GAS REGIONAL INVESTMENT PLAN SOUTHERN CORRIDOR

Based on ENTSOG's TYNDP 2018

MAIN REPORT

SOUTHERN CORRIDOR

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FOREWORD

It is my pleasure to welcome you to the fourth edition of the Southern Corridor Gas Regional Investment Plan.

This edition builds on the TYNDP 2018, presented by ENTSOG in December 2018 and in January 2020 (including a Feedback section with ENTSOG's response to the comments received from ACER and stakeholders) and on the third edition of the Southern Corridor GRIP released in September 2017, 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" approach the completion of their construction and entry into commercial operation (Trans Adriatic Pipeline), or enter their implementation phase after a long maturing period (Interconnector Greece–Bulgaria–IGB), while, on the other hand, new technologies start making their appearance as a reply to the decarbonisation policy announced by the E.U. bodies. The decarbonisation strategy in many of Southeastern Europe Member States and neighbouring contracting parties of the Energy Community will have as priority their gasification as a way to replace quickly more polluting fuels like oil, coal or lignite, in the long way to energy transition. At the same time, the CESEC initiative, launched by the European Commission, 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 and terminate the isolation or the dependence from sole suppliers. This initiative has already shown tangible results with the start, in 2019, of LNG imports by Bulgarian shippers through Greece. 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 have achieved new discoveries and in the Black Sea are getting closer to the exploitation phase and are comparing their options to reach markets. The bidirectional Poland–Slovakia Interconnector project would offer the possibility of connecting our region to the Baltic Sea area. Finally, the transit of Russian gas through alternative routes in the region enters implementation phase.

The GRIP is the result of close cooperation between 11 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 organized by ENTSOG, or at the coordinator's e-mail address (j.florentin @desfa.gr).

Dimitrios Kardomateas

Division Director for Strategy & Development
DESFA S.A.

EXECUTIVE SUMMARY

This 4rd edition of the Southern Corridor Gas Regional Investment Plan (GRIP) 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 2018 since the publications of the two documents have both been scheduled for 2020. Compared to TYNDP, GRIP is more focused on the Regional issues.

The total number of ongoing projects in the Region is 102 out of which 17 FID and 85 non-FID. These are split in the three main categories in the table below.

The Region is characterized 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 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 competing projects with very different maturity degrees , TAP (which is approaching completion of its construction phase), EastMed, the east – west gas transmission corridor between Romania and Austria, Eastring, IAP and the new LNG Terminals, in the Adriatic (where the FSRU is expected to be delivered in 4Q 2020) 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.

	FID	non-FID	Total
LNG	0	4	**4**
Pipeline	14	74	**88**
UGS	3	7	**10**

Table 0.1: Total number of projects

1 INTRODUCTION

The present 4th 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 9 countries[1]: Austria, Bulgaria, Croatia, Hungary, Greece, Italy, Romania, Slovakia, and Slovenia.

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 2018 and national plans. Some of these projects 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.

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.

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 third PCI list, adopted by the European Commission in November 2017, 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 annexes we present:

- Country profiles
- Project information
- IPs' data regarding technical capacity, booked capacity and actual flows
- Demand data

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

Note: This 4th edition of the SC GRIP has been approved by ten TSOs of the Region, namely Gas Connect Austria, Trans Austria Gasleitung, Bulgartransgaz, Plinacro, DESFA, FGSZ, Snam Rete Gas, Transgaz, Plinovodi and Trans Adriatic Pipeline.

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

Picture courtesy of Plinovodi

2 LIST OF PROJECTS

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.

For carried forward projects, the project code is the same as the one the projects were 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 and in the table 2.18, out of a total of 126 projects:

- 86 were already present in the previous GRIP
- 3 were already present in the previous GRIP but have since then been successfully commissioned
- 16 are new projects
- 21 were present in the previous GRIP but have been withdrawn from the present edition

Note: Croatia: The status of the project "Interconnection Croatia/Slovenia (Lucko-Zabok-Rogatec) has been changed from FID to "Advanced".

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)	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-F-954	TAG Reverse Flow	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	TRA-N-140	Interconnection Turkey-Bulgaria	Pipeline including CS
Bulgartransgaz EAD	TRA-F-298	Rehabilitation, Modernization 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	TRA-N-1197	Expansion of the gas infrastructure between BG–TR and BG–RS borders	Pipeline including CS
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

Legend

- [light green] Projects presented in both GRIP editions
- [yellow] Project presented only in GRIP 2017
- [blue] Project presented only in the present GRIP
- [green] Project presented in GRIP 2017and successfully commissioned

Croatica				
Plinacro Ltd	TRA-F-334	Compressor station 1 at the Croatian gas transmission system	Pipeline including CS	
Plinacro Ltd	TRA-N-086 (2)	Interconnection Croatia/Slovenia (Lučko–Zabok–Rogatec)	Pipeline including CS	
Plinacro Ltd	TRA-N-90	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	
LNG Hrvatska d.o.o. za poslovanje ukapljenim prirodnim plinom	LNG-N-082	LNG terminal Krk	LNG Terminal	

Greece				
DESFA S.A.	LNG-F-147	Revythoussa (2nd upgrade)	LNG Terminal	
DESFA S.A.	TRA-F-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 North Macedonia 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	

Greece				
DESFA S.A.	TRA-N-1092	Metering and Regulating Station at UGS South Kavala	Pipeline including CS	
DESFA.S.A.	TRA-N-1129	Compressor Station Kipi Increment	Pipeline including CS	
DESFA S.A.	TRA-N-1276	Compressor station at Nea Messimvria (3rd unit)	Pipeline including CS	
DESFA S.A.	TRA-N-1278	Compressor station at Ambelia	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	

Hungary				
FGSZ Ltd.	TRA-F-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	

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-N-1194	Sardinia Methanization	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-F-1193	TAP interconnection	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-N-1195	Matagiola-Massafra pipeline	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-N-1227	Gorizia plant upgrade	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-N-1246	Greece–Italy interconnection	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-N-1265	Biomethane productions interconnection	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-F-1228	Interconnection with UGS Cornegliano in Laudense	Pipeline including CS
Snam Rete Gas S.p.A.	TRA-F-1241	Interconnection with production in Gela	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
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
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
Gas Natural Fenosa	LNG-N-217	Zaule–LNG Terminal in Trieste	LNG Terminal
Ital Gas Storage	UGS-F-242	Corgnegliano UGS	Storage Facility

Legend

- Projects presented in both GRIP editions
- Project presented only in GRIP 2017
- Project presented only in the present GRIP
- Project presented in GRIP 2017and successfully commissioned

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-F-358	Development on the Romanian territory of the NTS (BG–RO–HU–AT Corridor) phase I	Pipeline including CS
SNTGN Transgaz S.A.	TRA-N-1322	Development on the Romanian territory of the NTS (BG–RO–HU–AT Corridor) phase II	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-1268	Romania-Serbia Interconnection	Pipeline including CS
SNTGN Transgaz SA	TRA-N-1277	Upgrading GMS Isaccea 1 and GMS Negru Voda 1	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)	LNG-N-376	Azerbaijan–Georgia–Romania Interconnector | AGRI	LNG Terminal

Legend

- Projects presented in both GRIP editions
- Project presented only in GRIP 2017
- Project presented only in the present GRIP
- Project presented in GRIP 2017and successfully commissioned

Slovakia				
eustream, a.s.	TRA-N-017	System Enhancements | Eustream	Pipeline including CS	
eustream, a.s.	TRA-F-190	Poland–Slovakia interconnection	Pipeline including CS	
eustream, a.s.	TRA-F-902	Capacity increase at IP Lanžhot entry	Pipeline including CS	
Eastring B.V./eustream, a.s.	TRA-N-628	Eastring–Slovakia	Pipeline including CS	
NAFTA	UGS-N-356	Underground Gas Storage Velke Kapusany	Storage Facility	
eustream, a.s.	TRA-N-1235	Firm transmission capacity increase at the IP Veľké Zlievce	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-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-365	M6 Ajdovščina–Lucija	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	

Table 2.1: Comparative list of projects in the previous and current SC GRIP

2.2 PROJECTS BY COUNTRY

In the tables of this chapter the commissioning dates shown are those of TYNDP 2018. Some of these are now outdated. Notes have been added with more recent estimates only for the projects which, in TYNDP 2018, showed a commissioning date in 2018 or 2019.

2.2.1 AUSTRIA

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	GCA 2015/08: Entry/Exit Murfeld	TRA-N-361	Advanced; PCI 6.26.1.4	2022	GAS CONNECT AUSTRIA GmbH
2	Bidirectional Austrian-Czech Interconnector (BACI)	TRA-N-021	Advanced; PCI 6.04	2021	GAS CONNECT AUSTRIA GmbH
3	GCA Mosonmagyaróvár	TRA-N-423	Advanced; PCI 6.24.1.3	2022	GAS CONNECT AUSTRIA GmbH
4	TAG Reverse Flow	TRA-F-954	FID	2019*	Trans Austria Gasleitung GmbH

* Updated commissioning year: 2020

Table 2.2: List of projects in Austria

2.2.2 BULGARIA

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	Interconnection Turkey-Bulgaria	TRA-N-140	Less-Advanced	2022	Bulgartransgaz
2	Rehabilitation, Modernization and Expansion of the NTS	TRA-F-298	FID; PCI 6.8.2	2021*	Bulgartransgaz
3	Eastring - Bulgaria	TRA-N-654	Less-Advanced; PCI 6.25.1	2023**	Bulgartransgaz
4	UGS Chiren Expansion	UGS-N-138	Advanced; PCI 6.20.2	2024	Bulgartransgaz
5	Looping CS Valchi Dol – Line valve Novi Iskar	TRA-N-592	Advanced; PCI 6.25.4	2022	Bulgartransgaz
6	Varna-Oryahovo gas pipeline	TRA-N-593	Advanced; PCI 6.25.4	2022	Bulgartransgaz
7	Construction of a Looping CS Provadia – Rupcha village	TRA-N-594	Advanced; PCI 6.25.4	2022	Bulgartransgaz
8	Expansion of the gas infrastructure between BG-TR and BG-RS borders	TRA-N-1197	Less-Advanced	2020***	Bulgartransgaz

* 2nd stage commissioning year: 2024 ** 2nd stage commissioning year: 2028 *** 2nd stage commissioning year: 2022

Table 2.3: List of projects in Bulgaria

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	Interconnector Greece–Bulgaria (IGB Project)	TRA-F-378	FID, PCI 6.8.1	2018*	ICGB a.d.

* Updated commissioning year: 2021, 2nd stage commissioning year: 2025

Table 2.4: List of projects in Bulgaria (Third Party projects)

2.2.3 CROATIA

Tarvisio
Murfeld
Ceršak
TRA-N-361
TRA-N-112
Tornyiszentmiklós
Siófok
Bordano
Kidričevo
Pince
TRA-N-094
HUNGARY
Flaibano
TRA-N-1227
TRA-N-108
SLOVENIA
TRA-N-390
Nagykanizsa
Rogatec
TRA-N-325
Ajdovščina
LJUBLJANA
TRA-N-1057
Kozármisleny
Istrana
TRA-N-008
Gorizia
Sempeter
TRA-N-092
TRA-N-086
ZAGREB
Trieste
Lučko
Drávaszerdahely
Sombor
Venezia
TRA-N-354
Kozarac
Karlovac
TRA-F-334
Donji Miholac
Umag
Koper
Porto Viro
TRA-N-336
Rijeka
Zlobin
TRA-N-075
TRA-N-1058
Osijek
Cavarzere
Porto Levante
Omisalj
Krk LNG
Krk
TRA-N-90
TRA-N-1057
Slobodnica
TRA-N-070
Sotin
Vel. Kladusa
TRA-N-303
Vodnjan
LNG-N-082
Lička Jasenica
TRA-N-910
Cazin
Brod
TRA-N-066
Pula
Rakovica
Tržac
Bos. Krupa
Modrica
Ravenna
Bihač
Banja Luka
Gospič
TRA-N-224
BOSNIA AND HERZEGOVINA
CROATIA
San Marino
S.M.
Zadar
Travnik
Zenica
Zvornik
Knin
G.Vakuf
Benkovac
Ancona
TRA-N-007
TRA-N-851
Kiseljac
TRA-N-910
SARAJEVO
Recanati
Imotski
Posušje
Perugia
TRA-N-009
Split
IAP
Mostar
TRA-N-302
TRA-N-974
Adriatic Sea
TRA-N-068
ADRIATICA PIPELINE
Cellino
Ploče
TRA-N-009
IAP
MONTEN
Chieti
L'Aquila
TRA-N-974
PODGORICA
TRA-N-009

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	Compressor station 1 at the Croatian gas transmission system	TRA-F-334	FID; PCI 6.5.5	2019	Plinacro Ltd
2	Interconnection Croatia/Slovenia (Lučko–Zabok–Rogatec)	TRA-N-086	Advanced; PCI 6.26.1.1	2021	Plinacro Ltd
3	LNG evacuation pipeline Omišalj–Zlobin (Croatia)	TRA-N-90	Advanced; PCI 6.5.1	2019*	Plinacro Ltd
4	Interconnection Croatia–Bosnia and Herzegovina (Slobodnica–Bosanski Brod)	TRA-N-066	Advanced	2020	Plinacro Ltd
5	LNG evacuation pipeline Zlobin–Bosiljevo–Sisak–Kozarac	TRA-N-075	Advanced; PCI 6.5.6	2020	Plinacro Ltd
6	Interconnection Croatia–Bosnia and Herzegovina (South)	TRA-N-302	Advanced	2021	Plinacro Ltd
7	Ionian Adriatic Pipeline	TRA-N-068	Advanced	2022	Plinacro Ltd
8	Compressor stations 2 and 3 at the Croatian gas transmission system	TRA-N-1057	Advanced; PCI 6.26.1.3	2022	Plinacro Ltd
9	Interconnection Croatia/Serbia (Slobdnica–Sotin–Bačko Novo Selo)	TRA-N-070	Advanced	2023	Plinacro Ltd
10	LNG Evacuation Pipeline Kozarac–Slobodnica	TRA-N-1058	Advanced; PCI 6.5.6	2023	Plinacro Ltd
11	Interconnection Croatia-Bosnia and Herzegovina (west)	TRA-N-303	Less-Advanced	2027	Plinacro Ltd
12	Interconnection Croatia/Slovenia (Umag–Koper)	TRA-N-336	Less-Advanced	2027	Plinacro Ltd

* Updated commissioning year: 2020

Table 2.5: List of projects in Croatia

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	LNG terminal Krk	LNG-N-082	Non-FID; PCI 6.5.1	2019*	LNG Hrvatska d.o.o.

