european network of transmission system operators for gas

GAS REGIONAL INVESTMENT PLAN 2017–2026

Southern Corridor

GRIP

MAIN REPORT

GAS CONNECT AUSTRIA · TAG Trans Austria Gasleitung · BULGARTRANSGAZ · plinacro · DESFA Hellenic Gas Transmission System Operator S.A.

FGSZ LTD. Natural Gas Transmission Member of the MOL Group · SNAM RETE GAS · TRANSGAZ Magistrala Energiei · eustream Slovak Gas TSO · Plinovodi Connected through energy

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Foreword

It is my pleasure to welcome you to the third edition of the Southern Corridor Gas Regional Investment Plan 2017–2026.

This edition builds on the TYNDP 2017–2026, published by ENTSOG in December 2016 and in April 2016 (including a Feedback section with ENTSOG's response to the feedback received from ACER and stakeholders) and on the second edition of the Southern Corridor GRIP released in June 2014, and takes into account the development of the recent years regarding the evolution of demand prospects the regulatory environment and the progress of the key infrastructure projects.

The present edition comes in an environment where on the one hand the first large projects that give to this Regional Group its "raison d' être" have well entered in the construction phase (Trans Adriatic Pipeline) while on the other hand, the uncertainty over a large number of initiatives regarding numerous interconnections among the Regions TSOs to form gas corridors both vertical (South-North) and horizontal (East-West) still persists. Among the positive recent news we may include the first fruits of the CESEC initiative, launched by the European Commission, like the Interconnection agreement enabling backhaul and reverse flow at the Greek/Bulgarian border and the MOU signed by TSOs of four countries for the development of the Vertical Corridor, from Greece to Hungary via Bulgaria and Romania, with possible branches to Ukraine and Moldova. CESEC continues to encourage and closely monitor the actions that can lead to a greater integration of the gas markets in most of the Southern Corridor region. Important projects, still under study, may bring gas from more indigenous sources to Europe, amidst a general decrease of national production in the traditional EU gas producing countries. In addition to the Caspian and other Asian sources, the promoters of new fields in the Levantine and in the Black Sea are comparing their options to reach markets. The bidirectional Poland – Slovakia Interconnector project would offer the possibility of receiving supplies from the Baltic Sea area. Finally numerous projects for new routes to transport Russian gas see the light other for a short time other more persisting over longer periods.

The GRIP is the result of close cooperation between 10 TSOs in 9 countries under the coordination of DESFA. The Region's TSOs would welcome any comments, advice or feedback that could assist in improving the effectiveness of the future editions of this report either through ENTSOG's website or with the occasion of dedicated events to be organised by ENTSOG, or at the coordinator's e-mail address (j.florentin@desfa.gr and a.spyropoulou@desfa.gr).

Dimitrios Kardomateas

ENTSOG General Assembly member

Division Director for-Strategy, Development and Regulation

DESFA S.A.

Executive Summary

This 3rd edition of the Southern Corridor Gas Regional Investment Plan (GRIP) 2017–2026 provides information on the Gas Transmission infrastructure plans, both by TSOs and 3rd party promoters, that will shape the energy landscape in the coming decade.

The information and the analysis contained in this report is consistent with the TYNDP 2017–2026 since the publications of the two documents have been scheduled both for 2017 with only few months separating one from the other. Compared to TYNDP, GRIP is more focused on the Regional issues.

The inclusion of flow analysis constitutes one of the main improvements in comparison with the 2nd Southern Corridor GRIP edition in 2014.

The total number of projects in the Region is 131 out of which 20 FID and 111 non-FID. These are split in the three main categories as follows:

Categories	FID	NON-FID	TOTAL
LNG	1	8	9
PIPELINE	15	93	108
UGS	4	10	14

The Region is characterised by the existence of a few very large projects, mostly interlinked and sometime also competing, aiming at the transportation of Caspian, Russian and Eastern Mediterranean gas to Europe. Some of them are influenced by wider geostrategic considerations of the main players in the European gas scene which makes their assessment particularly engaging.

In the Supply chapter, reference is made to the recent developments that have impacted the global gas market including the normalisation of demand in Asia after the spike caused by the Fukushima accident, and the increase of availability in the USA due to shale gas, and their result on the coal vs natural gas and the LNG vs pipe gas competition.

The network analysis shows a different image between the eastern and western parts of the Region.

Although in the reference case almost no shortages occur, under the Ukraine disruption scenarios shortages appear in Bulgaria, Romania, Croatia and Hungary which are more dependent both on Russian gas supplies and on the Ukraine route. These are relieved progressively as more projects are implemented. The implementation of the PCI projects in 2030 is sufficient to meet almost any shortage (with the exception of Romania), although implementation of all PCI projects is highly improbable as this group includes projects in competition as well as highly immature ones. TAP (which is already under construction), East-Med, the east–west gas transmission corridor between Romania and Austria, Eastring, IAP and the new LNG Terminals, in the Adriatic and in northern Greece are among the key projects contributing to the improvement of the network flexibility. However Romania remains somehow-exposed, if the White Stream project which is not included in the PCI list, is not taken into account, although this could be drastically changed in case new gas fields in the Black Sea are put in operation.

As it could be anticipated, the dependence on Russian gas remains high in the eastern part of the Region while the supply of LNG is important for Greece, in case of a disruption of the Ukraine route.

1 Introduction

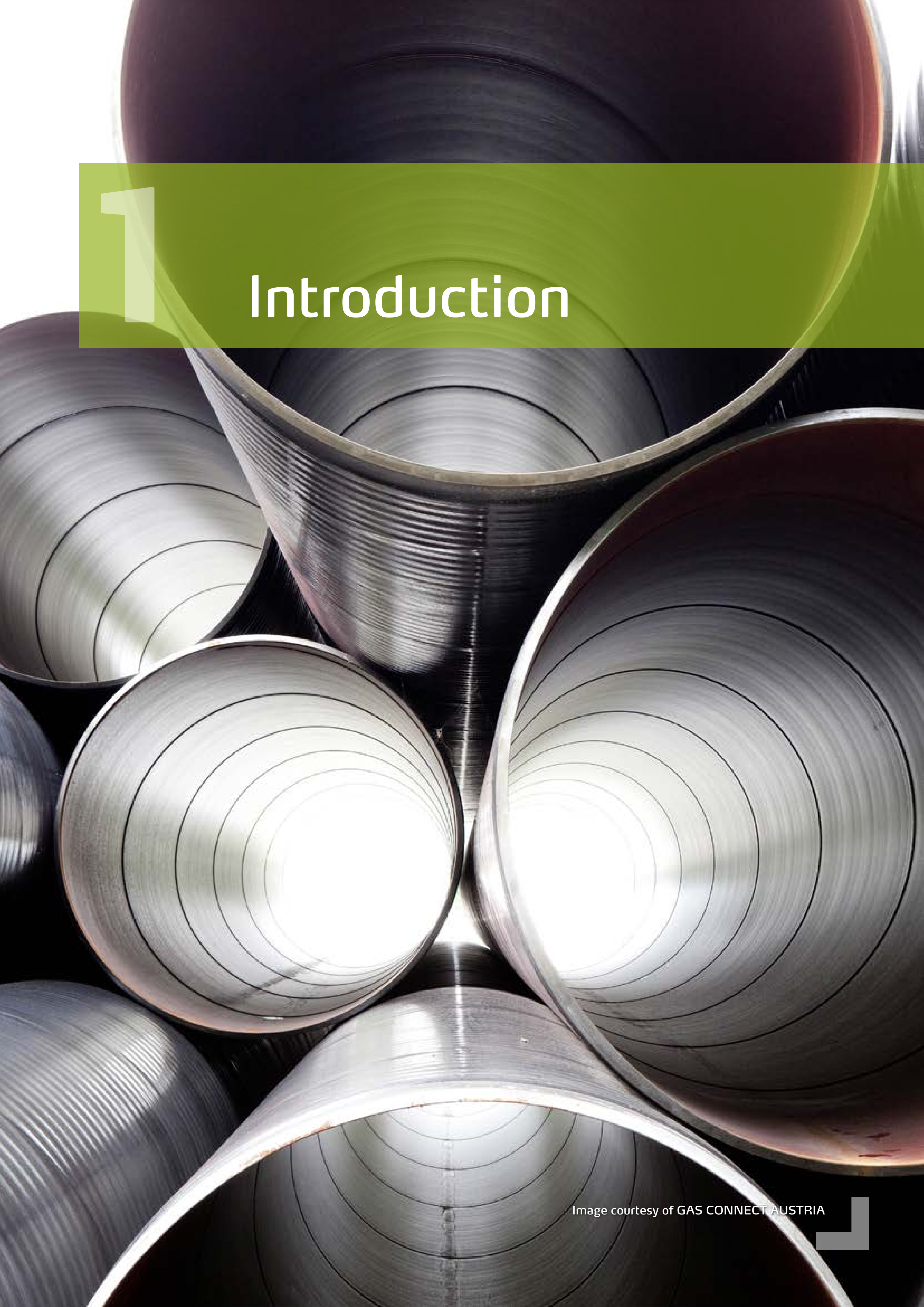


Image courtesy of GAS CONNECT AUSTRIA

The present 3rd edition of the Southern Corridor Gas Regional Investment Plan provides a specific overview of the investment projects in gas infrastructure (transmission, underground storage and LNG) with Regional relevance, sponsored by either the Region's TSOs or by 3rd parties.

This GRIP covers gas infrastructure projects and analysis from nine countries[1]: Austria, Bulgaria, Croatia, Hungary, Greece, Italy, Romania, Slovakia, and Slovenia (Table 1).

The projects included in the present GRIP have been proposed by the TSOs and other projects promoters in the SC Region as resulting from ENTSOG projects collection for TYNDP 2017 and national plans. Some of them may be in competition against each other and therefore they are not all supported by all the TSOs that have participated in the preparation of this GRIP.

1) The SC GRIP 2017–26 was prepared by TSOs of 9 countries since Cyprus and Malta do not yet have a TSO and are not represented in ENTSOG.

Legal Basis

The biannual publication of a Regional investment plan is a legal obligation for European TSOs, stemming from Directive 2009/73 Article 7 and further detailed by Regulation (EC) 715/2009 Article 12.

Enhancements of this edition

This GRIP edition is fairly consistent with the previous one with the addition of Flow analysis which highlights the flow patterns in the Southern Corridor Region under certain standard sourcing configurations.

Structure of the report

The report is structured in five main parts dealing with:

- **Gas Demand:** Historical data one presented and recent trends are shown, especially on the use of gas for power generation.
- **Gas Supply:** The gas sources supplying the Region are presented together with the trend and forecast for national production. Reference is also made to new potential gas sources in the Region as well as to non-conventional gas sources.
- **Market Analysis:** In this part import prices are compared among various areas of the Region and capacity reservation at IPs is presented in order to identify potentially congested IPs.
- **Role of the Region in the development of the EU infrastructure:** Reference is made to the large projects in the Region and their contribution to the EU's security of supply. Moreover smaller projects are also presented mainly those included in the PCI list, adopted by the European Commission in September 2015, grouped according to their rationale.
- **Network assessment:** In this part the results of the network modelling are presented along with the indicators for the infrastructure Resilience Assessment and the Sensitivity of expected flows to the price signals referring to three sources: Russian gas, LNG and Azeri gas.

In the Appendices we present:

- Country profiles
- Project information
- Demand data

The TSOs of the Region hope that this document will help the market assess the candidate infrastructure projects providing useful information to all stakeholders.

Note: the SC GRIP 2017–2026 has been approved by nine TSOs of the Region, namely GasConnect Austria, Trans Austria Gasleitung GmbH, Bulgartransgaz, Plinacro, DESFA, FGSZ, SRG, Transgaz, Plinovodi.

INVOLVED TSOs

AUSTRIA	GAS CONNECT AUSTRIA GmbH	GAS CONNECT AUSTRIA
	Trans Austria Gasleitung GmbH	TAG Trans Austria Gasleitung
BULGARIA	Bulgartransgaz EAD	BULGARTRANSGAZ
CROATIA	Plinacro d.o.o.	plinacro LTD GAS TRANSMISSION SYSTEM OPERATOR
GREECE	DESFA S.A.	DESFA Hellenic Gas Transmission System Operator S.A.
HUNGARY	FGSZ Ltd.	FGSZ LTD. NATURAL GAS TRANSMISSION MEMBER OF THE MOL GROUP
ITALY	Snam Rete Gas S.p.A.	SNAM RETE GAS
ROMANIA	Transgaz S.A.	TRANSGAZ MAGISTRALA ENERGIEI
SLOVAKIA	eustream, a.s.	eustream SLOVAK GAS TSO
SLOVENIA	Plinovodi d.o.o.	Plinovodi Connected through energy

Table 1: The list of TSOs contributing to the Southern Corridor GRIP 2017–2026

2 TSO and third Party sponsored Projects

Comparative List of Projects in the Previous and current SC GRIP | Projects by Country | Projects involving more than two EU Countries or non EU Countries or Offshore Projects

Image courtesy of Snam Rete Gas

The following list contains all projects in the Southern Corridor Region, presented in two tables by country:

- one for the projects sponsored by TSOs and
- one for the projects sponsored by 3rd parties.

One additional table includes the projects spanning over several countries.

The project code is the same as the one the projects are attributed in the TYNDP 2017–2026.

2.1 Comparative List of Projects in the Previous and current SC GRIP

As shown in the table below, out of a total of 131 projects:

- 65 were already present in GRIP 2014–2023
- 8 were present in the previous SC GRIP but have since been successfully commissioned
- 44 are new projects
- 14 were present in the previous GRIP but have been withdrawn from the present edition

Legend

- Projects presented in both GRIP editions
- Project presented in 2017–2026 GRIP (absent in 2014–2023 GRIP)
- Project presented in 2014–2023 GRIP (not included in 2017–2026 GRIP)
- Project presented in 2014–2023 GRIP and successfully commissioned

AUSTRIA

GAS CONNECT AUSTRIA GmbH	TRA-N-361	GCA 2015/08: Entry/Exit Murfeld	Pipeline including CS	
GAS CONNECT AUSTRIA GmbH	TRA-N-021	Bidirectional Austrian-Czech Interconnector (BACI, formerly LBL project)	Pipeline including CS	
GAS CONNECT AUSTRIA GmbH	TRA-N-423	GCA Mosonmagyaróvár	Pipeline including CS	
GAS CONNECT AUSTRIA GmbH	TRA-N-801	Břeclav-Baumgarten Interconnection (BBI) AT	Pipeline including CS	
Trans Austria Gasleitung GmbH	TRA-N-954	TAG Reverse Flow	Pipeline including CS	
TGL Tauern gas pipeline	TRA-N-035	Tauerngasleitung Gas Pipeline Project	Pipeline including CS	

BULGARIA

Bulgartransgaz EAD	TRA-N-379	A project for the construction of a gas pipeline BG-RO	Pipeline including CS	
Bulgartransgaz EAD	TRAN-140	Interconnection Turkey-Bulgaria	Pipeline including CS	
Bulgartransgaz EAD	TRA-N-298	Rehabilitation, Modernisation and Expansion of the NTS	Pipeline including CS	
Bulgartransgaz EAD	TRA-N-654	Eastring – Bulgaria	Pipeline including CS	
Bulgartransgaz EAD	UGS-N-138	UGS Chiren Expansion	Storage Facility	
Bulgartransgaz EAD	TRA-N-592	Looping CS Valchi Dol – Line valve Novi Iskar	Pipeline including CS	
Bulgartransgaz EAD	TRA-N-593	Varna-Oryahovo gas pipeline	Pipeline including CS	
Bulgartransgaz EAD	TRA-N-594	Construction of a Looping CS Provadia – Rupcha village	Pipeline including CS	
Bulgartransgaz EAD	UGS-N-141	Construction of new gas storage facility on the territory of Bulgaria	Storage Facility	
Ministry of Energy	TRA-F-137	Interconnection Bulgaria – Serbia	Pipeline including CS	
ICGB a.d.	TRA-F-378	Interconnector Greece-Bulgaria (IGB Project)	Pipeline including CS	

CROATIA

Plinacro Ltd	TRA-F-334	Compressor station 1 at the Croatian gas transmission system	Pipeline including CS	
Plinacro Ltd	TRA-F-086	Interconnection Croatia/Slovenia (Lučko – Zabok – Rogatec)	Pipeline including CS	
Plinacro Ltd	TRA-N-090	LNG evacuation pipeline Omišalj – Zlobin (Croatia)	Pipeline including CS	
Plinacro Ltd	TRA-N-066	Interconnection Croatia -Bosnia and Herzegovina (Slobodnica-Bosanski Brod)	Pipeline including CS	
Plinacro Ltd	TRA-N-075	LNG evacuation pipeline Zlobin-Bosiljevo-Sisak-Kozarac	Pipeline including CS	
Plinacro Ltd	TRA-N-302	Interconnection Croatia-Bosnia and Herzegovina (South)	Pipeline including CS	
Plinacro Ltd	TRA-N-068	Ionian Adriatic Pipeline	Pipeline including CS	
Plinacro Ltd	TRA-N-1057	Compressor stations 2 and 3 at the Croatian gas tranmission system	Pipeline including CS	
Plinacro Ltd	TRA-N-070	Interconnection Croatia/Serbia (Slobdnica-Sotin-Bačko Novo Selo)	Pipeline including CS	
Plinacro Ltd	TRA-N-1058	LNG Evacuation Pipeline Kozarac-Slobodnica	Pipeline including CS	
Plinacro Ltd	TRA-N-303	Interconnection Croatia-Bosnia and Herzegovina (west)	Pipeline including CS	
Plinacro Ltd	TRA-N-336	Interconnection Croatia/Slovenia (Umag-Koper)	Pipeline including CS	
Plinacro Ltd	TRA-N-083	International Pipeline Omišalj-Casal Borsetti	Pipeline including CS	
LNG Hrvatska d.o.o.	LNG-N-082	LNG terminal Krk	LNG Terminal	

GREECE				
DESFA S.A.	LNG-F-147	Revythoussa (2nd upgrade)	LNG Terminal	
DESFA S.A.	TRA-N-941	Metering and Regulating station at Nea Messimvria	Pipeline including CS	
DESFA S.A.	TRA-N-128	Compressor Station Kipi	Pipeline including CS	
DESFA S.A.	TRA-N-631	Greek part of Tesla project	Pipeline including CS	
DESFA S.A.	TRA-N-940	Metering and Regulating station at Komotini	Pipeline including CS	
DESFA S.A.	TRA-N-957	Metering Station at Komotini to IGB	Pipeline including CS	
DESFA.S.A.	TRA-N-967	Nea-Messimvria to FYRoM pipeline	Pipeline including CS	
DESFA S.A	TRA-N-1090	Metering and Regulating Station at Alexandroupoli	Pipeline including CS	
DESFA S.A.	TRA-N-971	Compressor station at Nea Messimvria	Pipeline including CS	
DESFA.S.A.	TRA-N-1091	Metering and Regulating station at Megalopoli	Pipeline including CS	
DESFA S.A.	TRA-N-014	Komotini-Thesprotia pipeline	Pipeline including CS	
DESFA S.A.	TRA-N-1092	Metering and Regulating Station at UGS South Kavala	Pipeline including CS	
DESFA S.A.	TRA-N-188	Bi-directional capacity at IP with BG	Pipeline including CS	
Trans Adriatic Pipeline AG	TRA-F-051	Trans Adriatic Pipeline	Pipeline including CS	
Gastrade S.A.	LNG-N-062	LNG terminal in northern Greece/Alexandroupolis – LNG Section	LNG Terminal	
Gastrade S.A.	TRA-N-063	LNG terminal in northern Greece/Alexandroupolis – Pipeline Section	Pipeline including CS	
Natural Gas Submarine Interconnector Greece-Italy Poseidon S.A	TRA-N-010	Poseidon Pipeline	Pipeline including CS	
Natural Gas Submarine Interconnector Greece-Italy Poseidon S.A	TRA-N-330	EastMed Pipeline	Pipeline including CS	
Hellenic Republic Asset Development Fund	UGS-N-385	South Kavala Underground Gas Storage facility	Storage Facility	
DEPA S.A.	LNG-N-129	Aegean LNG Import Terminal	LNG Terminal	

Image courtesy of DESFA

HUNGARY

FGSZ Ltd.	TRA-N-286	Romanian-Hungarian reverse flow Hungarian section 1st stage	Pipeline including CS	
FGSZ Ltd.	TRA-N-325	Slovenian-Hungarian interconnector	Pipeline including CS	
FGSZ Ltd.	TRA-N-585	Hungarian section of Tesla project	Pipeline including CS	
FGSZ Ltd.	TRA-N-586	HU-UA reverse flow	Pipeline including CS	
FGSZ Ltd.	TRA-N-656	Eastring – Hungary	Pipeline including CS	
FGSZ Ltd.	TRA-N-018	Városföld-Ercsi-Győr	Pipeline including CS	
FGSZ Ltd.	TRA-N-061	Ercsi-Szazhalombatta	Pipeline including CS	
FGSZ Ltd.	TRA-N-123	Városföld CS	Pipeline including CS	
FGSZ Ltd.	TRA-N-377	Romanian-Hungarian reverse flow Hungarian section 2nd stage	Pipeline including CS	
FGSZ Ltd.	TRA-N-380	BG-RO-HU-AT transmission corridor	Pipeline including CS	
FGSZ Ltd.	TRA-N-065	Hajduszoboszlo CS	Pipeline including CS	
Magyar Gáz Tranzit Zrt.	TRA-N-831	Vecsés-Városföld gas transit pipeline	Pipeline including CS	
Magyar Gáz Tranzit Zrt.	TRA-N-524	Enhancement of Transmission Capacity of Slovak-Hungarian interconnector	Pipeline including CS	
Magyar Gáz Tranzit Zrt.	TRA-N-636	Development of Transmission Capacity at Slovak-Hungarian interconnector	Pipeline including CS	
Magyar Gáz Tranzit Zrt.	TRA-F-195	AGRI Pipeline	Pipeline including CS	
Magyar Gáz Tranzit Zrt.	TRA-F-196	South Stream Hungary	Pipeline including CS	

ITALY

Snam Rete Gas S.p.A.	TRA-F-214	Support to the North West market and bidirectional cross-border flows	Pipeline including CS	
Snam Rete Gas S.p.A.	TRA-N-007	Development for new import from the South (Adriatica Line)	Pipeline including CS	
Snam Rete Gas S.p.A.	TRA-N-354	Interconnection with Slovenia	Pipeline including CS	
Snam Rete Gas S.p.A.	TRA-N-008	Import developments from North-East	Pipeline including CS	
Snam Rete Gas S.p.A.	TRA-N-009	Additional Southern developments	Pipeline including CS	
Snam Rete Gas S.p.A.	TRA-F-213	Support to the North West market	Pipeline including CS	
Snam Rete Gas S.p.A.		Sardinia Methanisation	Pipeline including CS	
STOGIT S.p.A.	UGS-F-1045	Bordolano Second phase	Storage Facility	
STOGIT	UGS-F-260	System Enhancements – Stogit – on-shore gas fields	Storage Facility	
STOGIT	UGS-F-259	Bordolano first phase	Storage Facility	
Edison Stoccaggio S.p.A	UGS-N-235	Nuovi Sviluppi Edison Stoccaggio	Storage Facility	
Edison Stoccaggio S.p.A	UGS-N-237	Palazzo Moroni	Storage Facility	
Edison Stoccaggio S.p.A	UGS-F-236	San Potito e Cotignola	Storage Facility	
Galsi S.p.A.	TRA-N-012	GALSI Pipeline Project	Pipeline including CS	
Nuove Energie S.r.l.	LNG-N-198	Porto Empedocle LNG	LNG Terminal	
Società Gasdotti Italia	TRA-N-974	LARINO – RECANATI Adriatic coast backbone	Pipeline including CS	
Società Gasdotti Italia	TRA-N-975	Sardinia Gas Transportation Network	Pipeline including CS	
Api Nova Energia	LNG-N-085	LNG off-shore regasification terminal of Falconara Marittima (Ancona)	LNG Terminal	
Gas Natural Fenosa	LNG-N-217	Zaule-LNG Terminal in Trieste	LNG Terminal	
GEOGASTOCK	UGS-N-288	Grottole-Ferandina Gas Storage	Storage Facility	
SORGENIA	LNG-N-088	LNG Medgas Terminal s.r.l.	LNG Terminal	
Ital Gas Storage	UGS-N-242	Cornegliano UGS	Storage Facility	
BG GROUP	LNG-N-011	Brindisi LNG	LNG Terminal	

ROMANIA

SNTGN Transgaz SA	TRA-F-029	Romania-Bulgaria Interconnection (EEPR-2009-INTg-RO-BG)	Pipeline including CS
SNTGN Transgaz SA	TRA-N-357	NTS developments in North-East Romania	Pipeline including CS
SNTGN Transgaz SA	TRA-N-139	Interconnection of the NTS with the DTS and reverse flow at Isaccea	Pipeline including CS
SNTGN Transgaz SA	TRA-N-964	New NTS developments for taking over gas from the Black Sea shore	Pipeline including CS
SNTGN Transgaz S.A.	TRA-N-358	Development on the Romanian territory of the NTS (BG–RO-HU-AT Corridor)	Pipeline including CS
SNTGN Transgaz SA	TRA-N-362	Development on the Romanian territory of the Southern Transmission Corridor	Pipeline including CS
SNTGN Transgaz SA	TRA-N-655	Eastring – Romania	Pipeline including CS
SNTGN Transgaz SA	TRA-N-959	Further enlargement of the BG–RO–HU–AT transmission corridor (BRUA) phase 3	Pipeline including CS
SNTGN Transgaz SA	TRA-N-126	Reverse flow on the interconnector RO-HU	Pipeline including CS
SNTGN Transgaz SA	TRA-N-132	EU Section of the AGRI project (East-West pipeline)	Pipeline including CS
White Stream Ltd	TRA-N-053	White Stream	Pipeline including CS
Societatea Națională de Gaze Naturale ROMGAZ S.A.	UGS-N-371	Sarmasel undeground gas storage in Romania	Storage Facility
Societatea Națională de Gaze Naturale ROMGAZ S.A.	UGS-N-366	New undergound gas storage in Romania	Storage Facility
Engie Romania SA	UGS-N-233	Depomures	Storage Facility
AGRI LNG Project Company SRL (RO)	TRA-N-376	Azerbaijan, Georgia, Romania Interconnector – AGRI	Pipeline including CS

SLOVAKIA

eustream, a.s.	TRA-F-017	System Enhancements - Eustream	Pipeline including CS
eustream, a.s.	TRA-N-190	Poland – Slovakia interconnection	Pipeline including CS
eustream, a.s.	TRA-N-902	Capacity increase at IP Lanžhot entry	Pipeline including CS
eustream, a.s.	TRA-F-016	Slovakia-Hungary interconnection	Pipeline including CS
Eastring B.V.	TRA-N-628	Eastring – Slovakia	Pipeline including CS

SLOVENIA				
Plinovodi d.o.o.	TRA-N-390	Upgrade of Rogatec interconnection (M1A/1 Interconnection Rogatec)	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-365	M6 Ajdovščina – Lucija	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-094	CS Kidričevo, 2nd phase of upgrade	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-108	M3 pipeline reconstruction from CS Ajdovščina to Šempeter/Gorizia	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-112	R15/1 Pince – Lendava – Kidričevo	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-389	Upgrade of Murfeld/Ceršak interconnection (M1/3 Interconnection Ceršak)	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-092	CS Ajdovščina, 1st phase of upgrade	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-093	CS Ajdovščina, 2nd phase of upgrade	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-099	M3/1a Šempeter - Ajdovščina	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-261	M3/1c Kalce – Vodice	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-262	M3/1b Ajdovščina – Kalce	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-101	M8 Kalce – Jelšane	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-107	M6 Interconnection Osp	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-114	R61 Dragonja – Izola	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-098	M9a Lendava – Kidričevo	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-263	M9b Kidričevo – Vodice	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-100	M10 Vodice – Rateče	Pipeline including CS	
Plinovodi d.o.o.	TRA-F-097	M2/1 Trojane-Vodice	Pipeline including CS	
Plinovodi d.o.o.	TRA-F-096	CS Kidričevo (3rd unit 3,5 MW)	Pipeline including CS	
Plinovodi d.o.o.	TRA-N-102	CS Vodice II (on M2/1 pipeline)	Pipeline including CS	
Plinovodi d.o.o.	TRA-F-110	MRS Šempeter reconstruction	Pipeline including CS	

Notes:

1. Slovenia: The project TRA-N-107 of the previous SC GRIP has been split in two projects TRA-N-107 and TRA-N- 365, in accordance with the submission to the TYNDP 2015, as it has been divided in two phases because M6 Ajdovščina-Lucija (TRA-N-365) is a system pipeline, which enables the connection of new municipalities along the route (46 km) and M6 Interconnection Osp (TRA-N-107) is a pipeline of length 1,2 km, which enables a new interconnection with the Italian network in Osp/San Dorligo della Valle.
2. Slovenia: The project TRA-N-109 of the previous GRIP has been renamed in the frame of the PCI 2015 application because it is a part of the PCI project 6.26 Cluster Croatia – Slovenia – Austria at Rogatec.
3. Greece: The projects TRA-N-940 and TRA-N-941 have replaced project TRA-N-512 that has been cancelled.
4. The project list includes some projects that have not been used in any assessment due to the absence of their mirror projects in neighbouring transmission systems (follow-up projects).
5. Italy: Project "Sardinia Methanisation", not yet part of TYNDP, includes the realisation of the natural gas transport network of Sardinia Island interconnected with new entry points from LNG plants. In accordance with the "Energy and Environmental Plan of Sardinia Region 2015–2030" the gas supply of the island network is guaranteed by LNG plants whose number and localisation are under consideration. The project includes a backbone National Network of about 380 km with diameter DN650/DN400 and regional network pipelines of about 190 km with diameter DN400/DN150 to supply the main consumption areas of the Region. The project is planned in three phases: the beginning will be in 2017 and 2018 and the completion between 2020 and 2022.

Image courtesy of Eustream

2.2 Projects by Country

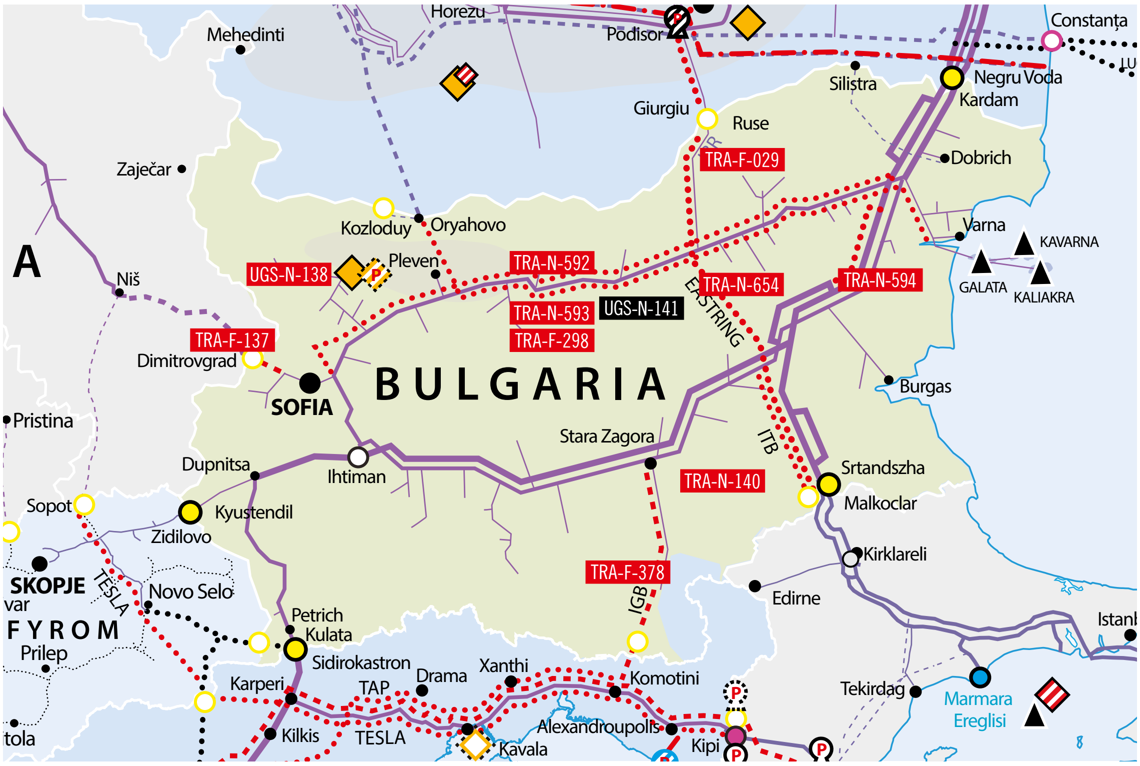
2.2.1 AUSTRIA

TSO PROJECTS						
	No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
•	1	TAG Reverse Flow	TRA-N-954	Non-FID	2018*	TAG Trans Austria Gasleitung

• Project not marked on the map

* Until the date of publication of the present document this date has been revised to 2019

2.2.2 BULGARIA



TSO PROJECTS					
No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Interconnection Turkey-Bulgaria	TRA-N-140	Non-FID, PCI 7.4.2	2020	BULGARTRANSGAZ
2	Eastring-Bulgaria	TRA-N-654	Non-FID, PCI 6.25.1	2021	
3	Rehabilitation, Modernisation and Expansion of the NTS	TRA-N-298	Non-FID, PCI, 6.8.2	2020	
• 4	A project for the construction of a gas pipeline BG-RO	TRA-N-379	Non-FID, PCI 6.8.4	2018*	
5	UGS Chiren Expansion	UGS-N-138	Non-FID, PCI 6.20.2	2022	
6	Looping CS Valchi Dol – Line valve Novi Iskar	TRA-N-592	Non-FID, PCI 6.25.4	2022	
7	Varna-Oryahovo gas pipeline	TRA-N-593	Non-FID, PCI 6.25.4	2022	
8	Construction of a Looping CS Provadia – Rupcha village	TRA-N-594	Non-FID, PCI 6.25.4	2022	
9	Construction of new gas storage facility on the territory of Bulgaria	UGS-N-141	Non-FID	Not defined	

THIRD PARTY PROJECTS					
No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Interconnection Bulgaria – Serbia	TRA-F-137	FID, PCI 6.10	2018**	Ministry of Energy of Bulgaria
2	Interconnector Greece-Bulgaria (IGB Project)	TRA-F-378	FID, PCI 6.8.1	2018**	ICGB AD

• Project not marked on the map

* The commissioning year is now "not defined"

** Updated commissioning year 2020

2.2.3 CROATIA

SLOVENIA
HUNGARY
CROATIA
BOSNIA HERZEGOVINA
MONTENEGRO
SER
Adriatic Sea
ADRIATICA PIPELINE
IAP
LJUBLJANA
ZAGREB
SARAJEVO
PODGORICA
BELGRADE
ROME
Tarvisio
Bordolano
Ceršak
Pince
Tornyószentmiklós
Siófok
Varosföld
Kidričevo
Nagykanizsa
Rogatec
Ajdovščina
Gorizia
Sempeter
Trieste
Zabok
Lučko
Zaule LNG
Koper
Umag
Karlovac
Rijeka
Omisalj
Krk
Lička Jasenica
Cavarzere
Porto Levante
Vodnjan
Pula
Ravenna
Rakovica
Tržac
Vel. Kladusa
Cazin
Bihač
Bos. Krupa
Banja Luka
Slobodnica
Brod
Modrica
Dravaszerdahely
Donji Miholac
Osijek
Sombor
Subotica
Kiskundorozsma
Bačko Novo Selo
Sotin
Novi Sad
Gospič
Loznica
Zvornik
Travnik
Zenica
G.Vakuf
Kiseljac
Zadar
Benkovac
Knin
Imotski
Posušje
Split
Mostar
Ploče
San Marino
Ancona
Recanati
Cellino
Chieti
L'Aquila
Larino
Campobasso
TRA-N-112
TRA-N-390
TRA-N-1057
TRA-N-86
TRA-N-334
TRA-N-075
TRA-N-1058
TRA-N-336
TRA-N-90
LNG-N-082
TRA-N-303
TRA-N-910
TRA-N-070
TRA-N-066
TRA-N-302
TRA-N-068

Image courtesy of Plinacro

TSO PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Compressor station 1 at the Croatian gas transmission system	TRA-F-334	FID PCI 6.26.3	2017*	PLINACRO L.T.D GAS TRANSMISSION SYSTEM OPERATOR
2	LNG evacuation pipeline Omišalj - Zlobin (Croatia)	TRA-N-090	Advanced Non-FID PCI 6.5.1	2018*	
3	Interconnection Croatia Slovenia (Lučko-Zabok-Rogatec)	TRA-F-086	FID** PCI 6.26.1	2019	
4	Interconnection Croatia -Bosnia and Herzegovina (Slobodnica-Bosanski Brod)	TRA-N-066	Advanced Non-FID	2019	
5	LNG evacuation pipeline Zlobin-Bosiljevo-Sisak-Kozarac	TRA-N-075	Advanced Non-FID PCI 6.5.2	2020	
6	Interconnection Croatia-Bosnia and Herzegovina (South)	TRA-N-302	Advanced Non-FID	2021	
7	Ionian Adriatic Pipeline	TRA-N-068	Advanced Non-FID	2022	
8	Compressor stations 2 and 3 at the Croatian gas tranmission system	TRA-N-1057	Non-FID PCI 6.26.3	2020	
9	Interconnection Croatia/Serbia (Slobdnica-Sotin-Bačko Novo Selo)	TRA-N-070	Non-FID	2023	
10	LNG Evacuation Pipeline Kozarac-Slobodnica	TRA-N-1058	Non-FID PCI 6.5.2	2023	
11	Interconnection Croatia-Bosnia and Herzegovina (west)	TRA-N-303	Non-FID	2026	
12	Interconnection Croatia/Slovenia (Umag-Koper)	TRA-N-336	Non-FID	2026	

THIRD PARTY PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	LNG terminal Krk	LNG-N-082	Non-FID PCI 6.5.1	2018*	LNG HRVATSKA

* Commissioning date has been updated to 2020

** This project has lost its FID status

2.2.4 GREECE


SKOPJE
Tetovo
Gostivar
FYROM
Prilep
Kafasan
Bitola
TESLA
Novo Selo
Petrich
Kulata
Sidirokastron
Karperi
TAP
Drama
Xanthi
Komotini
TRA-F-378
IGB
Kirklareli
Edirne
Istanbul
Tekirdag
Marmara
Ereglisi
TRA-N-1129
TRA-N-128
TRA-N-631
Alexandroupolis
TRA-N-063
Kipi
Alexandroupolis LNG
LNG-N-062
Kavala
UGS-N-385
TESLA
Kilkis
TRA-N-967
Thessaloniki
Nea Messimvria
TAP
TRA-N-971
Katerini
TRA-N-014
IGI
Karacabey
Gulf of Saros
Canakkale
Balikesir
Thesprotia
Trikala
Larissa
Volos
Florovouni
Aegean
Sea
EAST MED
Lamia
GREECE
Manisa
Turgutlu
Izmir
Halkida
Aliveri
Thiva
ATHENS
LNG-F-147
Revythoussa
Agia Triada
Aydin
Megalopolis
EAST MED
CRETA

TSO PROJECTS

No.	Project	TYNDP Code	Commissioning (TYNDP 2017)	Status	TSO/Sponsor
1	Komotini – Thesprotia pipeline	TRA-N-014	2023*	Non-FID PCI 7.1.7	DESFA Hellenic Gas Transmission System Operator S.A.
2	Compressor Station at Kipi	TRA-N-128	2020	Non-FID PCI 6.9.3 PCI 7.1.2 PCI 7.4.1	
3	Greek part of Tesla project	TRA-N-631	2020	Non FID PCI 6.25.2	
• 4	M/R station at Komotini	TRA-N-940	2020	Non_FID PCI 7.1.6	
• 5	M/R station at Nea Messimvria	TRA-N-941	2019	FID PCI 7.1.6	
• 6	M/R at Komotini to IGB**	TRA-N-957	2020	Non-FID	
7	M/R at Alexandroupoli	TRA-N-1090	2020	Non-FID	
• 8	M/R at UGS South Kavala	TRA-N-1092	2023	Non-FID	
• 9	M/R at Megalopoli	TRA-N-1091	2022	Non-FID	
10	Nea-Messimvria to FYRoM pipeline	TRA-N-967	2020	Non-FID	
11	Compressor station at Nea Messimvria for connection to TAP	TRA-N-971	2022	Non-FID	
12	Revythoussa (2nd upgrade)	LNG-F-147	2018	FID	

THIRD PARTY PROJECTS

No.	Project	TYNDP Code	Commissioning (TYNDP 2017)	Status	TSO/Sponsor
1	LNG terminal in northern Greece/ Alexandroupolis – LNG Section	LNG-N-062	2018	Non-FID PCI 6.9.1	gastrade
2	LNG terminal in northern Greece/ Alexandroupolis – Pipeline Section	LNG-N-063	2018	Non-FID PCI 6.9.1	
3	South Kavala UGS	UGS-N-385	2022	Non-FID	Hellenic Republic Asset Development Fund
4	Interconnector Greece-Bulgaria (IGB Project)	TRA-F-378	2018	FID, PCI 6.8.1	ICGB AD

• Project not marked on the map

* This project is on hold due to lack of expression of interest by the market

** This project is included in the TYNDP 2017 – 26 but will most probably be part of the IGB project

2.2.5 HUNGARY

TSO PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Romanian-Hungarian reverse flow Hungarian section 1st stage	TRA-N-286	FID PCI 6.24.1	2020*	FGSZ LTD.
2	Slovenian-Hungarian interconnector	TRA-N-325	Non-FID PCI 6.23	2020	
3	HU-UA reverse flow	TRA-N-586	Non-FID	2020	
4	Eastring – Hungary	TRA-N-656	Non-FID PCI 6.25.1	2021	
5	Városföld – Ercsi – Győr	TRA-N-018	Non-FID PCI 6.24.4	2022	
6	Ercsi-Százhalombatta	TRA-N-061	Non-FID PCI 6.24.5	2022	
7	Városföld CS	TRA-N-123	Non-FID PCI 6.24.6	2022	
8	Romanian-Hungarian reverse flow Hungarian section 2nd stage	TRA-N-377	Non-FID PCI 6.25.2	2022	
9	Hajdúszoboszló CS	TRA-N-065	Non-FID	–	
10	Hungarian Section of Tesla*	TRA-N-585	Non-FID PCI 6.25.2	2020	
11	BG – RO – HU – AT Transmission Corridor*	TRA-N-380	Non-FID PCI 6.25.3	2024	

* The 2016 issue of the Hungarian National Development Plan does not include this projects.

