748	1,2361
Czech Republic	2,7786	2,5512	2,6887
Hungary	1,0494	1,0138	1,0363
Poland	1,2243	1,0452	1,3175
Romania	0,8414	1,0000	1,0084
Slovakia	2,9404	2,8304	3,1222
Slovenia	2,3850	1,5922	1,3811

- Under disruption scenarios in the summer period all countries in the region obtain satisfactory results of the N-1 calculations
- Each country is expected to cover gas demand and meet injection requirements of UGS facilities, while having at the same time the Ukrainian route fully disrupted for at least 76 days
- The only exception is Bulgaria under the disruption scenario via Ukraine in 2014

DISRUPTION VIA BELARUS - RESULTS

COUNTRY	N-1 WINTER FORMULA		
	1.10.2014 - 31.3.2015	1.10.2018 - 31.3.2019	1.10.2022 - 31.3.2023
Austria	no effect	no effect	no effect
Bulgaria	no effect	no effect	no effect
Croatia	no effect	no effect	no effect
Czech Republic	no effect	no effect	no effect
Hungary	no effect	no effect	no effect
Poland	1,1783	1,0120	1,4205
Romania	no effect	no effect	no effect
Slovakia	no effect	no effect	no effect
Slovenia	no effect	no effect	no effect

- Due to geographical reasons assessment of the Belarus route is focused on Poland
- Under disruption scenarios in the summer period Poland is expected to cover gas demand and meet injection requirements of UGS facilities, while having at the same time the Belarusian route fully disrupted for at least 57 days

CEE GRIP 2014-2023
Conclusions

- The overall supply demand balance improves over the 10-year range owing to the FID projects to be implemented
- However there are still two sub-regions that will not have enough capacity (including all FID projects) to achieve full supply demand balance under CEE UR/EU AW and CEE 2W UR/EU AW conditions, which are:
  - Poland under disruption via Belarus and simultaneous disruption via Ukraine and Belarus
  - Bulgaria, Hungary, Romania under disruption via Ukraine and simultaneous disruption via Ukraine and Belarus
- Nevertheless potential problems and gaps identified in this assessment could be mitigated by non-FID projects listed in CEE GRIP 2014-2023
- As in the previous CEE GRIP the current overall analysis of CEE region confirmed the need to develop transmission systems in the North-South direction to complete the N-S corridor in the CEE region

Thank you for your attention