* Updated commissioning year: 2021

Table 2.6: List of projects in Croatia (Third Party projects)

2.2.4 GREECE

SKOPJE
NORTH MACEDONIA
TIRANA
ALBANIA
GREECE
ATHENS
CRETA
Aegean Sea
Gulf of Saros
Trans-Anatolian Pipeline
TRA-N-068
UGS-N-1229
TRA-F-051
TRA-N-1303
TRA-N-010
TRA-N-976
TRA-F-298
TRA-N-980
TRA-N-967
TRA-N-014
TRA-F-941
TRA-N-971
TRA-N-1276
TRA-N-1278
TRA-F-378
TRA-N-128
TRA-N-063
LNG-N-062
TRA-N-1090
TRA-N-1129
UGS-N-385
TRA-N-1092
TRA-N-1091
Alexandroupolis LNG
POSEIDON
TAP
IGB
EAST MED
Thessaloniki
Kavala
Komotini
Xanthi
Alexandroupolis
Kipi
Sidirokastron
Petrich
Kulata
Novo Selo
Gevgelija
Idomeni
Kilkis
Karperi
Nea Messimvria
Katerini
Larissa
Trikala
Volos
Ampelia
Lamia
Halkida
Aliveri
Thiva
Revythoussa
Agia Triada
Megalopoli
Floroyouni
Thesprotia
Fier
Vlore
Dumrea
Tetovo
Gostivar
Prilep
Bitola
Kafasan
Edirne
Kirklareli
Istanbul
Tekirdag
Marmara Ereglisi
Bursa
Karacabey
Canakkale
Balikesir
Aliaga
Manisa
Turgutlu
Izmir
Aydin

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	Metering & Regulating Station at Nea Messimvria	TRA-F-941	FID, PCI 7.1.3	2019*	DESFA
2	Compressor Station Kipi	TRA-N-128	Less-Advanced; PCI 6.8.1	2020	DESFA
3	Nea-Messimvria to North Macedonia pipeline	TRA-N-967	Less-Advanced	2021	DESFA
4	Metering and Regulating Station at Alexandroupoli	TRA-N-1090	Less-Advanced; PCI 6.9.1	2020	DESFA
5	Compressor station at Nea Messimvria	TRA-N-971	Less-Advanced; PCI 7.1.3	2022	DESFA
6	Metering and Regulating station at Megalopoli	TRA-N-1091	Less-Advanced; PCI 7.3.1	2025	DESFA
7	Komotini-Thesprotia pipeline	TRA-N-014	Less-Advanced	2024	DESFA
8	Metering and Regulating Station at UGS South Kavala	TRA-N-1092	Less-Advanced; PCI 6.20.3	2023	DESFA
9	Compressor Station Kipi Increment	TRA-N-1129	Less-Advanced	2024	DESFA
10	Compressor station at Nea Messimvria (3rd unit)	TRA-N-1276	Less-Advanced	2021	DESFA
11	Compressor station at Ambelia	TRA-N-1278	Less-Advanced	2022	DESFA

* Updated commissioning year: 2020

Table 2.7: List of projects in Greece

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	Promoter
1	LNG terminal in northern Greece/ Alexandroupolis – LNG Section	LNG-N-062	Advanced PCI 6.9.1	2020	Gastrade S.A.
2	LNG terminal in northern Greece/ Alexandroupolis – Pipeline Section	TRA-N-063	Advanced PCI 6.9.1	2020	Gastrade S.A.
3	South Kavala UGS	UGS-N-385	Less advanced PCI 6.20.3	2023	Hellenic Republic Asset Development Fund

Table 2.8: List of projects in Greece (Third Party projects)

2.2.5 HUNGARY

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	Romanian-Hungarian reverse flow Hungarian section 1st stage	TRA-F-286	FID PCI 7.1.3	2019*	FGSZ Ltd.
2	Slovenian-Hungarian interconnector	TRA-N-325	Less-Advanced PCI 6.8.1	2020	FGSZ Ltd.
3	Eastring–Hungary	TRA-N-656	Less-Advanced	2021**	FGSZ Ltd.
4	Városföld CS	TRA-N-123	Less-Advanced PCI 6.9.1	2020	FGSZ Ltd.
5	Romanian-Hungarian reverse flow Hungarian section 2nd stage	TRA-N-377	Less-Advanced PCI 7.1.3	2022	FGSZ Ltd.

* Actual year of commissioning ** 2nd stage commissioning year: 2028

Table 2.9: List of projects in Hungary

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	Promoter
1	Enhancement of Transmission Capacity of Slovak-Hungarian interconnector	TRA-N-524	Less-Advanced PCI 6.2.13	2022	Magyar Gáz Tranzit Zrt.
2	Development of Transmission Capacity of Slovak-Hungarian Interconnector	TRA-N-636	Less-Advanced PCI 6.2.13	2022	Magyar Gáz Tranzit Zrt.
3	Vecsés-Városföld gas transit pipeline	TRA-N-831	Less-Advanced PCI 6.2.14	2022	Magyar Gáz Tranzit Zrt.

Table 2.10: List of projects in Hungary (Third Party projects)

2.2.6 ITALY

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	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 S.p.A.
2	Development for new import from the South (Adriatica Line)	TRA-N-007	Less-Advanced PCI 7.3.4	2025	Snam Rete Gas S.p.A.
3	Interconnection with Slovenia	TRA-N-354	Less-Advanced	2023	Snam Rete Gas S.p.A.
4	Import developments from North-East	TRA-N-008	Less-Advanced	2034	Snam Rete Gas S.p.A.
5	Additional Southern developments	TRA-N-009	Less-Advanced	2034	Snam Rete Gas S.p.A.
6	Sardinia Methanization	TRA-N-1194	Less-Advanced	2020**	Snam Rete Gas S.p.A.
7	TAP interconnection	TRA-F-1193	FID	2019***	Snam Rete Gas S.p.A.
8	Matagiola-Massafra pipeline	TRA-N-1195	Less-Advanced	2025	Snam Rete Gas S.p.A.
9	Gorizia plant upgrade	TRA-N-1227	Less-Advanced	2022	Snam Rete Gas S.p.A.
10	Greece-Italy interconnection	TRA-N-1246	Less-Advanced	2025	Snam Rete Gas S.p.A.
11	Biomethane productions interconnection	TRA-N-1265	Less-Advanced	2022	Snam Rete Gas S.p.A.

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
12	Interconnection with UGS in Cornegliano Laudense	TRA-F-1228	FID	2018*	Snam Rete Gas S.p.A.
13	Interconnection with production in Gela	TRA-F-1241	FID	2020	Snam Rete Gas S.p.A.

* Actual year of commissioning ** Project merged with TRA-N-975 and promoted by ENURA S.p.A. *** Updated Commissioning year: 2020

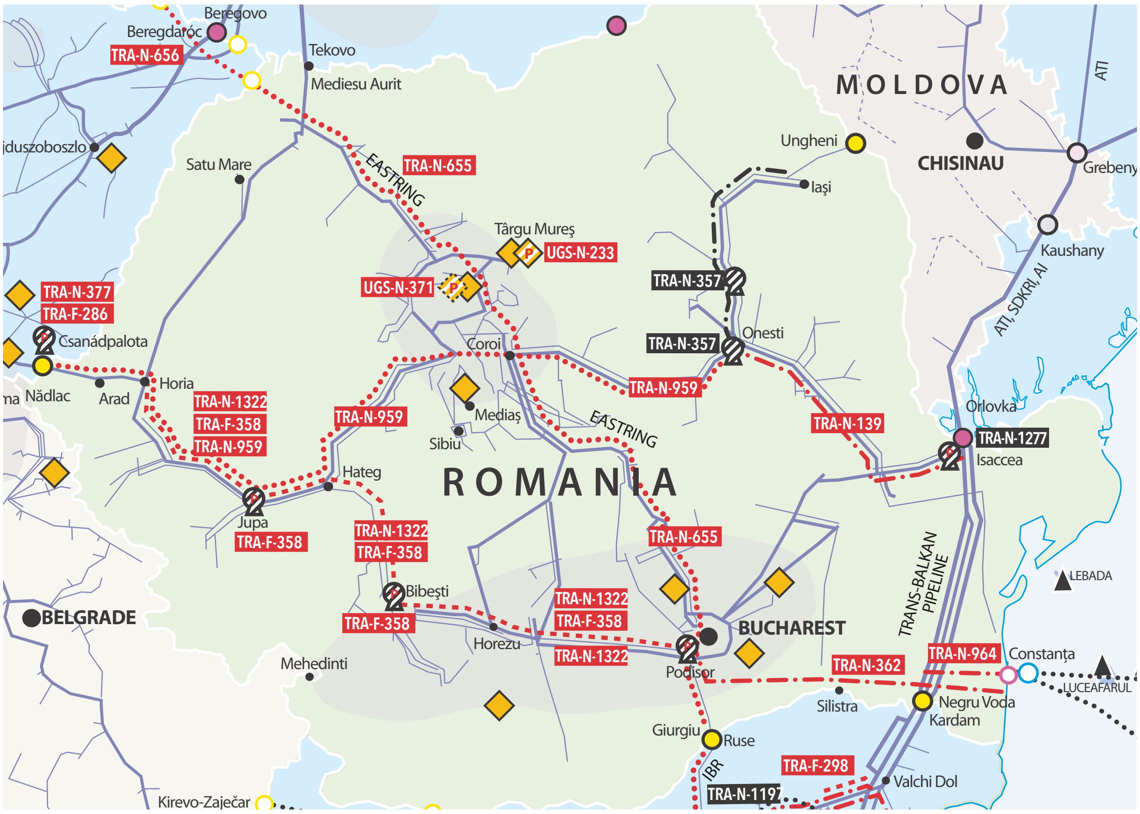
Table 2.11: List of projects in Italy

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	Promoter
1	Bordolano Second phase	UGS-F-1045	FID	2020	STOGIT S.p.A.
2	System Enhancements - Stogit - on-shore gas fields	UGS-F-260	FID	2027	STOGIT
3	GALSI Pipeline Project	TRA-N-012	Advanced	2019*	Galsi S.p.A.
4	Porto Empedocle LNG	LNG-N-198	Advanced	2021	Nuove Energie S.r.l.
5	Larino–Recanati | Adriatic coast backbone	TRA-N-974	Advanced	2022	Società Gasdotti Italia
6	Sardinia Gas Transportation Network	TRA-N-975	Advanced	2020**	Società Gasdotti Italia
7	Cornegliano UGS	UGS-F-242	FID	2018***	Ital Gas Storage

* Updated Commissioning year: 2022 ** Project merged with TRA-N-1194 and promoted by ENURA S.p.A. *** Actual year of commissioning

Table 2.12: List of projects in Italy (Third Party projects)