THIRD PARTY PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
• 1	Enhancement of Transmission Capacity of Slovak-Hungarian interconnector	TRA-N-524	Non-FID	2017	MAGYAR GÁZ TRANZIT ZRt.
• 2	Development of Transmission Capacity of Slovak-Hungarian Interconnector	TRA-N-636	Non-FID	2017	
3	Vecsés – Városföld gas transit pipeline*	TRA-N-831	Non-FID	2021	

• Project not marked on the map

* The 2016 issue of the Hungarian National Development Plan does not include this projects.

Image courtesy of FGSZ

2.2.6 ITALY

TSO PROJECTS

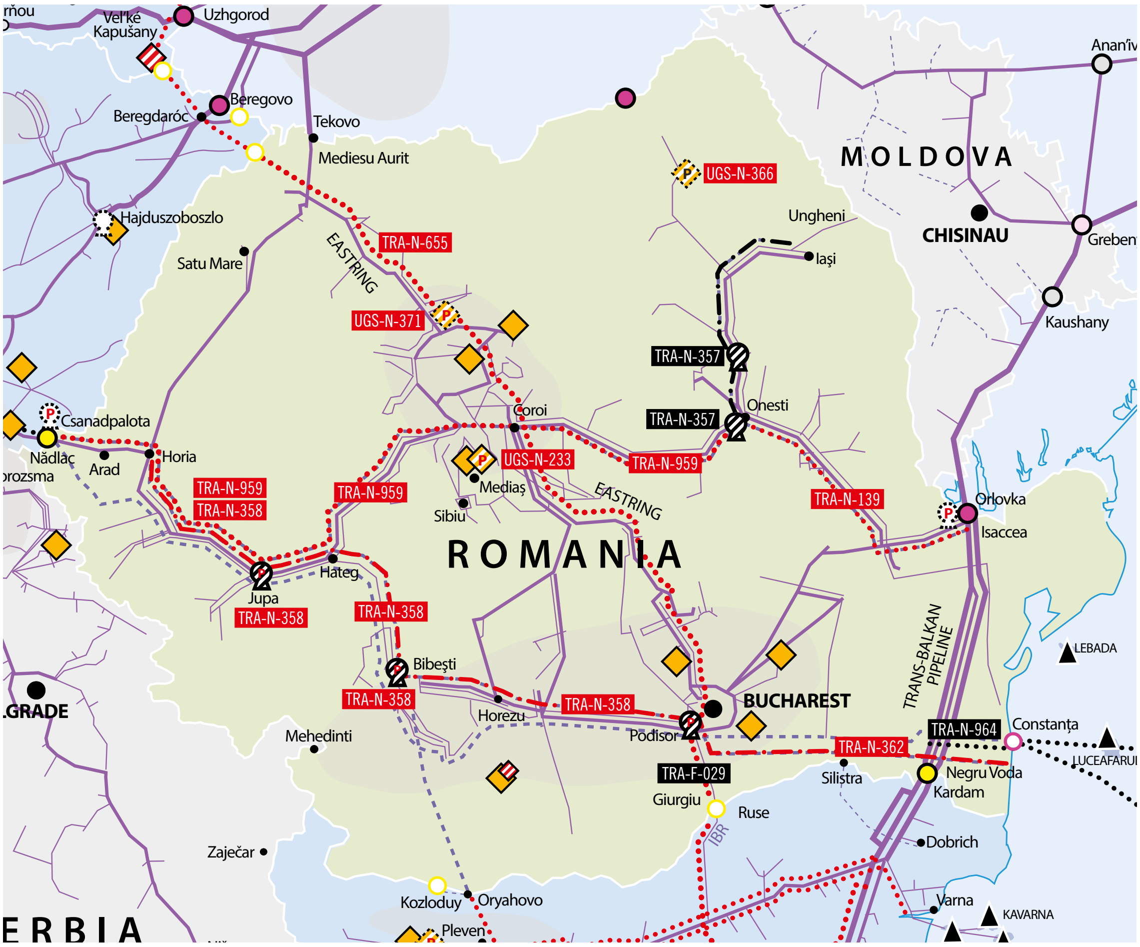
No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Support to the North West market and bidirectional cross-border flows	TRA-F-214	FID PCI 5.11	2018	SNAM RETE GAS
2	Development for new import from the South (Adriatica Line)	TRA-N-007	Non-FID PCI 6.18	2023	
• 3	Interconnection with Slovenia	TRA-N-354	Non-FID	2023	
4	Import developments from North-East	TRA-N-008	Non-FID	2034*	
5	Additional Southern developments	TRA-N-009	Non-FID	2034*	
• 6	Sardinia Methanisation		Non-FID	2020–2022	

THIRD PARTY PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	GALSI Pipeline Project	TRA-N-012	Non-FID Advanced PCI 5.20	2019	Galsi
2	LARINO – RECANATI Adriatic coast backbone	TRA-N-974	Non-FID Advanced	2022	S.G.I. Società Gasdotti Italia S.p.A.
3	Sardinia Gas Transportation Network	TRA-N-975	Non-FID	2031	
4	Bordolano Second phase	UGS-F-1045	FID	2019	STOGIT
• 5	System Enhancements – Stogit – on-shore gas fields	UGS-F-260	FID	2026	
6	Nuovi Sviluppi Edison Stoccaggio	UGS-N-235	Non-FID Advanced	2017	Edison
7	Palazzo Moroni	UGS-N-237	Non-FID Advanced	2019	
8	Porto Empedocle LNG	LNG-N-198	Non-FID Advanced	2021	enel
9	Onshore LNG terminal in the Northern Adriatic	LNG-N-217	Non-FID	2021	gasNatural fenosa

- Project not marked on the map

2.2.7 ROMANIA


Uzhgorod
Veľké Kapušany
Beregovo
Beregdaróc
Tekovo
Mediesu Aurit
Hajduszoboszlo
Satu Mare
EASTRING
TRA-N-655
UGS-N-371
UGS-N-366
Ungheni
Iași
MOLDOVA
CHISINAU
Ananiv
Grebeniki
Kaushany
TRA-N-357
TRA-N-357
Onesti
Csanadpalota
Nădlac
Arad
Horia
TRA-N-959
TRA-N-358
TRA-N-959
Coroi
UGS-N-233
Mediaș
Sibiu
TRA-N-959
EASTRING
TRA-N-139
Orlovka
Isaccea
ROMANIA
Jupa
Hațeg
TRA-N-358
TRA-N-358
Bibești
TRA-N-358
TRANS-BALKAN PIPELINE
LEBADA
BUCHAREST
Horezu
TRA-N-358
Podișor
TRA-N-964
Constanța
TRA-N-362
LUCEAFARUL
Mehedinti
TRA-F-029
Silistra
Negru Voda
Kardam
Giurgiu
Ruse
IBR
Dobrich
Zaječar
Kozloduy
Oryahovo
Varna
KAVARNA
Pleven
ERBIA

TSO PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Romania-Bulgaria Interconnection (EEPR-2009-INTg-RO-BG)	TRA-F-029	FID	December 2016	TRANSGAZ MAGISTRALA ENERGIEI
2	NTS developments in North-East Romania	TRA-N-357	Advanced Non-FID	2018	
3	Interconnection of the NTS with the DTS and reverse flow at Isaccea	TRA-N-139	Non-FID PCI – 6.15	2019	
4	New NTS developments for taking over gas from the Black Sea shore	TRA-N-964	Non-FID	2019	
5	Development on the Romanian territory of the NTS (BG–RO-HU-AT Corridor)	TRA-N-358	Stage I – FID PCI – 6.24.2	2020	
			Stage II –Advanced Non-FID PCI – 6.24.7	2020	
6	Development on the Romanian territory of the Southern Transmission Corridor	TRA-N-362	Advanced Non-FID PCI – 6.24.8	2020	
7	Eastring – Romania	TRA-N-655	Non-FID PCI – 6.25.1	2021	
8	Further enlargement of the BG-RO-HU-AT transmission corridor (BRUA) phase 3	TRA-N-959	Non-FID PCI – 6.25.3	2023	

THIRD PARTY PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Sarmasel Underground gas storage in Romania	UGS-N-371	Non-FID PCI 6.20.6	2022	ROMGAZ Societatea Națională de Gaze Naturale ROMGAZ S.A.
2	New underground gas storage in Romania	UGS-N-366	Non-FID PCI 6.20.5	2023	
• 3	Depomures	UGS-N-233	Advanced Non-FID PCI – 6.20.4	2019	engie Engie Romania SA
• 4	Azerbaijan, Georgia, Romania Interconnector – AGRI	TRA-N-376	Non-FID	2026	AGRI LNG Project Company SRL (RO)

- Project not marked on the map

2.2.8 SLOVAKIA

TSO PROJECTS

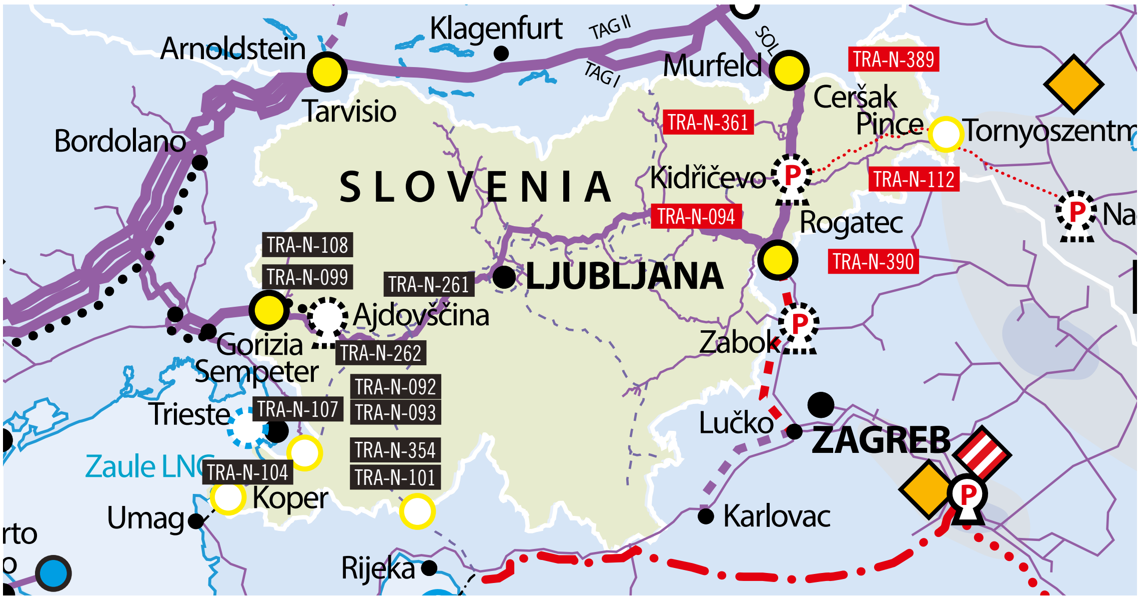
No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	System enhancements – Eustream	TRA-F-017	FID PCI 6.3	2026	eustream SLOVAK GAS TSO
2	Poland – Slovakia interconnection	TRA-N-190	Advanced Non-FID PCI 6.2.1	2019*	
3	Capacity increase at IP Lanžhot entry	TRA-N-902	Advanced Non-FID	2019	

THIRD PARTY PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Eastring – Slovakia	TRA-N-628	Non-FID PCI 6.25.1	2021	Eastring B.V.

* Since the publication of TYNDP 2017 the commissioning date was changed to 2021

2.2.9 SLOVENIA



TSO PROJECTS

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2017)	TSO/Sponsor
1	Upgrade of Rogatec interconnection (M1A/1 Interconnection Rogatec)	TRA-N-390	Advanced Non-FID PCI 6.26.6	2020	Plinovodi
• 2	M6 Ajdovščina – Lucija	TRA-N-365	Non-FID	2019	
3	CS Kidričevo, 2nd phase of upgrade	TRA-N-094	Non-FID PCI 6.26.2	2020	
4	M3 pipeline reconstruction from CS Ajdovščina to Šempeter/Gorizia	TRA-N-108	Non-FID	2020	
5	R15/1 Pince – Lendava – Kidričevo	TRA-N-112	Non-FID PCI 6.23	2020	
6	Upgrade of Murfeld/Ceršak interconnection (M1/3 Interconnection Ceršak)	TRA-N-389	Non-FID PCI 6.26.5	2020	
7	CS Ajdovščina, 1st phase of upgrade	TRA-N-092	Non-FID	2021	
8	CS Ajdovščina, 2nd phase of upgrade	TRA-N-093	Non-FID	2022	
9	M3/1a Šempeter – Ajdovščina	TRA-N-099	Non-FID	2022	
10	M3/1c Kalce – Vodice	TRA-N-261	Non-FID	2022	
11	M3/1b Ajdovščina – Kalce	TRA-N-262	Non-FID	2022	
12	M8 Kalce – Jelšane	TRA-N-101	Non-FID	2022	
13	M6 Interconnection Osp	TRA-N-107	Non-FID	2022	
14	R61 Dragonja – Izola	TRA-N-114	Non-FID	2024	

• Project not marked on the map

2.3 Projects involving more than two EU Countries or non EU Countries or Offshore Projects

PROJECTS INVOLVING MORE THAN TWO EU COUNTRIES OR NON EU COUNTRIES OR OFFSHORE PROJECTS					
Project	**TYNDP Code**	**PCI 2015 Code**	**Promoter**	**Status**	**Commissioning** (TYNDP 2017)
Interconnection Bulgaria – Serbia	TRA-F-137	6.10	Ministry of Energy of Bulgaria	FID	2018*
TANAP – Trans Anatolian Natural Gas Pipeline Project	TRA-F-221	7.11	TANAP	FID	2018
Trans Adriatic Pipeline	TRA-F-051	7.1.3	Trans Adriatic Pipeline	FID	2019
Poseidon Pipeline	TRA-N-010	7.1.4	IGI Poseidon	Advanced Non-FID	2020
EastMed Pipeline	TRA-N-330	7.3.1	ΔΕΠΑ	Non-FID	2020
White Stream	TRA-N-053	–	W-Stream	Non-FID	2022
Interconnection Bulgaria – FYRoM	TRA-N-976	–	MER JSC Skopje	Non-FID	2021
Interconnection Greece – FYRoM (FYRoM part)	TRA-N-980	–	MER JSC Skopje	Non-FID	2021

* Since the submission of project data for the preparation of the TYNDP 2017, the commissioning date has been moved to 2020


CZECH REP.
SLOVAKIA
AUSTRIA
SWITZERLAND
HUNGARY
SLOVENIA
CROATIA
ROMANIA
MOLDOVA
ITALY
BOSNIA HERZEGOVINA
SERBIA
MONTENEGRO
UNMI KOSOVO
FYROM
ALBANIA
BULGARIA
GREECE
CORSICA
SARDINIA
MALTA
CRETA
Ligurian Sea
Adriatic Sea
Tyrrhenian Sea
Ionian Sea
Aegean Sea
PRAGUE
VIENNA
BRATISLAVA
BUDAPEST
BERN
LJUBLJANA
ZAGREB
BELGRADE
SARAJEVO
PODGORICA
TIRANA
SKOPJE
SOFIA
BUCHAREST
CHISINAU
ROME
ATHENS
TUNIS
LA VALETTA
TAP
TESLA
EASTRING
TRA-F-137
TRA-N-053
TRA-F-051
TRA-N-010
TRA-N-330
TRA-F-221
EAST MED

3 Demand

Annual Demand | Annual Demand Breakdown
Peak Demand | Annual & Peak Demand Evolution
The impact of renewables on gas demand in the SC countries

image courtesy of DESFA

The following chapter shows the historical and potential development of demand and supply in the Region. All figures used have been sourced from the TYNDP 2017–26 or the Transmission System Operators (TSOs) of the Region in 2016, unless otherwise stated[1]. All ENTSOG data in this part come from the Blue transition scenario as described in ENTSOG's TYNDP 2017[2].

The following diagram shows the relative weigh of countries in EU-28

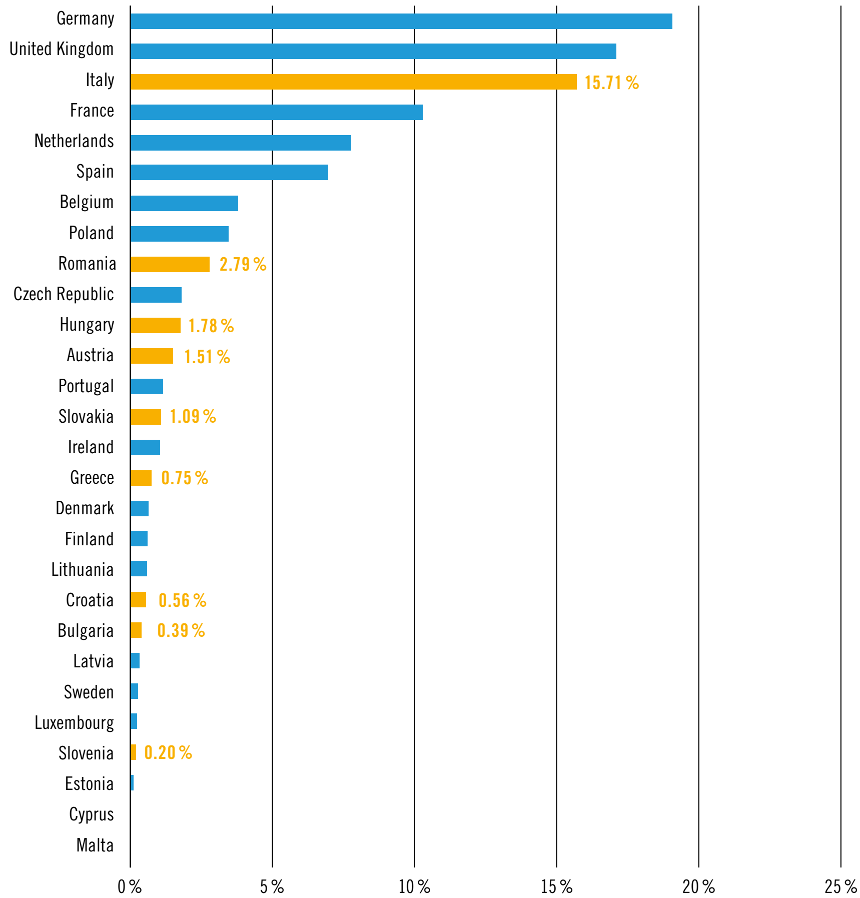


Figure 3.1: Annual gas consumption in the EU countries in 2015

Among the countries of the Southern Corridor Italy remains the largest gas market as it represents 63 % of the total gas consumption in the Region. This consumption gap has slightly widened since 2012 when it was 61 %.

1) Demand data refer to TSOs contributions sent to ENTSOG in April 2016 and their projections may have, in some cases, changed until the publication date.

2) For details about the TYNDP scenarios please refer to http://www.entsog.eu/publications/tyndp

3.1 Annual demand

Figure 3.2 below shows the historical and forecasted annual gas demand of the Southern Corridor Region compared to the rest of the European Union between 2013 and 2026. It shows that historically the 9 countries of the Southern Corridor Region made up around 25 % of the total EU demand.

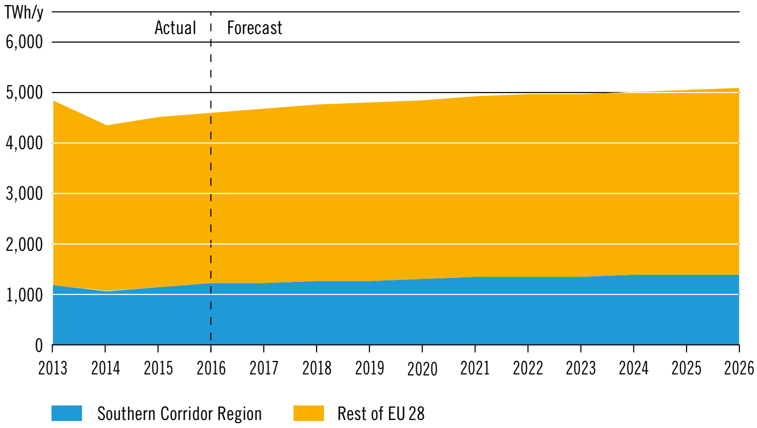


Figure 3.2: EU 28 and Southern Corridor annual gas demand

The demand for natural gas is expected to mark a moderate increase over the next ten years and this despite the decrease registered in some of the recent years. The countries of the Southern Corridor Region estimate to account for more than 27 % of the total EU gas demand in 10 years as shown in the following table 3.1. This increase, from 26,2 % to 27.4 %, in the forecast of the 10 next years, reflects the present potential still to be exploited in several of the Region's gas markets, where natural gas was rather recently introduced in the energy mix therefore the penetration of gas is still ongoing and the perspectives for increase of gas demand for power generation in some of the Region's countries.

%	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
S. Corridor	24,6 %	24,5 %	24,8 %	26,2 %	26,2 %	26,3 %	26,6 %	26,8 %	27,1 %	27,3 %	27,4 %	27,5 %	27,3 %	27,4 %

Table 3.1: Annual demand share of Southern Corridor region

Figure 3.3 below shows a comparison between the actual and forecast demand figures in the Southern Corridor GRIP 2014–2023 and the ones provided by the TSOs for this GRIP. The chart shows the annual demand evolution of the Southern Corridor Region.

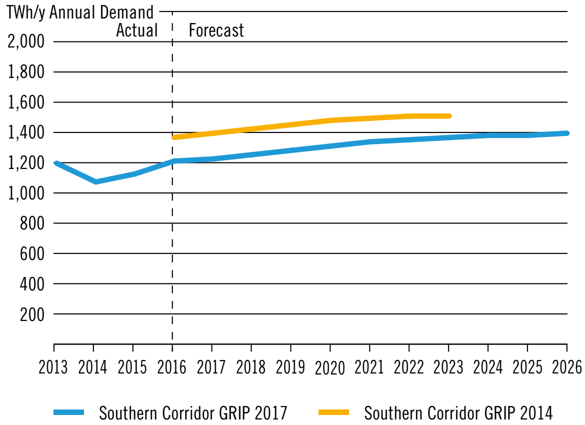


Figure 3.3: Southern Corridor annual gas demand GRIP 2017–2026 comparison & SC GRIP 2014–2023

The graph confirms the trend of the last years, according to which a slight increase in annual demand is shown over the period however the consecutive demand forecasts have been adjusted to reflect actual gas demand levels.

The evolution between Southern Corridor GRIP demand forecast 2014–2023 and 2017–2026 is shown in the following table:

	2017	2018	2019	2020	2021	2022	2023
Difference (TWh)	–160	–174	–176	–174	–167	–156	–146
Difference (%)	–13 %	–14 %	–14 %	–13 %	–12 %	–12 %	–11 %

Table 3.2: Decrease between demand forecast of Southern Corridor GRIP 2014–2023 and 2017–2026

3.2 Annual Demand Breakdown

Figure 3.4 shows the annual demand breakdown of the Southern Corridor Region for the last seven years together with their percentage evolution. The chart is broken down into Final (Residential, Commercial, Industrial & Transport) demand compared to Power Generation demand. We may see the downward trend that prevailed in the last five years, mainly in the Power Generation sector. On one hand cheap coal combined with low carbon prices from the EU Emission Trading Scheme (ETS) have made it, during part of this period, attractive to make use of coal fired instead of gas fired power plants. On the other hand, progression of Renewable Energy Sources (RES) may have reduced overall demand of Gas for power generation although they support the role of CCGTs in the stability of electrical systems due to the high intermittency of power production from RES. However this downward trend was reversed in 2015 due to the decrease of the oil price which, to some extent led to a decrease of gas price. This reversal was confirmed also in 2016 and similar positive consumption patterns have been detected also in the first part of 2017. Gas demand is also expected to be increased due to the phasing out of nuclear plants and the pressure to reduce pollution from coal fired plants. Bio-methane is one more promising factor for the longer term.

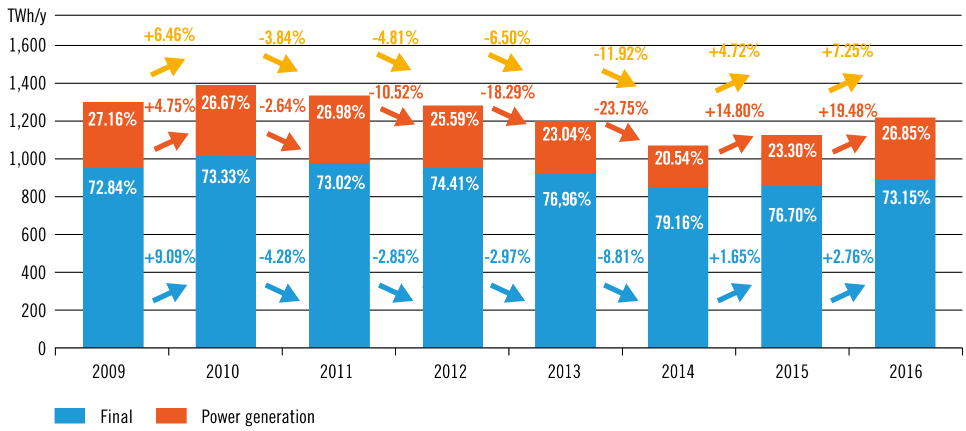


Figure 3.4: Evolution of Southern Corridor yearly demand in the period 2009 – 2016 and its breakdown

The historical data in figure 3.5 illustrates, that annual temperatures and economic downturn also heavily influence gas demand. This is due to the high percentage of households (in most countries) that rely on gas for heating, as demand increases when outdoor temperatures decrease. Since annual weather conditions cannot be forecasted, such extremes are not included in annual demand forecasts. In the same way, economic growth rates can only be reasonably assumed during forecasting, without the possibility to anticipate negative or positive unexpected shocks. This should be borne in mind when comparing actual data and forecasts.

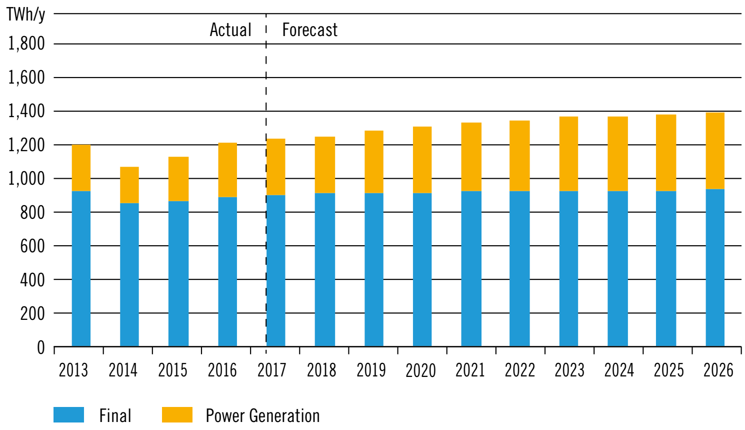


Figure 3.5: Southern Corridor Yearly Demand Breakdown (historical and forecast)

The reasons for the higher expected increase in the power generation sector are the relative immaturity of gas fired power generation sector in several countries (see Fig. 3.9 on the following pages) and the complementarity with renewable energy sources that CCGT power plants can offer.

The maps in the following Figures 3.6 to 3.8 depict the demand evolution per country in total and broken down to Residential-Commercial-Industrial (RCI) and Power Generation[3].

3) Figures 3.5 and 3.6 do not contain information on Austria as its demand breakdown between RCI and power generation is not available.

Figure 3.6: Southern Corridor countries annual demand evolution over the period 2017–2026

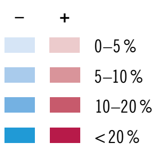


Figure 3.7: Southern Corridor countries RCI annual demand evolution over the period 2017–2026

Figure 3.8: Southern Corridor countries annual gas demand for power generation evolution over the period 2017–2026

3.3 Peak Demand

3.3.1 DEMAND MODULATION

The graphs of the following figure 3.9 show the daily demand in 2013, 2014 and 2015 in every country as well as the part of it attributed to power generation.

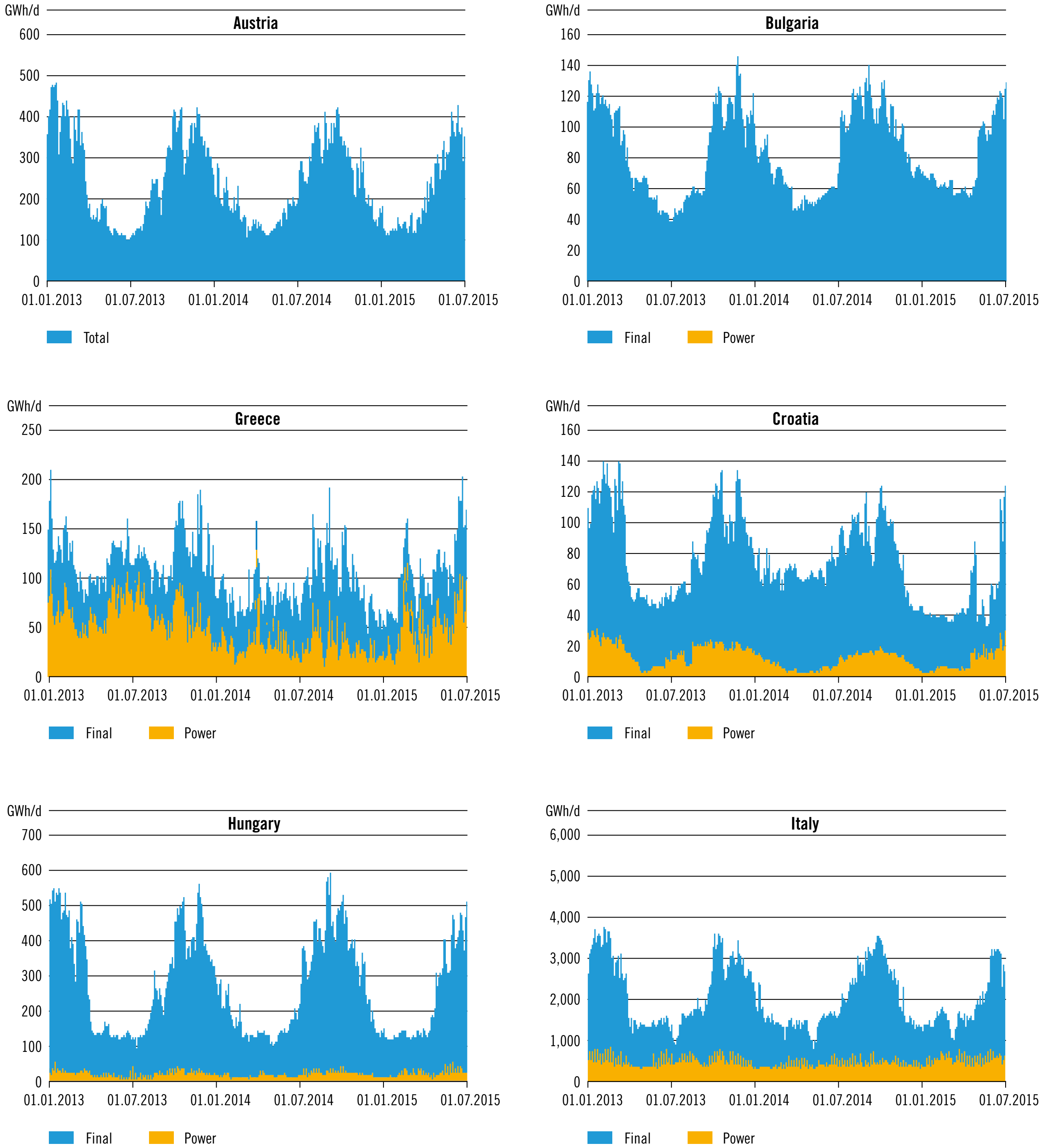
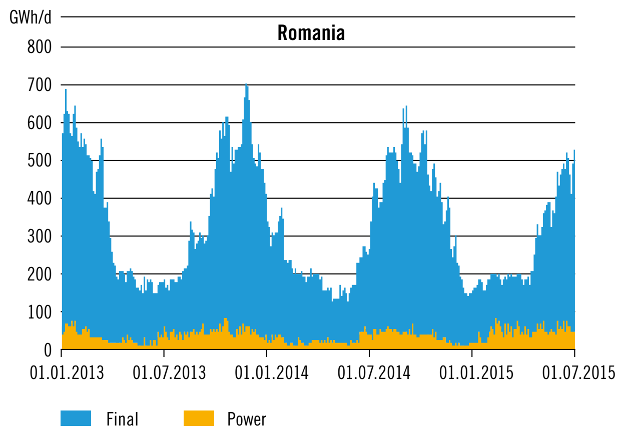
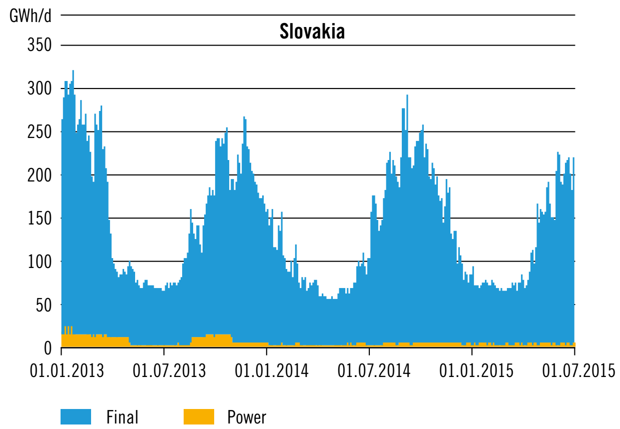
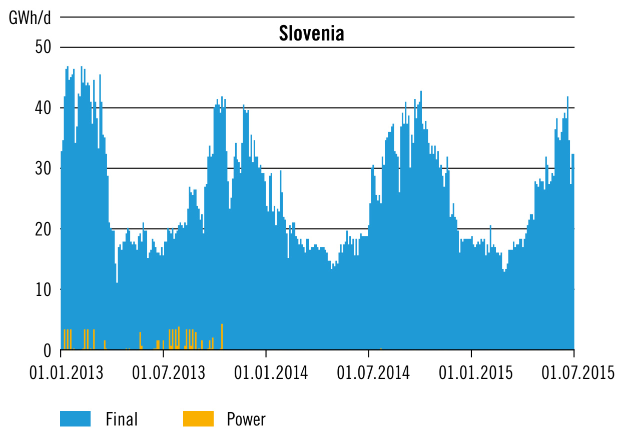


Figure 3.9: Demand profile per country in 2013, 2014 and 2015







It results from the analysis of the graphs of Fig. 3.9 that countries with less use of gas for power generation (therefore more subject to the weather dependent residential sector demand) and having a more continental climate have less flat demand profiles. Greece which combines the higher rate of gas use for power generation and the milder climate as well as a still immature residential market, has the more flat demand profile, i.e. the higher (yearly) ratio between average and maximum demand.