2.2.7 ROMANIA



No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	NTS developments in North-East Romania	TRA-N-357	Advanced	2019*	SNTGN Transgaz SA
2	Interconnection of the NTS with the DTS and reverse flow at Isaccea	TRA-N-139	Advanced PCI 6.24.10.1	2019**	SNTGN Transgaz SA
3	New NTS developments for taking over gas from the Black Sea shore	TRA-N-964	Advanced PCI 6.24.10.3	2019***	SNTGN Transgaz SA
4	Development on the Romanian territory of the NTS (BG–RO–HU–AT Corridor) phase I	TRA-F-358	FID PCI 6.24.1.2	2020	SNTGN Transgaz S.A.
5	Development on the Romanian territory of the NTS (BG–RO–HU–AT Corridor) phase II	TRA-N-1322	Advanced PCI 6.24.4.4	2022	SNTGN Transgaz S.A.
6	Development on the Romanian territory of the Southern Transmission Corridor	TRA-N-362	Advanced PCI 6.24.4.5	2020	SNTGN Transgaz SA
7	Eastring – Romania	TRA-N-655	Less-Advanced PCI 6.25.1	2023*	SNTGN Transgaz SA
8	Further enlargement of the BG–RO–HU–AT transmission corridor (BRUA) phase III	TRA-N-959	Less-Advanced PCI 6.24.10.2	2023	SNTGN Transgaz SA
9	Romania-Serbia Interconnection	TRA-N-1268	Advanced	2020	SNTGN Transgaz SA
10	Upgrading GMS Isaccea 1 and GMS Negru Voda 1	TRA-N-1277	Advanced	2019*	SNTGN Transgaz SA

* Updated commissioning year: 2021 ** Updated commissioning year: 2020 *** 2nd stage commissiomning year: 2028

Table 2.13: List of projects in Romania

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	Promoter
1	Sarmasel undeground gas storage in Romania	UGS-N-371	Less-Advanced PCI 6.20.6	2024	Societatea Națională de Gaze Naturale ROMGAZ S.A.
2	Depomures	UGS-N-233	Advanced PCI 6.20.4	2020	Engie Romania SA
3	Azerbaijan, Georgia, Romania Interconnector – AGRI	LNG-N-376	Less-Advanced	2026	AGRI LNG Project Company SRL (RO)

Table 2.14: List of projects in Romania (Third Party projects)

2.2.8 SLOVAKIA

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	System Enhancements–Eustream	TRA-N-017	Less-Advanced	2027	eustream, a.s.
2	Poland–Slovakia interconnection	TRA-F-190	FID PCI 6.2.1	2021	eustream, a.s.
3	Capacity increase at IP Lanžhot entry	TRA-F-902	FID	2019*	eustream, a.s.
4	Eastring–Slovakia	TRA-N-628	Advanced PCI 6.25.1	2023**	eustream, a.s.
5	Firm transmission capacity increase at the IP Veľké Zlievce	TRA-N-1235	Less-Advanced	2022	eustream, a.s.

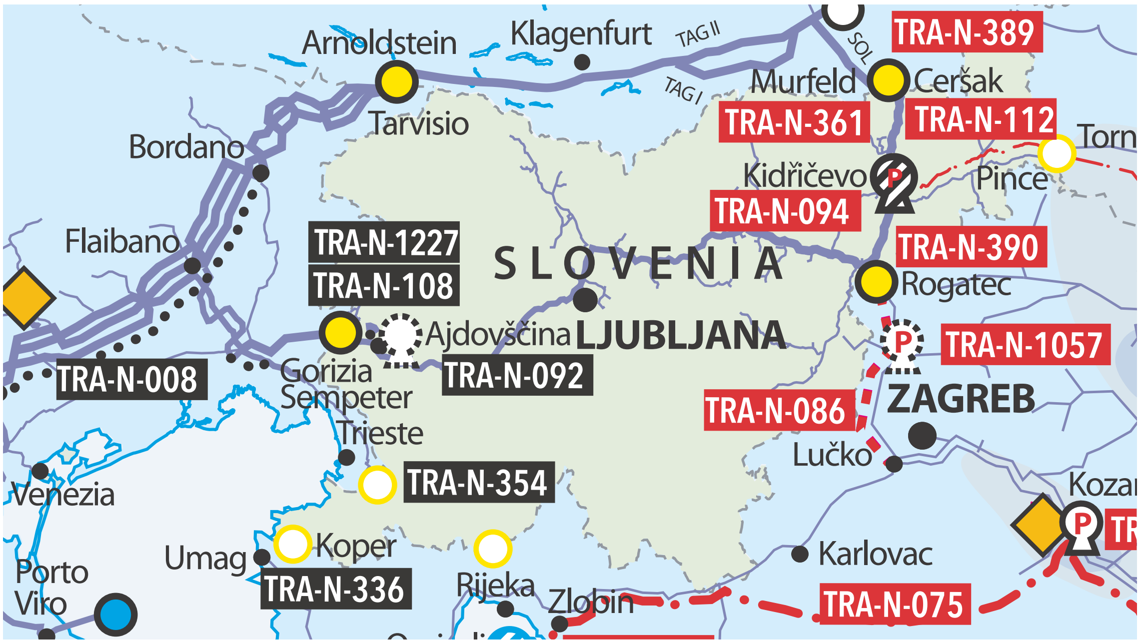
* Actual commissioning year ** 2nd stage commissioning year: 2028

Table 2.15: List of projects in Slovakia

No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	Promoter
1	Underground Gas Storage Velke Kapusany	UGS-N-356	Advanced	2023	NAFTA

Table 2.16: List of projects in Slovakia (Third Party projects)

2.2.9 SLOVENIA



No.	Project	TYNDP Code	Status	Commissioning (TYNDP 2018)	TSO/Sponsor
1	Upgrade of Rogatec interconnection (M1A/1 Interconnection Rogatec)	TRA-N-390	Less-Advanced PCI 6.26.1.6	2022	Plinovodi d.o.o.
2	CS Kidričevo, 2nd phase of upgrade	TRA-N-094	Less-Advanced PCI 6.26.1.2	2022	Plinovodi d.o.o.
3	M3 pipeline reconstruction from CS Ajdovščina to Šempeter/Gorizia	TRA-N-108	Less-Advanced	2022	Plinovodi d.o.o.
4	R15/1 Pince–Lendava–Kidričevo	TRA-N-112	Less-Advanced PCI 6.23	2022	Plinovodi d.o.o.
5	Upgrade of Murfeld/Ceršak interconnection (M1/3 Interconnection Ceršak)	TRA-N-389	Less-Advanced PCI 6.26.1.5	2022	Plinovodi d.o.o.
6	CS Ajdovščina, 1st phase of upgrade	TRA-N-092	Less-Advanced	2022	Plinovodi d.o.o.

Table 2.17: List of projects in Slovenia

2.3 PROJECTS INVOLVING MORE THAN TWO EU COUNTRIES OR NON EU COUNTRIES OR OFFSHORE PROJECTS

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

* Updated commissioning year: 2022 ** Actual commissioning year: 2019 ***Updated commissioning year: 2020

Table 2.18: Projects involving more than two EU countries or non EU countries or offshore projects

2.4 INCREMENTAL CAPACITY PROCEDURE RESULTS

According to the CAM NC, TSOs are obliged to launch a capacity demand survey every odd year. The first market demand survey took place in 2017, right after the modified CAM NC came into force. The market survey started on 06 April 2017. Southern Corridor GRIP TSOs submitted their data for this chapter according to the first 2017 Incremental Survey. CAM NC regulates, for which IPs market survey is compulsory. IPs between EU member states are included in this scope (17 existing and 1 future prospective) while IPs on the border of EU are excluded (13 cases). The non-binding capacity demand survey results are published on TSOs' and ENTSOG's website in a Demand Assessment Report (DAR) according to ENTSOGs' suggested structure, which was approved by ENTSOG Investment Working Group.

Some IPs on the EU's outer border were also tested as well as one future prospective IP.

DARs were published at almost every obligatory case (except 2 cases). In 6 cases the iTSOs decided to auction the new capacities while in three cases the examination continued in 2018.

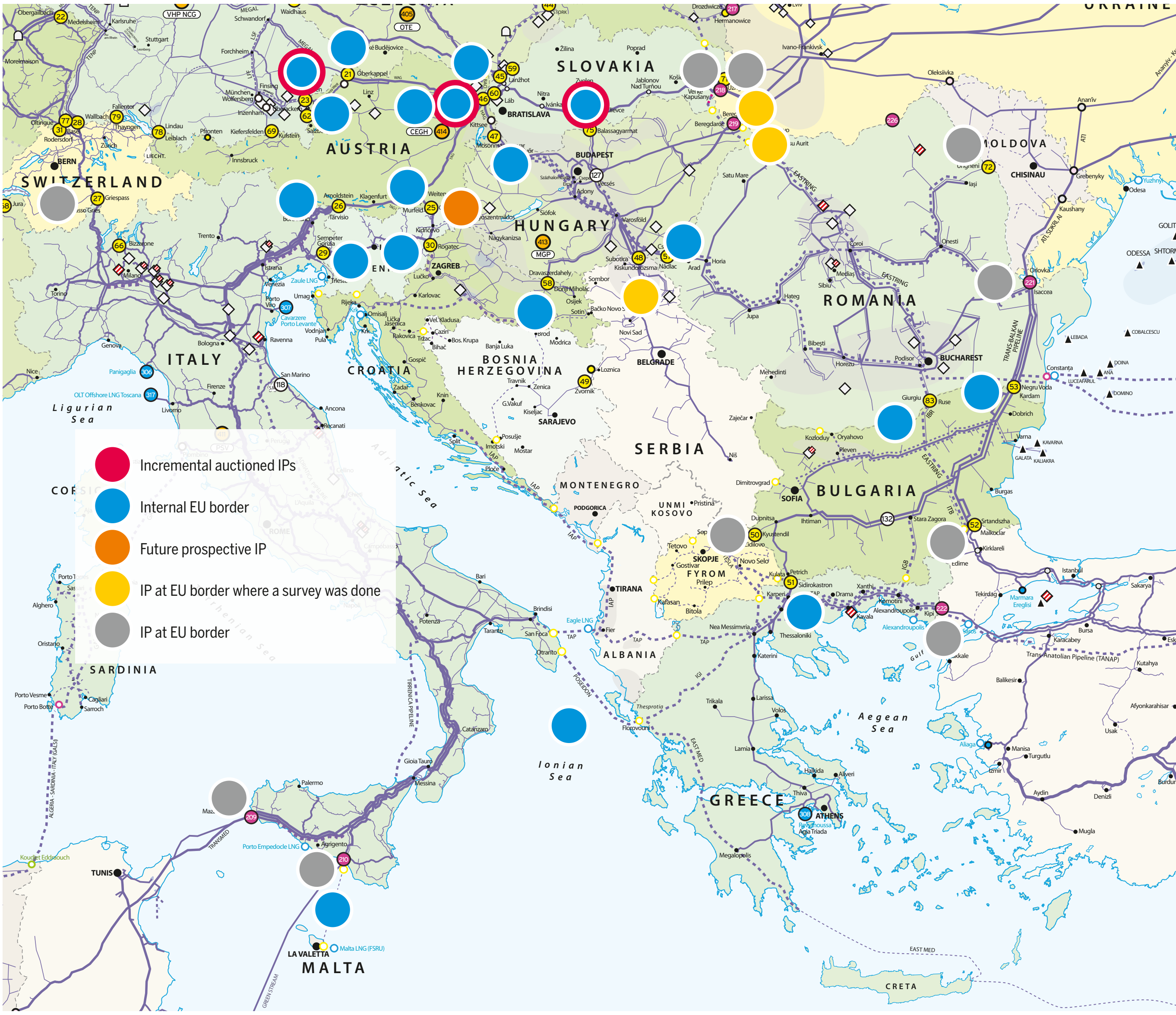


Figure 2.1: Map of IPs involved in the Incremental Capacity process 2017

Detailed information related to incremental process can be found in the table on the next two pages. >

No.	Number of IP on ENTSOG Capacity map	Border	IP	Number of IP	Name of IP	TSO1/TSO2	Non binding demand survey	DAR published	Capacity demand	Direction
1	51	GR/BG	Existing	Kulata (BG)	Sidirokastro (GR)	DESFA/ Bulgartransgas	Yes	Yes	0	–
2	53	RO/BG	Existing	Negru Voda 1 (RO)	Kardam (BG)	Transgaz/ Bulgartransgas	Yes	No	13,7 GWh/d from 2019/2020 to 2020/2021; 94,3 GWh/d from 2021/2022 to 2030/2031; 13,7 GWh/d from 2031/2032 to 2033/2034; There was no capacity demand on BG side.	RO>BG
3	83	RO/BG	Existing	Ruse (BG)	Giurgiu (RO)	Transgaz/Bulgartransgas	Yes	No	13,7 GWh/d from 2019/2020 to 2033/2034;	RO>BG
4	57	HU/RO	Existing	Csanádpalota (HU)	Nadlac (RO)	FGSZ/Transgaz	Yes	Yes	RO>HU 64,42...3,6 GWh/d; HU>RO 0,1 GWh/d; There was no capacity demand on RO side.	RO>HU; HU>RO
5	47	AT/HU	Existing	Mosonmagyaróvár (HU)		GCA/FGSZ	Yes	Yes	153 GWh/d/267 GWh/d	HU>AT
6	48	HU/SRB	Existing	Kiskundorozsma (HU)	Horgos (SRB)	FGSZ/Srbijagas	Yes, but not obligatory	Yes	SRB>HU 291 GWh/d	SRB>HU
7	58	HU/HR	Existing	Dravaszerdahely (HU)	Donji Miholac (HR)	FGSZ/Plinacro	Yes	Yes	HU>HR 2,6..3,0 GWh/h; 62,4 GWh/d in 2018/2018 to 73,05 GWh/d in 2034/2035 / HR>HU 1,1...1,36 GWh/h; from 26,4 GWh/d in 2020/2021 to 32,62 GWh/d in 2034/2035	Both
8	75	SK/HU	Existing	Vel'ké Zlievce (SK)	Balassagyarmat (HU)	Eustream/MGT	Yes, 2 times	Yes	HU>SK 4,6 GWh/d; SK>HU 4,6 GWh/d, higher on the HU side	HU>SK; SK>HU
9		HU/UA	Existing	Beregdaróc (HU)	Beregovo (UA)	FGSZ/ Ukrtransgaz	Yes, but not obligatory	Yes	HU>UA 3,6 GWh/d	HU>UA
10	219	UA/HU	Existing	Beregovo (UA)	Beregdaróc (HU)	Ukrtransgaz/ FGSZ	Yes, but not obligatory	Yes	UA>HU 28,2..6,7 GWh/d;	UA>HU
11	SI/HU	SI/HU	Non existing	Pince (SI)	Tornyiszentmiklós (HU)	Plinovodi/FGSZ	Yes	Yes	3,96 GWh/d	SI>HU
12	25	AT/SI	Existing	Murfeld (AT)	Cersak (SI)	GCA/Plinovodi	Yes	Yes	AT 9,071 MWh/h FF (0,21 GWh/d) & 6,938 MWh/h RF (0,17 GWh/d) / SI No	SI>AT AT>SI
13	29	SI/IT	Existing	Sempeter (SI)	Gorizia (IT)	Plinovodi/Snam Rete Gas	Yes	Yes	No	
14	30	SI/HR	Existing	Rogatec (HR)		Plinovodi (SI) / Plinacro (HR)	Yes	Yes	SI 11,88 GWh/d / HR from 26,4 GWh/d in 2020/2021 to 22,6 GWh/d in 2034/2035	HR>SI
15	45	SK/CZ	Existing	Lanžhot (CZ)			Yes	Yes	0	
16	46	SK/AT	Existing	Baumgarten (AT)		Eustream/GCA	Yes	Yes	SK>AT 4,648 GWh/h; 111,5 GWh/d FF from 2022/23 to 2036/37 on both side	SK>AT
17	46	SK/AT	Existing	Baumgarten (AT)		Eustream/TAG/ GCA	Yes	Yes	No	
18	21	AT/DE	Existing	Oberkappel (AT)		GCA/GRTgaz Deutschland	Yes	Yes	960 MWh/h	AT > DE
	21	AT/DE	Existing	Oberkappel (AT)		GCA/Open Grid Europe	Yes	Yes	960 MWh/h	AT > DE
19	23	AT/DE	Existing	Überackern SUDAL (AT)	Überackern 2 (DE)	GCA/bayernets	Yes	Yes	960 MWh/h FF from 2023 to 2028 / 2,500 MWh/h RF from 2018 to 2027	AT <->DE
20	23	AT/DE	Existing	Überackern ABG (AT)	Überackern (DE)	GCA/Open Grid Europe	Yes	Yes	960 MWh/h	AT > DE
21	26	AT/IT	Existing	Arnoldstein (AT)	Tarvisio (IT)	TAG/Snam Rete Gas	Yes	Yes	No	
22	N/A	GR/IT	Non existing	N/A		DESFA/Snam Rete Gas	Yes	Yes	357.7 GWh/d	GR>IT

Table 2.19: Detailed information on the Southern Corridor IPs Incremental Process 2017

Requested demand TSO1 side/TSO2 side	Conditions	Incremental procedure started	Public consultation	Incremental auction on (in possible, please specifiy year)	Alternative capacity allocation mechanism	Project proposal to NRA's for aprroval	Comment
–							
Yes	The capacities should be freely allocable between the Romanian and Bulgarian VTP	No	No	No		No	DAR was not yet agreeded by both parts (Transgaz, Bulgartransgaz), but the conclusion of the analized non-binding demands, in relation to the available technical capacity at the interconnection points between the border of the adjacent entry-exit systems of Romania and Bulgaria was: an incremental capacity project will not be initiated.
Yes	The capacities should be freely allocable between the Romanian and Bulgarian VTP	No	No	No		No	DAR was not yet agreeded by both parts (Transgaz, Bulgartransgaz), but the conclusion of the analized non-binding demands, in relation to the available technical capacity at the interconnection points between the border of the adjacent entry-exit systems of Romania and Bulgaria was: an incremental capacity project will not be initiated.
No	No	No	No	No		No	Ongoing development up to 51 GWh/d RO>HU capacity; Successful OS, pending FID 128 GWh/d capacity both directions
Yes, but different levels.		Yes	Yes	Not decided yet.		Yes	Alternative delivery route will be auctioned in 2018 HU>SK>AT direction
Yes		No	No	No		No	Non EU border
Yes	HR>HU depends on KRK LNG	No	No	No		No	Plinacro and FGSZ were conducting an Open Season procedure for incremental capacity demand on HR>HU linked to LNG Krk capacity but it was unsuccesful.
SK Yes / HU additional demand	Link over IPs	Yes	Yes	Yes	Yes; HU/SK and SK/AT border	No	Alternative capacity allocation, 2 EU borders are involved, but it was unsuccesful.
No		No	No	**No**		No	Non EU border, limited capacity demand
No		No	No	**No**		No	Non EU border, limited capacity demand
SI Yes/ HU No	Depends on Krk LNG terminal	No	**No**	No		No	Limited capacity demand.
Yes	No	Yes	Yes	**Yes**		AT: Yes / SI: No	Gas flow in the direction HR>SI currently is not possible. Croatian part of the project which will enabled gas flow in the direction from HR to SI is on gioing and it is in the designing phase.
SI Yes/ IT No		No	No	**No**		No	
Yes	Depends on Krk LNG	No	Yes	**No**		No	
Yes	Link over IPs	Yes	Yes	**Yes**		Yes	Alternative capacity allocation, 2 EU borders are involved
No	No	No	No	**n/a**		No	Incremental demand oly on NCG side
No	No	No	No	**n/a**		No	
No	No	Yes	Yes	**Yes**		Yes	Incremental demand only on NCG side (Incremental auction RF took place on 2 July 2018
No	No	No	No	**n/a**		No	Incremental demand oly on NCG side
Yes/Yes	Link over IPs (demand at IP TK>GR)	Yes	Yes	**n/a**	under consideration	In progress*	In the consultation, two offer levels have been proposed (respectively, 190,4 GWh/d and 357,7 GWh/d). Offer levels for economic test are not yet defined since the process is still in the design phase.

* Process flown into the 2019 incremental cycle.

3 DEMAND

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 2018 or the Transmission System Operators (TSOs) of the Region in 2017, unless otherwise stated[2]. All ENTSOG data in this part come from the Sustainable Transition scenario as described in ENTSOG's TYNDP 2018[3]. Figure 3.1 shows the relative weigh of countries in EU-28. Among the countries of the Southern Corridor Italy remains, by far, the larger gas market as it represents 61 % of the total gas consumption in the Region. This consumption gap has slightly closed since 2015 when it was 63 %.

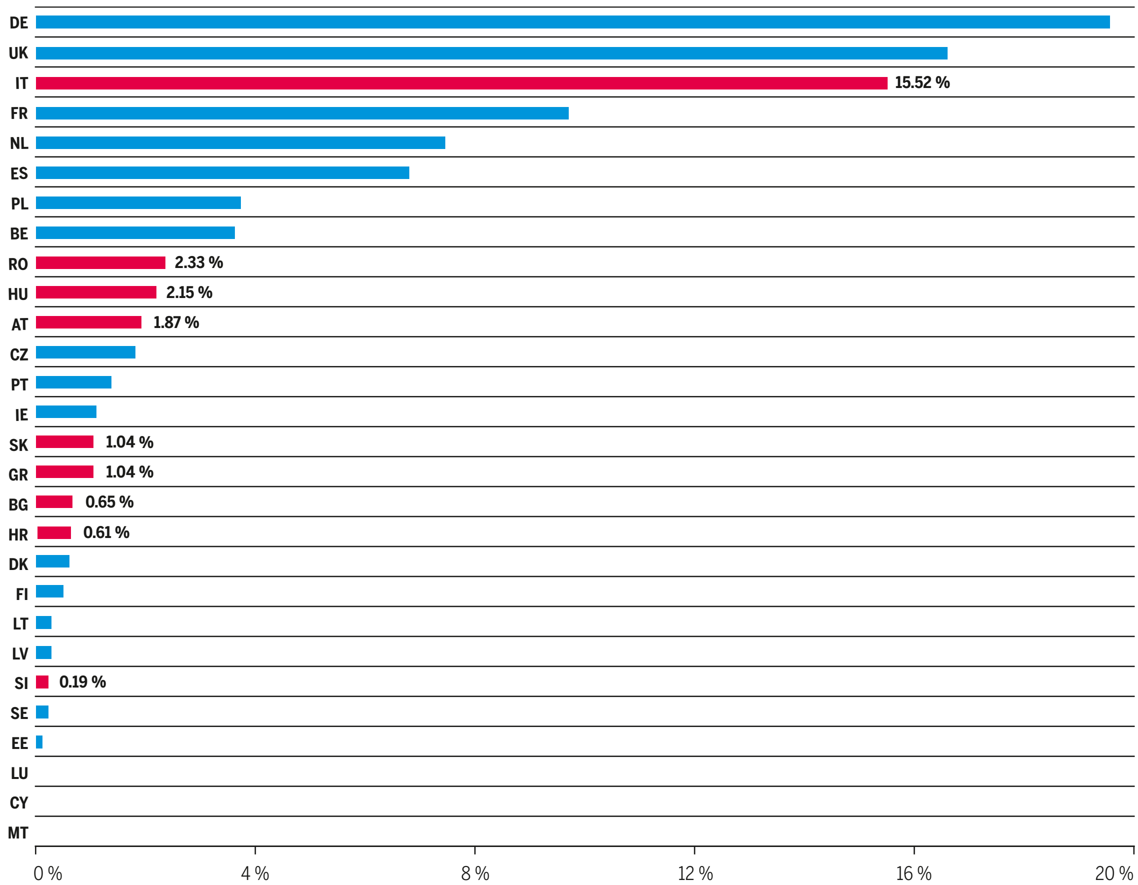


Figure 3.1: Annual gas consumption in the EU countries in 2017

2 Demand data refer to TSOs contributions sent to ENTSOG in April 2018 and their projections may have, in some cases, changed until the publication date.

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

3.1 ANNUAL DEMAND

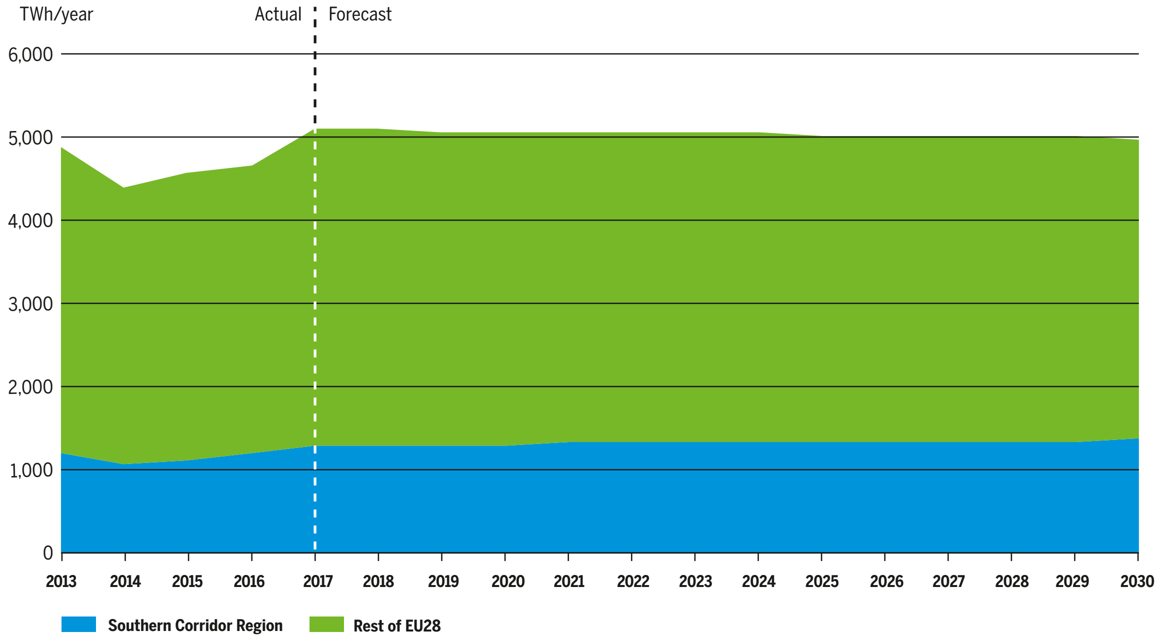


Figure 3.2: EU 28 and Southern Corridor annual gas demand

2013	2014	2015	2016	2017	2018	2019	2020
24.6 %	24.5 %	24.8 %	26.2 %	25.4 %	25.7 %	25.9 %	26.1 %
2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	
26.3 %	26.4 %	26.6 %	26.7 %	26.8 %	26.9 %	27.0 %	

Table 3.1: Annual demand share of Southern Corridor region

Figure 3.2 shows the historical and forecasted annual gas demand of the Southern Corridor Region compared to the rest of the European Union between 2013 and 2027. It shows that historically the 9 countries of the Southern Corridor Region made up around 25 % of the total EU demand.