These graphs also show that most of the gas demand for power generation comes from Italy, followed, far behind, by Greece, Hungary, Romania and Croatia[4)] and that there is an important potential for increase of this type of demand in the Region.

They, moreover, show that the highest daily demand remained at comparable level, across the period considered, in each country, being mainly affected by winter demand. This signal is particularly important for gas infrastructure operators in order to keep the safety and performance of gas systems, and the related underlying assets ready to face peak requirements. This is the main prerequisite to guarantee adequate security of supply standards to domestic, and to a higher level, Regional energy system.

4) No data for the use of gas in power generation are available for Austria and Bulgaria

3.3.2 Forecast peak daily demand

Daily peak demand is of vital importance, as it is the main criterion for network design. The chart below shows the historical Regional aggregated peak demand over the last 4 years. This demand is the sum of national peak demand days during the last four years that may have occurred on different days in each country. The tables below show the comparison between the Southern Corridor GRIP 2014–2023, and Southern Corridor GRIP 2017–2026 data. It results that the forecasted peak demand has been reassessed in the two consecutive investment plans, following the trend of the average demand established in the last years.

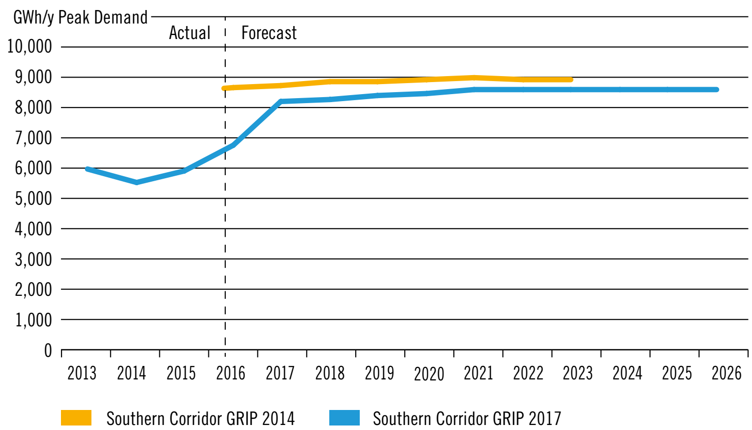


Figure 3.10: Southern Corridor peak demand comparison between the SC GRIP 2014–2023 and SC GRIP 2017–2026

Peak demand forecasts show a decrease consistent with annual demand revisions, but their contractions are relatively less important as the percentage decreases of peak demand are about half of the corresponding reductions of the total demand. This means that the gas infrastructures are still key and necessary for reasons of security of supply and market integration as well as for supporting the increase of the use of RES in the power production.

	2017	2018	2019	2020	2021	2022	2023
Difference (TWh)	–545	–563	–504	–462	–389	–365	–348
Difference (%)	–7 %	–7 %	–6 %	–5 %	–5 %	–4 %	–4 %

Table 3.3: Decrease of peak demand daily forecast between GRIP 2014–2023 and GRIP 2017–2026

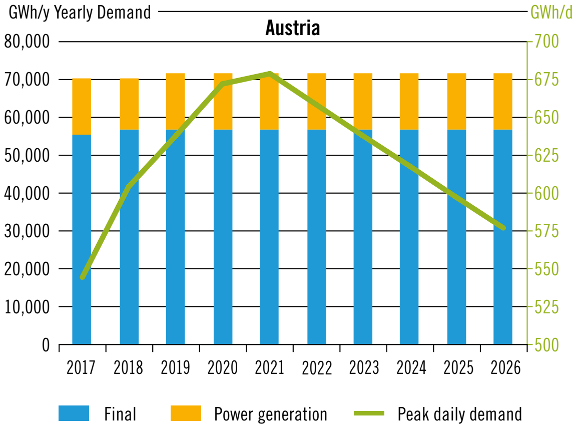
3.4 Annual and Peak Demand evolution

In this paragraph we present forecasted data of annual and peak daily demand country by country. The Regional increase in annual demand is expected to be 16 %. From the graphs of figure 3.11 it results that Bulgaria, Croatia, Hungary, Italy and Slovenia expect an increase in gas demand for power generation. Moreover it is shown that in several countries the increase percentage of the daily peak demand is expected to exceed the one of the yearly demand. This may be attributed to the increase of intermittency of the CCGT operation needed to support the use of renewable energy sources.

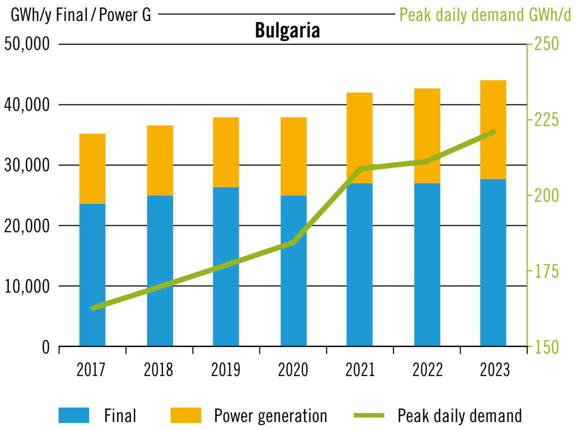
The evolution of the annual demand refers to the period 2017–2026[5].

Please note that the peak demand line corresponds to the right-hand vertical axis. Therefore the distance of this line from the bars representing the annual demand (read on the left-hand axis) does not have any significance.

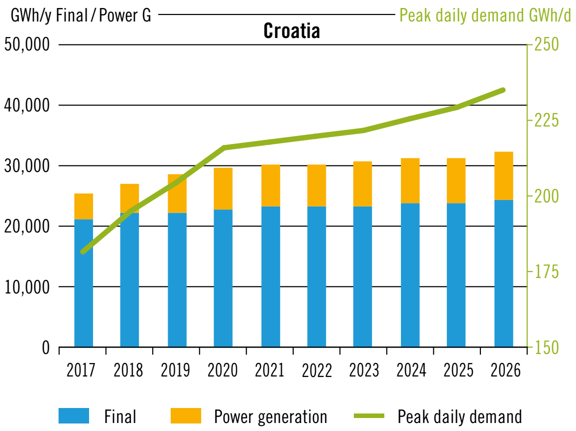
The right graphs provide an additional sign on the importance of peak demand requirements in terms of disaggregated analysis per country. Peak daily demand is growing in the majority of Regional States, providing an indication for potential infrastructure development needs. This conclusion is particularly relevant for those countries having still an important potential ahead. For mature markets peak demand is more stable and infrastructure enhancements could be more linked to the changing evolution of demand and supply patterns and to the necessity to adequately refurbish gas system components and equipment.



Evolution of annual demand (%): 0.36
Evolution of Final/PowerG (%): 2/–6[6]
Evolution of peak demand (%): 6



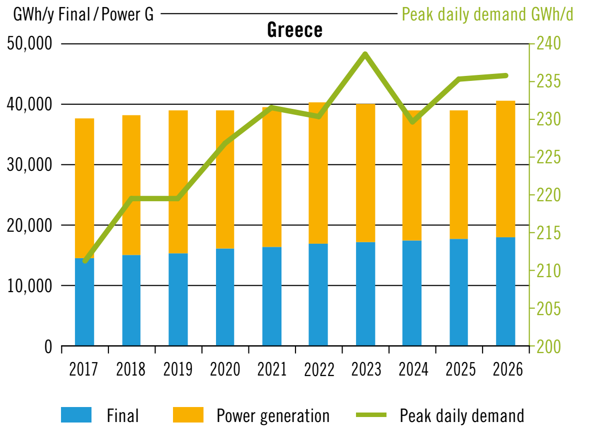
Evolution of annual demand (%): 29
Evolution of Final /PowerG (%): 19/50
Evolution of peak demand (%): 55



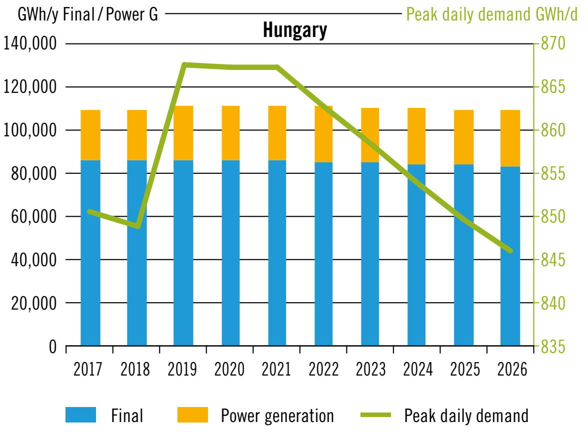
Evolution of annual demand (%): 26
Evolution of Final /PowerG (%): 14/88
Evolution of peak demand (%): 29

5) Demand data refer to TSOs contributions sent to ENTSOG in April 2016 and their projections may have, in some cases, changed until the publication date.

6) Figures 3.11 do not contain information on the demand breakdown between RCI and power generation in Austria as this is not available.

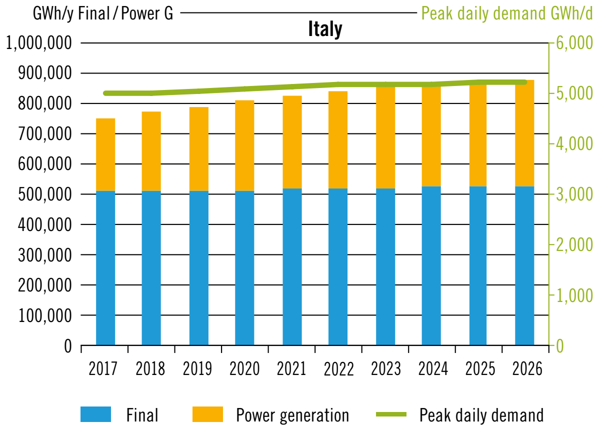


Evolution of annual demand (%): 7
Evolution of Final/PowerG (%): 25/–3
Evolution of peak demand (%): 12

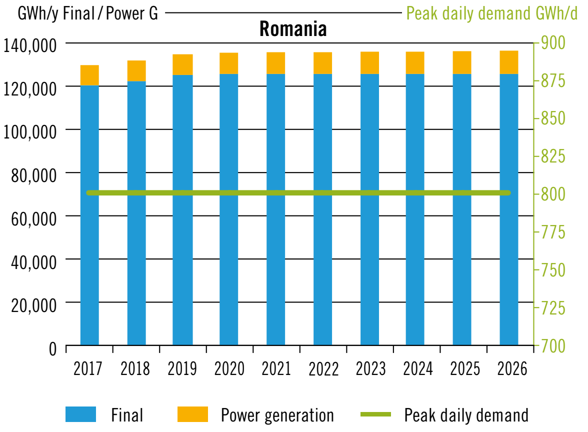


Evolution of annual demand (%): 0
Evolution of Final /PowerG (%): –3/8
Evolution of peak demand (%): –1

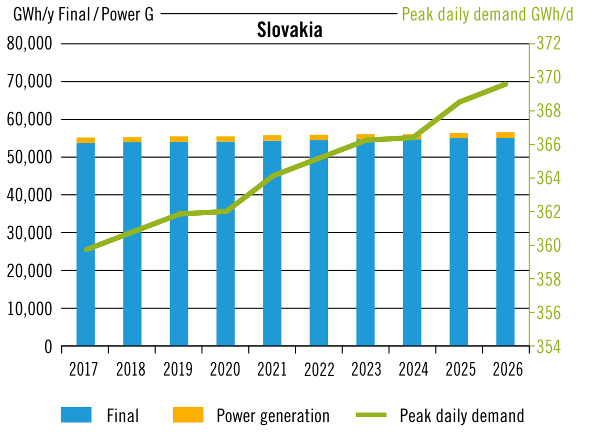
The Hungarian DCI data also contains the gas forecast demand of power generation facilities connected to the distribution system.



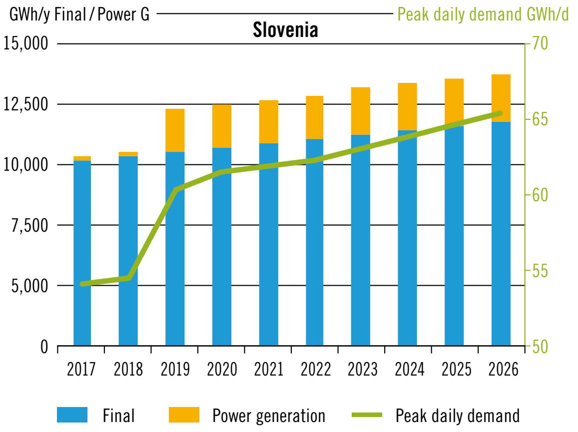
Evolution of annual demand (%): 17
Evolution of Final /PowerG (%): 2/49
Evolution of peak demand (%): 4



Evolution of annual demand (%): 5
Evolution of Final/PowerG (%): 4/14
Evolution of peak demand (%): 0



Evolution of annual demand (%): 3
Evolution of Final /PowerG (%): 3/3
Evolution of peak demand (%): 3



Evolution of annual demand (%): 46
Evolution of Final /PowerG (%): 20/4467
Evolution of peak demand (%): 42

Figure 3.11: Evolution of actual and forecast gas demand per country

3.5 The impact of renewables on gas demand in the Southern Corridor countries

The most significant developments expected in terms of European energy and climate policy objectives, destined to promote renewable energy sources and energy efficiency, will be driven by the following acts formulating targets for 2020 (2020 Energy Strategy[7)]), 2030 (2030 Energy Strategy[8)]) and 2050 (Energy Roadmap 2050[9)]) and by the adoption of a challenging long-term strategy with progressively higher objectives.

In the Southern Corridor Region there are no available yearly data in all countries about planed installation and the usage of renewable sources in primary energy production over the next ten years.

Impacts of RES on the overall gas demand are difficult to estimate depending on key energy policy decisions (e.g. coal or nuclear phase out). By the way, for peak demand requirements, due to the inherent intermittent nature of RES, gas will play a key role.

Indeed, a sustainable and reliable growth of green electricity sources is heavily dependent on the back-up solutions put in place to substitute the renewable electricity streams when wind is not blowing or sun not shining. Due to the possibility of CCGTs to come on stream at a very short notice they are the necessary complement to the increased penetration of RES. As natural gas is the fossil fuel having the least impact in terms of CO_2 emission, CCGTs represent the most appropriate solution to fulfil RES back-up function without running the risk to waste the environmental gain provided by green energy sources.

7) So called 20-20-20 targets: reduction of Greenhouse gases emission by at least 20 %, increase of the RES share to at least 20 % of the power production mix and improvement of the energy efficiency by at least 20 %, all compared to 1990.

8) Objectives by 2030: 40 % reduction in GHG emmissions, at least 27 % share of renewable energy consumption and increase of energy efficiency by at least 27 %, to be potentially raised to 30 %.

9) EU targets for 2050: reduction of GHG emmissions by 80 % to 95 % compaired to 1990.

Image courtesy of Snam Rete Gas

The situation in several selected countries is presented below:

3.5.1 AUSTRIA RENEWABLES

Figure 3.12 shows the evolution of electricity production and of the shares of the various energy sources used for power generation, in Austria, for the period 2009–2015.

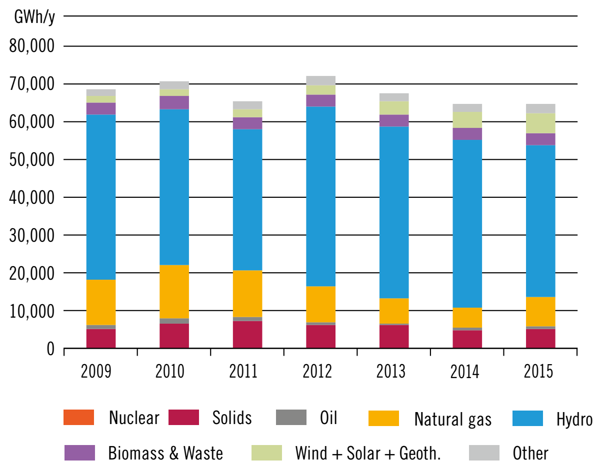


Figure 3.12: Power generation in Austria by source (historical; Energie-Control Austria)

Renewable sources in Austria represent about 75 % of the total power production (76% in 2015) with a major part covered by the hydroelectric production. The production coming from solar and wind power experience a quick growth since 2011 with more than doubling the feed in the last past 4 years.

Gas represents the second main used source of electricity with a range of 10–15 % of the part of the production mix in Austria. Following the general economic contraction from 2012 to 2014 fossil fuels underwent a slow decrease with a particular rebound in 2015 for gas.

3.5.2 BULGARIA RENEWABLES

Renewable energy sources production in Bulgaria experience a steady growth, during the last years, reaching 18,000 GWh/y in 2014, including use of RES for power generation.

In 2014 the power generated by RES amounted to 187 GWh/y, which represents 18,9 % of the gross electricity consumption in the country, while in 2010 it was 12,7 %.

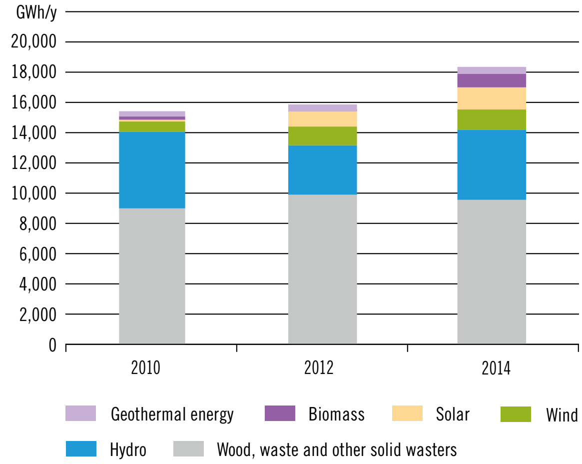


Figure 3.13: Historical data on power generation in Bulgaria from Renewable Energy sources (GWh/y) (Data source: National Statistical Institute of Bulgaria)

3.5.3 GREECE RENEWABLES

In Greece the renewables have an important share in power generation, about 11 % (2016), with hydropower being the most important.

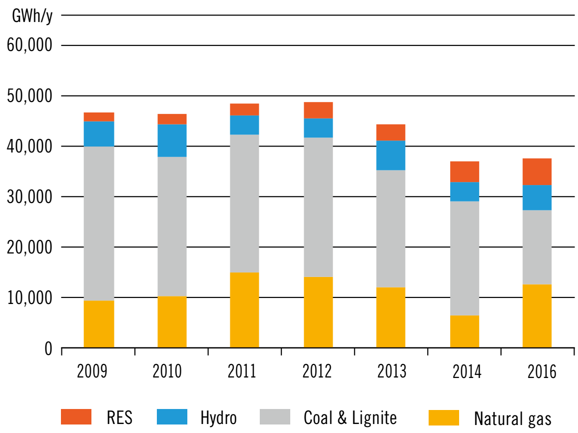


Figure 3.14: Power generation of Greece by source (historical)

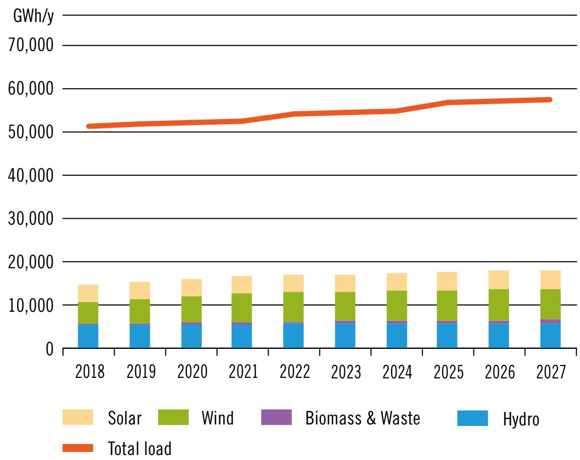


Figure 3.15: Share of Renewable Energy Sources in power generation from 2018 to 2027

The share of renewables in power generation is expected to reach 32 % by 2027 and, according to the forecast, hydro, wind and solar will contribute most to this increase. The difference between the historical value in 2016 and the forecasted value in 2027 is 12,605 GWh which is more than 230 %. If we compare this increase with the difference between the historical and forecasted power generation figures for Greece (Figure 3.14 and 3.15) it results that the renewables can provide the additional power generation demand for the next 10 years.

3.5.4 HUNGARY RENEWABLES

The Figure 3.16 shows split among the sources used for power generation in Hungary during the recent years. Figure 3.17 presents the forecasted evolution in the use of renewable sources for power generation in Hungary.

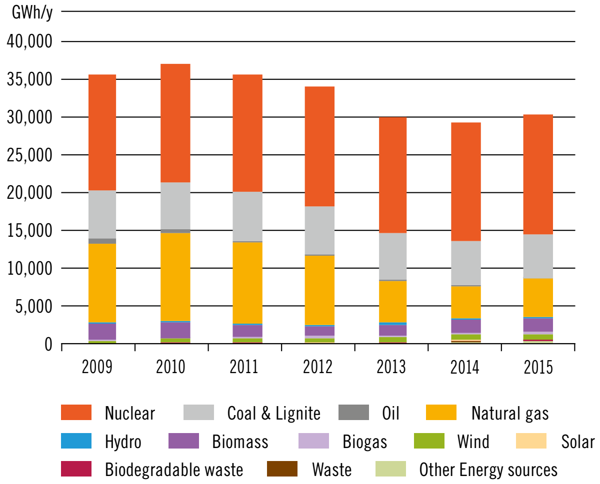


Figure 3.16: Power generation of Hungary by source (historical)

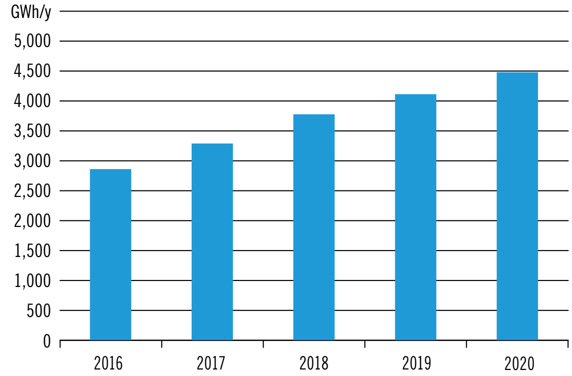


Figure 3.17: Forecast of power generation in Hungary from Renewable Energy sources from 2016 to 2020[10)]

3.5.5 ITALY POWER PRODUCTION (INCLUDING RENEWABLES)

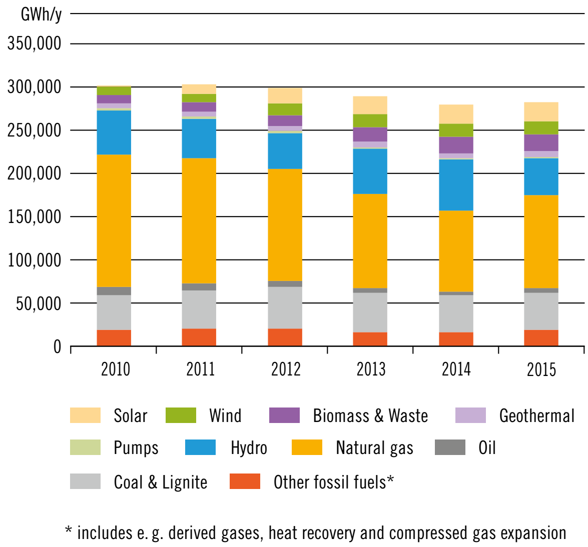


Figure 3.18: Power generation in Italy by source (historical) (Source: Terna)

Figure 3.18 shows the evolution of electricity production and of the shares of the various energy sources used for power generation, in Italy, for the period 2010–2015.

Renewable sources in Italy experienced a steady growth, during the last years, reaching in 2015 38 % of the total power production. Hydroelectric production covers around 40 % of RES share, followed by solar energy which accounts for around 8 % out of the total production.

Anyway, other fuels are expected to keep a key position in the Italian electricity balance, accounting for more than 60 % of the electricity production. In particular, gas is by far the first among other fuels, covering in 2015 38 % of the total production, followed by coal with 15 % and oil, both in progressive decrease (complete phase out from coal is proposed for 2030).

10) Source: Hungary's Renewable Energy Utilisation Action Plan

3.5.6 SLOVENIA RENEWABLES

In Slovenia the renewables have a high share in power generation (approximately 43 %), and among the renewables hydro has the highest share, as shown in the figure below Slovenia has already fulfilled the EU 2020 requirements.

Figure 3.19 and 3.20 presents the historical and forecasted evolution in the use of renewable sources for power generation in Slovenia.

The increase of the, already predominant, hydropower is expected to exceed the increase of all other renewable sources, among which biomass is to be the more important.

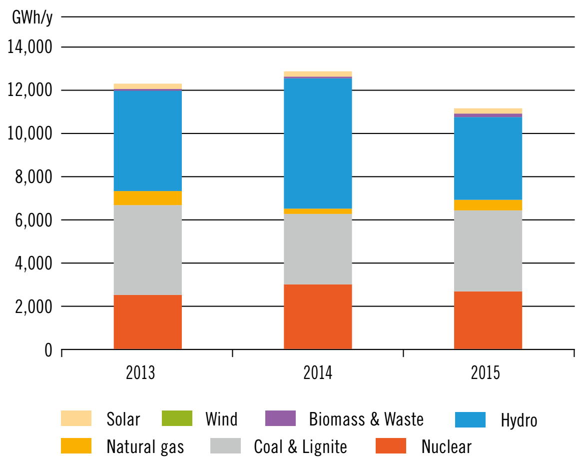


Figure 3.19: Power generation of Slovenia by source (historical) (Source: The Energy Agency of the Republic of Slovenia)

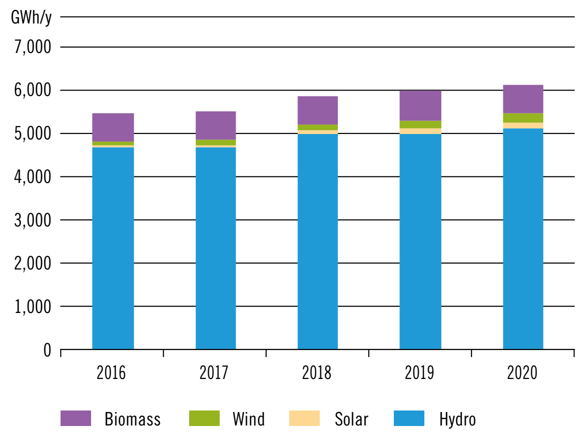


Figure 3.20: Forecast of power generation in Slovenia from Renewable Energy sources from 2016 to 2020 (GWh/y)[11)]

3.5.7 SLOVAKIA RENEWABLES

Figure 3.21 shows the breakdown of (actual and forecasted) power generation by energy source in Slovakia between 2010 and 2030. The dominant source of electricity production is nuclear energy. In 2015 nuclear power plants produced 56 % of total electricity consumption. Electricity from coal covered 10 % of the total production.

Among the renewables hydropower plants are on the first place, in 2015 covering 16 % of the total production, followed by biomass and biogas with 7 % share. Photovoltaic installations accounted for 2% of electricity production.

Share of biomass and biogas is expected to increase by 2030. The forecast growth from 2015 to 2030 is 850 GWh (68 %). Significant increase is also expected in wind power production

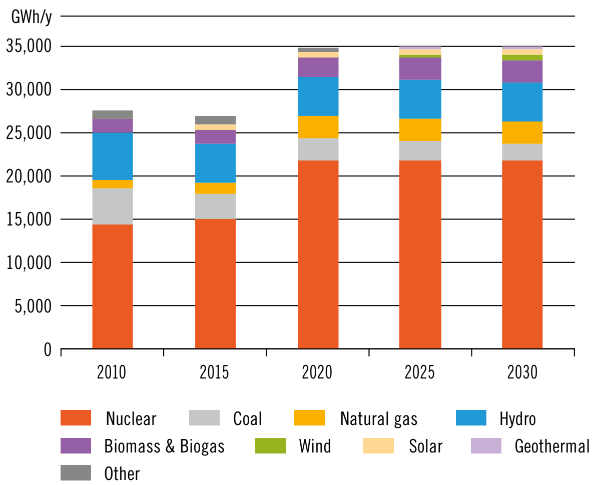


Figure 3.21: Power generation by source in Slovakia (historical and forecast) from 2010 to 2030 (GWh/y) (Source: Prediction of power consumption in Slovakia to 2035 – Study by EGU Brno, 2016)

11) Source: Action plan for renewable energy sources in Slovenia from 2010 – 2020

4 Supply

National Production | Imports | Prices

Image courtesy of Eustream

4.1 National Production

Gas from national production still plays an important role in some countries of the Southern Corridor Region, especially in Romania where coverage of yearly demand by national production is expected to be 79 % in 2017 and 104 % in 2026, Croatia (52 % in 2017 and 14 % in 2026), Bulgaria (2 % in 2017 and 35 % in 2026), Austria (15 % in 2017 and in 2026), Italy (12 % in 2017 and 14 % in 2026) and Hungary (19 % in 2017 and 9 % in 2026). By 2026, Romania will still be the major producer in the Region, among the countries already having a national production, with 46 % of the Region's production closely followed by Italy with 41 %. In 2015 the share of gas for national production has covered 22 % of the overall Southern Corridor demand as shown in Figure 4.1. Figure 4.2 shows the participation of each country in the national production of the Region in 2015. The increase in above percentages may come from the introduction of biogas (as in the case of Italy) and/or the exploitation of new fields (as in the case of Romania).

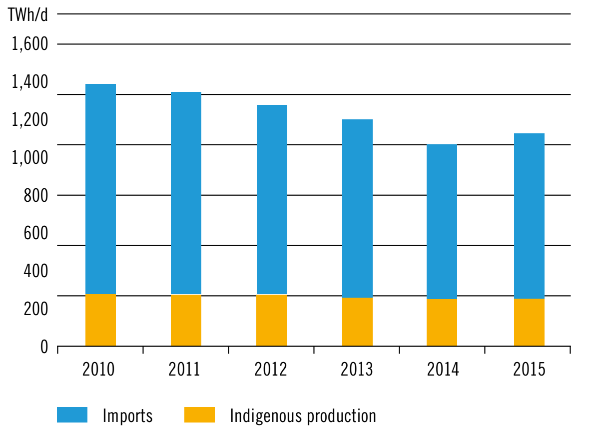


Figure 4.1: Part of gas imports in total consumption (Source: TYNDP 2017, ENTSOG)

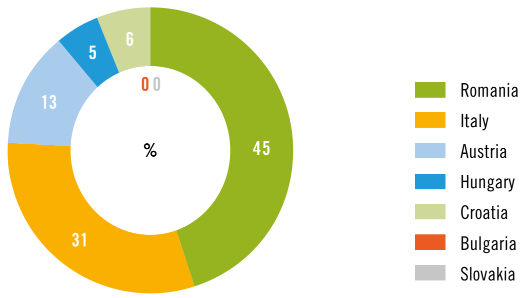


Figure 4.2: Share of national production on the total Regional indigenous productions by country in 2015 (Source: TYNDP 2017, ENTSOG)

Although the part of National production in the gas mix of the Region has been decreasing for a number of years, the forecast indicates a stabilisation due to the recent discoveries in the Black Sea expected to go on stream in the early '20s. The trend will even be reversed if and when the off-shore gas fields in Cyprus will enter production phase. Unlike the national production of the other European countries, where this is primarily used to satisfy national demand (or part of it), the production of Cyprus will greatly exceed its consumption even taking into account the commissioning of gas fired power plants, presently planned to enter in operation by 2020[1], and any other use that will be developed, given that no gas is presently used on the island. Figure 4.3 shows the impact on the gas production from Cyprus on the SC Region national production, from 2022 onwards. This impact will make the SC Region national production jump from a 25 % share of the EU national production, to 35 %.

1) Operation should be first based on imported LNG

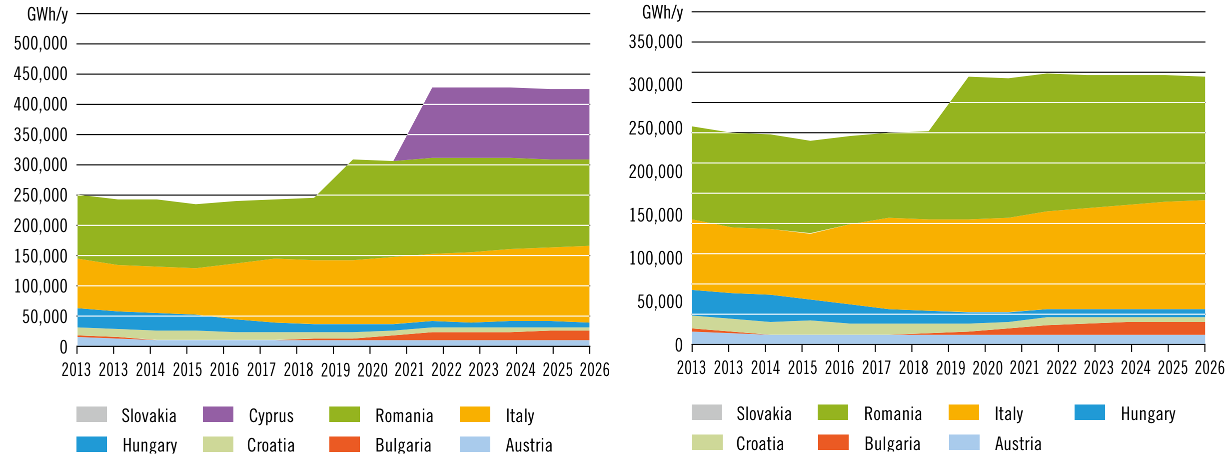


Figure 4.3: National production forecast with and without the production of Cyprus

It has however to be noted that the estimation of the effective, and not only arithmetic, share of national production on the Region's demand depends on the final destination of the Cypriot gas.

In fact, this gas will need to be exported but it is not yet known in what form (liquid or gaseous) neither to which destination. Moreover, the quantities discovered so far do not seem sufficient to make feasible the initial plan of installing a liquefaction plant in Cyprus, however exploration still goes on and there are more promising areas to be explored. Among the export schemes proposed are a pipeline to Turkey, (a low probability option), a pipeline to Egypt, either to cover the growing needs of this country or to use its liquefaction installations (an option with reduced appeal since the discovery the Zhor gas field in Egypt) and a pipeline to Crete and on to continental Greece, connected to the Poseidon offshore pipeline connecting Greece with Italy (an option technically challenging). In order to enhance the feasibility of this last option, Cyprus could team with other countries of the eastern Mediterranean, like Israel and possibly Lebanon, so that a critical mass is reached that will increase the attractiveness of such a gas export project. The number of potential partners and the tensions inherent to this Region make, at this stage, any prediction on the successful option uncertain. In the present GRIP the non-FID project of a pipeline linking the eastern Mediterranean gas fields to Greece and further to Italy, proposed by 3rd parties, has been included.

4.2 Imports

The easternmost countries of the Region are greatly dependent on imports from Russia, as shown by the modelling results in the case of a disruption of flows via Ukraine (see Chapter 7). LNG is an important source for Italy and Greece. Figure 4.4 that shows the relative importance of the infrastructure in place (several LNG projects in Italy and the ongoing project of the 2nd extension of the Revithoussa terminal in Greece together with the construction of a 3rd storage tank) and the one planned (such as the LNG terminal in northern Greece/Alexandroupolis, the Krk LNG terminal in the Adriatic and the Porto Empedocle LNG – all of them non FID however), indicates that a further increase is possible. The rate of use of LNG will also depend on its price evolution. High demand from the far-east and prospects for the increase of LNG exports by the USA, are factors working in opposite directions (see also paragraph 4.3 below).

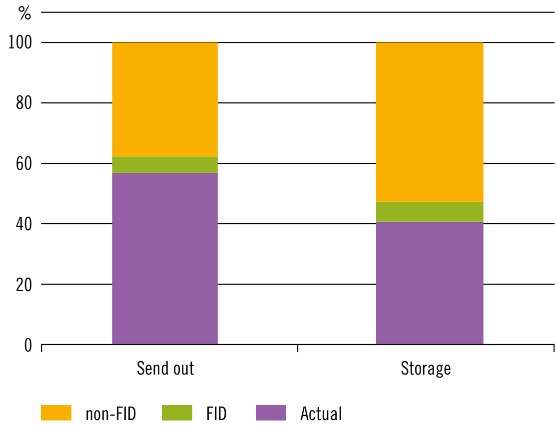


Figure 4.4: Relative capacity of existing, FID and non-FID LNG terminals in the Region

Other important import sources include North African gas to Italy by pipeline (Transmed from Algeria and Green Stream from Libya). Norwegian gas also reaches Northern Italy through the connections with neighbouring countries at the north.

Figure 4.5 shows that gas supply to the Region as a whole is rather well diversified. However the aggregation at the Regional level conceals the fact that four countries (Bulgaria, Croatia, Hungary) depend on Russian gas for more than 80 % of their supply.

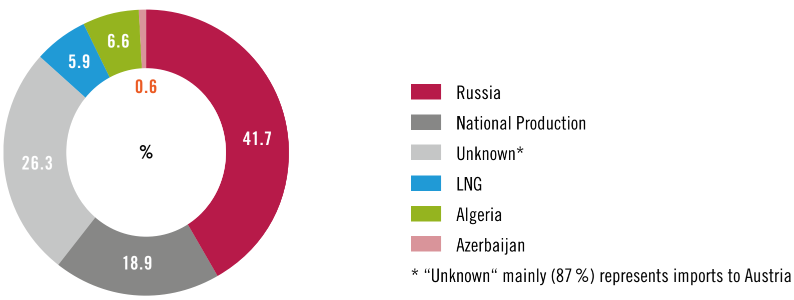


Figure 4.5: Diversification of supply in the Southern Corridor Region in 2015

During the first three of the last four years, the gas demand in the SC Region has stopped increasing and marked a slight decrease despite the fact that some of the markets are still immature and therefore have a potential for increase. This was the combined effect of:

- the economic crisis in Europe,
- the reduction in the power generation sector, due to the switch from gas to coal, to the decrease in electricity demand and to the progression of renewables in the power generation sector.

This trend was somehow reversed in 2016 due to the increase in the price of coal and the decrease in the oil prices which had a similar impact on the oil-linked gas supply contracts.

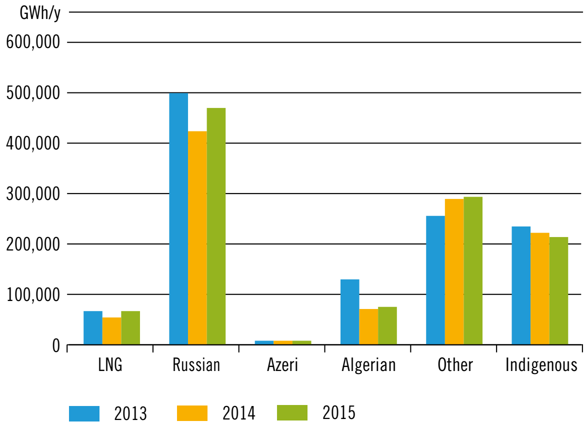


Figure 4.6: Evolution of gas supply by source[2)]

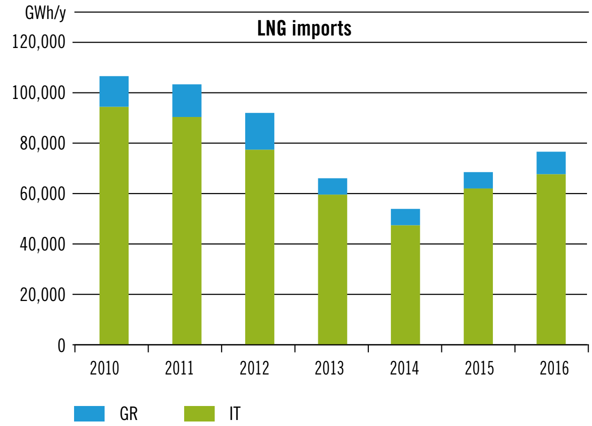


Figure 4.7: Evolution of LNG imports in Italy and Greece

The split among the various sources of supply did not change substantially, as shows Figure 4.6 There was a decrease of national Production, an increase of "other sources", mainly at the expense of Algerian (pipeline) gas and LNG. The reasons for the decrease of LNG are described in paragraph 4.3. Its reduction trend has been confirmed and even made more important in 2014 as shown in Figure 4.7. However this trend was reversed in 2015 and furthermore in 2016.

2) Other means imports from sources that cannot be identified. These include a part of the imports to Italy and Slovenia and the sum of the imports to Austria

4.3 Prices

Although during the recent years the alignment with the most liquid EU markets significantly improved, the hubs and import prices in the region remain in general slightly higher than those of the markets of Central and Western Europe.

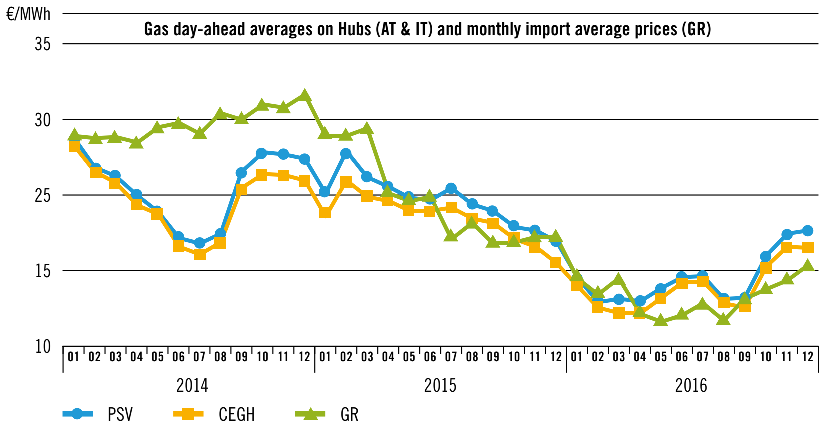


Figure 4.8: Comparison of gas prices in the SC region

Figure 4.8 shows more in detail the differences between the main three regional gas markets providing the historical evolutions of prices from 2014 to 2016 with monthly granularity.

The most evident trend is the alignment among the three countries price levels until the beginning of 2015 when the mostly oil-linked contract prices applying in Greece marked an important decrease compared with the more market related Austrian and Italian prices, resulting therefore aligned with the more liquid markets of the Western parts of the region (Austria and Italy). We find here below the result of the still persistent separation between the Greek market and the more liquid markets of the Western parts of the region. On the three-year period the average of the differences between the most and the least priced hubs in the Region is around 3.7 €/MWh.

More specifically, the graph also reveals:

i. A consolidated price-alignment between the Italian and the Austrian hubs, particularly strong during the first and the final parts of the analyzed time horizon, never exceeding a gap of 2.5 €/MWh and even 1.4 €/MWh in 2016 (monthly average difference below 1.1 €/MWh during the 3-year period 2014–2016). The link between these two hubs performances is following a more general correlation trend shown by all EU major hubs during the last years.

ii. The persistence of a consistent positive amount to be paid for Greek imports during 2014 and the first quarter of 2015, which firstly disappeared during the second quarter and, finally, turned into a negative price position during the remaining part of the same year. This trend is probably explained by the oil prices collapse happened in the second half of 2014 and then transferred – with the typical 6–9 months gap – to Greek gas prices (mainly set on the basis of long-term-oil-linked import contracts).

iii. The lower effect of winter climatic conditions on the Greek prices (lack of price surges registered at PSV and CEGH) which, together with the current lack of interconnections, isolated Hellenic price from upward pressure in periods of winter peak demand. Future planned interconnections should partially export price oscillations linked to climatic conditions, having a bi-directional stabilising role on gas quotations.

Widening the analysis scope to a European scale, it is possible to appreciate even more clearly the progressive downward and alignment trend already described above for the three regional marketplaces.

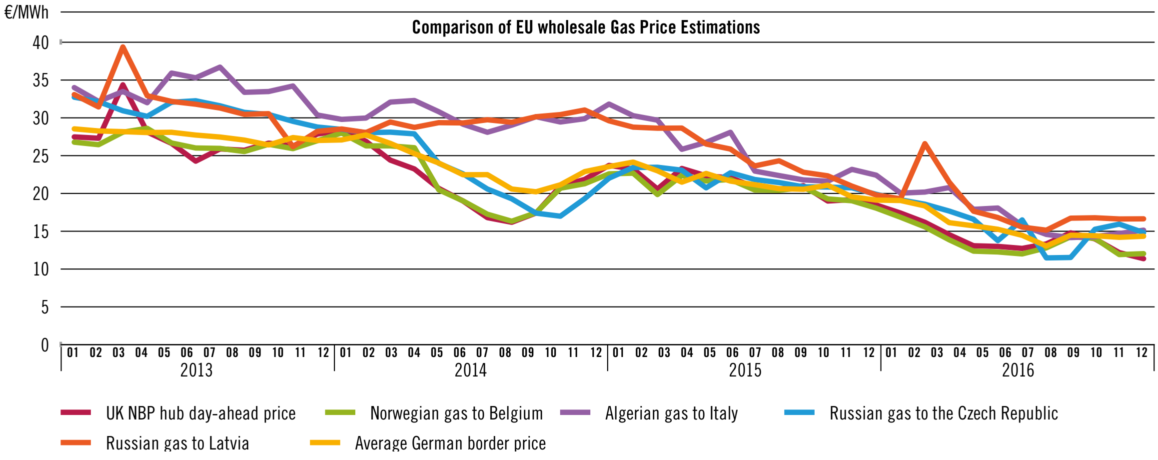


Figure 4.9: Comparison of EU wholesale gas price estimations[3)]

Figure 4.9 shows that all import contracts tended to align towards NBP prices, progressively following a trend which in the past was restricted only to Norwegian gas to Belgium. Gradual renegotiation of long term contracts and indexation to hub prices instead of oil quotations are both drivers behind the emergence of a correlated EU-wide price reference.

Broadening even more the analysis scope and taking into consideration worldwide trends, it is possible to observe a progressive alignment of prices extended till Far-East, with an increased correlation of global natural gas quotations. Henry Hub spot prices stayed relatively stable as the lowest value, being a sign that shale gas production in the USA still plays a strong downward role on natural gas cost.

Figure 4.10 shows that Japan prices considerably aligned towards the main European market references, as likely indication that the strong pressures started after 2011 Fukushima nuclear accident are fading away.

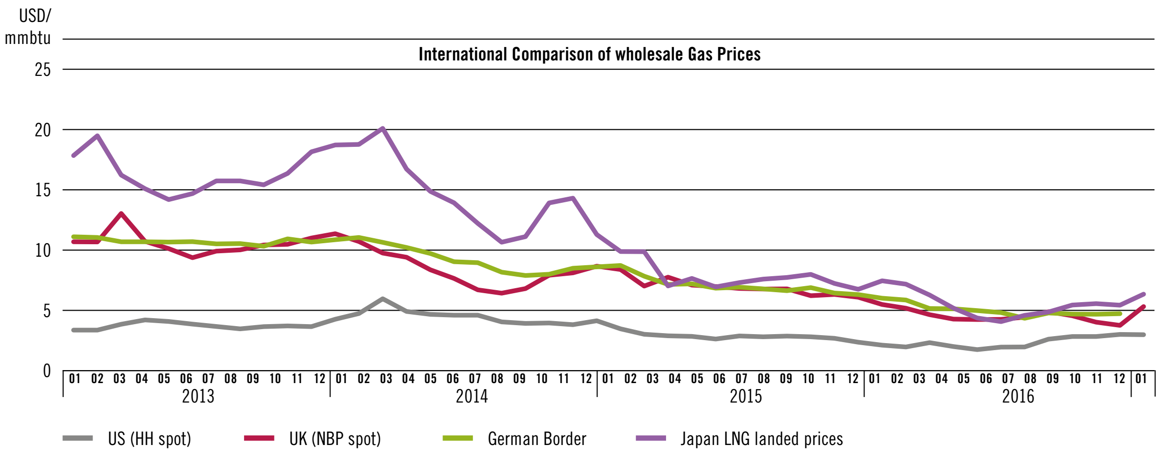


Figure 4.10: International Comparison of wholesale gas price[4)]

3) Source: EU Quarterly Report on European Gas Markets, 4Q 2015 (page 28) https://ec.europa.eu/energy/sites/ener/files/documents/quarterly_report_on_european_gas_markets_q4_2015-q1_2016.pdf

4) Source: EU Quarterly Report on European Gas Markets, 4Q 2015 (page 22) https://ec.europa.eu/energy/sites/ener/files/documents/quarterly_report_on_european_gas_markets_q4_2015-q1_2016.pdf

Focusing the scope toward LNG, a general alignment trend toward a reference value of 14 €/MWh was clearly evident in the first part of 2016. Only US gas market was benefitting from considerably lower cost conditions (between 5 and 6 €/MWh), confirming the persistent abundance of natural gas followed shale gas revolution and providing room for US producers to gain from export dynamics. However, as shown in Figure 4.11 for estimation referred to May 2017, LNG prices marked an increase, from the second half of 2016 and into 2017, driving Asian prices at 17 €/MWh, European prices at 15 €/MWh and US prices substantially lower at around 10 €/MWh. This increase was the result of both the increase of oil prices and the strong demand in Asia, mainly in India and China. It is expected though that the gradual start-up of nuclear reactors in Japan and the exports from USA will have a stabilising effect on prices.

The change, from the year of the previous SC GRIP publication, is particularly relevant since at the end of 2013 LNG prices were estimated to be around 38 €/MWh in Japan, value 50 % higher than in Europe (around 25 €/MWh), which in turn experienced price levels three times higher than in the east coast of the USA (around 8 €/MWh). Regional differences have since been greatly reduced as indicated by the ratio between Japan and USA prices which has fallen, since the publication of the last SC GRIP, from around 12 to less than 2.

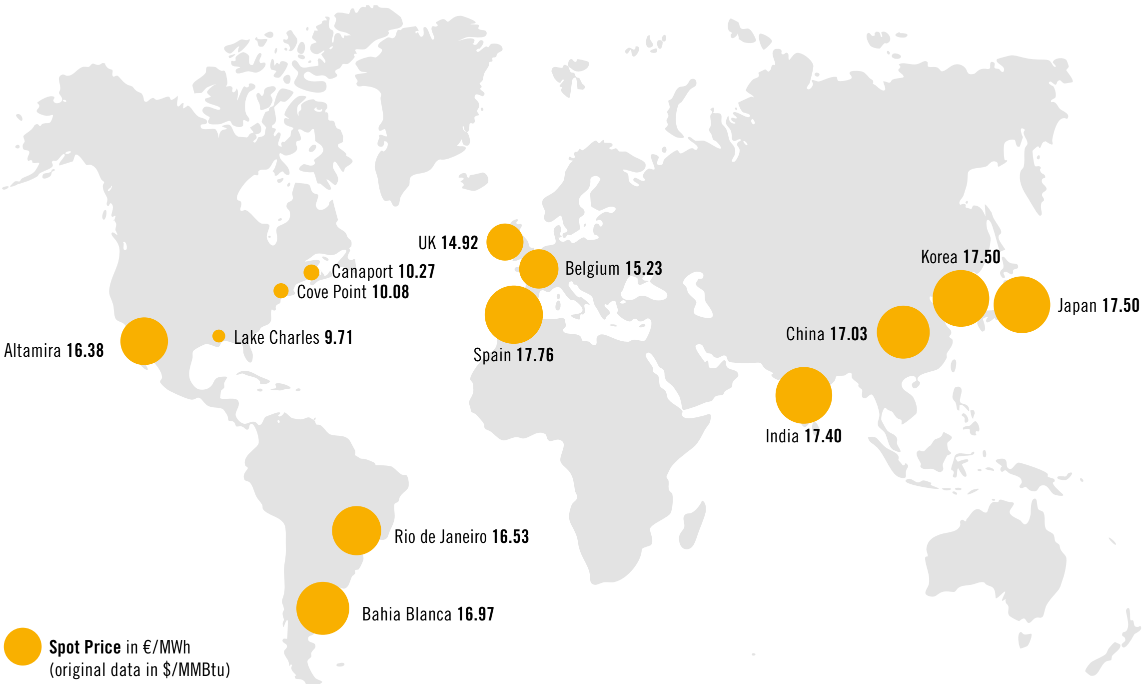


Figure 4.11: Estimated World LNG spot prices[5)]

5) Source: Waterborne Energy, Inc. Monthly average of the weekly landed prices for the listed month. Landed prices are based on a netback calculation (Data in euro/MWh, converted from USD/Mbtu with the following rates: USD=0,9091 €; Mbtu=0,293071083 Mwh) – Federal Energy Regulatory Commission • Market Oversight • https://www.ferc.gov/market-oversight/mkt-gas/overview/ngas-ovr-lng-wld-pr-est.pdf

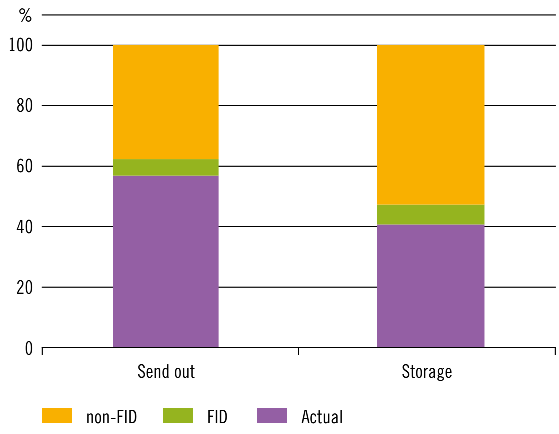


Figure 4.12: Production of shale gas in the USA[6)]

As evidenced by the evolution of prices of coal and gas, shown in Figure 4.13 coal price has increased significantly during 2016. This, combined with the drop of oil prices represents an additional reason explaining the continuation, in 2016, of the increase of LNG demand that started in 2015.

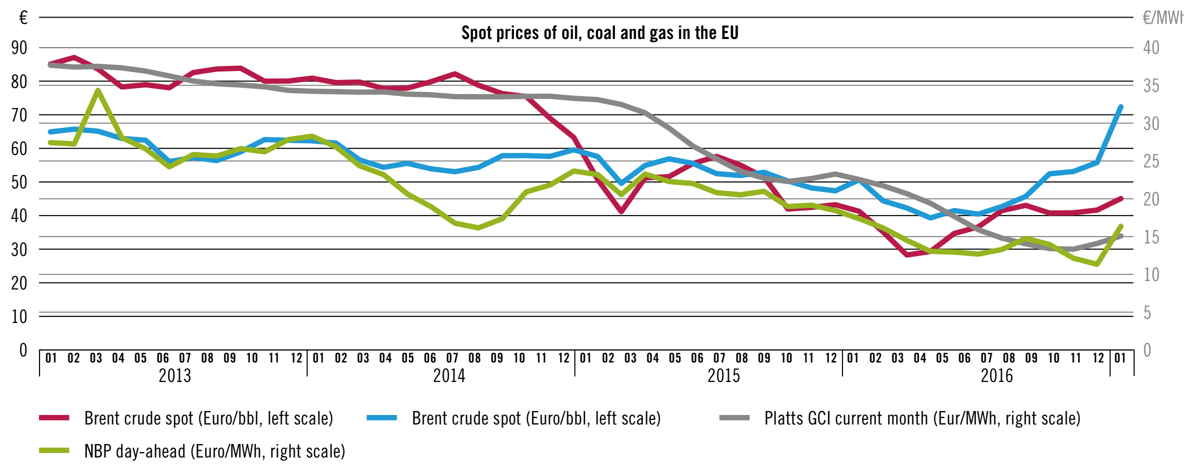


Figure 4.13: Spot prices of Oil, Coal and Gas in the EU[7)]

6) Source: USA Energy Information Administration

7) Source EU Quarterly Report on European Gas Markets, 2Q 2013 http://ec.europa.eu/energy/observatory/gas/gas_en.htm

5 Assessments and Market Analysis

IP Capacity offered, booked and used

Conclusion on the Existence of the Congestion at IPs

image courtesy of Snam Rete Gas

5.1 Interconnection Point capacities offered (technical capacity), booked and used

In this paragraph the capacities of all Region's IPs are presented in a graphical form making easier the comparison of the technical capacity of the IP, the part booked and the part actually used during the two-year period from April 2014 to March 2016, both on a daily basis and on an average per month one. In some cases the data, concerning technical capacity, published by TSOs on either side of the IPs are not identical. In such cases the lesser rule was applied.

The interconnection points, import points and LNG entry points are presented in this chapter in the same order as in the ENTSOG capacity map[1].

This section aims at providing an analysis of possible congestion at Regional IPs evaluating:

- Flows versus technical capacity (physical congestion considerations);
- Booked versus technical capacity (contractual congestion considerations)

Although several of the IPs offer reverse flow capacity, the graphs for both directions are only presented in the case of significant reverse flows.

1) http://www.entsog.eu/maps/transmission-capacity-map

A. CROSS-BORDER IPS WITHIN EU

Oberkappel (GCA > GRT gaz Deutschland and Open Grid Europe) bidirectional

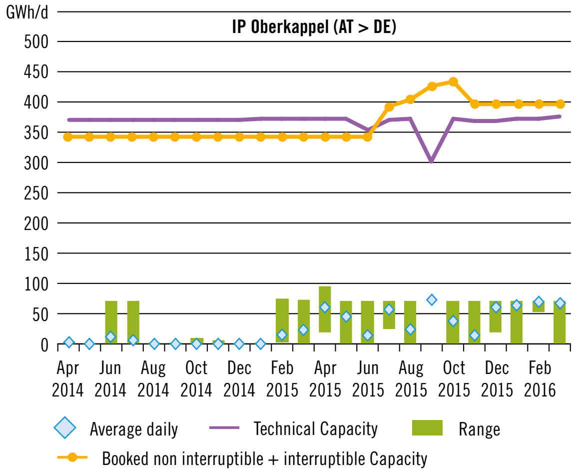


Figure 5.1: Oberkappel: Flows and booked capacity vs. technical capacity (monthly)

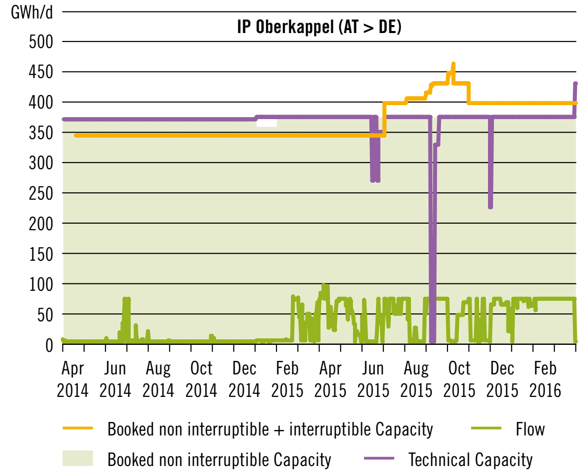


Figure 5.2: Oberkappel: Flows and booked capacity vs. technical capacity (daily)

Oberkappel (GRT gaz Deutschland and Open Grid Europe > Gas Connect Austria) bidirectional

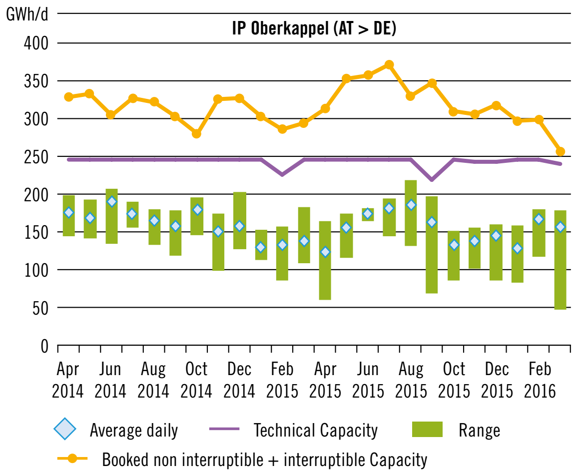


Figure 5.3: Oberkappel: Flows and booked capacity vs. technical capacity (monthly)

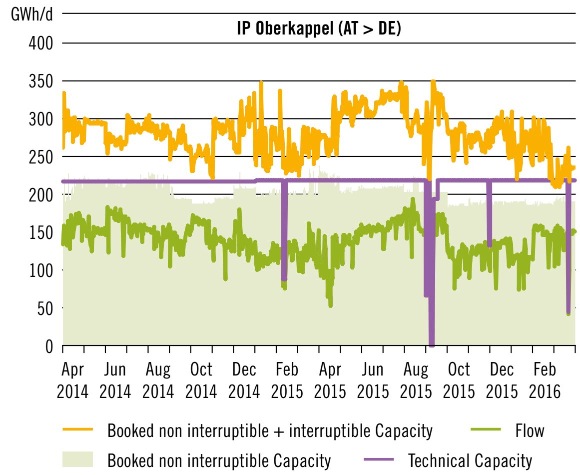


Figure 5.4: Oberkappel: Flows and booked capacity vs. technical capacity (daily)

Murfeld/Ceršak (Gas Connect Austria > Plinovodi) unidirectional

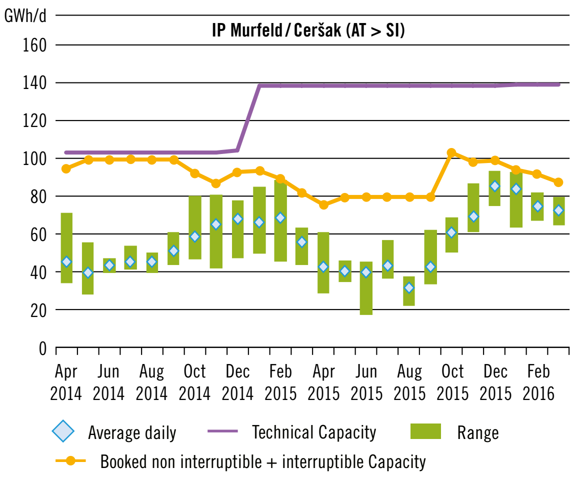


Figure 5.5: Murfeld/Ceršak: Flows and booked capacity vs. technical capacity (monthly)

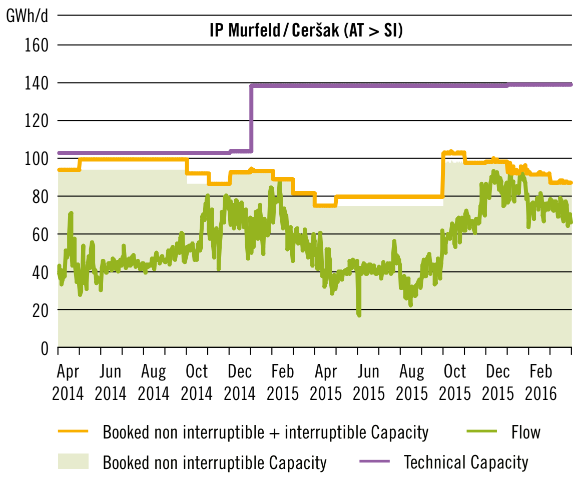


Figure 5.6: Murfeld/Ceršak: Flows and booked capacity vs. technical capacity (daily)

Tarvisio/Arnoldstein (Trans Austria Gasleitung > Snam Rete Gas) bidirectional

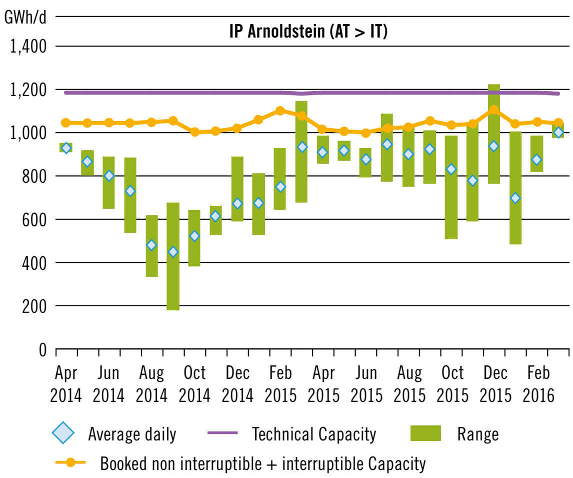


Figure 5.7: Tarvisio/Arnoldstein: Flows and booked capacity vs. technical capacity (monthly)

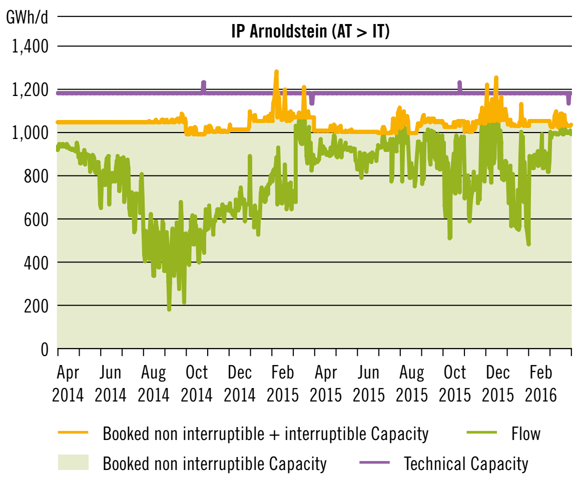


Figure 5.8: Tarvisio/Arnoldstein: Flows and booked capacity vs. technical capacity (daily)

At the Interconnection point Exit Tarvisio/Entry Arnoldstein, physical reverse flow is possible. In particular Trans Austria Gasleitung GmbH is offering as firm capacity around 417 GWh/d at the Austrian entry side and Snam Rete Gas is making available around 194 GWh/d at the Italian exit side[2]. Nevertheless, under the current prevailing hub prices conditions, the activation of these flows is likely to be triggered more by security of supply situations than by commercial reasons.

2) For years 2016 and 2017 Snam Rete Gas capacity is offered as "Interruptible transportation capacity available with a physical inlet flow or a physical flow equal to zero at the entry point of Passo Gries". Starting from 2018 onward Snam Rete Gas capacity will be offered as firm but competing with Passo Gries capacity (source: Snam Rete Gas Ten-Year Network Development Plan 2016 – 2025).

Gorizia/Šempeter (Snam Rete Gas > Plinovodi) bidirectional

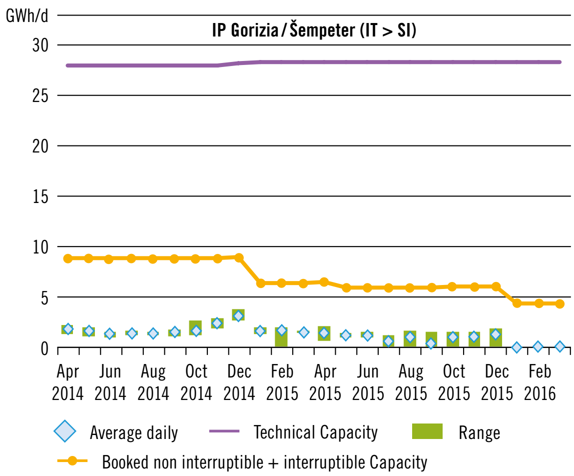


Figure 5.9: Gorizia/Šempeter: Flows and booked capacity vs. technical capacity (monthly)

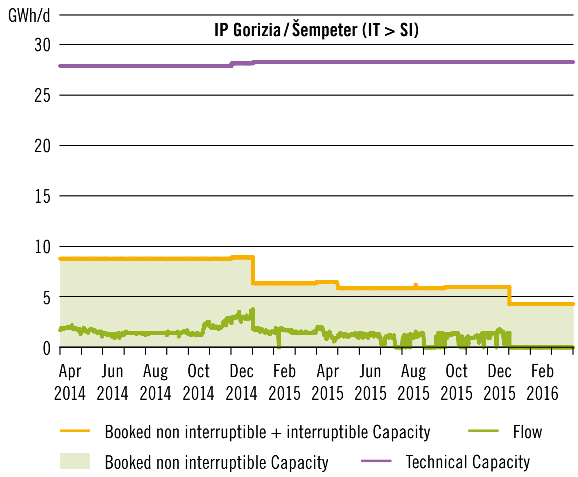


Figure 5.10: Gorizia/Šempeter: Flows and booked capacity vs. technical capacity (daily)

This IP has become bidirectional as of 1 January 2015. Before that date, capacity from Slovenia to Italy was offered only at the Italian side (technical firm capacity of 47 GWh/d), but no flow in that direction was registered.

Gorizia/Šempeter (Plinovodi > Snam Rete Gas)

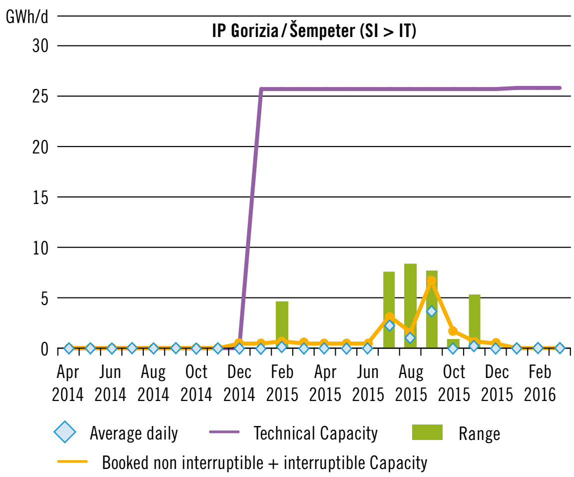


Figure 5.11: Gorizia/Šempeter: Flows and booked capacity vs. technical capacity (monthly)

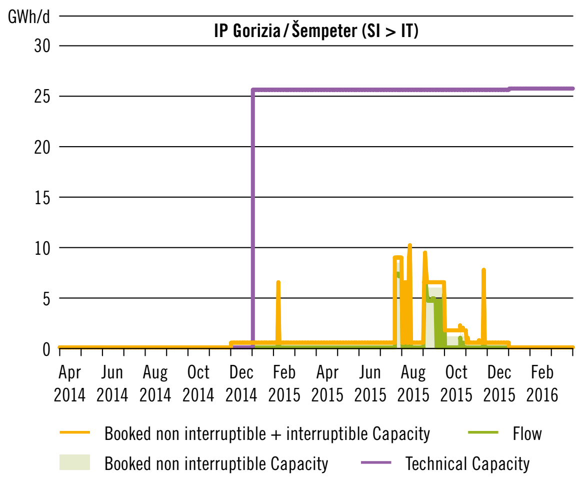


Figure 5.12: Gorizia/Šempeter: Flows and booked capacity vs. technical capacity (daily)

The technical firm and interruptible capacity offered at the Italian side of the IP is between 47 GWh/d and 51 GWh/d.

Rogatec (Plinovodi > Plinacro) Unidirectional

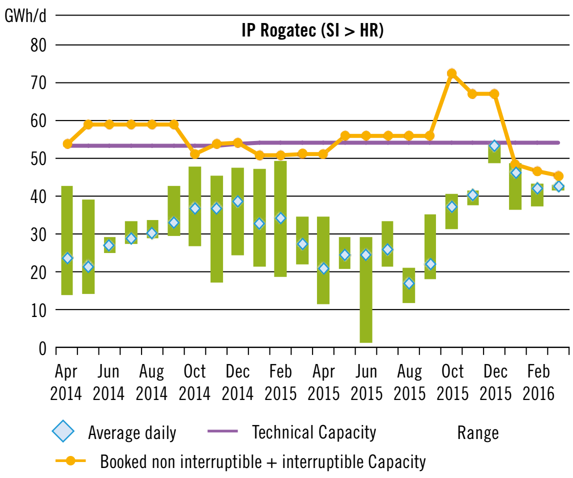


Figure 5.13: Rogatec: Flows and booked capacity vs. technical capacity (monthly)

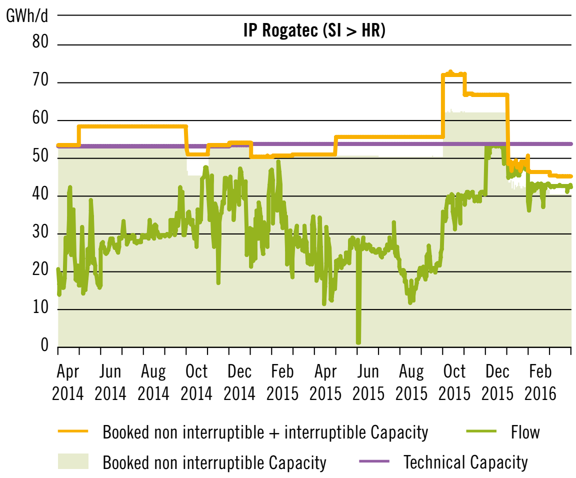


Figure 5.14: Rogatec: Flows and booked capacity vs. technical capacity (daily)

Lanžhot (eustream > NET4GAS) Bidirectional

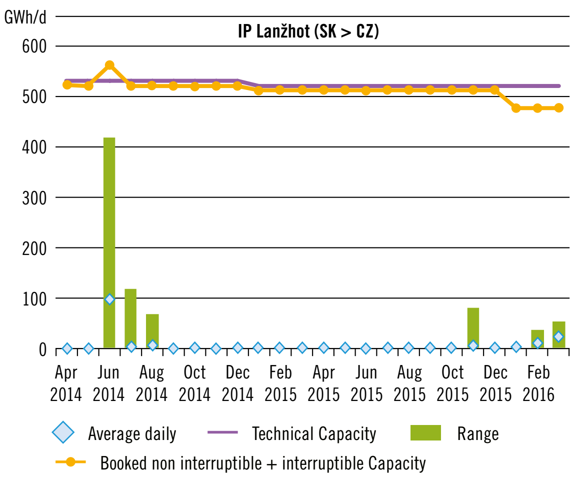


Figure 5.15: Lanžhot: Flows and booked capacity vs. technical capacity (monthly)

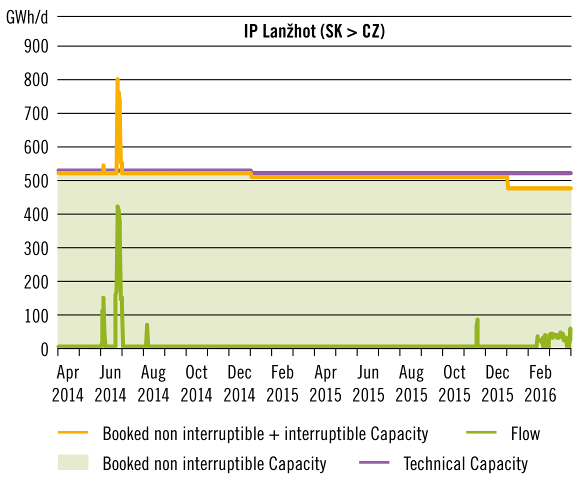


Figure 5.16: Lanžhot: Flows and booked capacity vs. technical capacity (daily)

Above figure includes only firm technical capacity as published by eustream.
Available interruptible capacity is not included.