The demand for natural gas is expected to mark a low increase over the next ten years slower than the increase marked during the few recent years. The countries of the Southern Corridor Region are expected to account for 27 % of the total EU gas demand in 10 years as shown in table 3.1. This increase, from less than 26 % to 27 %, 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. At the same time, it reflects the slow decrease of gas demand in the EU as a whole, especially in North-Western Europe.

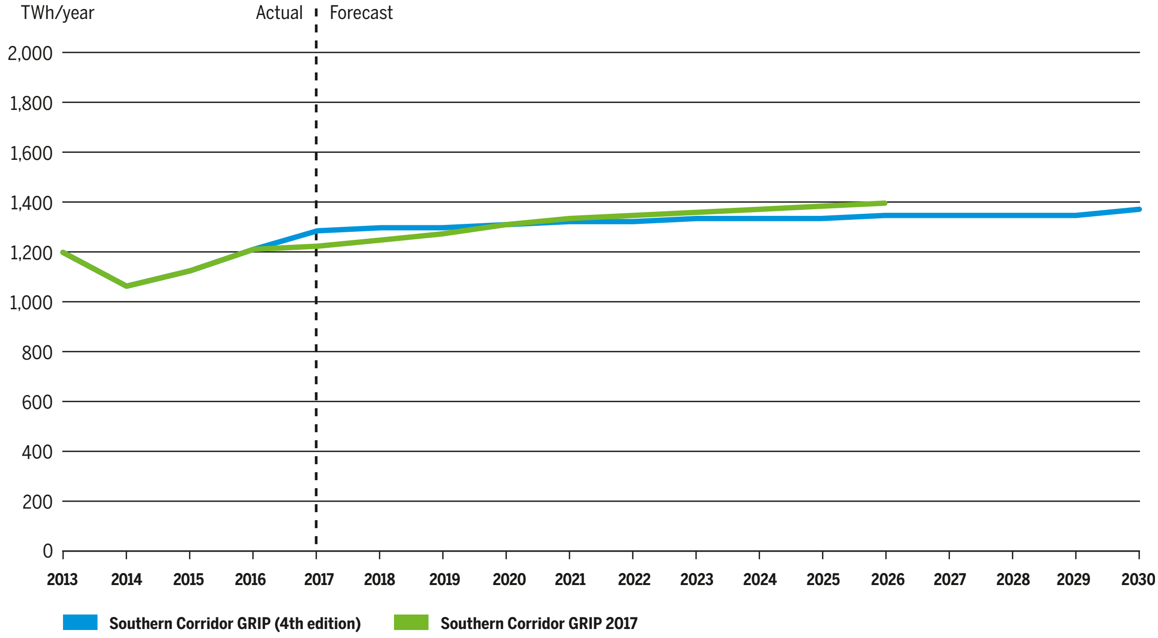


Figure 3.3: Southern Corridor annual gas demand GRIP (4th edition) comparison & SC GRIP 2017–2026

	2019	2020	2021	2022	2023	2024	2025	2026
Difference (TWh)	24	6	-14	-27	-37	-40	-48	-58
Difference (%)	1.9	0.4	-1.1	-2.0	-2.7	-2.9	-3.4	-4.1

Table 3.2: Decrease between demand forecast of Southern Corridor GRIP 2017–2026 and the 4th edition

Figure 3.3 shows a comparison between the actual and forecast demand figures in the Southern Corridor GRIP 2017–2026 and the ones provided by the TSOs for this GRIP. The chart shows the annual demand evolution of the Southern Corridor Region.

The graph confirms the trend of the last years, according to which the increase in annual demand is slower over the period in comparison with the one forecasted in the last SC GRIP.

The evolution between Southern Corridor GRIP demand forecast 2017–2026 and the 4th edition is shown in the table 3.2.

3.2 ANNUAL DEMAND BREAKDOWN

Figure 3.4 shows the annual demand breakdown of the Southern Corridor Region for the last nine 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 period 2011 to 2014, 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 the overall demand of Gas for power generation although CCGTs play a key role for 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 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 to the

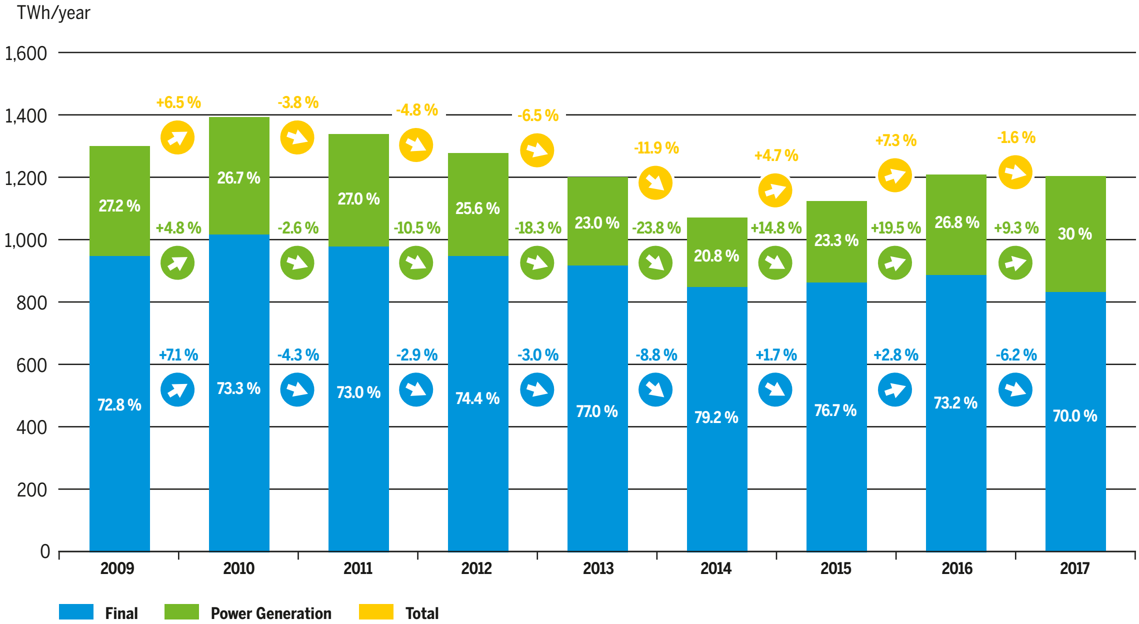


Figure 3.4: Evolution of Southern Corridor yearly demand in the period 2009–2017 and its breakdown

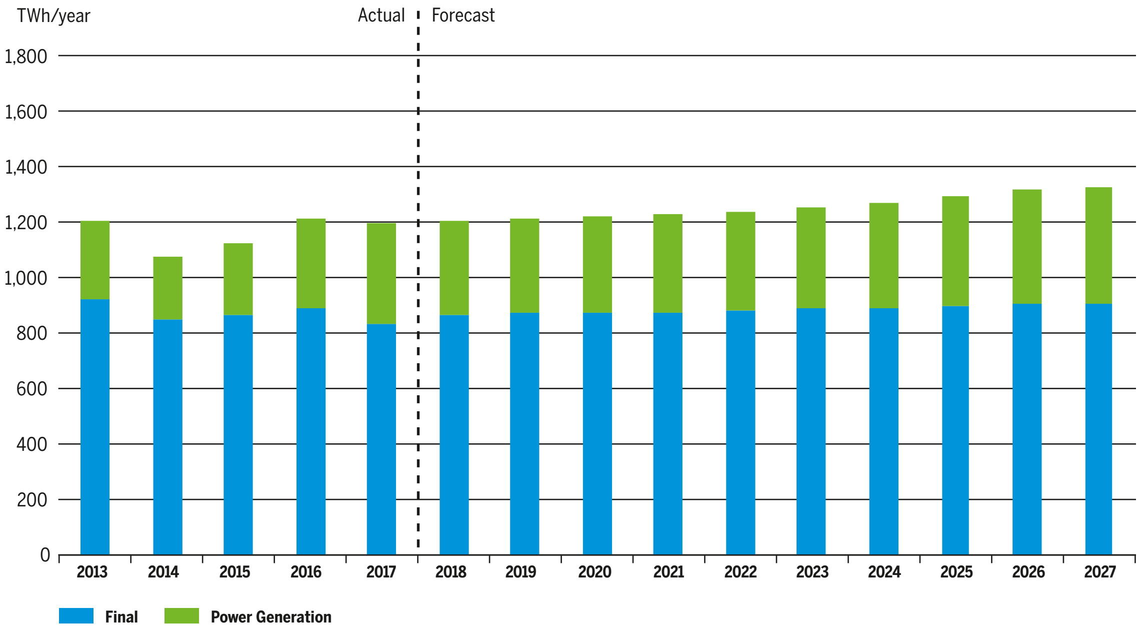


Figure 3.5: Southern Corridor Yearly Demand Breakdown (historical and forecast)

recent decrease in LNG prices and, to a lesser extent, to new uses of natural gas in the transportation sector (see also chapter 3.6). Bio-methane and hydrogen are other promising factors for the longer term future role of gases, in a deeper decarbonisation perspective.

The historical data in figure 3.5 illustrate, 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.

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 figure 3.9) and the complementarity with renewable energy sources that CCGT power plants can offer.

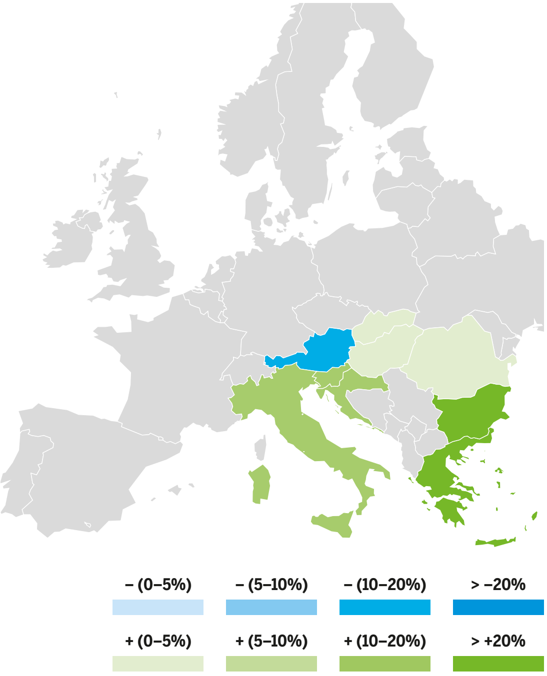


Figure 3.6: Southern Corridor countries annual demand evolution over the period 2018–2027

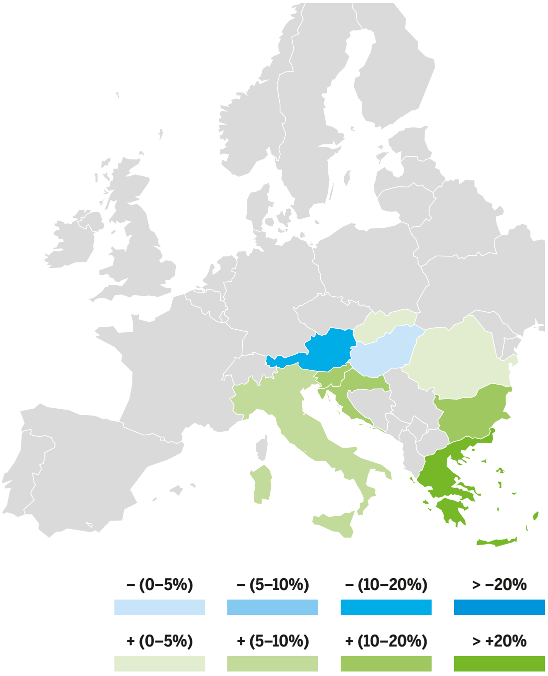


Figure 3.7: Southern Corridor countries final annual demand evolution over the period 2018–2027

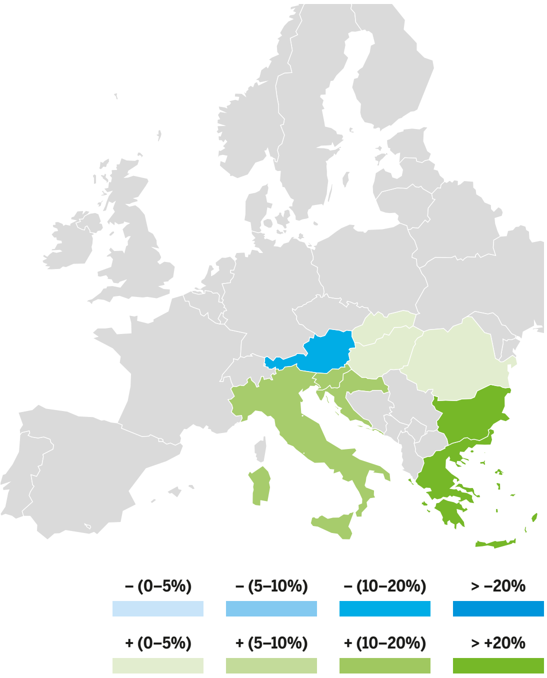


Figure 3.8: Southern Corridor countries annual gas demand for power generation evolution over the period 2018–2027

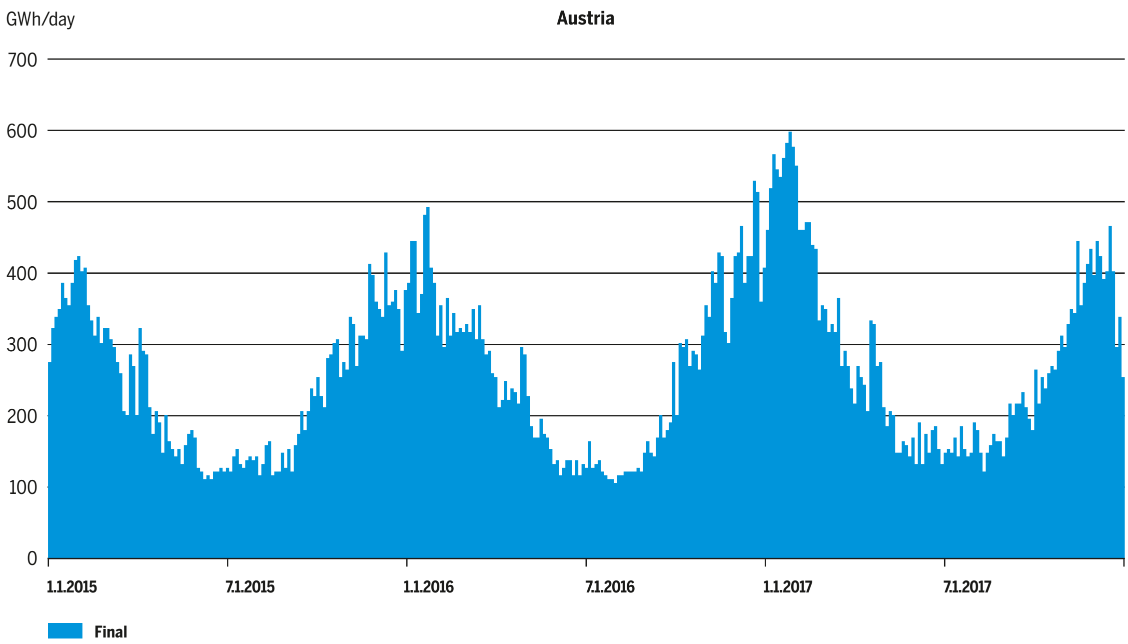
The maps in the following figures 3.6 to 3.8 depict the demand evolution forecast per country, in total and broken down to final and power generation

3.3 PEAK DEMAND

3.3.1 DEMAND MODULATION

The graphs of figure 3.9 show the daily demand in 2015, 2016 and 2017 in every country as well as the part of it attributed to power generation (where data are available).

Note: In Bulgaria power is produced from natural gas in CHP plants whose demand is included in Total demand. The only power plant of the country (Power Plant Varna) was not in operation in the period 01.01.2015–31.12.2017.



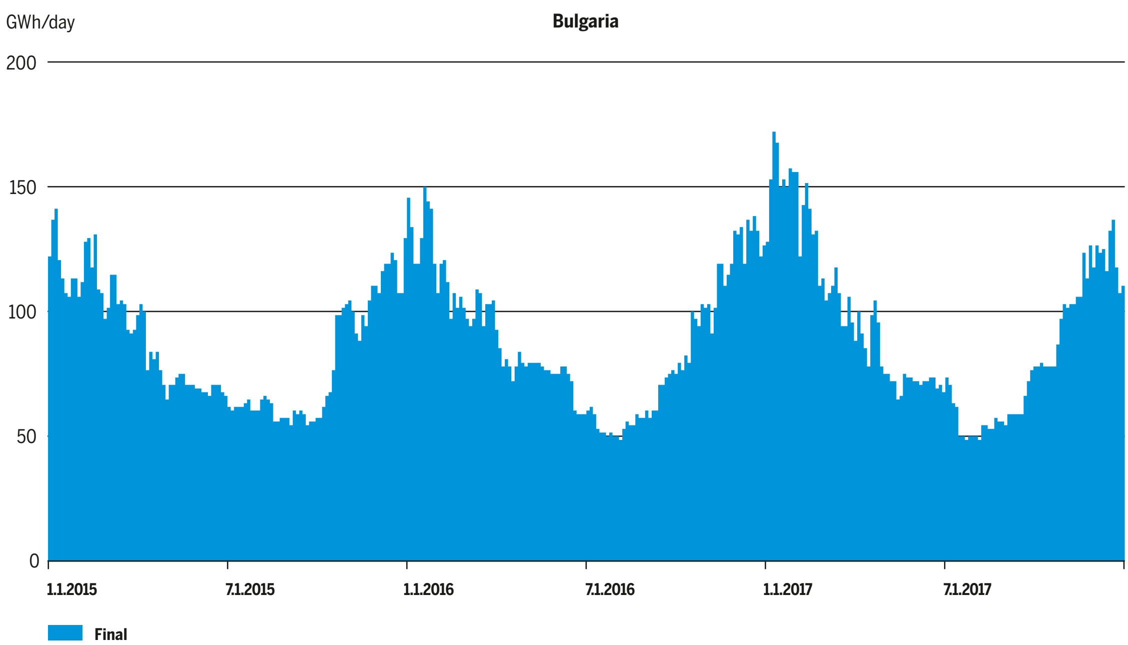


Figure 3.9: Demand profile per country in 2015, 2016 and 2017

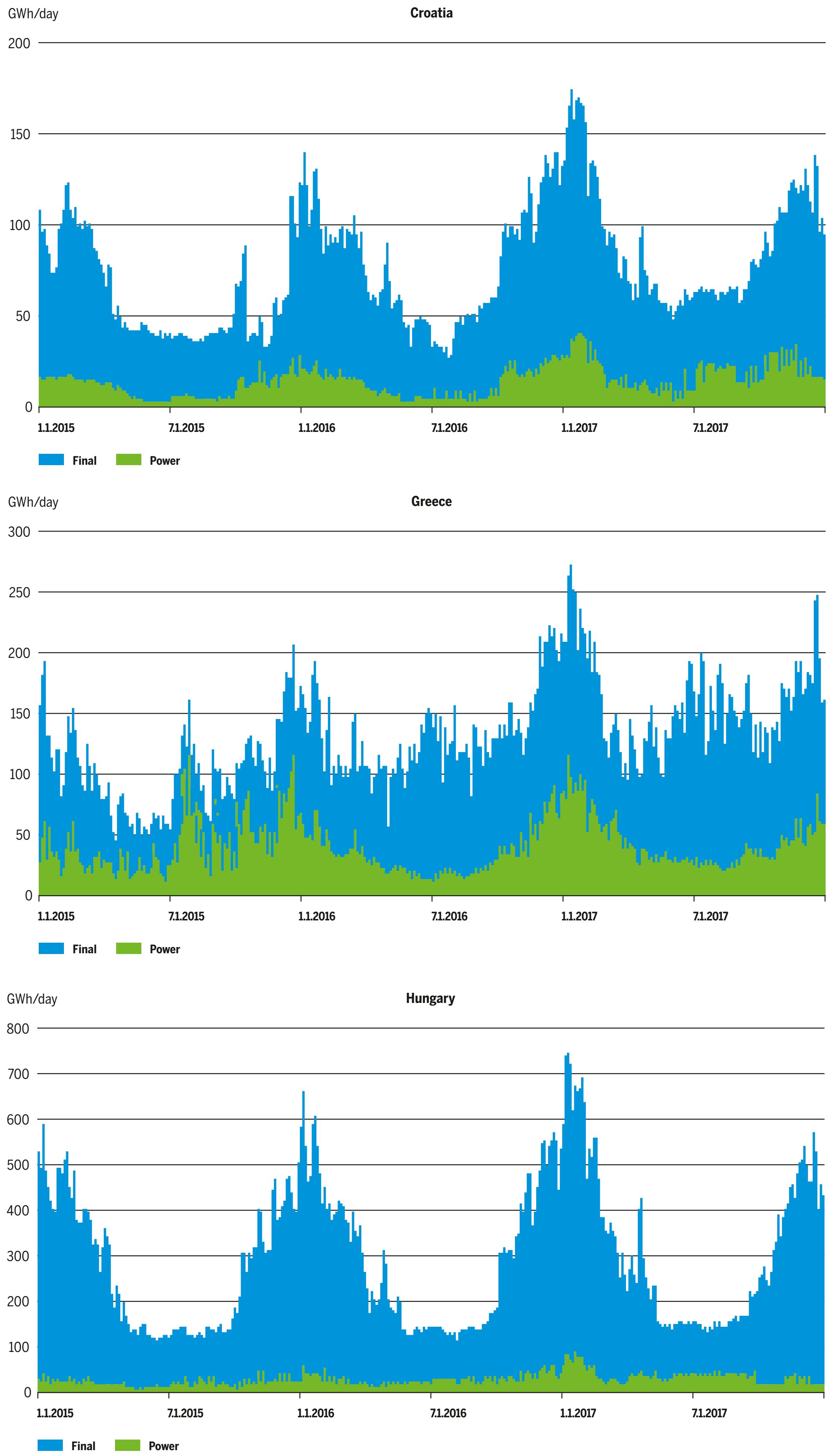
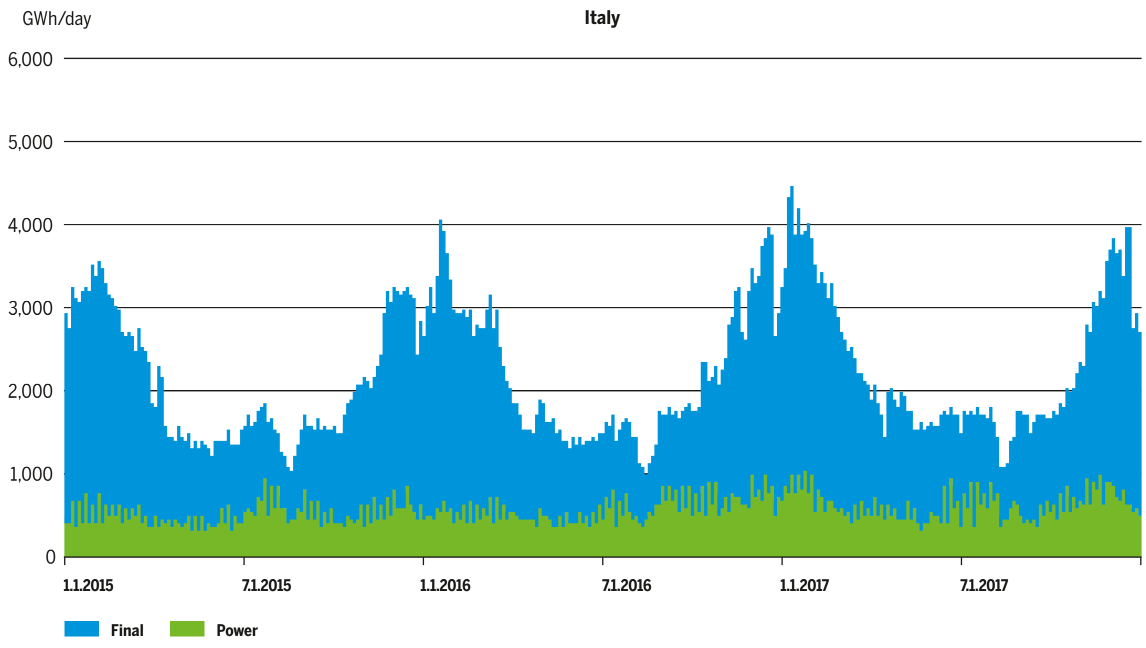
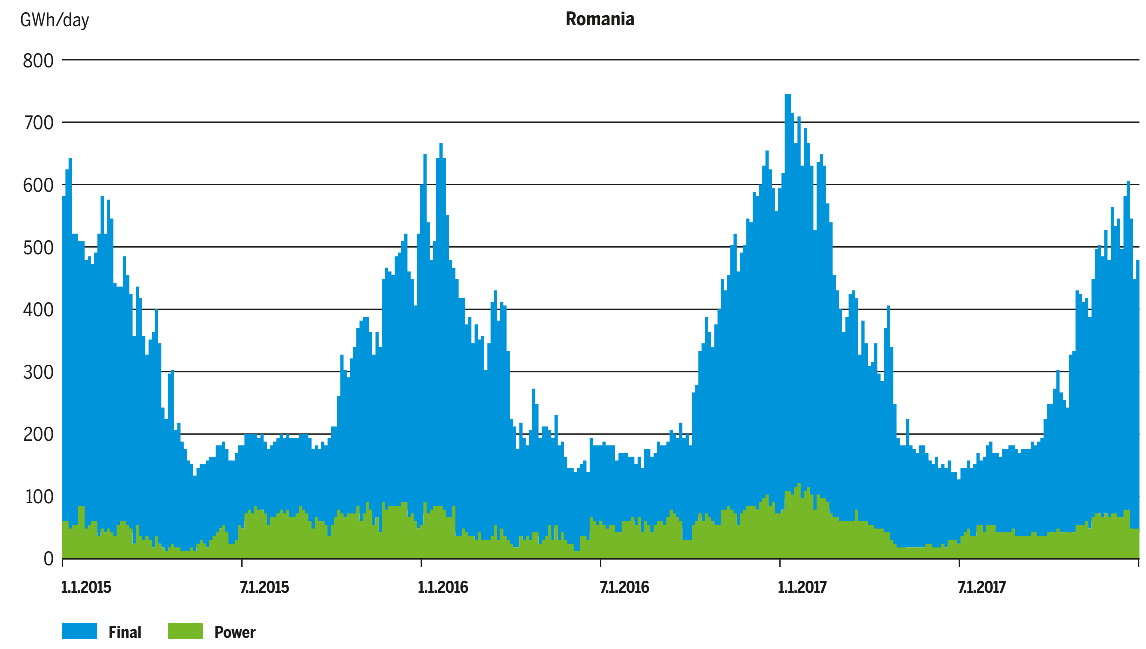