Lanžhot (NET4GAS > eustream)

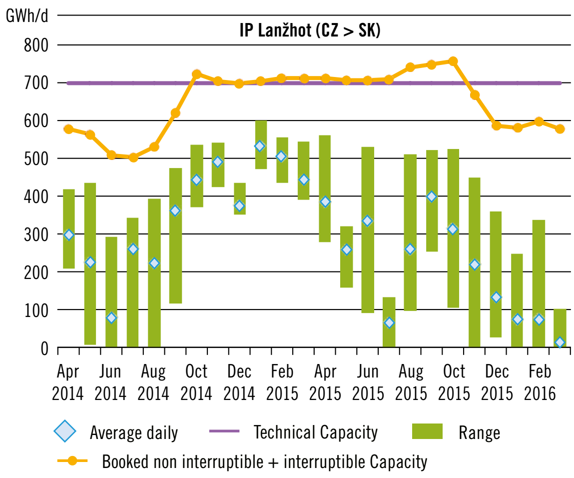


Figure 5.17: Lanžhot: Flows and booked capacity vs. technical capacity (monthly)

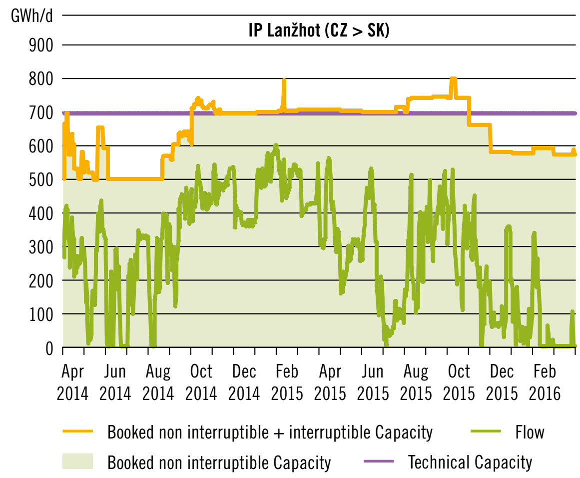


Figure 5.18: Lanžhot: Flows and booked capacity vs. technical capacity (daily)

Baumgarten (eustream > Gas Connect Austria and Trans Austria Gasleitung) Bidirectionnal

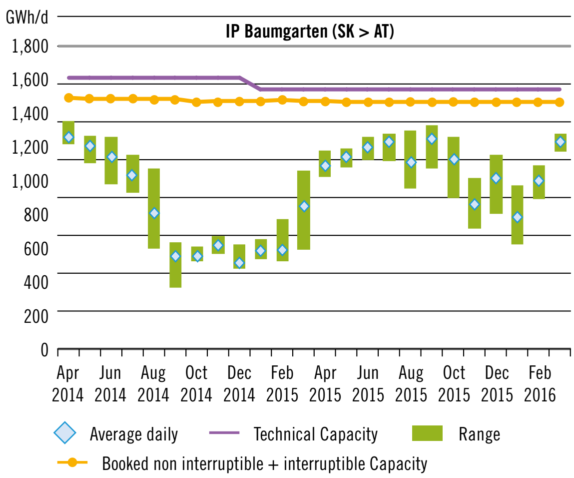


Figure 5.19: Baumgarten: Flows and booked capacity vs. technical capacity (monthly)

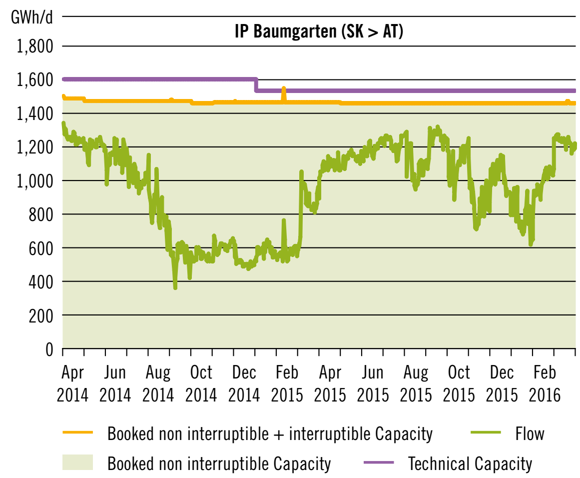


Figure 5.20: Baumgarten: Flows and booked capacity vs. technical capacity (daily)

Mosonmagyaróvár (Gas Connect Austria > FGSZ) Unidirectional

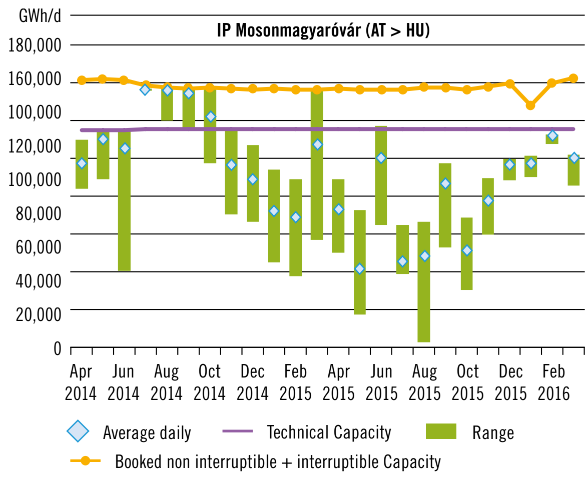


Figure 5.21: Mosonmagyaróvár: Flows and booked capacity vs. technical capacity (monthly)

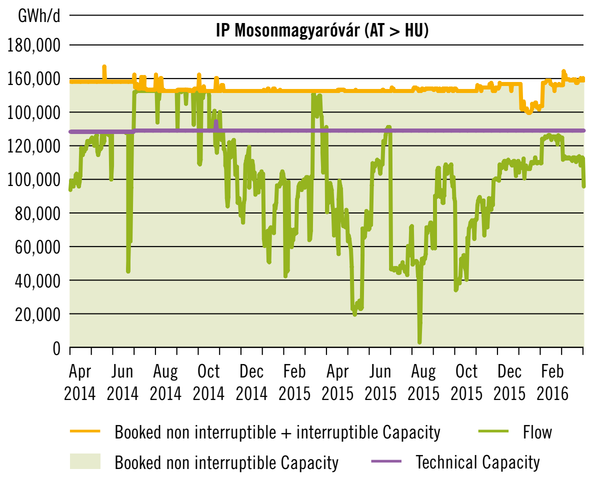


Figure 5.22: Mosonmagyaróvár: Flows and booked capacity vs. technical capacity (daily)

From July 2014 to June 2015 the total booked capacity at the Hungarian side was substantially higher (approximately 225 GWh/d)

Kulata/Sidirokastro (Bulgartransgaz > DESFA) Bidirectional

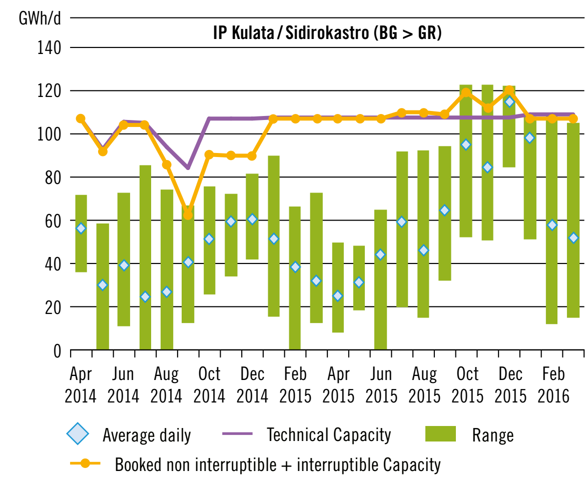


Figure 5.23: Kulata/Sidirokastro: Flows and booked capacity vs. technical capacity (monthly)

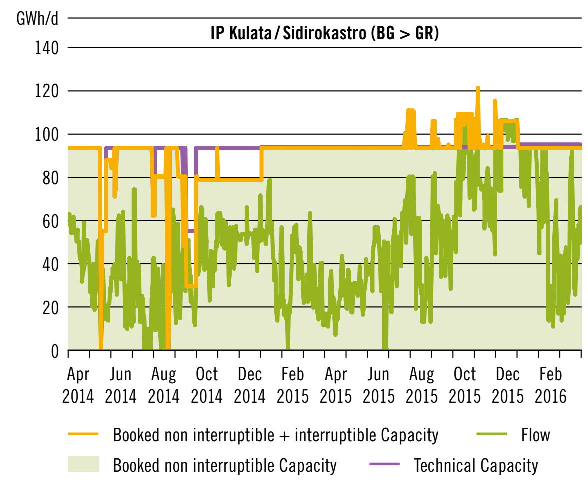


Figure 5.24: Kulata/Sidirokastro: Flows and booked capacity vs. technical capacity (daily)

As in the previous GRIP report, this IP presents periods with flows and booked capacities above the technical one which resulted from the application of the lesser rule.

The booked capacity at the beginning of the reporting period shows reductions (at the Sidirokastro side) due to announced reduced capacity periods caused by maintenance works.

Negru Voda 1 (Transgaz > Bulgartransgaz) Bidirectional

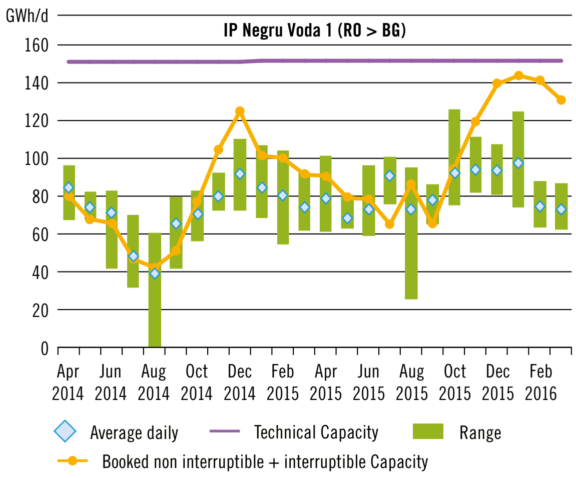


Figure 5.25: Negru Voda 1: Flows and booked capacity vs. technical capacity (monthly)

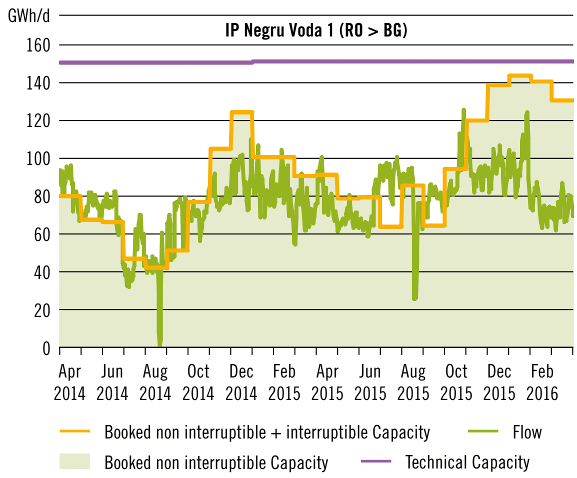


Figure 5.26: Negru Voda 1: Flows and booked capacity vs. technical capacity (daily)

Negru Voda 2 & 3 (Transgaz > Bulgartransgaz) Unidirectional

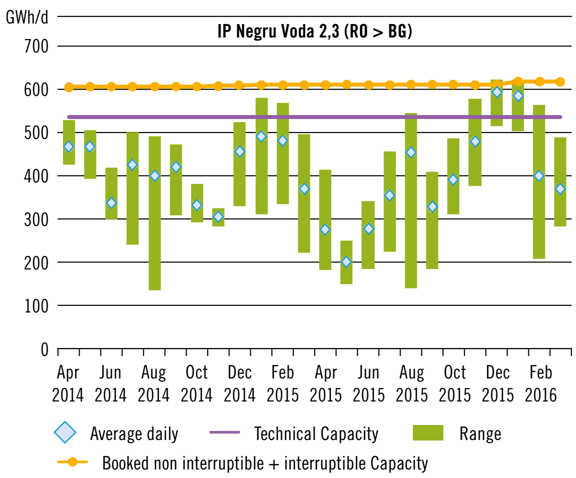


Figure 5.27: Negru Voda 2 & 3: Flows and booked capacity vs. technical capacity (monthly)

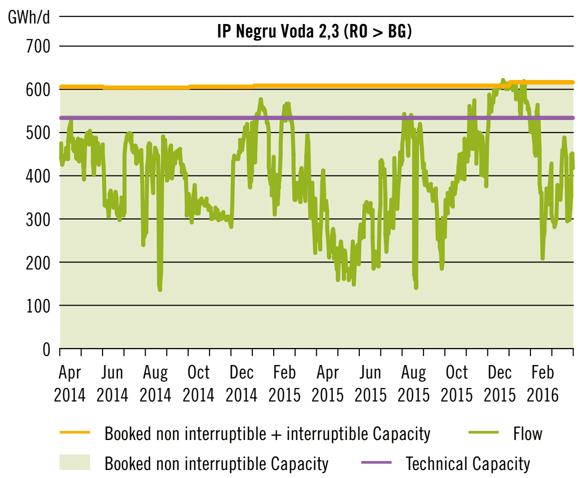


Figure 5.28: Negru Voda 2 & 3: Flows and booked capacity vs. technical capacity (daily)

This IP presents periods with flows and booked capacities above the technical one which resulted from the application of the lesser rule (as the technical capacity is higher on the Bulgarian side).

Csanádpalota (FGSZ > Transgaz) Bidirectional

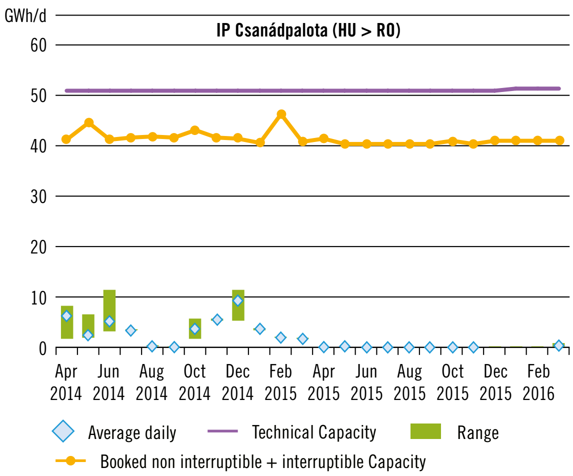


Figure 5.29: Csanádpalota: Flows and booked capacity vs. technical capacity (monthly)

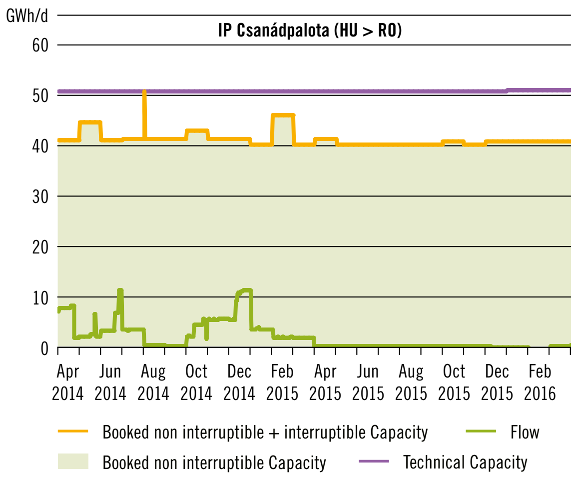


Figure 5.30: Csanádpalota: Flows and booked capacity vs. technical capacity (daily)

Dravaszerdahely (FGSZ > Plinacro) Unidirectional

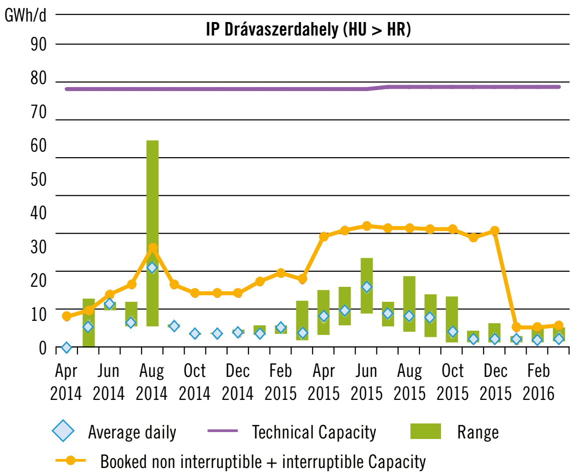


Figure 5.31: Dravaszerdahely: Flows and booked capacity vs. technical capacity (monthly)

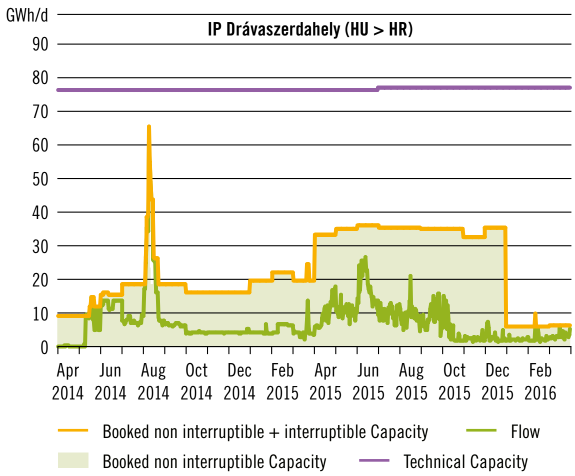


Figure 5.32: Dravaszerdahely: Flows and booked capacity vs. technical capacity (daily)

This IP has been designed as bi-directional but presently offers capacity only in the direction HU > HR at about 40 % of design capacity. Subject to a pressure management agreement between the two TSOs and an increased use of FGSZ CS the IP could operate at about 60 % of design capacity in both directions. The full bi-directional capacity will be made available after the installation of a CS on the Croatian side.

Budince (Eustream>UKRTRANSGAZ)

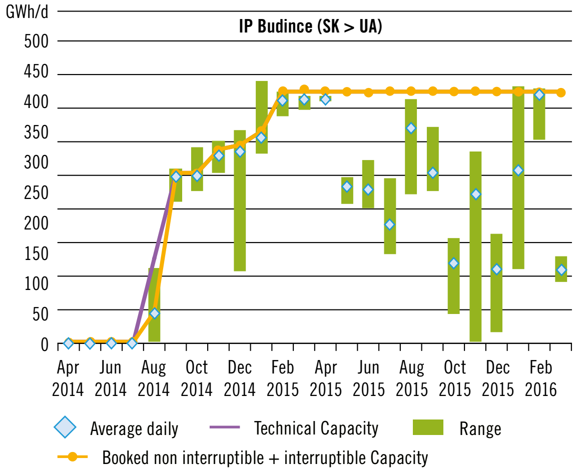


Figure 5.33: Budince: Flows and booked capacity vs. technical capacity (monthly)

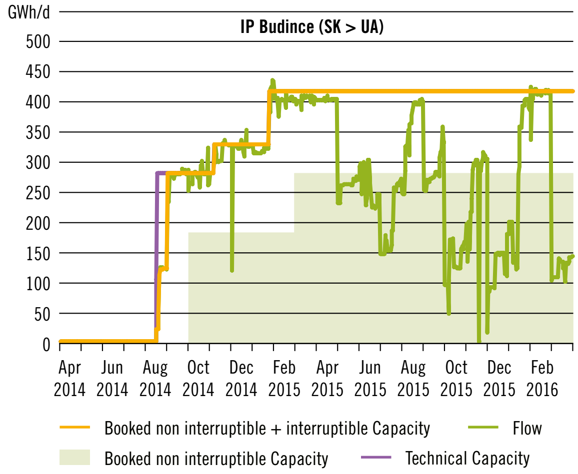


Figure 5.34: Budince: Flows and booked capacity vs. technical capacity (daily)

The above graphs include interruptible technical capacity as this is used on a regular basis.

Vel'ké Zlievce (eustream > Magyar Gáz Tranzit ZRt.)

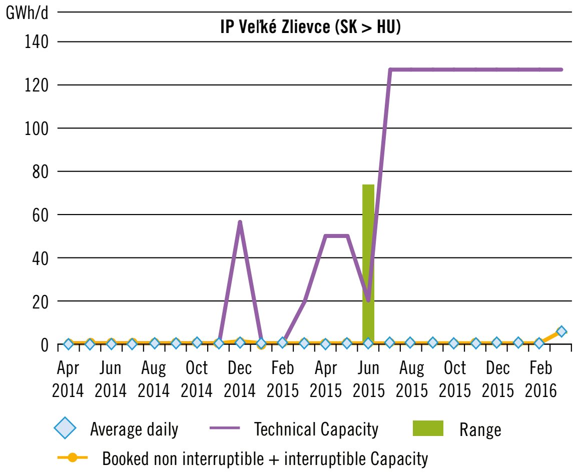


Figure 5.35: Vel'ké Zlievce: Flows and booked capacity vs. technical capacity (monthly)

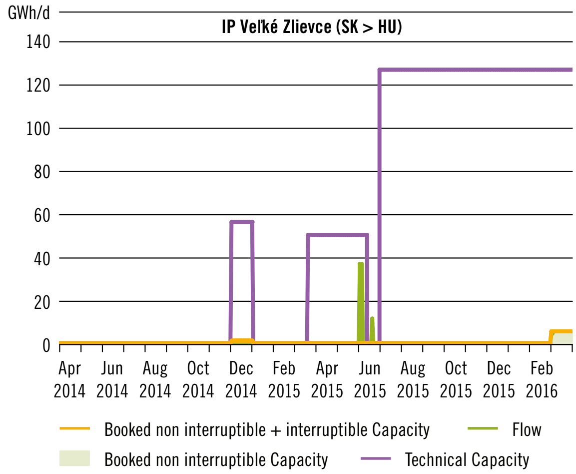


Figure 5.36: Vel'ké Zlievce: Flows and booked capacity vs. technical capacity (daily)

B. CROSS-BORDER IP WITH NON EU COUNTRIES

b.1 Import

Mazara del Vallo (TMPC > Snam Rete Gas)

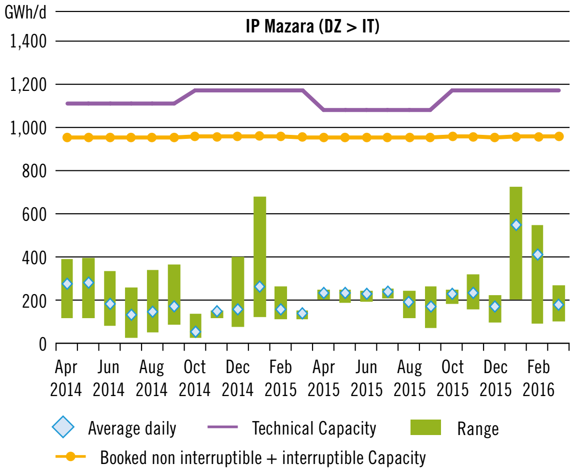


Figure 5.37: Mazara del Vallo: Flows and booked capacity vs. technical capacity (monthly)

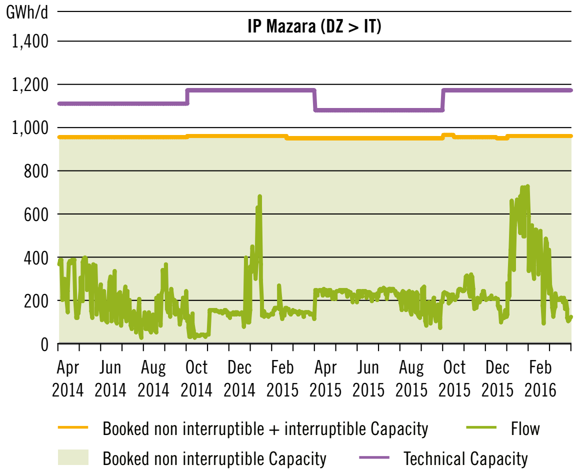


Figure 5.38: Mazara del Vallo: Flows and booked capacity vs. technical capacity (daily)

Gela (Green Stream > Snam Rete Gas)

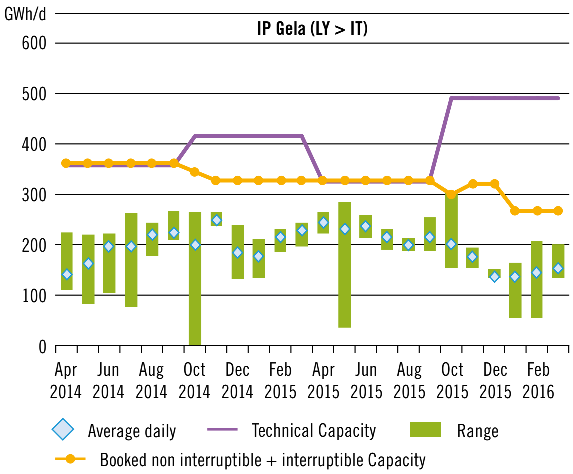


Figure 5.39: Gela: Flows and booked capacity vs. technical capacity (monthly)

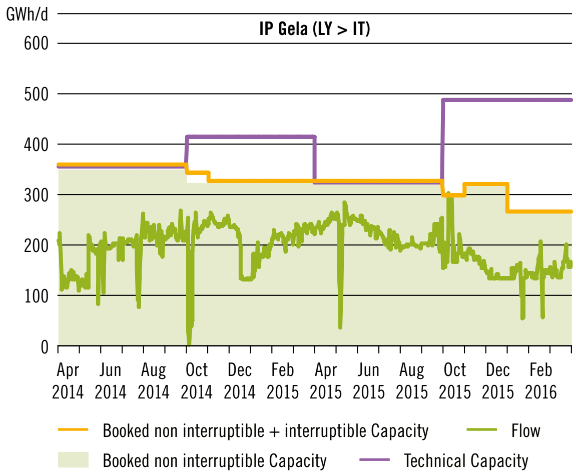


Figure 5.40: Gela: Flows and booked capacity vs. technical capacity (daily)

Uzhgorod/Vel'ké Kapušany (Ukrtransgaz > eustream)

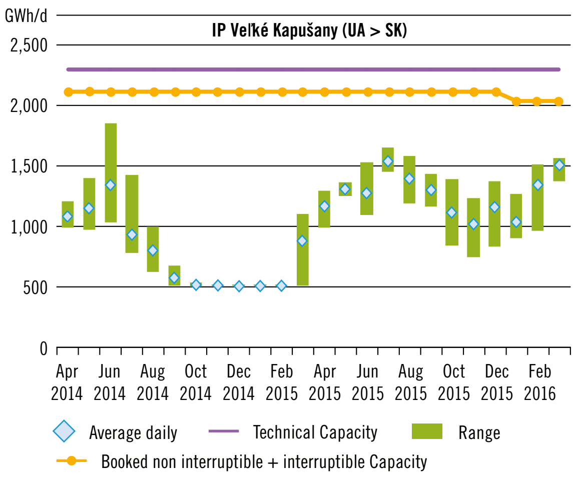


Figure 5.41: Uzhgorod/Vel'ké: Flows and booked capacity vs. technical capacity (monthly)

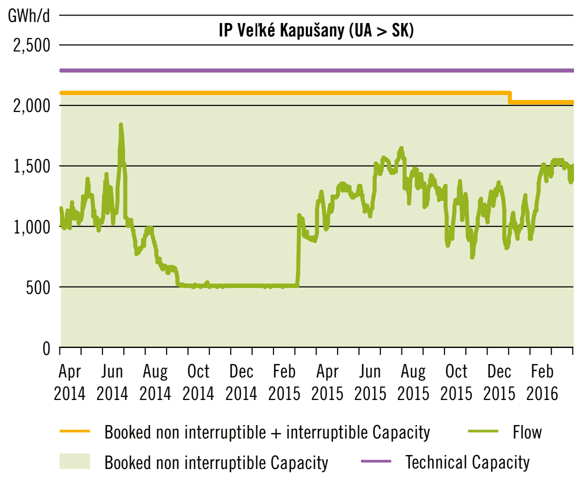


Figure 5.42: Uzhgorod/Vel'ké: Flows and booked capacity vs. technical capacity (daily)

Above picture includes only firm technical capacity as published by eustream. Available interruptible capacity is not included.

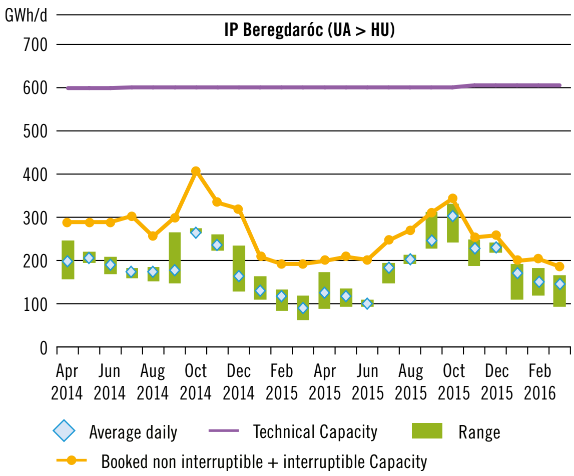


Figure 5.43: Beregdaróc: Flows and booked capacity vs. technical capacity (monthly)

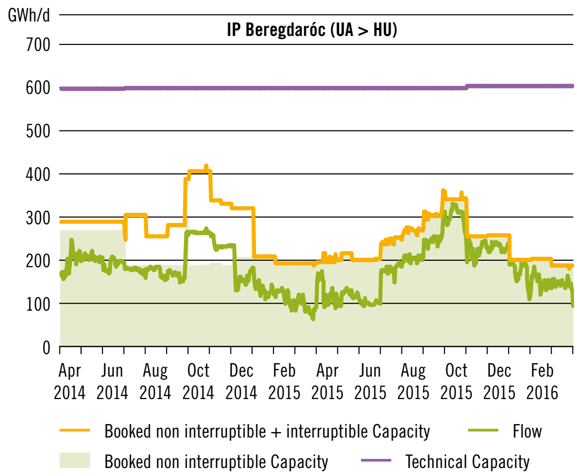


Figure 5.44: Beregdaróc: Flows and booked capacity vs. technical capacity (daily)

Tekovo/Mediesu Aurit (Ukrtransgaz > Transgaz)

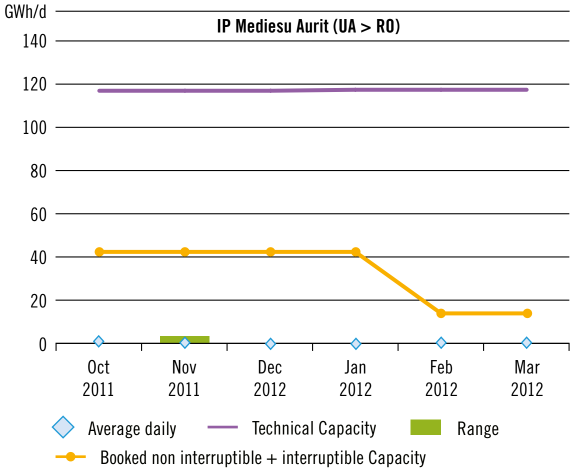


Figure 5.45: Tekovo/Mediesu Aurit: Flows and booked capacity vs. technical capacity (monthly)

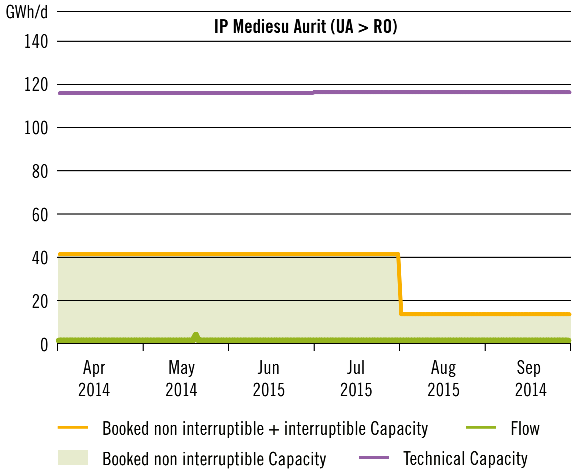


Figure 5.46: Tekovo/Mediesu Aurit: Flows and booked capacity vs. technical capacity (daily)

Orlovka/Isaccea (Ukrtransgaz > Transgaz)

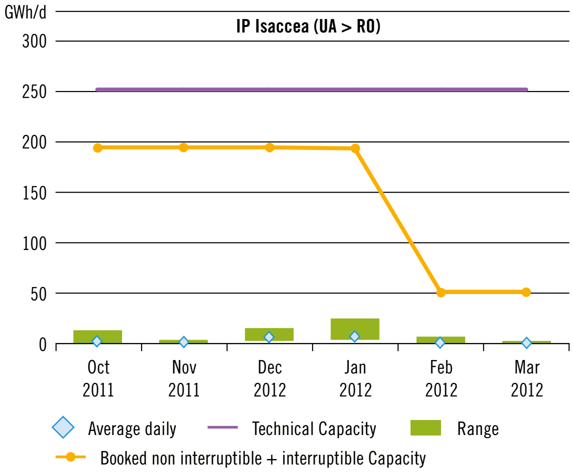


Figure 5.47: Orlovka/Isaccea: Flows and booked capacity vs. technical capacity (monthly)

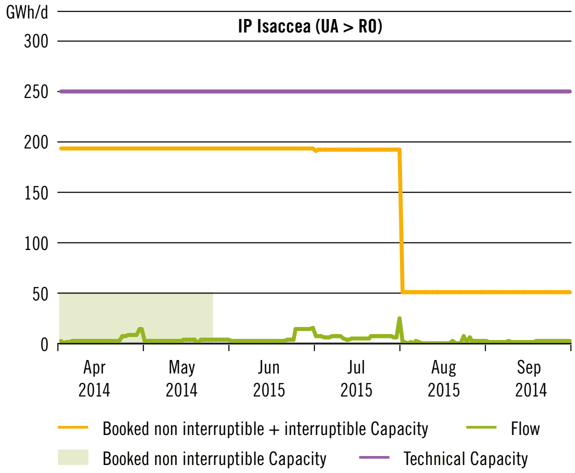


Figure 5.48: Orlovka/Isaccea: Flows and booked capacity vs. technical capacity (daily)

Mediesu Aurit-Isaccea (Uktransgaz > Transgaz)

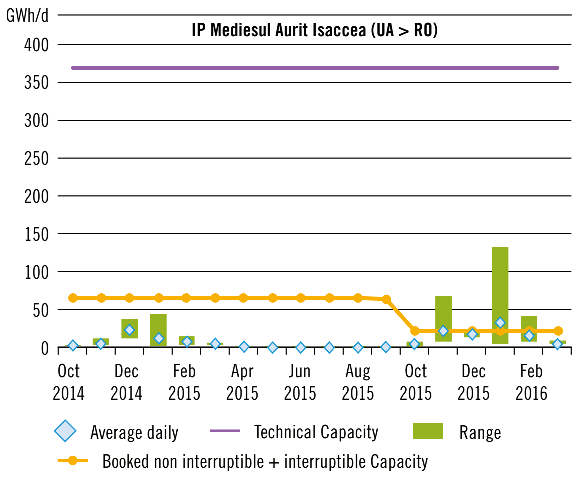


Figure 5.49: Mediesu Aurit-Isaccea: Flows and booked capacity vs. technical capacity (monthly)

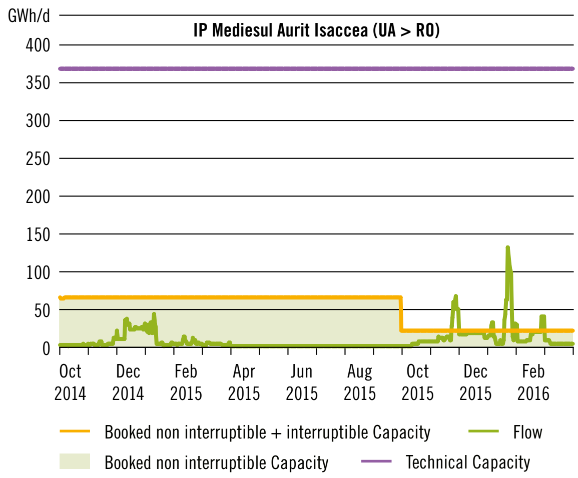


Figure 5.50: Mediesu Aurit-Isaccea: Flows and booked capacity vs. technical capacity (daily)

Starting 1 October 2014 former commercial points Mediesu Aurit and Isaccea were clustered into a single commercial point (Virtual Interconnection Point Mediesu Aurit – Isaccea) taking into account that they are connecting the same 2 transmission systems (Ukrtransgaz > Transgaz, UA > RO).