Figure 3.9: Demand profile per country in 2015, 2016 and 2017





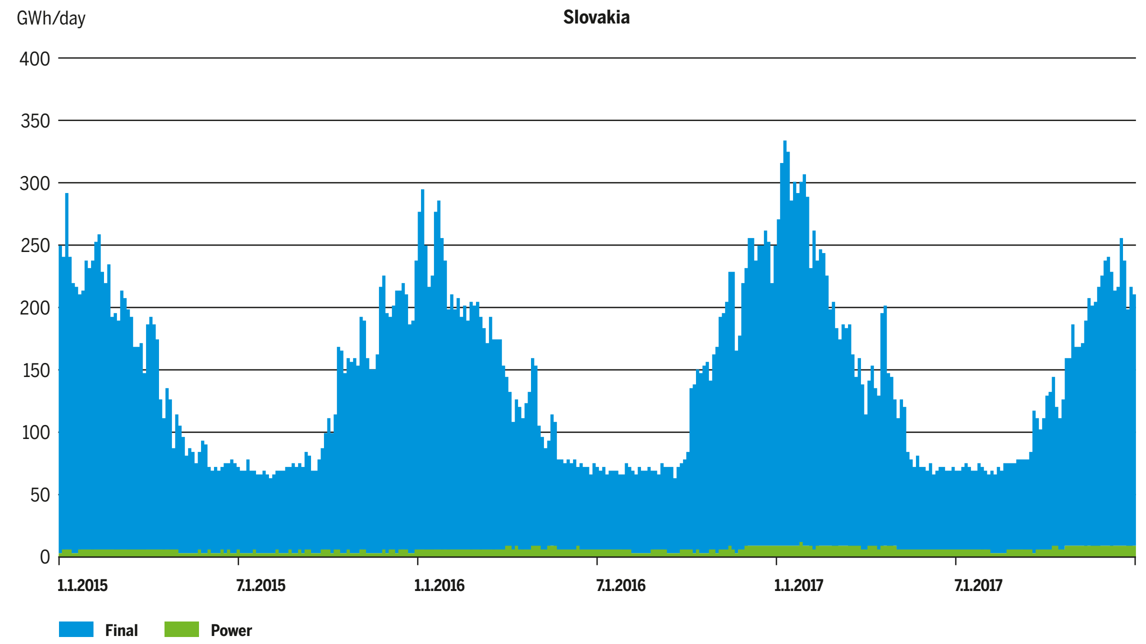


Figure 3.9: Demand profile per country in 2015, 2016 and 2017

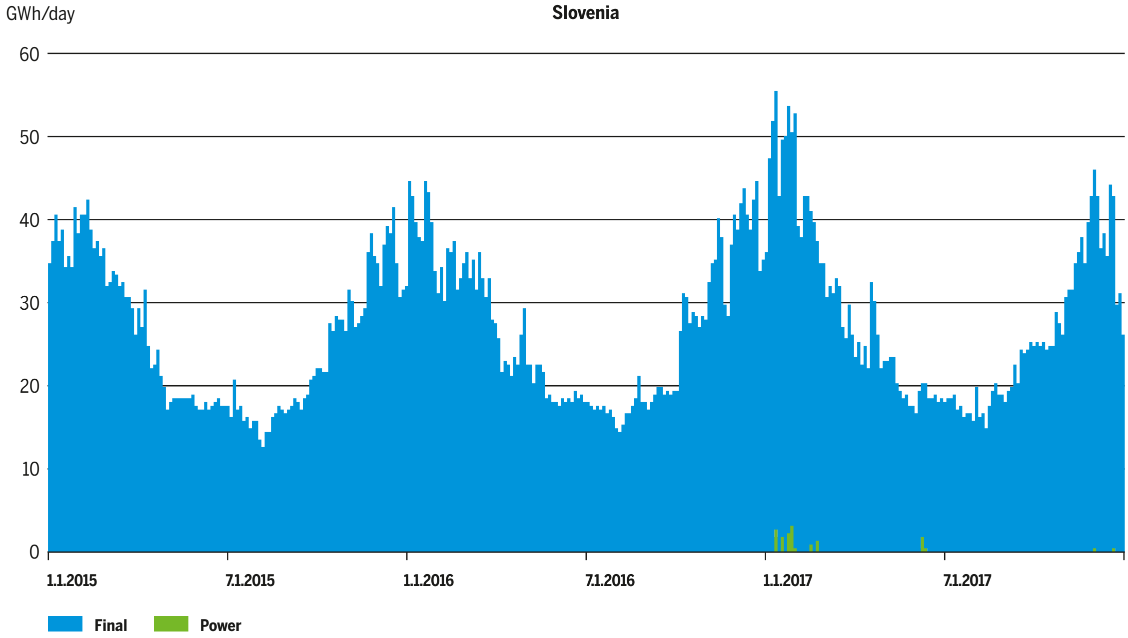


Figure 3.9: Demand profile per country in 2015, 2016 and 2017

It results from the analysis of the graphs of figure 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 more flat demand profile, (i.e. the higher (yearly) ratio between average and maximum demand) as the space cooling demand in summer creates intermediate peaks due to the demand for power.

These graphs also show that most of the gas demand (in absolute terms) for power generation continues to come 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.

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 2017–2026, and Southern Corridor GRIP 2018–2027 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.

Peak demand forecasts show a decrease consistent with annual demand revisions, although it should be taken into account that the recent actual trends went in the opposite direction with an increase of registered peak demands. 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.

4 No data for the past use of gas in power generation are available for Austria

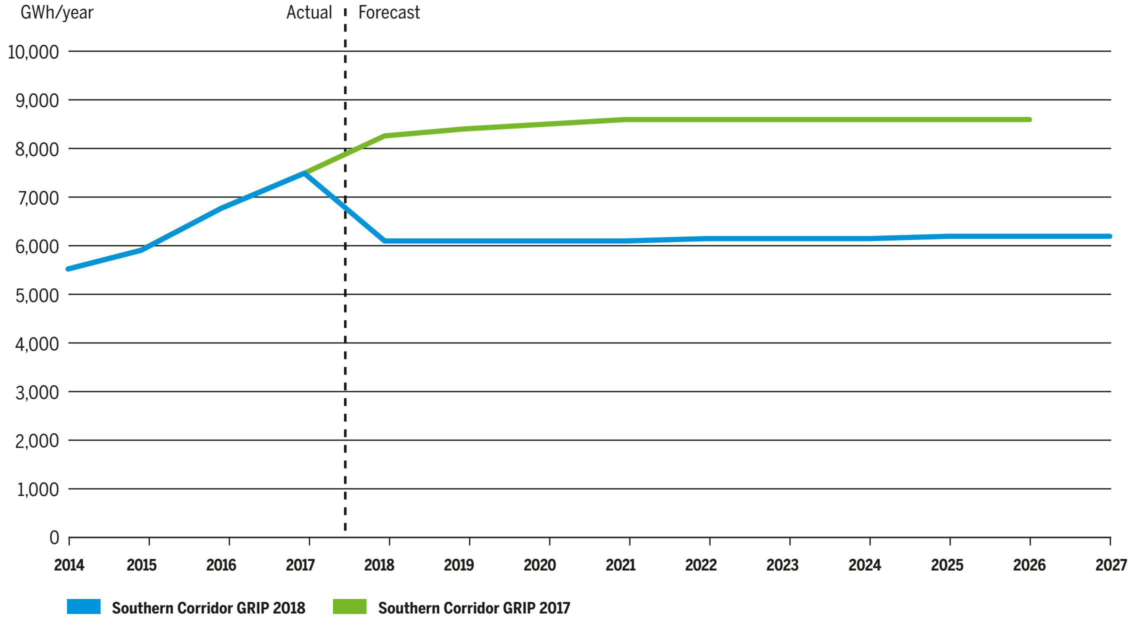


Figure 3.10: Southern Corridor peak demand comparison between the SC GRIP 2017–2026 and SC GRIP (4th edition)

	2018*	2019	2020	2021	2022	2023	2024	2025	2026
Difference (GWh/d)	-2,200	-2,271	-2,388	-2,480	-2,470	-2,484	-2,460	-2,457	-2,454
Difference (%)	-36	-37	-39	-41	-40	-40	-40	-40	-40

* Peak demand values for 2018 are forecast.

Table 3.3: Decrease of peak demand daily forecast between GRIP 2017–2026 and GRIP (4th edition)

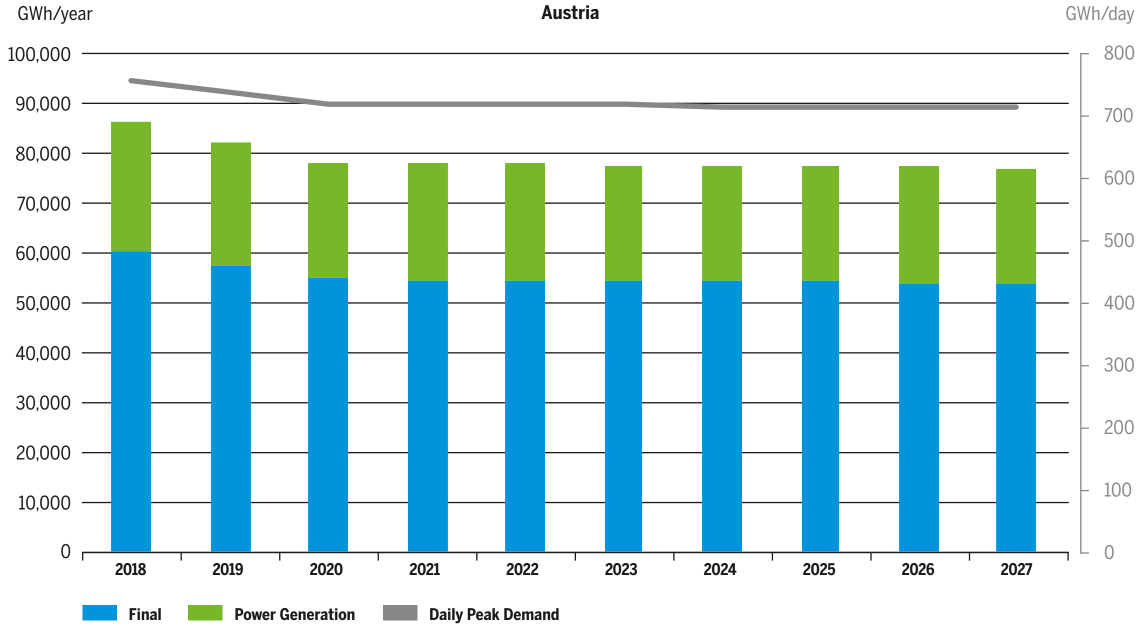
3.4 ANNUAL AND PEAK DEMAND EVOLUTION

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 11 %. From the graphs of figure 3.11 it results that, with the exception of Austria, the gas demand for power generation is expected to increase in all countries of the region. 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, or, for less mature markets, to the increase in the gas use by the residential/commercial sector which has a lower load factor.