Kipi (BOTAŞ > DESFA)

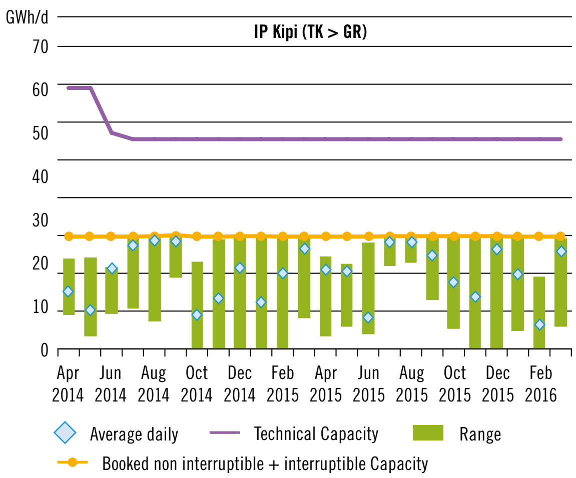


Figure 5.51: Kipi: Flows and booked capacity vs. technical capacity (monthly)

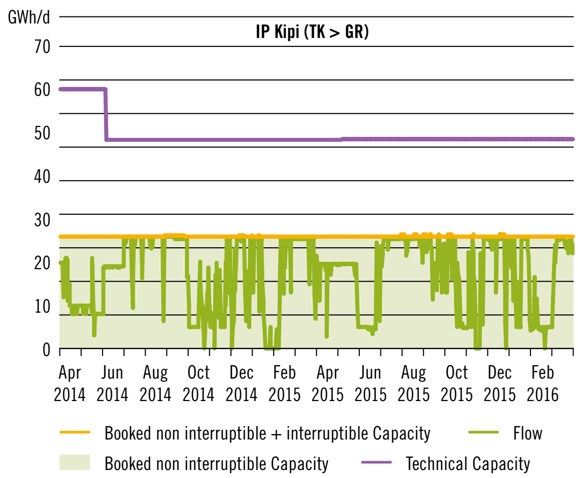


Figure 5.52: Kipi: Flows and booked capacity vs. technical capacity (daily)

b.2 Export

Kiskundorozsma (FGSZ > Srbijagas) Unidirectional

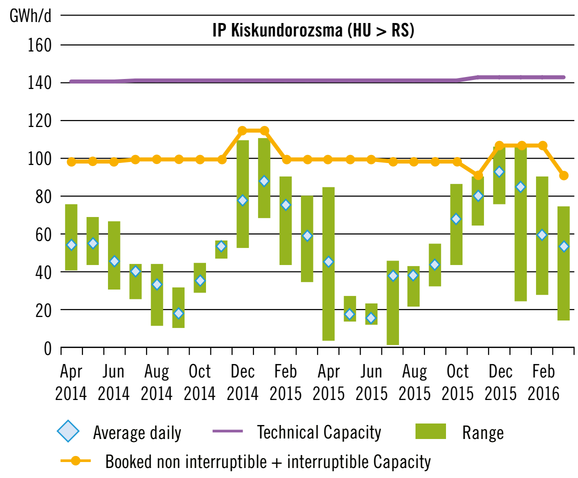


Figure 5.53: Kiskundorozsma: Flows and booked capacity vs. technical capacity (monthly)

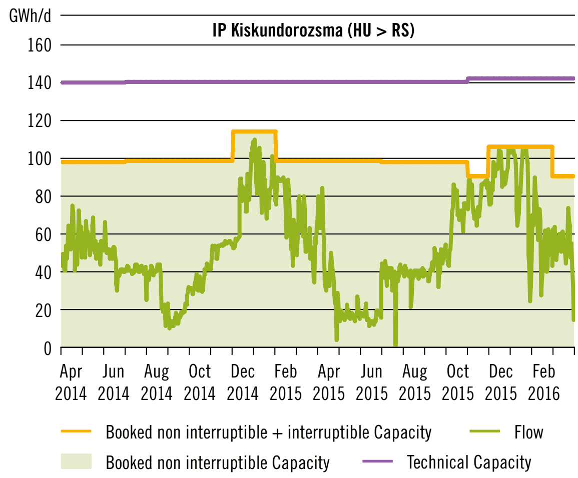


Figure 5.54: Kiskundorozsma: Flows and booked capacity vs. technical capacity (daily)

Malkoclar (Bulgartransgaz > BOTAŞ) Unidirectional

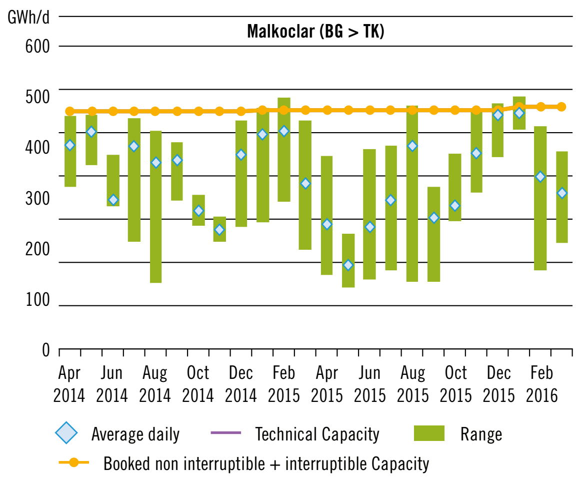


Figure 5.55: Malkoclar: Flows and booked capacity vs. technical capacity (monthly)

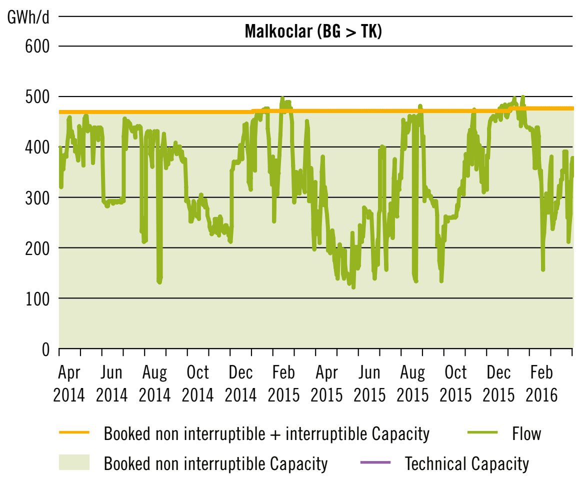


Figure 5.56: Malkoclar: Flows and booked capacity vs. technical capacity (daily)

Jidilovo (Bulgartransgaz > GA-MA) Unidirectional

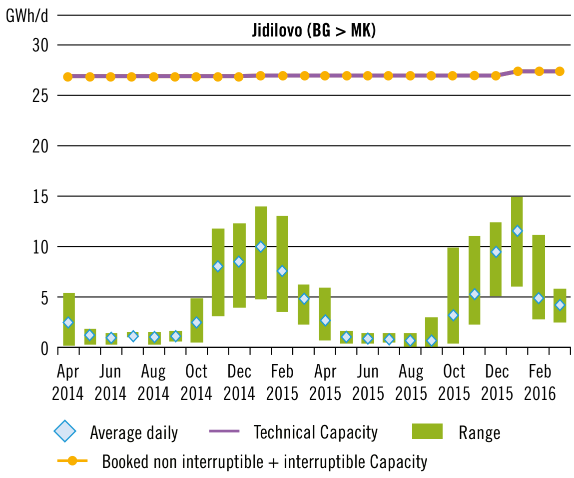


Figure 5.57: Jidilovo: Flows and booked capacity vs. technical capacity (monthly)

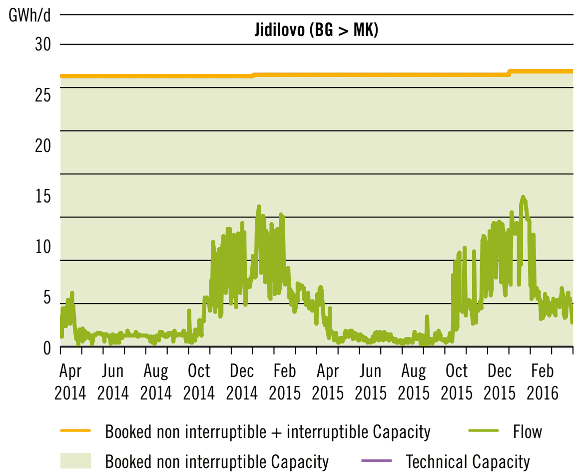


Figure 5.58: Jidilovo: Flows and booked capacity vs. technical capacity (daily)

Beregdaróc (FGSZ > Ukrtransgaz)[3] Bidirectional

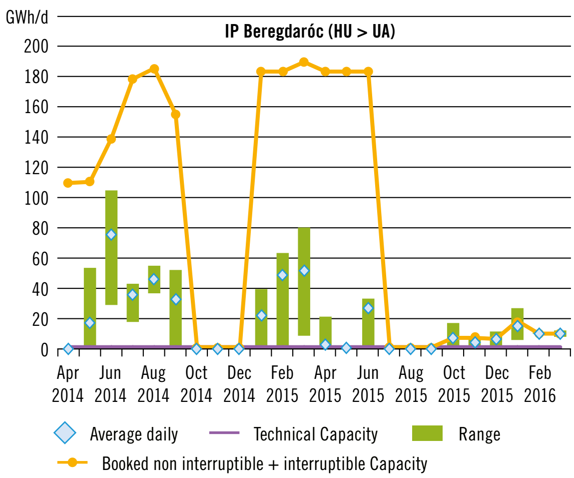


Figure 5.59: Beregdaróc : Flows and booked capacity vs. technical capacity (monthly)

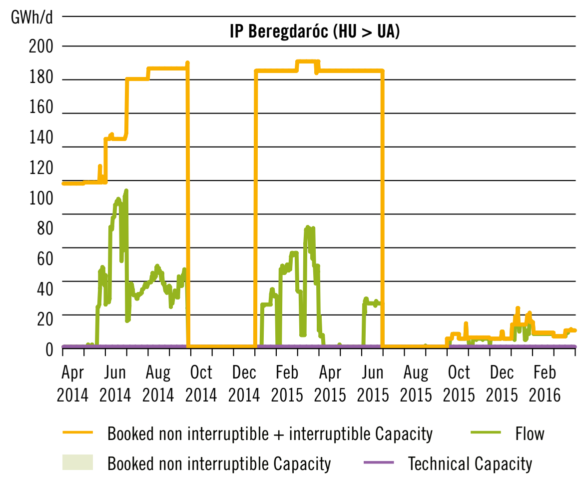


Figure 5.60: Beregdaróc : Flows and booked capacity vs. technical capacity (daily)

3) Only interruptible capacity is offered at the Beregdaróc IP in the direction from Hungary to Ukraine.

Ungheni (Transgaz > Vestmoldtransgaz)

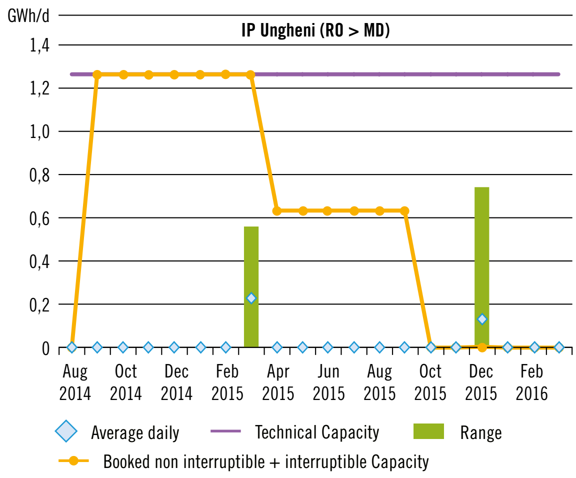


Figure 5.61: Ungheni: Flows and booked capacity vs. technical capacity (monthly)

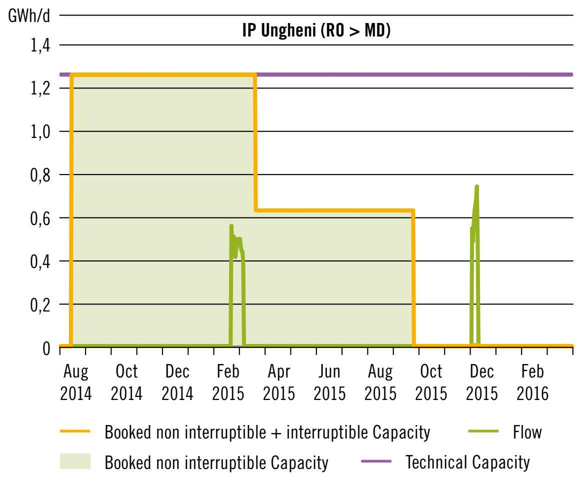


Figure 5.62: Ungheni: Flows and booked capacity vs. technical capacity (daily)

C. LNG ENTRY POINTS

Differently from the dynamics experienced at pipelines interconnection points, at LNG Entry Points gas flows are intrinsically more fluctuating, especially if the punctual, daily values are considered.

More stable indications can be drawn from the analysis of monthly dynamics.

Although the LNG imports are generally more volatile than the pipeline ones, and therefore the terminals may know periods of low utilisation, depending on the market conditions, the role of LNG terminals both, on one hand, for security of supply and peak shaving needs and, on the other hand, for the exploitation of possible commercial opportunities cannot be denied or based on the study of a limited time window.

In this paragraph the technical capacity is meant to be the regasification capacity of the terminal which may be different from that of the downstream pipeline infrastructure.

Panigaglia (GNL Italia > Snam Rete Gas)

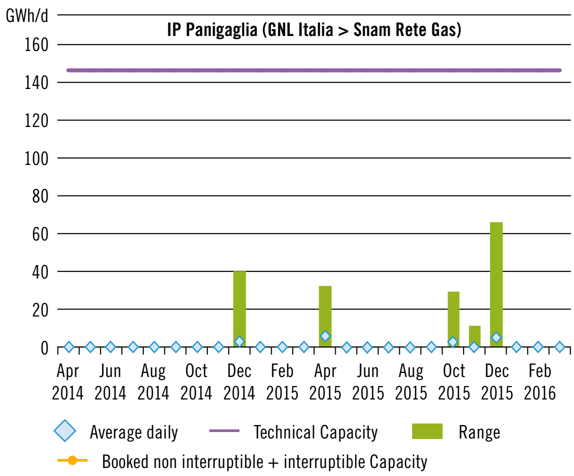


Figure 5.63: Panigaglia : Flows and booked capacity vs. technical capacity (monthly)

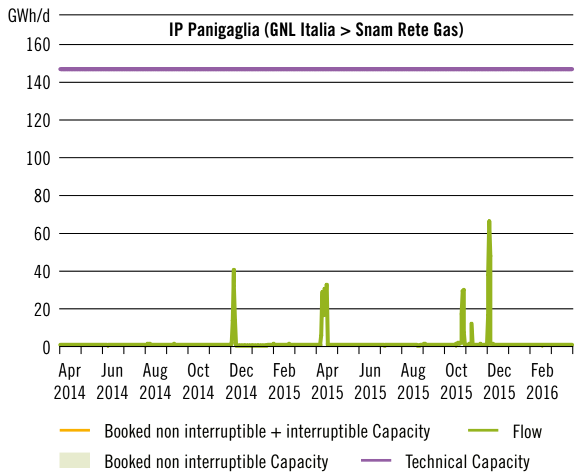


Figure 5.64: Panigaglia : Flows and booked capacity vs. technical capacity (daily)

Cavarzere (Terminale GNL Adriatico > Snam Rete Gas and Infrastrutture Trasporto Gas)

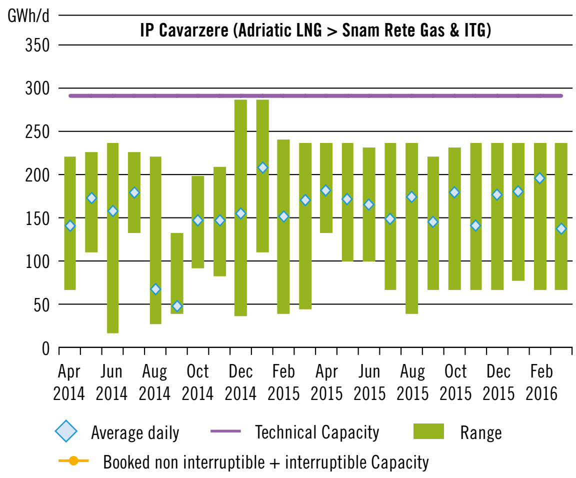


Figure 5.65: Cavarzere: Flows and booked capacity vs. technical capacity (monthly)

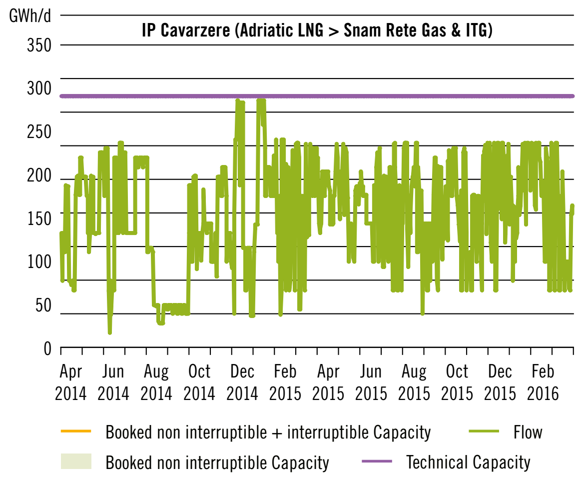


Figure 5.66: Cavarzere: Flows and booked capacity vs. technical capacity (daily)

IP Livorno (OLT LNG > Snam Rete Gas)

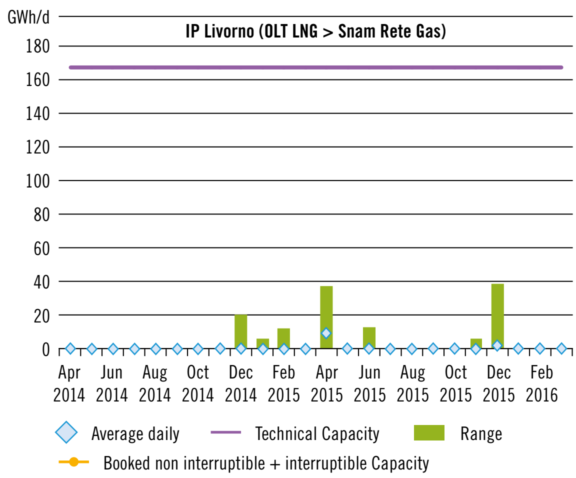


Figure 5.67: Livorno: Flows and booked capacity vs. technical capacity (monthly)

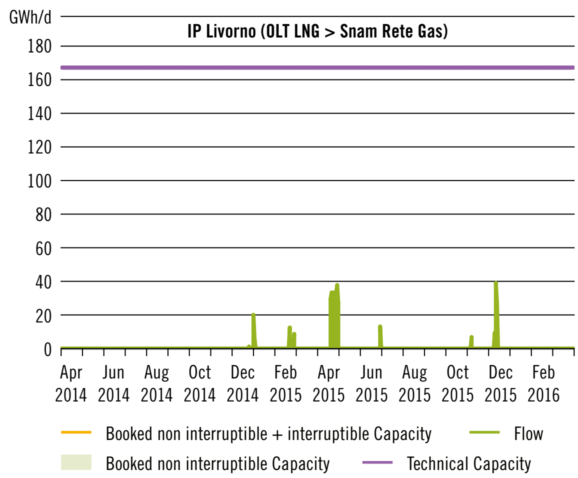


Figure 5.68: Livorno: Flows and booked capacity vs. technical capacity (daily)

Booked capacity on TSOs network is not, in this case, a useful indicator for the capacity adequacy analysis, as in Italy the terminal operators reserve capacity in the transmission system on behalf of their users.

The graphs above reflect the low utilisation rate of the Italian LNG regasification terminals (GNL Italia and OLT LNG) except for the one backed by long-term supply contracts (Terminale GNL Adriatico). The reported trend is related to the period 2014–2016. Improved utilisation rates are expected in the next years when additional LNG liquefaction capacity will come on stream.

Revythoussa (DESFA > DESFA)

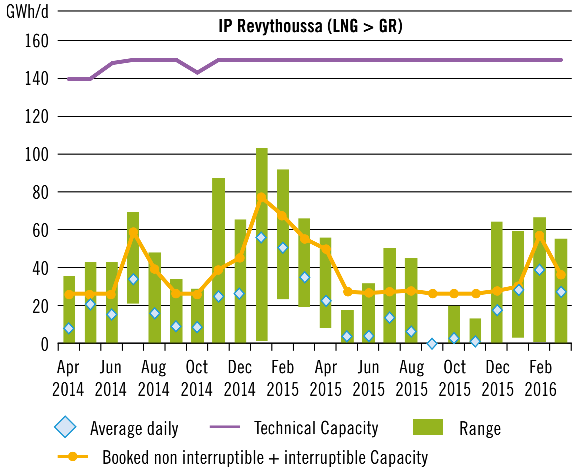


Figure 5.69: Revythoussa: Flows and booked capacity vs. technical capacity (monthly)

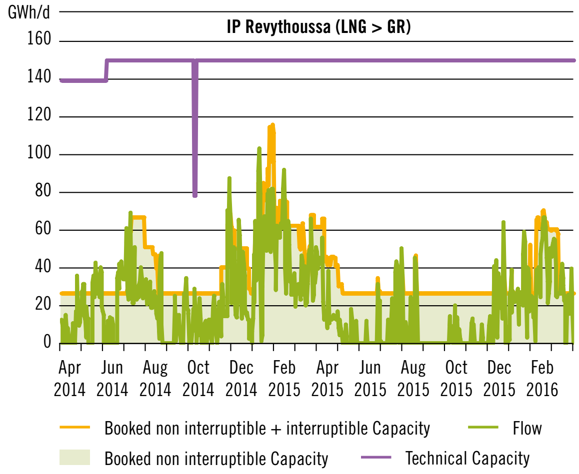


Figure 5.70: Revythoussa: Flows and booked capacity vs. technical capacity (daily)

5.2 Conclusion on the existence of congestion of the Region's Interconnecting Points

The graphs and data presented in the previous paragraph 5.1 indicate that, regarding the sufficiency of technical capacity and the use made of it, the Region's IPs belong in different categories.

a. Several IPs have a high percentage of unused capacity (i.e. relatively low utilisation rate during part of the year) both physically and contractually. In this category belong the supply Import Points from non EU members of Kipi (TK > GR) and Beregdaróc (UA > HU), as well as the IPs of Dravaszerdahely (HU > SI), of Gorizia/Šempeter (IT > SI), of Negru Voda 1 (RO > BG) and of the non-EU import points Mediesu Aurit (UA > RO) and Kipi (TR > GR). The LNG terminals are also among the points with the lower use reflecting the LNG market conditions during the period examined and the inherently modulated profile of the LNG terminals operation due to their role as sources to meet peaks of demand.

b. Some IPs have a large booked capacity of which a small part only is physically used. This is the case of Csanádpalota (HU > RO), Oberkappel (AT > DE), Lanžhot (SK > CZ), Jidilovo (BG > MK) and of the non-EU import point Mazara del Vallo (DZ > IT), although for this last IP the trend resulted recently reverted since in 2016 the ratio between booked capacity and flows jumped on average to 65 %.

c. In some IPs we notice that the capacity in winter is higher than the one in summer. This is due to the fact that in winter the gas flowing through the IP is consumed within a shorter distance from the IP and is therefore subject to lower pressure loss.

d. Some IPs seem to be physically congested, presenting a high average ratio of "used over technical" capacity like the IP of Mosonmagyaróvár (AT > HU) and Negru Voda 2, 3 with flows often higher than firm capacity over the period examined (Apr. 2014 to Mar. 2016) while the majority of the IPs presents intermediate average usage rates, some of them showing however their maximum use close to or even exceeding the declared firm technical capacity in peak demand situations.

e. Regarding the comparison between booking capacities and technical capacities, although we notice high average booking rates in the IPs of Oberkappel, (AT > DE), Murfeld/Ceršak (AT > SI before the increase of technical capacity at the beginning of 2015), Baumgarten (SK >AT), Arnoldstein/Tarvisio (AT > IT), Velké Kapušany (UA > SK), Lanžhot (SK > CZ), Negru Voda 2&3 (RO > BG), Jidilovo (BG > MK), Rogatec (SI > HR) and Kulata/Sidirokastro (BG > GR), an easy conclusion on contractual congestion in all these IPs should be avoided as the relevant graphs may correspond to very different situations like, indicatively:

- In some cases shippers had proceeded, in the past, to long term booking saturating the technical capacity. Such situations have been mitigated with the entry into force of CMP provisions and CAM Network Code.
- in some cases, as the actual flows were reduced, the TSOs proceeded to the sale of interruptible capacity to other shippers. This produces the image of a congestion situation while an important part of capacity may be available although sold as interruptible capacity.
- in some cases TSOs may have reduced the technical capacity, leaving however the margin imposed by the above Network Codes available, due to the lack of capacity booking by shippers.

6 The role of the Southern Corridor Region

Key transmission Projects of the Region
Other projects

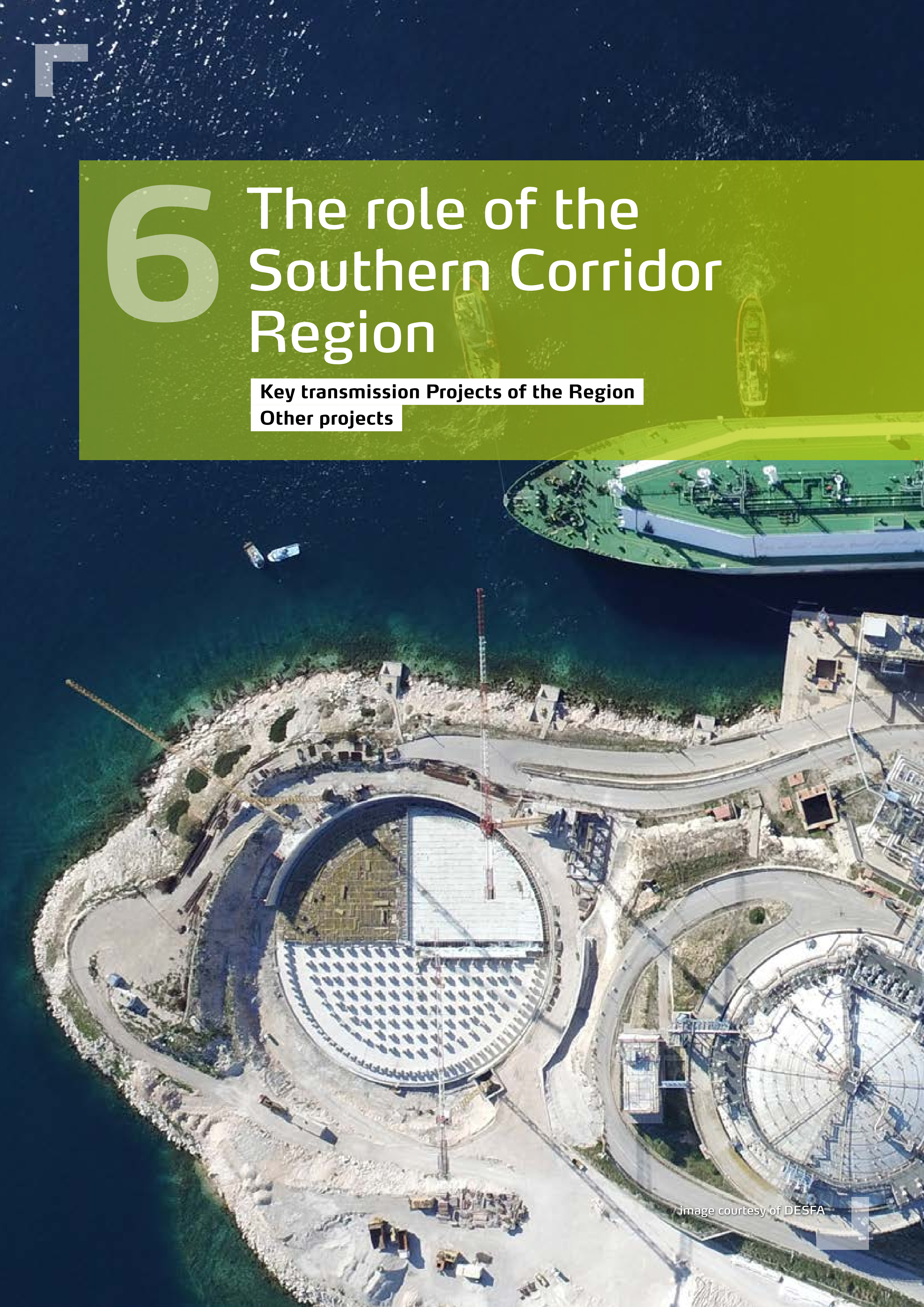


image courtesy of DESFA

The Role of the Souther Corridor Region in the development of the EU Gas Infrastructure and the quest for diversification of supply sources and routes

The capacity and integration of gas transmission networks into a common European network generally depends on the historical development of supply and sources. The development of new gas infrastructure supports the three pillars of the European energy policy: market integration, security of supply and sustainability. Ultimately, it enables and facilitates a liquid and competitive common gas market, through increased market participation and integration.

The rationale behind the key European gas transmission projects is increasing the flexibility and integration of energy markets by ensuring different connections, more alternatives of supply sources and at the same time increasing the cross-border capacities. Despite the fact that a very significant part of the natural gas, which is used in the EU, crosses at least one border, the flexibility of its transmission system still needs to be increased. The resulting increased flexibility of the European gas system will enable and enhance supply diversification thus improving the security of gas supply.

The integration level of different gas transmission networks is also dictated by the characteristics of larger projects in which the EU member countries are included. Approximately half of these projects are intended to increase the existing capacities and the other half to develop new gas transmission infrastructure with new capacities.

Gas infrastructure can also have a significant role to play in improving sustainability in Europe, since natural gas is expected to have a key role in helping the EU meet its environmental targets as the cleanest available fossil fuel and the one better suited to complement the intermittency of most renewable energy sources used for power generation.

6.1 Key transmission projects of the Region

TAP (TRA-F[1]-051)

The Trans Adriatic Pipeline (TAP) is a natural gas pipeline project, which will transport natural gas from the giant Shah Deniz II field in Azerbaijan, to Greece, Albania and, across the Adriatic Sea, to Southern Italy. Through the Italian transmission network, Azeri gas may be forwarded to North and Western Europe. Connections to other planned pipelines (IGB, IAP) and to the Greek transmission system, may provide supply of Caspian gas to Greece and to the Eastern and Western Balkans. The connection to the Greek system will be bi-directional, with the help of a planned compressor station (TRA-N-971). TAP represents the shortest (and most direct) link from the Caspian Region to the European markets. One of the main aims of the TAP project is securing future energy supply, which supports a strategic goal of the European Union. The 1,200 mm pipeline that will operate at 95 bar, is designed to expand transportation capacity from 10 bcm, initially, to 20 bcm per year, depending on supply and demand. Other benefits of the TAP project are:

- providing a diversification opportunity for Europe;
- interlinking several strategic European corridors (bridging Southern and North-South West Corridors and also, with the contribution of the lateral connections IAP and IGB, the North-South East Corridor);
- allowing the development of natural gas storage facilities in Albania and Greece to further ensure security of supply to European markets during possible operational interruptions;
- promoting economic development and creation of jobs along the pipeline route.

The project is in its implementation phase. In July 2015 construction of access roads started in Albania. In May 2016 the inauguration of the project took place in Thessaloniki. At the end of 2016, 95 km of pipe had been laid in Greece. Commissioning is expected at the end of 2019 with first commercial flows planned in 2020.

TANAP (TRA-F-221)

the Trans Anatolian Pipeline (TANAP) is the link between the South Caucasus Pipeline (SCP) and TAP. This is an Azeri-Turkish project that will carry the Caspian Gas through Turkey and up to the Greek-Turkish border at Kipi. A branch will also connect to the Interconnector Turkey-Bulgaria (ITB) in case the latter will be implemented.

Construction works started in March 2015. First gas deliveries to Turkey are expected to start in 2018.

East-Med (TRA-N-330)

This is an ambitious project for the transportation of gas from the Levantine basin to Greece and further west to Italy, via the Poseidon (TRA-N-010) offshore pipeline. The main challenge of this project is the depth at which the pipeline has to be laid combined with its length. The project consists of 1,300 km of offshore pipeline, with a diametre of 600 to 800 mm (24” to 32”) and 600 km of onshore pipeline, in Greece, with a diametre of 1,050 mm (42”). The project includes a M/R station at Megalopolis (TRA-N-1091) for the connection to the existing DESFA system.

1) The project reached FID status In December 2013

A pre-FEED study was underway in 2016. The governments of Cyprus, Israel and Greece actively support the project however more options are on the table for Cyprus and Israel. On the other hand exploration is ongoing and new discoveries might influence investment decisions.

This project represents one of the options included in the proposal of the government of Cyprus, in the TYNDP 2017–26, under code TRA-N-1146, aiming at lifting the energy isolation of Cyprus and includes also, inter alia, a pipeline from the gas fields to the Vassiliko area, a FSRU installed at the same area, transmission infrastructure to supply power stations with gas and small scale LNG facilities.

IGI-Poseidon (TRA-N-010)

The IGI-Poseidon project consisted of a new offshore pipeline that would connect the westwards extension of the Greek transmission system, i.e. the **Komotini-Thesprotia** pipeline (TRA-N-014), with the Italian one. The project also includes a compressor station at Kipi at the GR/TR border (TRA-N-128) that will provide the necessary increased capacity to the DESFA system. The main objective of the IGI-Poseidon project was to complete the natural gas corridor through Turkey, Greece and Italy (Interconnection Turkey Greece Italy – ITGI), enabling Italy and the rest of Europe to import natural gas from the Caspian Sea and the Middle East. This way it would contribute to the security and diversification of European energy supply. The design capacity of the IGI-Poseidon project was 12 billion cubic meters per year. After the selection of TAP, for the same purpose, by the Shach Deniz consortium, both above projects were put on hold. However, the cancellation of the South Stream pipeline may be a valid reason to keep this project alive. In February 2016, indeed, "*the Shareholders of IGI Poseidon, respectively DEPA SA with 50% and Edison SpA with 50%, signed with Gazprom the 'Memorandum of Understanding in relation to gas supplies from Russia across the Black sea through third countries to Greece and from Greece and Italy' to develop a gas pipeline project between Greece and Italy, enabling the realization of a new route for gas supply*"[2] .A further agreement was signed by the three parties in St. Petersburg, in June 2017.

Eastring (TRA-N-628, TRA-N-654, TRA-N-655, TRA-N-656)

According to its main promoter, the Eastring Project connects Central and Western Europe with Southeastern Europe, routing from SK–UA border via Hungary and Romania to an external border of the EU on the territory of Bulgaria.

The main goal of the project is to create a bi-directional cross-border pipeline of approx. 1,100km with capacity up to 40bcm/a in the final phase. Commissioning is planned for 2021 (first phase) and 2025 (final phase). The Project incorporates direct connections to national transmission systems of involved countries, so these countries can benefit on a strategic level by enhancing their status on the European energy map.

The project could allow the flow of gas in both directions – the Balkan region will have the possibility to be supplied with gas coming from northern sources/routes including LNG from the Polish LNG terminal via the planned Polish–Slovak interconnector or Central Europe with eastern gas and central and western European region will get access to gas from the Caspian region or other eastern sources.

The Eastring Project would (i) secure supply in case of RU disruption and therefore it will increase SoS in the broader Central-South-East EU region, (ii) allow access to alternative gas sources, (iii) mean step towards EU single gas market.

In November 2016 the promoters of the project requested the co-financing of a feasibility study by the EU CEF programme, based on its PCI status. In 2017 the financial support for the feasibility study was approved and the project promoters were provided with financial sources from the EU CEF programme of 50% out of total eligible costs.

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2) Source: IGI Poseidon website http://www.igi-poseidon.com/en-drupal/media/poseidon-gazprom-depa-and-edison-sign-memorandum-understanding

IAP (TRA-N-068)

The Ionian Adriatic Pipeline is foreseen to run from Albania (Fier), where it will connect with the Trans Adriatic Pipeline (whose implementation is also one of the prerequisites for IAP's implementation) through Montenegro to Croatia (Ploče) with a connection to Bosnia and Herzegovina. IAP will have a diametre of 800 mm and a pressure of 75 bar with reverse flow capability. The objectives of the IAP project are to:

- ensure the possibility of gas supply from the Caspian and central-eastern sources to the western Balkan markets, enabling easier gasification of Albania, creating the preconditions for gasification of Montenegro, and completing the gasification of South Croatia and a significant part of Bosnia and Herzegovina, thus promoting economic development in the western Balkans,
- diversify natural gas supply, provide access to Albanian and Croatian storage capacities,
- integrate the western Balkans gas market into the European gas market,
- promote economic development in this region.

Bulgaria – Romania – Hungary – Austria transmission corridor, project.

This is a multi-stage project aiming at creating a corridor that will ensure gas transmission between the cross-border interconnection points Bulgaria-Romania, Romania-Hungary and Hungary-Austria. It will create the necessary conditions for bidirectional gas transmission between the Southern Corridor and Central Eastern Europe ensuring the increase of the interconnection at European level.

The following projects are involved in each stage of development:

Stage I. for 1.75 Bcm/a:

- TRA-F-029: BG-RO Interconnection
- TRA-N-358-stage I: Development of the NTS in RO territory, stage I
- TRA-N-286: Reverse flow capacity at RO-HU border, stage I

Stage II. for 4.4 Bcm/a:

- TRA-N-358-stage II: Development of the NTS in RO territory, stage II
- TRA-N-377: Reverse flow capacity at RO-HU border, stage II
- TRA-N-018: Városföld-Ercsi-Győr pipeline
- TRA-N-061: Ercsi-Szazhalombatta pipeline
- TRA-N-123: Városföld CS
- TRA-N-423: Mosonmagyaróvár CS

Stage III. for 8.8 – 12 Bcm/a:

- TRA-N-139: interconnection of the National Transmission System with the Distribution System and reverse flow at Isaccea
- TRA-N-959: BRUA phase III
- TRA-N-380: BRUA transmission Corridor

At the same time, together with the project Development on the Romanian territory of the Southern gas transmission Corridor (TRA-N-362) and new NTS development for taking over new gas from the Black Sea shore (TRA-N-964), the above mentioned projects contribute to the diversity of gas supply sources as well as to the increase of security of supply by taking over the recently discovered Black Sea gas.

IGB (TRA-N-149) and ITB (TRA-N-140)

Gas Interconnectors Greece – Bulgaria and Turkey – Bulgaria are proposed gas pipelines, connecting the Bulgarian natural gas pipeline network with the Greek and the Turkish transmission systems respectively. The IGB project includes the construction of a trans-border reverse gas pipeline from the area of Komotini in Greece to the area of Stara Zagora in Bulgaria, with a length of approximately 168.5 km (Bulgarian section: 140 km, Greek section: 28.5 km), and a diametre of 700 mm. The ITB project includes the construction of an onshore gas pipeline in the section between the village of Losenets and the Bulgarian-Turkish border in the region of the village of Strandja, running in parallel to the existing transit gas pipeline of about 76 km length on Bulgarian territory and diameter of the pipe 700 mm. Both projects have similar planned capacities (3 up to 5 bcm/year for IGB and 3 bcm/year for ITB). The objective of both projects is mainly the diversification of sources of natural gas supply thus providing enhanced security of supply to the Bulgarian and other South and Central-eastern European gas markets. IGB project will also enhance, through its reverse flow capability, the security of supply of Greece.

Although the IGB promoters have announced the Final Investment Decision, already in December 2015, the project implementation depends on the booking of sufficient capacity by the market. A market test was launched in 2016 in two phases. The second one (bidding phase) was to last until 31 October 2016, was extended by one month, then the promoters announced their willingness "*to assess a new allocation procedure for the remaining capacity not [yet] allocated […] [following a] procedure intended to be under the same procedural ground with a suited timeframe*"[3].The project is included in the 1st priority projects of the CESEC initiative.

ITB has not yet reached the same level of maturity as IGB. ITB Feasibility study has been completed in 2016. ITB can secure access to all existing and future entry points and sources of Turkey–Azerbaijan and other natural gas and LNG spot supplies from the existing terminals in Turkey. Its implementation would also enhance the creation of a competitive gas market and would increase systems' flexibility and market integration.

Poland – Slovakia interconnection (TRA-N-190)

This project, supplemented by the reinforcement of the Polish internal system, is a part of the North-South gas interconnections in Central Eastern and South Eastern Europe. The Project Promoters are GAZ-SYSTEM (Polish side) and eustream (Slovak side).

The main goal of the Project is to create the first bi-directional cross-border pipeline between Poland and Slovakia of approx. 164 km with capacity of 144 GWh/d (direction PL – SK) and 174.6 GWh/d (direction SK – PL). The Project would allow to increase level of security of supplies, market integration and diversification of gas routes and gas sources by creating a missing interconnection between Polish and Slovak gas transmission systems. Commissioning is planned for 2021.

Realisation of the Project would enable a direct connection to other projects such as the SK-HU Interconnection, LNG terminal in Świnoujście and planned project Eastring, routing from Veľké Kapušany (Eastern Slovakia) through the Balkans, to the Turkish gas hub and Southern Corridor, which both would offer to neighbouring countries, including Ukraine, a connection to various gas sources, including Caspian gas. The project is in the final stage of engineering works performed with financial support from CEF. Substantial contribution was also granted by the EC for construction works.

3) Source: ICGB website http://www.icgb.eu/market_test

AGRI project (TRA-N- 376)

this project consists in the installation of natural gas liquefaction facilities on the Georgian shore and the transportation of LNG from Georgia to Romania. The Maximum Annual Capacity would be 8.0 bcma and the Maximum send-out rate 22.0 mcm/d. The onshore storage capacity would be 160,000 m³ and the supply chain would be operated by two LNG carriers of 140,000 m³ each.

White Stream (TRA-N-053)

This is a PCI project that consists of the implementation of an offshore pipeline in the Black sea from Georgia to Romania. In addition to being technically challenging (as the pipeline should cross the Black see in its longer direction) and relying on the permission by states with contrary interests (Russia or Turkey), the project did not show any activity in the last years.

Image courtesy of FGSZ

6.2 Other projects

6.2.1 BALKAN GAS HUB PROJECT

This project includes the realisation of the following projects: TRA-N-593 – Gas pipeline Varna–Oryahovo; TRA-N-594 – Construction of a looping CS Provadia – Rupcha; TRA N-592 – Looping to CS Valchi dol), promoted by Bulgartransgaz: The rationale of these projects is the creation of a gas distribution centre (hub) on the territory of Bulgaria, supported by a real physical entry point in the region of Varna.

In November 2016 Bulgartransgaz requested the co-financing of a feasibility study by EU which was awarded in 2017 under the Connecting Europe Facility (CEF) programme[4].

6.2.2 PROJECTS ALLOWING GAS TO FLOW FROM CROATIAN LNG TERMINAL

The purpose of the Croatian LNG terminal, at Krk island, is to secure energy needs, contribute to diversification of sources and increase security of supply in case of possible disruptions of existing and other sources, by providing a new gas supply route for the Central and South-eastern European countries. The LNG terminal represents an additional source of natural gas for Croatia as well as its neighbouring countries, including Hungary, Slovenia, Austria, Bosnia & Herzegovina, and Serbia.

Main projects that will contribute to this effect are the new interconnections:

- between Croatia and Slovenia (Lučko–Zabok–Rogatec),
- between Croatia and Bosnia and Herzegovina (connections south Zagvoz-Imotski Posušje)
- between Croatia and Serbia (Slobodnica–Sotin–Bačko Novo Selo)
- between Slovenia and Austria (interconnection Ceršak/Murfeld)

4) Action 6.25.4-0015-BG-S-M-16 "Feasibility Study on the Balkan Gas Hub"

The complete list of projects in this category is the following:

LIST OF PROJECTS

Project	Code	Promoter
Compressor station 1 at the Croatian gas transmission system	TRA-F-334	PLINACRO
Compressor stations 2 and 3 at the Croatian gas tranmission system	TRA-N-1057	PLINACRO
Interconnection Croatia/Bosnia and Herzegovina (Slobodnica-Bosanski Brod)	TRA-N-066	PLINACRO
Interconnection Croatia/Serbia Slobodnica – Sotin (Croatia) – Bačko Novo Selo (Serbia)	TRA-N-070	PLINACRO
Interconnection Croatia/Slovenia (Lučko – Zabok – Rogatec)	TRA-N-086	PLINACRO
Interconnection Croatia-Bosnia and Herzegovina (West)	TRA-N-303	PLINACRO
Interconnection Croatia-Bosnia and Herzegovina (South)	TRA-N-302	PLINACRO
LNG evacuation pipeline Zlobin-Bosiljevo-Sisak-Kozarac	TRA-N-075	PLINACRO
LNG evacuation pipeline Omišalj – Zlobin (Croatia) *	TRA-N-090	PLINACRO
LNG evacuation pipeline Kozarac-Slobodnica	TRA-N-1058	PLINACRO
LNG terminal Krk	LNG-N-082	LNG Hrvatska
M8 Kalce – Jelšane	TRA-N-101	PLINOVODI
M3/1c Kalce – Vodice	TRA-N-261	PLINOVODI
M3/1b Ajdovščina – Kalce	TRA-N-262	PLINOVODI
M3/1a Gorizia/Šempeter – Ajdovščina	TRA-N-099	PLINOVODI
CS Ajdovščina, 2nd phase of upgrade	TRA-N-093	PLINOVODI
Upgrade of Rogatec interconnection (M1A/1 Interconnection Rogatec)	TRA-N-390	PLINOVODI
CS Kidričevo, 2nd phase of upgrade	TRA-N-094	PLINOVODI
Upgrade of Murfeld/Ceršak interconnection (M1/3 Interconnection Ceršak)	TRA-N-389	PLINOVODI
GA 2015/08: Entry/Exit Murfeld	TRA-N-361	Gas Connect Austria

* This project has a reduced scope in the present SC GRIP and the corresponding TYNDP 2017 edition. However the addition of the pipeline section Zlobin (Croata) – Rupa (Slovenia) will be reconsidered in the next National Development Plan of Plinacro.

6.2.3 PROJECTS ALLOWING GAS FLOWS FROM GREECE TOWARDS NORTH

The main objective of these projects is to provide an additional source of natural gas for Greece and enable gas to flow to the north, running from the LNG terminals in Greece (the Revithoussa terminal – currently under expansion – and the new Alexandroupolis FSRU, in northern Greece) to Bulgaria, FYRoM, Serbia, Romania, Hungary and up to Ukraine.

Projects that will contribute to this effect are, in addition to the reverse flow capacity already implemented at the interconnecting points at the Greek/Bulgarian border (Kulata/Sidirokastro), the new interconnections between Greece and Bulgaria (IGB), between Bulgaria and Romania (IBR and TRA-N-379) and between Bulgaria and Serbia (IBS) as well as the projects at the Romanian/Ukrainian (Isaccea) borders and the east-west axis between Romania, Hungary and Austria. The objective is achieving diversification of sources and ensuring the security of natural gas supply to the relevant corridor/area. The last project added in this group is the 55 km long (for the Greek part) interconnection between Greece and FYRoM.

The list of projects in this category is the following:

LIST OF PROJECTS

Project	Code	Promoter
A project for the construction of a gas pipeline BG – RO	TRA-N-379	BULGARTRANSGAZ
Rehabilitation, Modernisation and Expansion of the National Transmission System	TRA-N-298	BULGARTRANSGAZ
Interconnection Bulgaria -Serbia	TRA-F-137	Min. of Energy BG
Revythoussa LNG 2nd upgrade	LNG-F-147	DESFA
Reverse flow capacity at RO-HU border, stage I (Csanádpalota CS; 2 units)	TRA-N-286	FGSZ
Reverse flow capacity at RO-HU border, stage II (Csanádpalota CS; 1 unit)	TRA-N-377	FGSZ
Városföld – Ercsi – Győr	TRA-N-018	FGSZ
Városföld CS	TRA-N-123	FGSZ
Ercsi-Szazhalombatta pipeline	TRA-N-061	FGSZ
Mosonmagyaróvár CS	TRA-N-423	Gas Connect Austria
Interconnection of the NTS with the DTS and reverse flow at Isaccea	TRA-F-139	SNTGN Transgaz
LNG terminal in northern Greece/Alexandroupolis – LNG Section	LNG-N-062	Gastrade
LNG terminal in northern Greece/Alexandroupolis – Pipeline Section	TRA-N-063	Gastrade
Nea-Messimvria to FYRoM pipeline	TRA-N-967	DESFA

6.2.4 DEVELOPMENT FOR NEW IMPORTS FROM THE SOUTH (TRA-N-007)

Snam Rete Gas, in line with the findings of SEN (National Energy Strategy), considers the development of new imports from Southern Italy as a strategic element to enable a greater diversification of energy sources, so as to increase the competitiveness of the gas market and provide greater security of supply to the entire national transmission system.

Snam Rete Gas has therefore planned the construction of a project called "Development for new imports from the South" (TRA-N-007), that will create new transmission capacity of approximately 24 MSm³/d (equivalent to around 264 GWh/d) to facilitate gas from future entry points in the South of the country.

The project includes the construction of an approximately 430 km-long new pipeline (48" – DN1200) and a compression plant of approximately 33 MW (Sulmona compressor station[5)]), along the South-North line, known as the "Adriatica Line". The Adriatica Line will serve to transport quantities of gas from any new sourcing initiative from Sicily and from the middle Adriatic. The project can be considered as a backbone development that has the character of generality, allowing to set up the system of gas supply to new Italian imports from the South), for transmission across Italy and towards Northern Europe.

The upgrade work required for the transport of new quantities of gas is currently under feasibility study. In addition, the project is included in the list of PCI presented in November 2015 by the European Commission ("PCI 6.18 Adriatica Line"). The commissioning of the project is scheduled for 2023.

Another development for new imports from the South is the project "TAP Interconnection", specifically dedicated to the access of new gas flows from TAP. The initiative foresees the construction of 55 km of new national network pipelines (56'' – DN1400) between Melendugno (TAP entry point) to the existing national network in Brindisi area. The commissioning date of this project is aligned to TAP entry into operation (start of 2020).

5) The construction of the compressor station of Sulmona has been approved (FID project) to improve the reliability and safety of the transport and also in relation to the expected increase in withdrawal capacity planned for the Stogit storage field of Fiume Treste.

6.2.5 PROJECTS ALLOWING THE DEVELOPMENT OF UNDERGROUND GAS STORAGE CAPACITY

6.2.5.1 Underground storage in South-Eastern Europe

The development of underground gas storages in Bulgaria (UGS Chiren Expansion and the construction of a new gas storage facility on the territory of Bulgaria), Greece (planned South Kavala UGS facility) and Romania (Depomures, Sarmasel UGS facility upgrading and the construction of a new underground storage, in north-eastern Romania, near Falticeni) will enable the possibility to seasonally balance supply and consumption and increase safety of gas supply in South-Eastern Europe by securing higher storage gas volumes. New storage capacity in the southern part of the Balkans will be better valued in conjunction with the TAP project.

The projects in Romania (with the exception of the new UGS Moldova) and Bulgaria consist in the expansion of existing storage facilities while the project in Greece would be the first underground storage in this country.

The list of projects in this category is the following:

LIST OF PROJECTS

Project	Code	Promoter
Construction of new gas storage facility on the territory of Bulgaria	UGS-N-141	BULGARTRANSGAZ
UGS Chiren Expansion	UGS-N-138	BULGARTRANSGAZ
South Kavala underground gas storage facility	UGS-N-385	Hellenic Republic Asset Management Fund
Metering and Regulating Station at South Kavala	TRA-N-1092	DESFA
Depomures (RO)	UGS-N-233	Engie Romania
Sarmasel underground storage in Romania	UGS-N-371	ROMGAZ
New underground gas storage in Romania	UGS-N-366	ROMGAZ

6.2.5.2 Underground storage in Italy

Italy already disposes of the larger underground storage capacity in the Southern Corridor region, with 10 operational depleted field storage facilities, located in the regions of Lombardy, Emilia-Romagna, Veneto and Abruzzo. However new projects are considered to increase further more the supply security. Most of them concern the expansion or modernisation of existing facilities.

The available storage capacity at the end of 2016 amounted to 16.5 bcm; this amount includes 4.5 bcm of strategic reserve – a value yearly defined by the Ministry of Economic Development (MiSE) – to mitigate gas shortage emergencies. Gas storage plays an important role in the Italian market, as it provides both the major source of flexibility, and increases security of supply in a market that is heavily dependent on imports. The need to develop storage capacity is highlighted in the Italian Energy Strategy (SEN), which indicated the need to increase the capacity margin of the system as well as increasing flexibility in gas supply to prevent emergency situations during peak demand conditions and/or supply interruption. Increases in storage capacity are expected because of the expansions of the existing storage facilities in Fiume Treste, Minerbio, Ripalta, Sabbioncello, Sergnano and Settala, but also through the commissioning of new sites under construction or authorisation: Bordolano, in Lombardy, developed by Stogit (first phase already commissioned in February 2016); San Potito and Cotignola, in Emilia-Romagna, owned by Edison Stoccaggio in the activation phase (already connected with the national network); Palazzo Moroni in Marche, on initiative of Edison Storage; Cornegliano in Lombardy, on the initiative of Ital Gas Storage.

The list of projects in this category is the following:

LIST OF PROJECTS

Project	Code	Promoter
Bordolano Second phase	UGS-F-1045	Stogit
System Enhancements – Stogit – on-shore gas fields	UGS-F-260	
Nuovi Sviluppi Edison Stoccaggio	UGS-N-235	Edison
Palazzo Moroni	UGS-N-237	Non-FID Advanced

6.2.6 ALL OTHER PROJECTS

The remaining projects of the Region are included in the following table

LIST OF PROJECTS

Project	Code	Promoter
Bidirectional Austrian-Czech Interconnector (BACI, formerly LBL project)	TRA-N-021	Gas Connect Austria
Břeclav-Baumgarten Interconnection (BBI) AT	TRA-N-801	Gas Connect Austria
TAG Reverse Flow	TRA-N-954	Trans Austria Gas-leitung GmbH
Looping CS Valchi Dol – Line valve Novi Iskar	TRA-N-592	Bulgartransgaz
Varna-Oryahovo gas pipeline	TRA-N-593	Bulgartransgaz
Construction of a Looping CS Provadia – Rupcha village	TRA-N-594	Bulgartransgaz
Rehabilitation, Modernisation and Expansion of the NTS	TRA-N-298	Bulgartransgaz
Interconnection Croatia/Slovenia (Umag – Koper)	TRA-N-336	Plinacro Ltd
Metering and Regulating station at Komotini	TRA-N-940	DESFA
Enhancement of Transmission Capacity of Slovak-Hungarian interconnector	TRA-N-524	Magyar Gáz Tranzit
Development of Transmission Capacity at Slovak-Hungarian interconnector	TRA-N-636	Magyar Gáz Tranzit
Vecsés – Városföld gas transit pipeline	TRA-N-831	Magyar Gáz Tranzit
HU-UA reverse flow	TRA-N-586	FGSZ
Hajduszoboszlo CS	TRA-N-065	FGSZ
Support to the North West market and bidirectional cross-border flows	TRA-F-214	Snam Rete Gas
Import developments from North-East	TRA-N-008	Snam Rete Gas
Additional Southern developments	TRA-N-009	Snam Rete Gas
Interconnection with Slovenia	TRA-N-354	Snam Rete Gas
Sardinia Methanisation		Snam Rete Gas
GALSI Pipeline Project	TRA-N-012	Galsi S.p.A.
Porto Empedocle LNG	LNG-N-198	Nuove Energie S.r.l.
On-shore LNG terminal in the Northern Adriatic	LNG-N-217	Gas Natural
LARINO – RECANATI Adriatic coast backbone	TRA-N-974	Società Gasdotti Italia
Sardinia Gas Transportation Network	TRA-N-975	Società Gasdotti Italia
NTS developments in North-East Romania	TRA-N-357	SNTGN Transgaz
New NTS developments for taking over gas from the Black Sea shore	TRA-N-964	SNTGN Transgaz
System Enhancements – Eustream	TRA-F-017	eustream
Poland – Slovakia interconnection	TRA-N-190	eustream
Capacity increase at IP Lanžhot entry	TRA-N-902	eustream
M6 Ajdovščina – Lucija	TRA-N-365	PLINOVODI
M6 Interconnection Osp	TRA-N-107	PLINOVODI
M3 pipeline reconstruction from CS Ajdovščina to Šempeter/Gorizia	TRA-N-108	PLINOVODI
CS Ajdovščina, 1st phase of upgrade	TRA-N-092	PLINOVODI
R61 Dragonja – Izola	TRA-N-114	PLINOVODI

7 Network Assessment

Introduction | Scenarios | Security of supply Analysis
Flows response tp price signals

image courtesy of DESFA

7.1 Introduction

This chapter presents the capabilities and behaviour of the gas transmission system in the Region, with reference to two factors:

- The security of supply in case of disruption of a supply route
- The change of flows pattern when the price of one of the available sources of gas decreases

This investigation is done with the use of the ENTSOG network simulation model ("NeMo"). This is a linear programming model which minimises the cost for meeting the demand in all countries (or balancing zones). Each balancing zone is represented as a single node[1] connected to neighbouring nodes with arcs having a limited capacity equal to the sum of the capacities of existing interconnectors after applying the "lesser of" rule. Each arc is divided into several parts with increasing cost weights. This approach allows to utilise the arcs, more or less, evenly (otherwise some of arcs would not be used at all while others would be fully used. Flow patterns resulting from computation reflect this input condition. LNG and UGS capacities, import points (from non-EU sources) and new projects are represented by additional arcs.

The minimisation of the gas bill at EU level means that the results obtained may differ from the optimal solution for each individual country.

The ENTSOG model calculations are based on

- Entry and Exit Capacities of IPs between two countries respectively balancing zones as calculated by the relevant TSOs
- Working gas volume respectively injection/withdrawal capacities of UGS
- Send-out Capacities of LNG Regasification facilities
- National production capacities

This model was used to:

- Analyse the balance between demand and supply
- Estimate the resilience of the transmission network
- Estimate the flows between various countries and their sensitivity to supply disruptions and level of prices.
- Estimate the impact of new projects to the mitigation of the consequences of supply disruptions.

This is achieved through the examination of various scenarios modelled by modifying the capacity assigned to different arcs. A more detailed description of the ENTSOG Network Modelling tool can be found in the ENTSOG TYNDP 2017–2026[2].

It is important to keep in mind that this model only proposes one of many possible combinations that cover the demand of various markets (one per country) while respecting the constraints regarding:

- the capacity of interconnections and entry points (from third countries) and
- the availability of supply sources

1) There are a few countries in the EU where the internal transmission system applies constraints or competing capacities in the gas transmission within the country. In such cases a country may be represented by more nodes

2) ENTSOG TYNDP 2017–2026, Annex F – Methodology

The model does not forecast the actual flows neither can the solution proposed be considered more probable than other solutions. The actual flows will depend from decisions made by the shippers who take into account gas prices, use of system tariffs and other commercial conditions of the transportation contracts, which are not considered in the ENTSOG Network Modelling tool. We have seen in chapter 4 that prices are influenced by several parameters both technical and commercial. For this reason the utility of the model is mainly proved in the stress cases where it is crucial to determine whether there is a possibility of overcoming a supply disruption or supply minimisation, under high demand conditions, or this might be impossible, in one or more areas, because of lack of adequate transportation capacity.

7.2 Scenarios

In order to perform the above analysis a certain number of cases were defined by combining the values of the following parameters:

- **Demand.** Regarding Demand the following options have been used:

Design Case (DC). In this case the daily demand in every country is equal to the daily demand used for the design of infrastructures according to the national provisions (usually 1 occurrence in 20 years). This is the highest possible demand case. The DC demand is used in the disruption scenarios.

Average day: In this case the demand in every country is equal to the average daily demand of the full year or to the average daily demand of the winter period only (AW). The AW demand is used in the study of the impact of gas source prices on flows.

It should be noted that the demand is the one of the Blue Transition scenario[3)] of the TYNDP 2017–26 which gives the higher values and therefore evaluate the gas infrastructure under higher stress conditions.

- **Infrastructure level:** Regarding this parameter two values were used:

Low: including the existing infrastructure and the projects which have already a Final investment decision

PCI: including, on top of the Low infrastructure level, the projects included in the 2015 PCI list.

- **Year:** Results of years 2020 and 2030 were mainly used, however reference is sometimes made to 2017 results

- **Disruption of supply route:** Two disruptions were considered:

Ukraine (UA): disruption of flows through Ukraine

Transmed: disruption of flows of Algerian pipeline gas to Italy.

3) Please see "ENTSOGTYNDP 2017 – 2026, Annex F – Methodology" for a more detailed description of the TYNDP 2017–26 scenarios

It should be noted that in the supply disruption analysis the cooperative approach is followed. This means that an affected country starts supplying its neighbours even before fully covering its own demand. This is in line with the new Security of Supply Regulation which gives priority to the supply of "protected customers" recognised as such by the competent NRA, regardless of the country where they are established

- Price: For the examination of the impact of supply sources price differences to flows, the prices of three sources have been reduced, one at a time, by 10 % compared to the Reference price. These sources are:

Russian gas, LNG and Azeri gas

As the use of the cheaper source is maximised those cases are also referred to as RU max, LNG max and AZ max.

The following table summarises the scenarios and the corresponding values of the parameters used

SECURITY OF SUPPLY				
Year	**Infrastructure level**	**Demand**	**Disruption**	**Price**
2020	Low	AW	None	Reference
2020	Low	DC	UA	
2020	Low	DC	Transmed	
2030	Low	AW	None	
2030	Low	DC	UA	
2030	Low	DC	Transmed	
2020	PCI	AW	None	
2020	PCI	DC	UA	
2020	PCI	DC	Transmed	
2030	PCI	AW	None	
2030	PCI	DC	UA	
2030	PCI	DC	Transmed	

FLOWS PATTERN UNDER PRICE VARIATION				
Year	**Infrastructure level**	**Demand**	**Disruption**	**Price**
2020	Low	AW	None	Reference
2020	Low			RU max
2020	Low			AZ max
2020	Low			LNG max
2030	Low			Reference
2030	Low			RU max
2030	Low			AZ max
2030	Low			LNG max
2020	PCI	AW	None	Reference
2020	PCI			RU max
2020	PCI			AZ max
2020	PCI			LNG max
2030	PCI			Reference
2030	PCI			RU max
2030	PCI			AZ max
2030	PCI			LNG max

Note: In the non-disruption cases the average winter demand is considered while in the cases with disruption the Design Case demand is considered, therefore their results are not directly comparable.

Table 7.1: Scenarios examined in the Assessment chapter

7.3 Security of Supply analysis

In this paragraph we present the Remaining Flexibility of the various countries of the Region under the scenarios combining years, infrastructure level and disrupted source listed in the Table 7.1.

The Figures in this paragraph are maps where the colour of each country corresponds to a level of Remaining Flexibility or Disrupted Rate and where flows are represented by arrows: thickness of arrow responds to flow, and utilisation of maximum capacity is indicated by traffic lights.

The remaining flexibility level is indicated by the following colours:

- < 20 %
- 20–40 %
- < 40 %

and the disruption rate level by the following colours

- > 20 %
- 10–30 %
- < 30 %

The arrows correspond to the following legend:

- 0–50 GWh/d
- 50–250 GWh/d
- 250–600 GWh/d
- 600–1100 GWh/d
- >1100 GWh/d

- 0–80 % of capacity
- 80–99 % of capacity
- 99–100 % of capacity

7.3.1 NON – DISRUPTION CASE

7.3.1.1 Remaining Flexibility and Flows in Non-disruption case

As shown in the following Figures 7.3.1 to 7.3.4, all countries, with the exception of Croatia in the 2030 low infrastructure scenario, have positive Remaining Flexibility in non-disruption cases. Austria, Slovakia, Bulgaria, Bosnia & Herzegovina and Serbia mark the higher values at or near 100 % while Croatia has the lower, at the Low infrastructure level case.

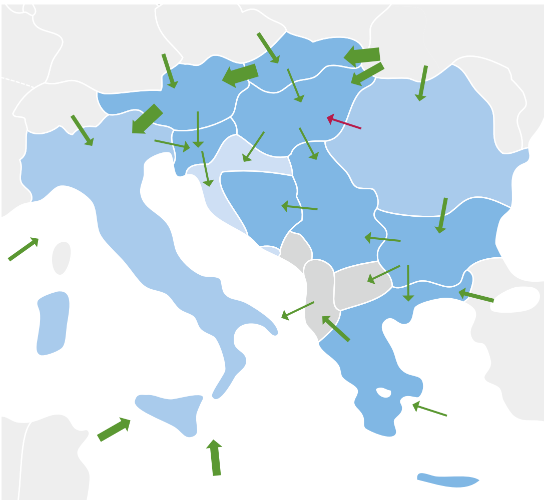


Figure 7.3.1: 2020 Low No disruption

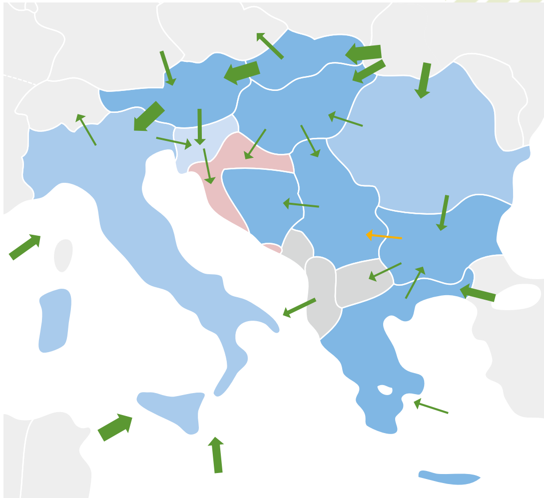


Figure 7.3.2: 2030 Low No disruption

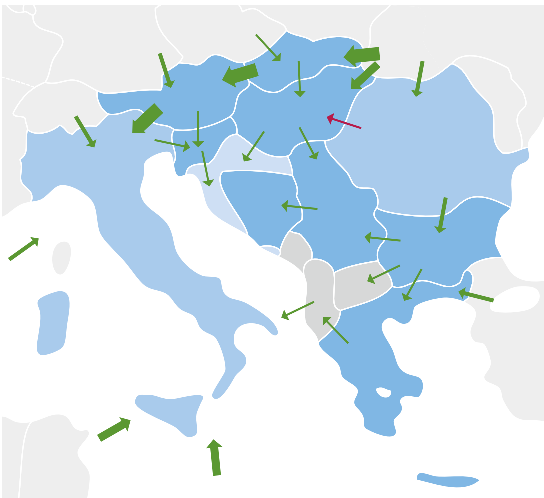


Figure 7.3.3: 2020 PCI No disruption

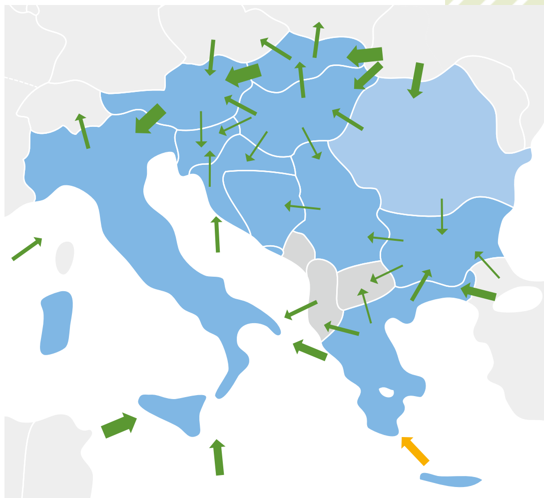


Figure 7.3.4: 2030 PCI No disruption

As expected, the Remaining Flexibility is reduced from 2020 to 2030 under the same infrastructure level due to increasing demand and decreasing national production. It is also increasing, for the same year, with the increase of infrastructure level. This effect, is more important in 2030 because most of the PCI projects are expected to be commissioned after 2020. The major improvements in 2020 PCI case are seen in Greece (due to the commissioning of the TAP pipeline) and in Slovenia. In 2030 Low case, Croatia experiences a substantial Disruption Rate. This is reversed in the 2030 PCI case where the Remaining Flexibility becomes positive again (due to the commissioning of the Krk LNG facility)

Regarding flows we see that in the non-disruption cases there is no stress on the infrastructure. This was expected, for two reasons, the adequacy of the Region's infrastructure under normal operating conditions and the fact that the non-disruption results have been provided for the Average Winter day case.

Comparing the 2030 cases with the 2020 ones in the Low infrastructure scenario, we see an increase in some flows at existing or FID infrastructure. The same-comparison in the PCI infrastructure scenario more changes are evident due to the existence of new infrastructure:

- Flow from the eastern Mediterranean fields to Greece the East Med pipeline and further west to Italy, via the Poseidon pipeline.
- Flow via GALSI pipeline
- Flow from Italy to Malta
- Flow from CZ to Austria
- Flow from Turkey to Bulgaria via the Eastring and the ITB projects .
- LNG imports to Croatia

7.3.2 UKRAINE DISRUPTION

The UA disruption case is the one that has most important consequences on the gas supply of the SC Region as well as further west, for this reason this is presented in more detail in this paragraph, including an analysis per country or group of countries, especially for the Low infrastructure level which puts the Region's gas transmission system under higher stress.

Transit routes from Ukraine have a total capacity of approx. 4,000 GWh/d. A complete halt of gas supply via all Ukrainian routes can only be caused by non-technical disruption. For a peak day, the disruption of transit through Ukraine cannot be completely replaced by other routes and would result in a demand curtailment in South-Eastern Europe.

The situation in South-Eastern Europe would improve from 2017 to 2020 and even more in 2030 following the commissioning of the following projects with FID status, included in the Low infrastructure level.

1. Revythoussa LNG terminal – 2nd upgrade (capacity increase from 150 GWh/d to 230 GWh/d, commissioning: 2018)
2. Interconnection Bulgaria – Serbia (with bidirectional capacity of 51 GWh/d, commissioning: 2018)
3. a. Trans Adriatic Pipeline (TAP) (capacity at IP Kipi: 350 GWh/d, commissioning: 2020)

   b. TAP interconnection in Italy (capacity: 350 GWh/d, commissioning: 2020)
4. Interconnector Greece – Bulgaria (IGB project) (capacity: 90 GWh/d, commissioning: 2018, increased in 2022 to 142 GWh/d)
5. Expansion of the interconnection Slovenia – Croatia from 53 GWh/d to 68 GWh/d, commissioning: 2019)

7.3.2.1 Remaining Flexibility and Flows in UA Disruption case

As shown in the following Figures 7.3.5 to 7.3.8 some of the countries lose entirely their Remaining flexibility and experience Demand Disruptions. As expected the worst situation is encountered in 2030 and in the Low infrastructure scenario, where the increased demand, the decline in national production and the lack of important additional infrastructure result to less Remaining Flexibility.

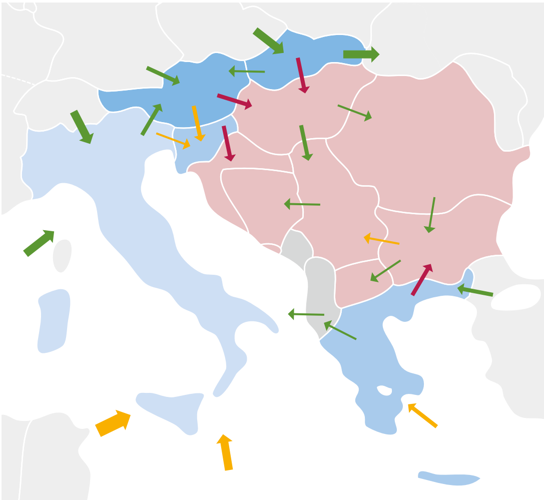


Figure 7.3.5: 2020 Low UA disruption

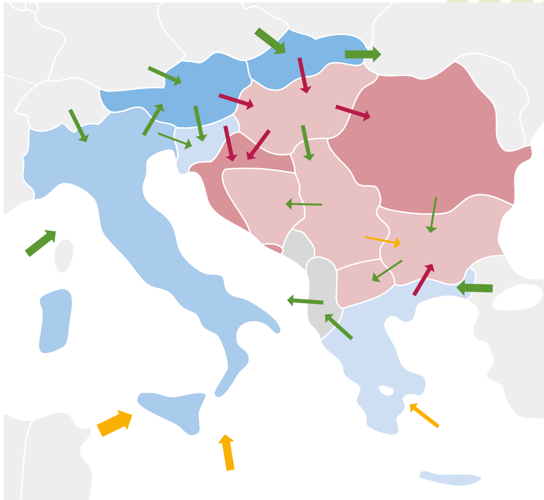


Figure 7.3.6: 2030 Low UA disruption

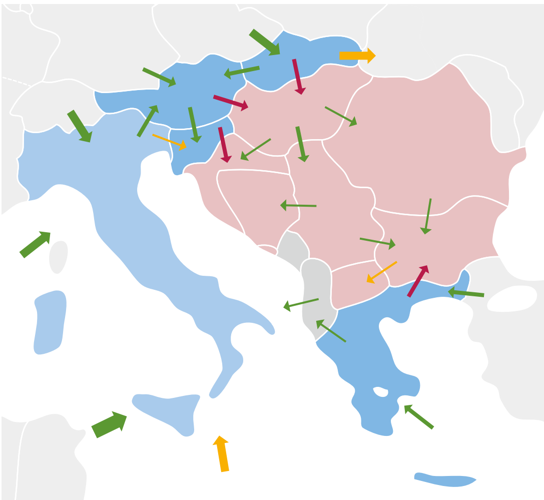


Figure 7.3.7: 2020 PCI UA disruption

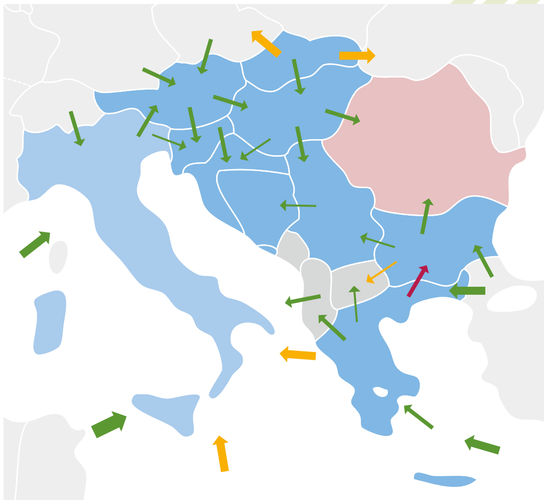


Figure 7.3.8: 2030 PCI UA disruption

Legend

< 20 %	> 20 %	0–50 GWh/d	0–80 % of capacity
20–40 %	10–30 %	50–250 GWh/d	80–99 % of capacity
< 40 %	< 30 %	250–600 GWh/d	99–100 % of capacity
		600–1100 GWh/d	
		>1100 GWh/d	

In the above graphs we can also see the improvement of the supply situation in the 2030-PCI case, where the additional capacity offered by the PCI project counterbalances the increase of demand and the decrease of national production.

Further detail is given below, together with the analysis of the flows, for the Low Infrastructure case.

In 2017, without any disruption, all supply sources, except for Russian supply, reach their maximum supply potentials. Russian supply is limited by maximum capacities at all entry points. Russian import routes towards Germany and Poland are fully used. In case of UA disruption, only about half of Russian maximum supply potential would be available due to infrastructure limitations therefore[4].

In 2020, the situation is very similar to 2017. Only LNG Greece would not reach its maximum supply potential, as demand in Greece is met from other sources (first year of TAP operation), and further transport from this source to the surrounding countries is not yet possible. Maximum supply potential of TAP in 2020 is 131 GWh/d due to the rump-up phase of the Shah Deniz gas field (gradual increase of production from 2019 to 2022). In 2022 maximum supply potential would increase to 297 GWh/d.

In 2030, AZ, DZ, LY, NO and LNG sources sources (except for LNG Greece) would be used close to their maximum potential. Utilisation of Russian supply would be again constrained by maximum capacities of Yamal pipeline and Nordstream – only half of Russian maximum supply potential could be used.

Italy would contribute to supply the Region with reverse flow to Austria.

Flow from Czech Republic via Slovakia will be mainly directed to Ukraine and Hungary. Flow from Slovakia to Austria is very low and represents only a minor share of the total interconnection capacity.

This flow pattern does not correspond to the incremental capacities expected to be offered by all of the following projects: Nordstream 2, EUGAL, Capacity4Gas (C4G) – DE/CZ, Capacity4Gas (C4G) – CZ/SK and Capacity increase at IP Lanžhot entry, which are expected to mitigate the impact of a supply disruption through Ukraine. In fact above mentioned projects are not considered in the cases presented in this GRIP report as only Nordstream 2 has a FID status (and is therefore included in the Low infrastructure level) and the other projects do not have a PCI label and are therefore not included in the PCI infrastructure level. These new projects will (if implemented) significantly expand the supply and transit route via Germany, Czech Republic and Slovakia towards Austria. Consequently, they will increase remaining flexibility in countries with sufficient cross-border capacity. Still, the demand curtailment in South-Eastern Europe caused by infrastructure gaps would not be mitigated by these projects due to restrictions in cross-border capacities.

4) 2017: Russian maximum supply potential: 5,222 GWh/d, flow, probably equal to max. capacity at all entry points from Russia. Without UA routes maximum supply potential is reduced to: 3,281 GWh/d. In 2020 supply potential reaches 6,338 GWh/d and flow: 3,355GWh/d.

More specifically, the results per country or group of countries in the Region are as follows:

Bulgaria and Former Yugoslav Republic of Macedonia

In 2017, Bulgaria and FYRoM are hit hardest in case of UA disruption, with a disruption rate of 62 %. In Bulgaria disrupted demand represents 100 GWh/d.

In 2020 and 2030 the situation would significantly improve although a low disruption rate would remain, mainly thanks to additional gas from IGB connected to TAP. Bulgaria can also receive gas from Serbia via a new bidirectional interconnector. Supply to FYRoM is considered to take place only through Bulgaria (the project for an interconnection with Greece is not included in the infrastructure levels considered.).

Romania

In 2017 Romania is the third most affected country in 2017 with disruption rate of 25 % (DD = 200 GWh/d, which is twice as much as in Bulgaria).

In 2020, the situation would be significantly improved although a low disruption rate would remain.

From 2030 onwards, Romania would face difficulties in covering its high demand mainly due to the reduction of its national production (which alone represents more than half of the Region's production) in the '20s and even more in the '30s. Disrupted rate would reach 24 % (191 GWh/d) in 2030 and even 41 % (335 GWh/d) in 2035. Romania would be the most affected country in the region.

Serbia

In 2017 Serbia is marginally resilient to Ukrainian disruption. From 2020 the situation would get worse and Serbia would suffer low disruption rates in 2020 and in 2030.

Commissioning of the new interconnection Bulgaria – Serbia would allow Bulgaria to get additional gas from Serbia in 2020. Assuming a cooperative approach between neighbouring countries, where countries with higher resilience mitigate the disrupted rate of other countries by sharing their supplies, this will lead to disrupted demand in Serbia. Serbia can receive additional gas from Hungary, as there is sufficient infrastructure capacity. Consequently, the impact of this new interconnection would spread further from Serbia to the surrounding countries (Hungary, Bosnia & Herzegovina) thus aligning their disrupted rates.

Bosnia and Herzegovina, Croatia, Hungary

In 2017 these countries are able to cope with their high demands. Bosnia & Herzegovina reaches quite high level of remaining flexibility (35 %). In Croatia and Hungary, remaining flexibility is close to 0 %.

In 2020, mitigating the negative effect of disrupted demand in other countries (cooperative approach), Bosnia and Herzegovina, Croatia and Hungary would also face limited demand curtailment of 6 %. Expansion of the interconnection Slovenia – Croatia from 53 to 68 GWh/d would slightly ease the situation in the area.

In 2030 Bosnia & Herzegovina and Hungary would experience a low increase in their disruption rates.

In Croatia the situation would be worse due to the increased demand (2017: 182 GWh/d, 2020: 216 GWh/d, 2030: 257 GWh/d) and declining national production. Consequently, it would lead to higher disrupted rates (25 % in 2030, 29 % in 2035). Additional sources such as LNG and/or infrastructure reinforcements would be required.

Greece

In 2017 Greece would face disrupted demand of 6 %.

From 2020 onwards Greece would not be affected by Ukrainian disruption due to the expansion of the Revythoussa LNG terminal and commissioning of TAP. Remaining Flexibility in Greece will reach around 20 % in 2020 and in 2030.

Italy, Slovenia, Austria, Slovakia

These countries would not face disrupted demand, but all of them except Slovakia would be impacted by Ukraine disruption.

In Italy Remaining Flexibility would decrease from 35 % to 20 %. In Slovenia it would decrease significantly, from 22 % to 10 % due to increase in domestic demand (2017: 47 GWh/d, 2020: 60 GWh/d, 2030: 66 GWh/d)

Austria would remain with high flexibility of 80 % (100 % without UA disruption). Slovakia would not be affected and would maintain a flexibility of 100 %.

Regarding the flows, in the PCI infrastructure level case, as in the previous case we notice, that the flows in central Europe are reversed, in comparison with the "non-disruption" case. Germany, Czech Republic, Switzerland and Austria supply gas to Austria, Slovakia, Italy and Hungary and Slovenia respectively. Slovakia also contributes to the supply of Ukraine. For this reason the northernmost countries of the Region show comfortable Remaining Flexibilities while the easternmost experience disruptions although at rather moderate rates.

The situation is without problems to the Region in 2030, when more infrastructure is available to carry gas to the southern and western part of the Region. In particular, the Eastmed pipeline carries 290 GWh/d to Greece which are forwarded to Italy through the Poseidon pipeline, while the increased capacity of TAP is used to carry 326 GWh/d to Greece which is equally shared between Bulgaria and Italy while a small quantity is forwarded to FYRoM.

7.3.3 TRANSMED DISRUPTION CASE

The disruption of the supply from Algeria through the Transmed pipeline does not have an impact on the overall Region, since it remains mainly limited to Italy.

7.3.3.1 Remaining Flexibility and Flows in Transmed disruption case

The only country which sees a reduction of its Remaining Flexibility, in comparison with the "non-disruption" case, is Italy where this value decreases, in 2020, from 37 % to 19 %.

The lack of gas supplied by the Transmed is replaced by other sources available to the Italian system, given that Italy is the country with the higher number of supply options, therefore having a good level of source diversification.

In the Low infrastructure case, all other sources to Italy increase their flow (LNG, Libya, Switzerland) and mainly Austria. This more than doubles the flow from Ukraine to Slovakia and almost doubles the flow from Slovakia to Austria. Ukrainian deliveries are also increased to Hungary and Romania. At the same time the flow of LNG to Greece reaches 87 % of its maximum capacity and TAP deliveries to Greece reach the maximum capacity of its first phase of development.

In the PCI infrastructure case few additional projects are considered already in 2020 therefore the changes, compared to the Low case are limited, mainly concerning the sharing between the use of the various entry points and of the UGS. In 2030 more projects are in operation, namely the Eastmed and the Poseidon pipelines. As the supply through Austria is not reduced this allows Italy to increase supply to Switzerland.

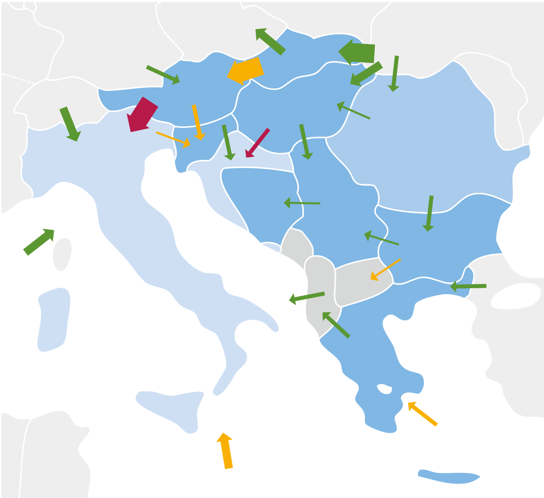


Figure 7.3.9: 2020 Low, Transmed disruption

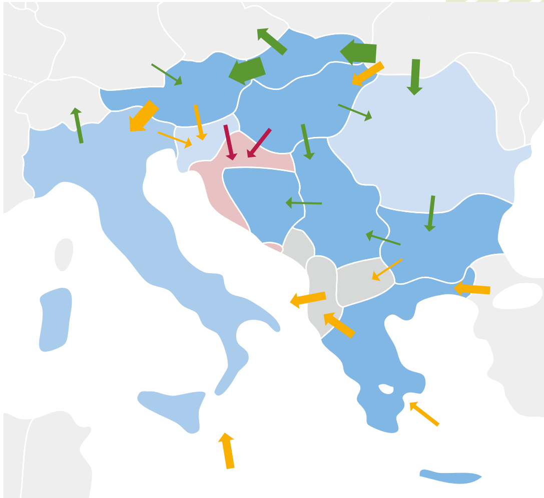


Figure 7.3.10: 2030 Low Transmed disruption

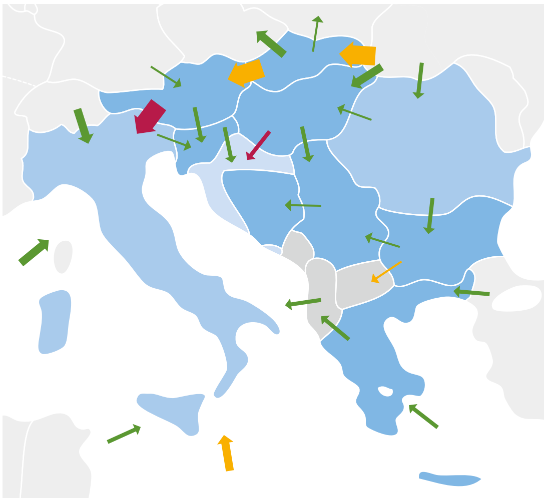


Figure 7.3.11: 2020 PCI Transmed disruption

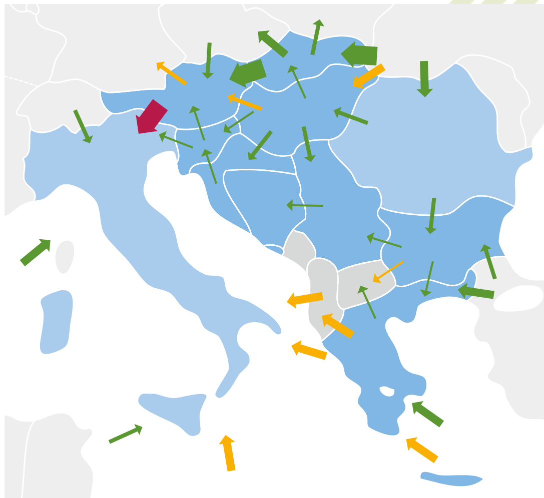


Figure 7.3.12: 2030 PCI Transmed disruption

Legend

< 20 %
20–40 %
< 40 %

> 20 %
10–30 %
< 30 %

0–50 GWh/d
50–250 GWh/d
250–600 GWh/d
600–1100 GWh/d
>1100 GWh/d

0–80 % of capacity
80–99 % of capacity
99–100 % of capacity

7.4 Flows response to price signals

In this paragraph we examine how the flows in the Region are changed when the supply source prices are modified with reference to the reference case. The gas sources examined are Russia, LNG and Azerbaijan. The price of one source at a time is reduced by 10 % and the flows are recalculated by the ENTSOG NeMo tool which minimises the overall EU gas bill. The results are presented for the two infrastructure levels (Low and PCI) and the two points in time (2020 and 2030).

7.4.1 LOW INFRASTRUCTURE CASE

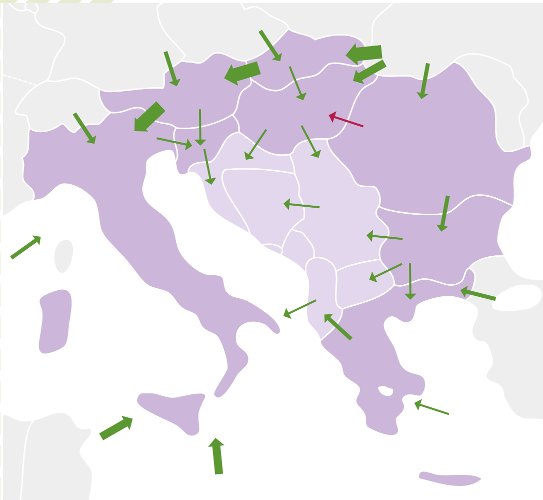


Figure 7.4.1: 2020 Low Reference

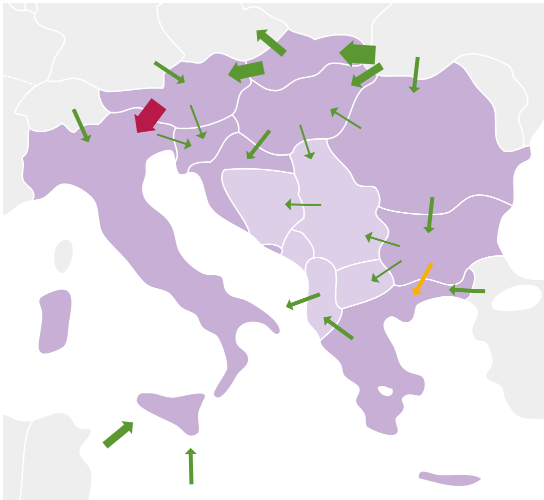


Figure 7.4.2: 2020 low RU max

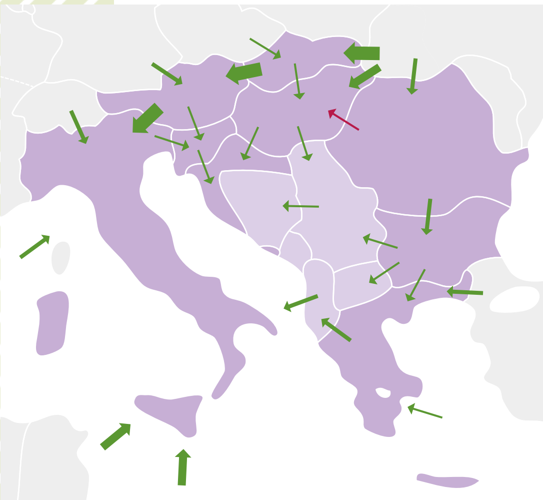


Figure 7.4.3: 2020 Low AZ max

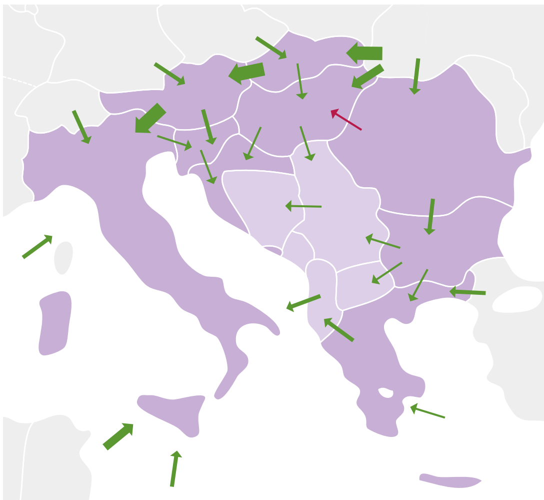


Figure 7.4.4: 2020 Low LNG max

Legend

0–50 GWh/d
50–250 GWh/d
250–600 GWh/d
600–1100 GWh/d
>1100 GWh/d

0–80 % of capacity
80–99 % of capacity
99–100 % of capacity

Comparing the reference case with the three max cases (RU, AZ, LNG), in 2020, we note that:

- In the case of RU max, we see an important increase of the flows from Ukraine via Slovakia to Austria, Italy and the Czech Republic at the expense of the flows to Italy from all other pipeline sources which are reduced while LNG flows to both Italy and Greece are reduced to zero.
- In the case of AZ max, we see a small increase in the exports through TAP to Italy, compensated by the reductions in the imports from Algeria and Switzerland.
- In the case of LNG max, we see an important increase of the imports to Greece (in percentage, as the absolute volumes are rather low) and in Italy, at the expense of the imports from Algeria and to a lesser extent, Libya and Austria. We also see a reduction of the imports from UA, in central Europe and an increase in the flows from CZ, DE and CH to the SC Region.

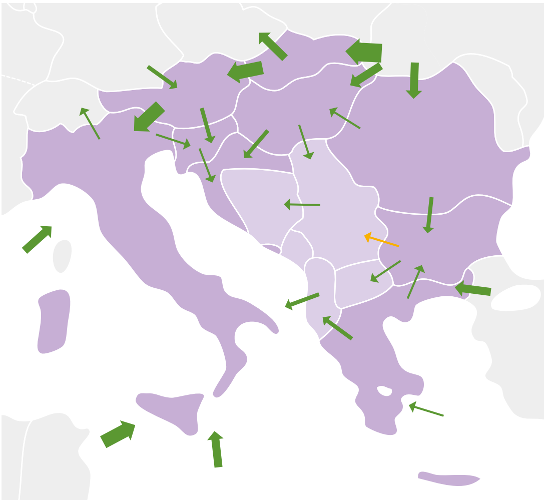


Figure 7.4.5: 2030 Low Reference

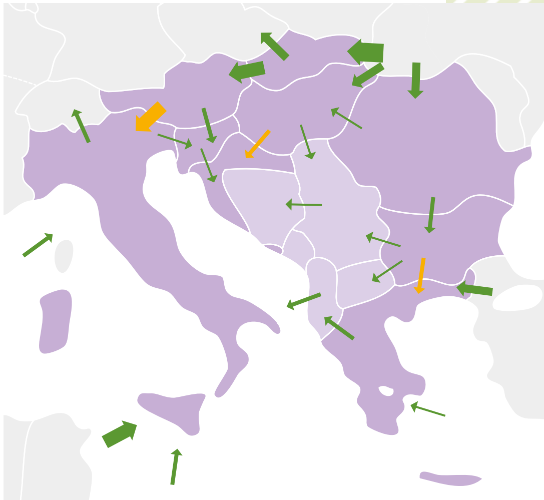


Figure 7.4.6: 2030 Low RU max

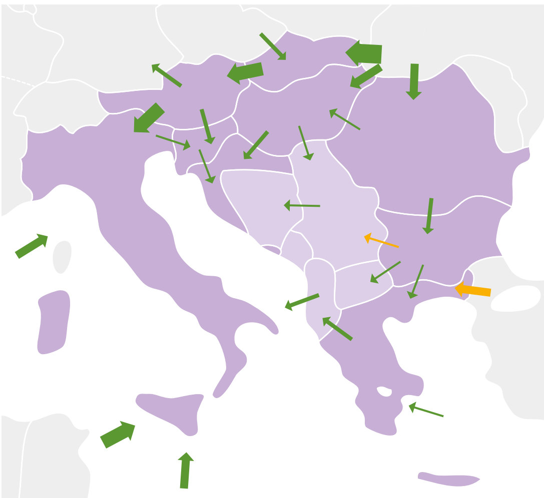


Figure 7.4.7: 2030 Low AZ max

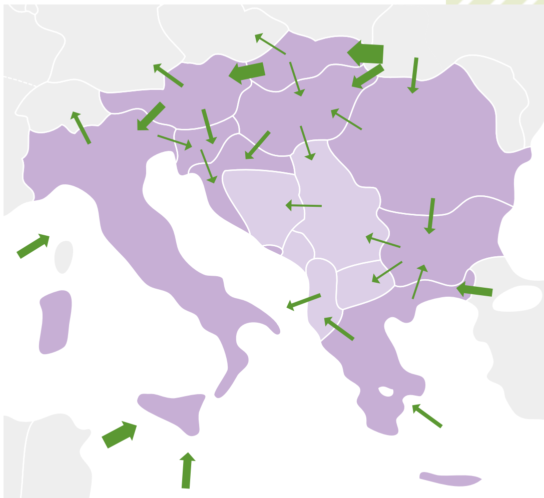


Figure 7.4.8: 2030 Low LNG max

In the 2030 cases, we see the higher flows through the TAP pipeline, since neither the East-Med nor the Poseidon pipelines are considered in the Low infrastructure level. We also see the higher flows to the LNG terminals of Italy and Greece.

Comparing the reference case with the three max cases (RU, AZ, LNG) we see that the sources becoming relatively cheaper bring additional flows to Europe, in particular:

- In the case of RU max we have the higher reduction of the LNG flow, to almost zero in Greece and by almost 50% in Italy as well as an important increase of the westward flows from UA in Central Europe and up to Italy, and in the Balkan route up to Greece.
- In the case of AZ max, we mainly see an increase of the flow to Italy via TAP.
- In the case of LNG max, we see an important increase (by almost four times) of the LNG received by Greece and by 30 % of the LNG received by Italy. As in the previous cases we also see a small decrease of the flows from UA westwards, via SK.


Image courtesy of Snam Rete Gas

7.4.2 PCI INFRASTRUCTURE CASE

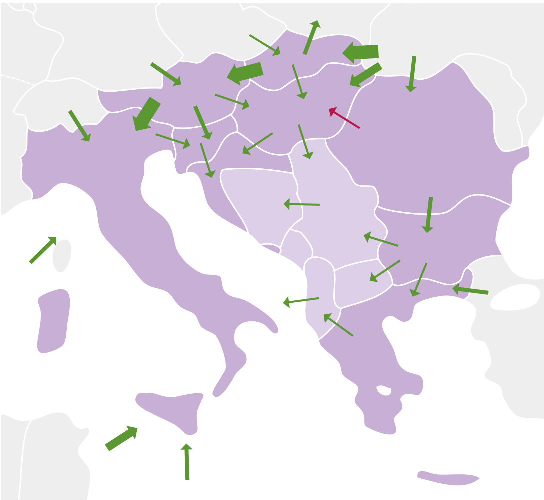


Figure 7.4.9: 2020 PCI Reference

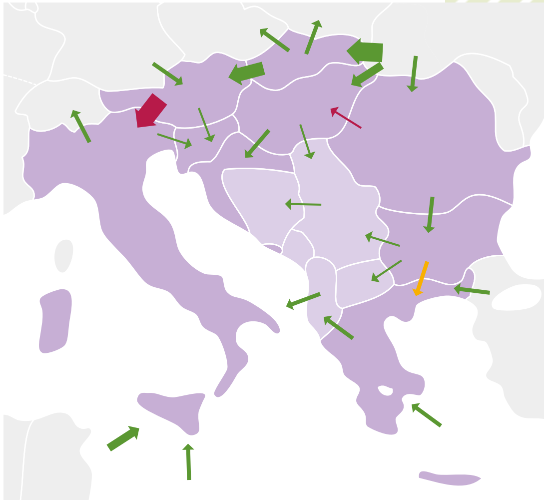


Figure 7.4.10: 2020 PCI RU max

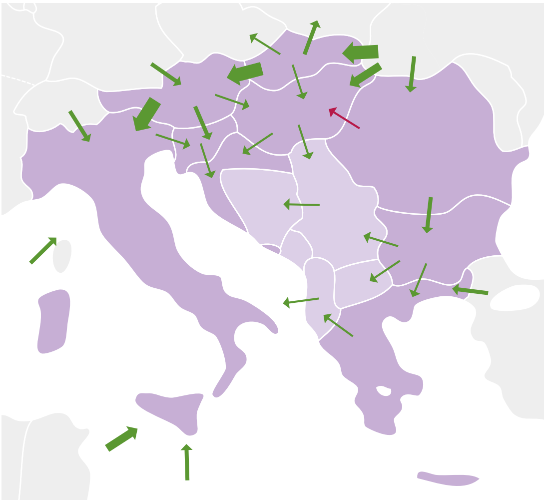


Figure 7.4.11: 2020 PCI AZ max

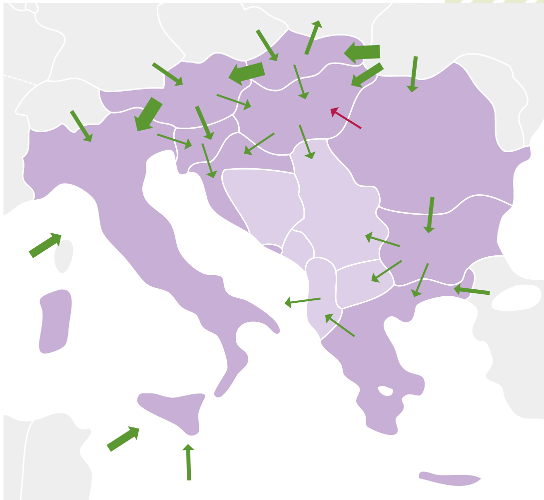
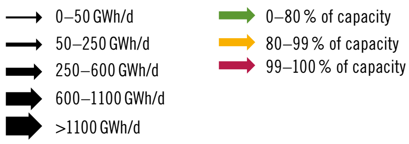


Figure 7.4.12: 2020 PCI LNG max

Legend



Comparing the 2020 reference case with the three maximum flow cases (RU, AZ, LNG), in 2020, we note that:

- In the case of the RU max there is an important increase of flows from UA to the central European countries which is visible up to Italy. The impact on the Balkan route is less important, probably due to the small import needs of these markets. We also see that under RU max case the flow from TAP to Italy is tripled – possibly since no AZ gas is spilled over the route – and the LNG imports to IT are completely displaced by cheaper gas via pipes.
- In the case of the AZ max it is interesting to see how the model simulates that the flows to Italy through TAP are increased, while increased flows seem to be firstly attracted by the eastern Balkan region.
- In the case of the LNG max we see an increase in the LNG flows to Italy, by 22 %, but none to Greece remaining (as in the reference case) to zero LNG. However, flows to the IGB are increased under this case. A more important effect is seen in the flows from UA which are reduced, probably because of LNG imports. Flow from CH to IT is doubled, from CZ to SK is increased sevenfold and flow from DE to AT is increased by 30 %. As a result the flow from TAP to Italy is reduced to one third of the reference value.

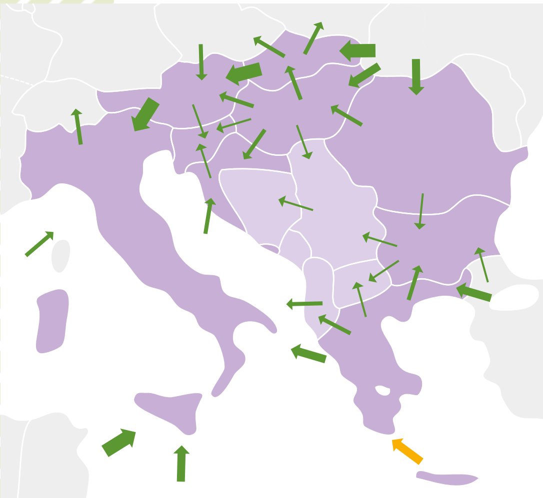


Figure 7.4.13: 2030 PCI Reference

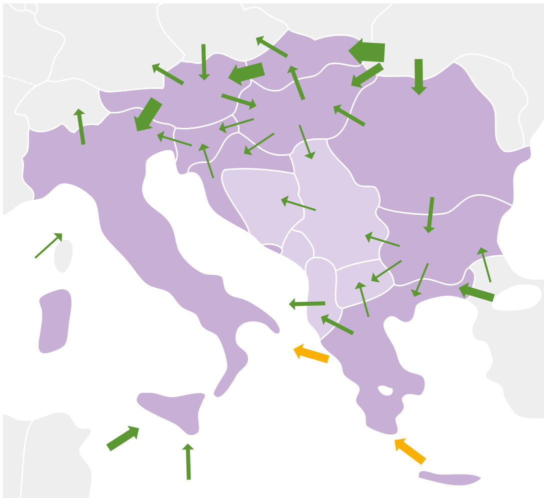


Figure 7.4.14: 2030 PCI RU max

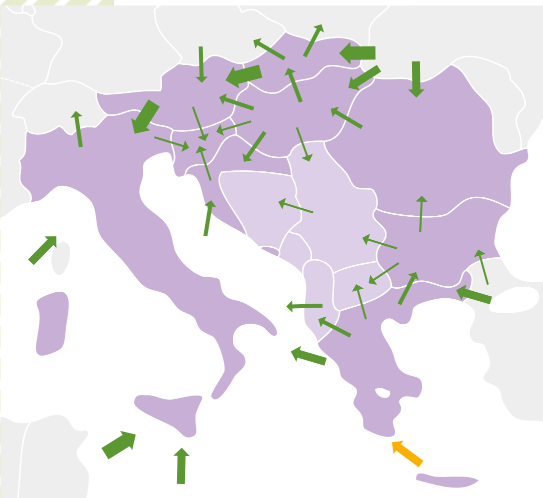


Figure 7.4.15: 2030 PCI AZ max

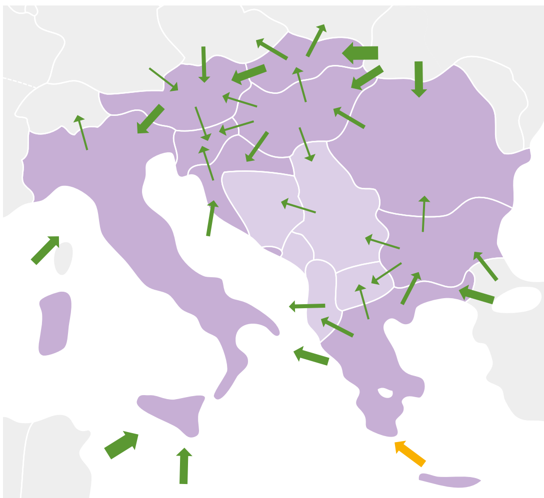
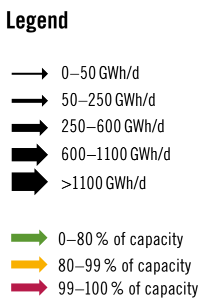


Figure 7.4.16: 2030 PCI LNG max



Comparing the 2030 PCI reference case, with the three max cases (RU, AZ, LNG) we see that:

- In the case of the RU max, there is again an important increase in the flows from UA to the central European countries which is visible up to Italy and Germany. There is an impact in the Balkan route as well since the Russian gas now arrives to Greece whereas in the reference case GR was supplying Bulgaria with 95 GWh/d. The flows of LNG to Italy are substantially reduced (by almost 90 %) while the imports from Algeria and Libya are also affected by to a lesser extent.
- In the case of AZ max, we see that the flows in central Europe are not affected, while the imports to Greece from Turkey and the exports to Italy and Bulgaria are increased. The balance in Italy is kept thanks to an equal reduction of imports from Algeria and the balance in Bulgaria is kept due to a reverse of the flow to Romania (from import to export of 11 GWh/d)
- In the case of LNG max we still do not have any import to Greece. Imports of LNG to Italy are increased by 33 % at the expense of reduced imports from Austria, Algeria and Libya. The effect on the flows from UA to the west also there but less pronounced than in 2020.

Interestingly, in all the four 2030 PCI configurations reverse flows from Italy toward Northern Europe via CH are activated, as possible combined effect of the higher gas supply availability for Italy (Eastmed, Poseidon and additional LNG terminals) and the backbone reinforcement of the Italian grid aimed at moving flows from south import toward north (Adriatica line).


Image courtesy of Snam Rete Gas

8 Conclusions

image courtesy of Snam Rete Gas

The present publication of the "Southern Corridor Gas Regional Investment Plan" is the third edition of a report aimed at gathering and processing information from TSOs of countries which surround or are more directly influenced by the gas transportation route defined as "Southern Corridor". As in the second edition, we tried to offer to the reader a complete picture of the Region mainly through the "Assessment and Market analysis" chapter, including the examination of congestion at Regional IPs, and "Network Assessments" chapter, where we show modelling results for the security of supply issue and the response of the gas flows to the gas supply price signals.

Results reflect all the specific attributes of the area which the readers of this document have to take into account, in particular:

- This Region hosts new transmission projects with larger capacities than planned infrastructure in the other Regions. Therefore new potential volumes will have high influence on security of supply and diversification of routes and/or sources in the States of the area and all over Europe.
- Many of the members of the Southern Corridor Region are transit countries, while infrastructure in other Regions has more a balanced role, being mostly destined to handle internal consumption.
- This Region gathers countries with great variety of their national production. From one side, we have systems where production is from 0% to 10% of their peak consumption and may only marginally contribute to cover gas demand even in normal circumstances, let alone during crisis situation. On the other side, there are countries where production is a significant element in the supply mix, representing a substantial factor for the diversification of sources both for themselves and for their neighbours as well. Nevertheless the gas production volume in all producing countries of the Region follows a decreasing trend.
- Such mixed picture can be seen also at the demand side, which is affected by different population sizes of member states, by their geographical spread, from central parts of Eastern Europe, with high consumption in winter periods, to Southern Europe countries, with relatively high consumption levels also during summer and finally, by different market maturity.

Despite these differences all the countries, in the Region, and their TSOs, will be strongly affected by the construction of any of the big transmission projects and are prepared to adapt their investments to such possibilities.

Furthermore the present GRIP is providing a complete overview of the gas demand trends in the past four years and those expected in the next ten years, analysing the current situation characterised by a weak annual consumption (reflected also in a decrease of successive forecasts). This dynamic is mainly due to the economic crisis effects and to the substitution of gas in power generation by other sources, such as coal and Renewable Energy Sources. At the same time the Region faces a general decrease of average load factor while the peak requirements remain important. Added to a higher intermittency of demand (RES-drive) the need for flexible infrastructure is destined even to increase its importance.

On the supply side Southern Corridor Region faces probably the biggest challenge across Europe. Projects planned in the Region are expected to enable a considerable change of the supply patterns with positive impacts also for the Europe as a whole. Such a change will be brought out by new sources of gas (Caspian and East-Mediterranean/Middle East) and new routes, first with TAP that entered in the construction phase and with the other relevant projects described in the specific section 6.1 “Key transmission projects of the Region”. Additional potential may be represented by the Turkish Stream, expected to link Russia with the European part of Turkey.

When assessing demand and supply of the Southern Corridor Region, the GRIP gives us as clear message that they are balanced in the reference case scenario. On the other hand, the Region is still vulnerable to disruption of the Ukrainian route, while the FID projects help to satisfy part of the expected demand but are not sufficient to fully mitigate the situation. Therefore, also some of the non-FID projects like those that are aiming at the transmission of gas expected to be made available in Turkey from various sources, are needed to ensure a complete redress. This again proves that the Region has high dependence on Russian gas, although this is expected to be reduced for some of the countries with the help of FID and PCI projects. Among these projects, the ones that aim to bring to the Region’s market new sources of indigenous gas, like gas from Cyprus and the Black sea are most interesting since they will not be affected by any considerations external to the Region.

As one of the main roles of TSOs is to reduce any possible bottlenecks at their IPs, the GRIP also analyses congestion dynamics both from a physical and from a contractual point of view. The findings are that no physical congestion appears in any IP (with the exception of Mosonmagyaróvár) while contractual congestion is a very limited phenomenon, expected to progressively improve with the implementation of projects and the new CMP and CAM rules.

The TSOs of the Region hope that stakeholders will consider that the present report is a valuable informative tool offering a comprehensive overview of the Southern Corridor Region’s countries, projects, and gas market data.

Legal Disclaimer

The Southern Corridor GRIP was prepared in a professional and workmanlike manner by the TSOs of the nine countries forming the Southern Corridor Region, on the basis of information collected and compiled by them and from stakeholders, and on the basis of the methodology developed by ENTSOG with the support of the stakeholders via public consultation for the preparation of the TYNDP 2017–2026. The Southern Corridor GRIP contains TSOs' own assumptions and analysis based upon this information.

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The reader in its capacity as professional individual or entity shall be responsible for seeking to verify the accurate and relevant information needed for its own assessment and decision and shall be responsible for use of the document or any part of it for any purpose other than that for which it is intended.

Definitions

Number formatting	, Coma (,) is used as a 1,000 separator
	. Point (.) is used as a decimal separator
1-day Uniform Risk Demand Situation	means a daily demand Situation forecasted under the same risk of a climatic occurrence close to 1-in-20 years
14-day Uniform Risk Demand Situation	means a 14-day average daily demand Situation forecasted under the same risk of a climatic occurrence close to 1-in-20 years
Average Day Demand Situation	means a daily average demand Situation calculated as 1/365th of an annual demand
Case	means a combination of a demand and supply situation, infrastructure cluster and the respective time reference
Design-Case Demand Situation	means a high daily demand situation used by TSOs in their National Development Plans to determine the resilience of their system and needs for investment
FID project	means a project where the respective project promoter(s) has(have) taken the Final Investment Decision.
Import	means the supply of gas at the entry of the European network as defined by this GRIP or gas delivered at the entry of a Zone.
Interconnection Point	means a point of interconnection between two different infrastructures; an Interconnection Point may or may not be operated by different infrastructure operators
National Production	means the indigenous production related to each country covered in the GRIP; a Zone allocation has been carried out where relevant
Network Resilience	means a notion related to the capability of a network to ensure supply demand balance in High Daily Demand Situations, including also under Supply Stress.
Non-FID project	means a project where the Final Investment Decision has not yet been taken by the respective project promoter(s)
Plan	means the referenced GRIP, including all Annexes; Plan and Report are used interchangeably
Reference Case	means the Case that extends the historical (last three years) trend of supply over the 10-year period covered by the GRIP; where new import pipe/LNG terminal projects are planned to come on stream the supply is adjusted in proportion to the last applicable supply situation
Remaining Flexibility	means a notion related to the assessment of Network Resilience; it refers to the ability of a Zone to offer additional room for supply arbitrage; the value of the Remaining Flexibility is benchmarked against defined limits to identify potential capacity gaps
Report	means the referenced GRIP, including all Annexes; Report and Plan are used interchangeably
Scenario	means a set of assumptions related to a future development which is the basis for generating concrete value sets covering demand or supply.
Situation	Situation means a combination of conditions and circumstances relating to a particular occurrence of demand or supply, or both; such conditions and circumstances may relate to e.g. time duration, climatic conditions, or infrastructure availability.
Supply Stress	means a supply situation which is marked by an exceptional supply pattern due to a supply disruption.

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(1)(18), 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(1)(1), REG-715)

Transmission system means any transmission network operated by one Transmission System Operator (based on Article 2(13), DIR-73)

Transmission System Operator means a natural or legal person who carries out the function of transmission and is responsible for operating, ensuring the maintenance of, and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transport of gas (Article 2(4), DIR-73)

Zone means an Entry/Exit Transmission system or sub-system, including all National Production, Underground Gas Storage and LNG terminal Interconnection Points connected to such system or sub-system, which has been defined on the basis of either the commercial (capacity) framework applicable in such system or sub-system or the physical limits of the respective Transmission system

Abbreviations

AD	Average Day
AGRI	Azerbaijan-Georgia-Romania Interconnector
AW	Average Winter
bcm	Billion Cubic Meter
BOTAŞ	BOTAŞ Petroleum Pipeline Corporation (Turkey)
CAM	Capacity Allocation Mechanisms
CCGT	Combined Cycle Gas Turbine
CEE	Central Eastern Europe
CEGH	Central European Gas Hub
CESEC	Central and South Eastern Europe Gas Connectivity
CMP	Congestion Management Procedures
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CS	Compressor Station
DC	Design Case
DN	Nominal Diameter
DSO	Distribution System Operator
EC	European Commission
ENTSOG	European Network of Transmission System Operator for Gas
ETS	Emission Trading Scheme
EU	European Union
FID	Final Investment Decision
GRIP	Gas Regional Investment Plan
GRS	Gas Receiving Station
GWh/y	Giga Watt hour/year
IAP	Ionian Adriatic Pipeline
IGB	Interconnector Greece Bulgaria
IP	Interconnection Point
ISO	Independent System Operator
ITB	Interconnector Turkey Bulgaria
ITO	Independent Transmission Operator
km	Kilometer
LNG	Liquified Natural Gas
mcm	Million cubic meter
mm	Millimeter
MRS	Metering & Regulating Station
MW	Mega Watt
NBP	National Balancing Point (UK)
NSI	North South Interconnections
OU	Ownership Unbundling
PCI	Project of Common Interest
PowerG	Power Generation
RCI	Residential-Commercial-Industrial
RES	Renewable Energy Sources
SC	Southern Corridor
SCP	South Caucasus Pipeline
SOCAR	State Oil Company of Azerbaijan Republic
TANAP	Trans Anatolian Pipeline
TAP	Trans Adriatic Pipeline
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan
UGS	Underground Storage
UR	Uniform Risk
USA	United States of America
WGV	Working Gas Volume

Country Codes according to ISO 3166-1 (alpha-2)

AL	Albania
AT	Austria
AZ	Azerbaijan
BY	Belarus
BE	Belgium
BH	Bosnia & Herzegovina
BG	Bulgaria
CH	Switzerland
CZ	Czech Republic
CY	Cyprus
DE	Germany
DK	Denmark
DZ	Algeria
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
LY	Libya
MA	Morocco
ME	Montenegro
MK	FYRoM
MT	Malta
NL	Netherlands, the
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RU	Russia
RS	Serbia
SE	Sweden
SI	Slovenia
SK	Slovakia
TN	Tunisia
TK	Turkey
UA	Ukraine
UNMIK	United Nations interim administration Mission In Kosovo
UK	United Kingdom

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