The evolution of the annual demand refers to the period 2018–2027.[5]

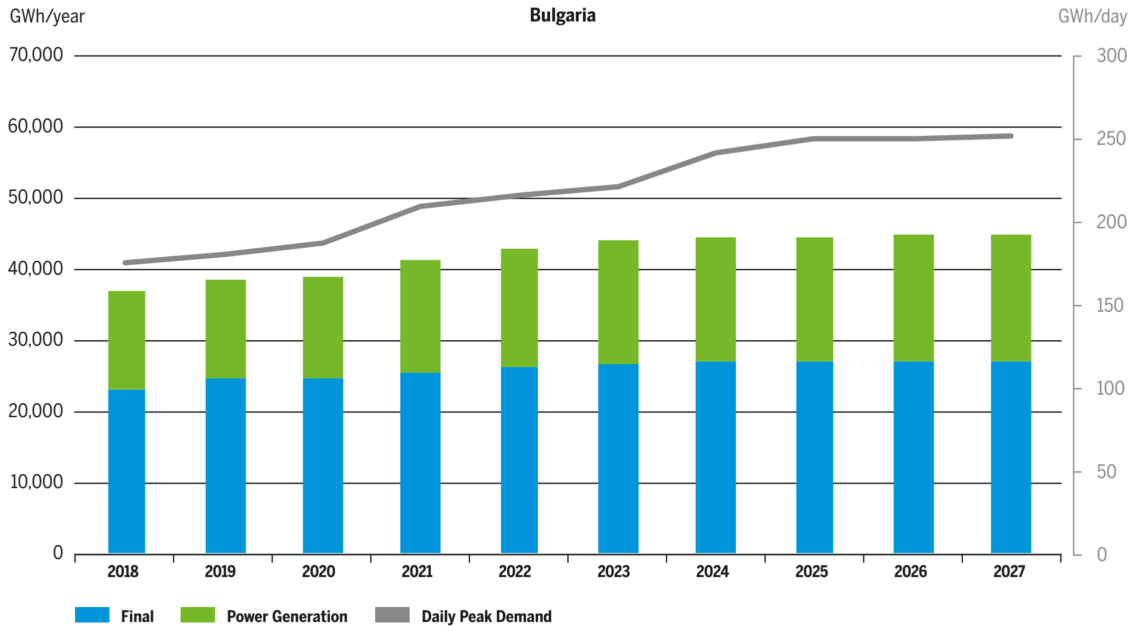
Please note that the peak demand line corresponds to the right-hand vertical axis. Therefore, the distance of this line from the bars representing the annual demand (read on the left-hand axis) does not have any significance.

5 Demand data refer to TSOs contributions sent to ENTSOG for the preparation of TYNDP 2018 and their projections may have, in some cases, changed until the publication date of the present GRIP.



Evolution of annual demand: -10 %
Evolution of Power Generation: -10 %

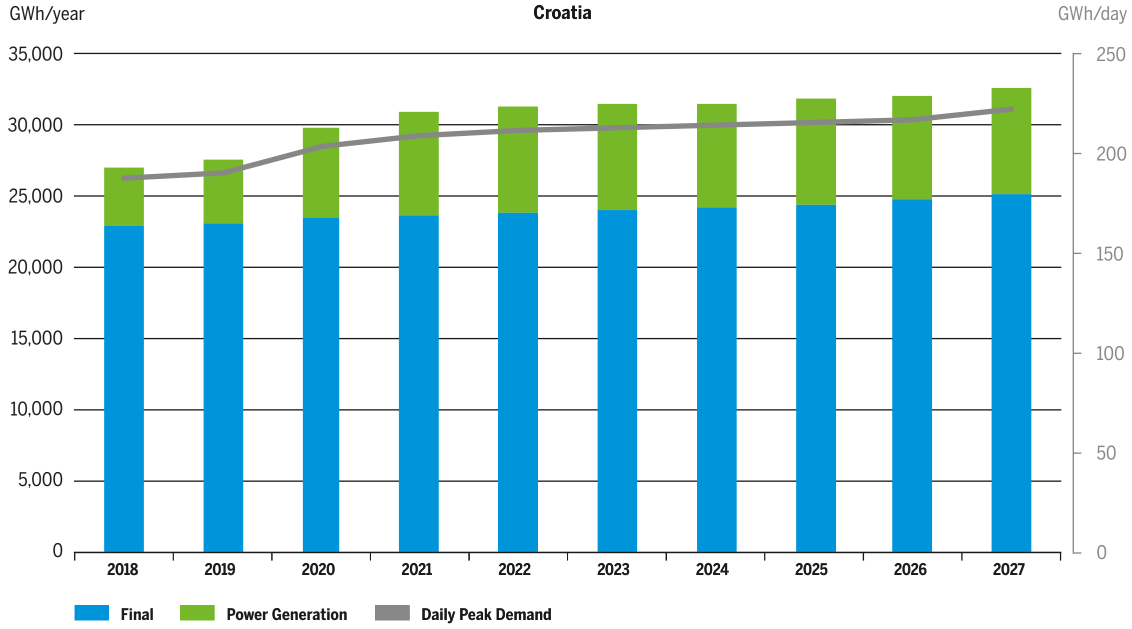
Evolution of Final demand: -10 %
Evolution of peak demand: -6 %



Evolution of annual demand: 22 %
Evolution of power generation: 29 %

Evolution of final demand: 17 %
Evolution of peak demand: 44 %

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

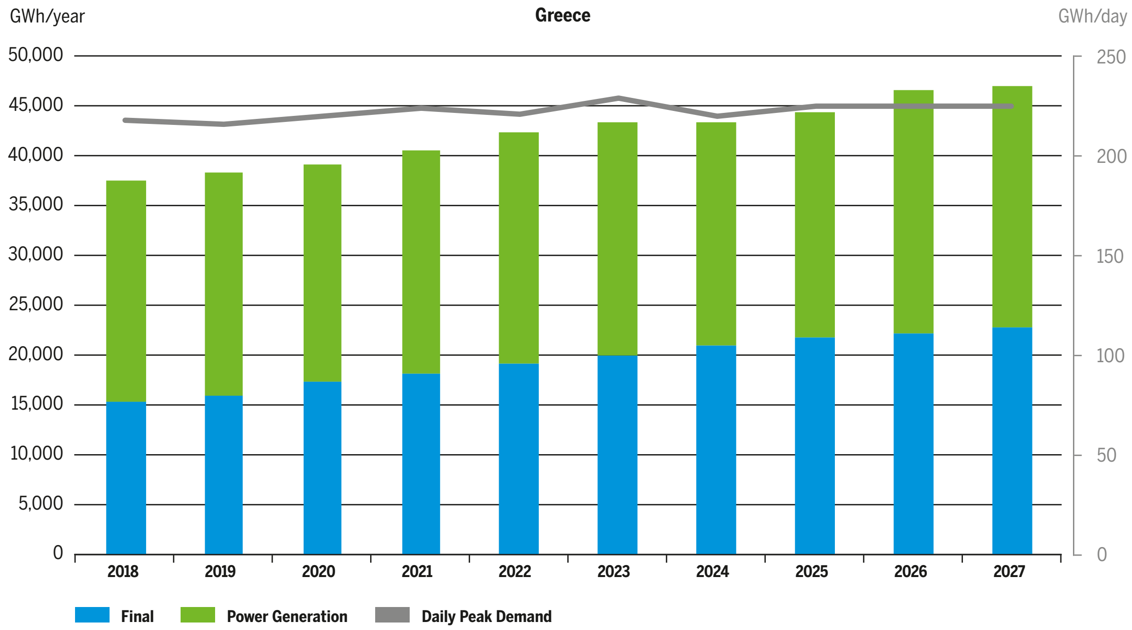


Evolution of annual demand:20 %

Evolution of power generation: 77 %

Evolution of Final demand: 10 %

Evolution of peak demand: 18 %



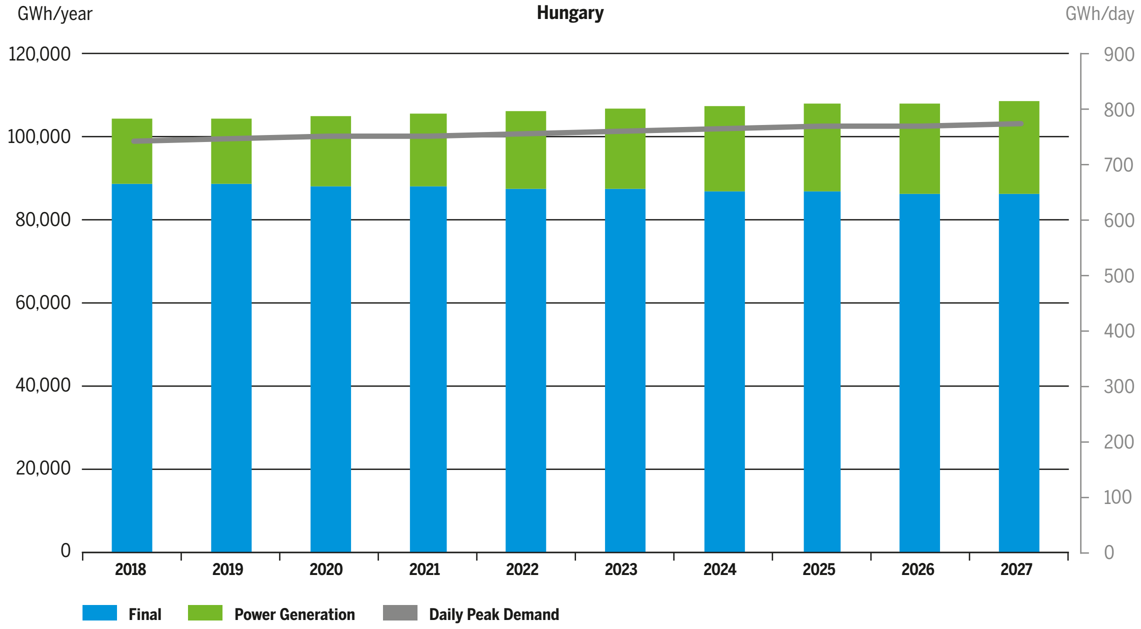
Evolution of annual demand:25 %

Evolution of power generation: 10 %

Evolution of Final demand: 48 %

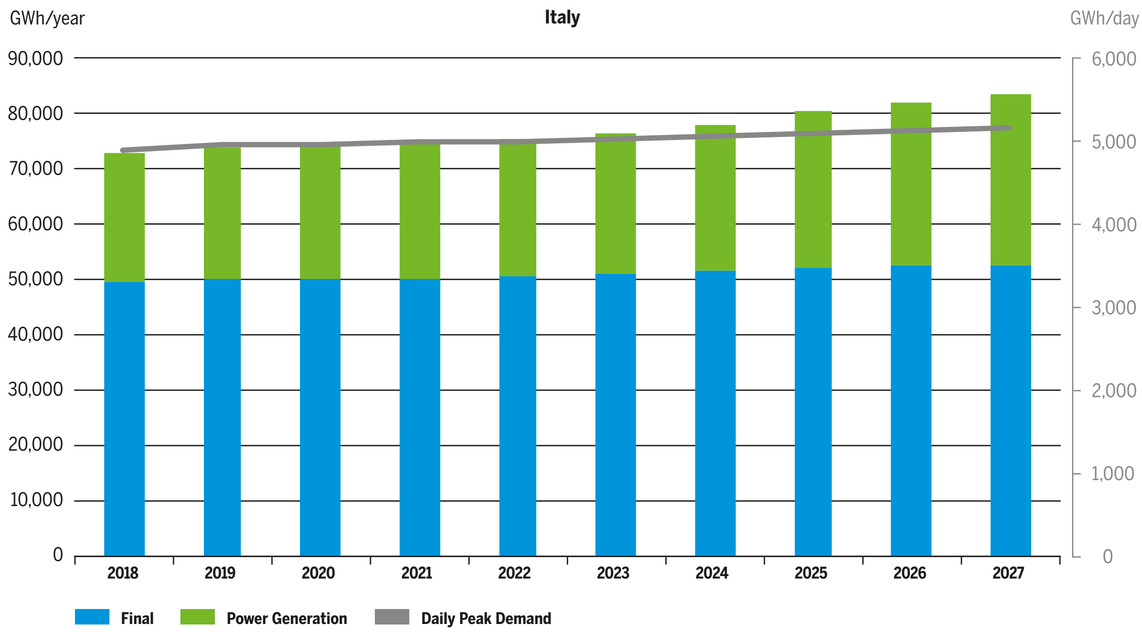
Evolution of peak demand: 3 %

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



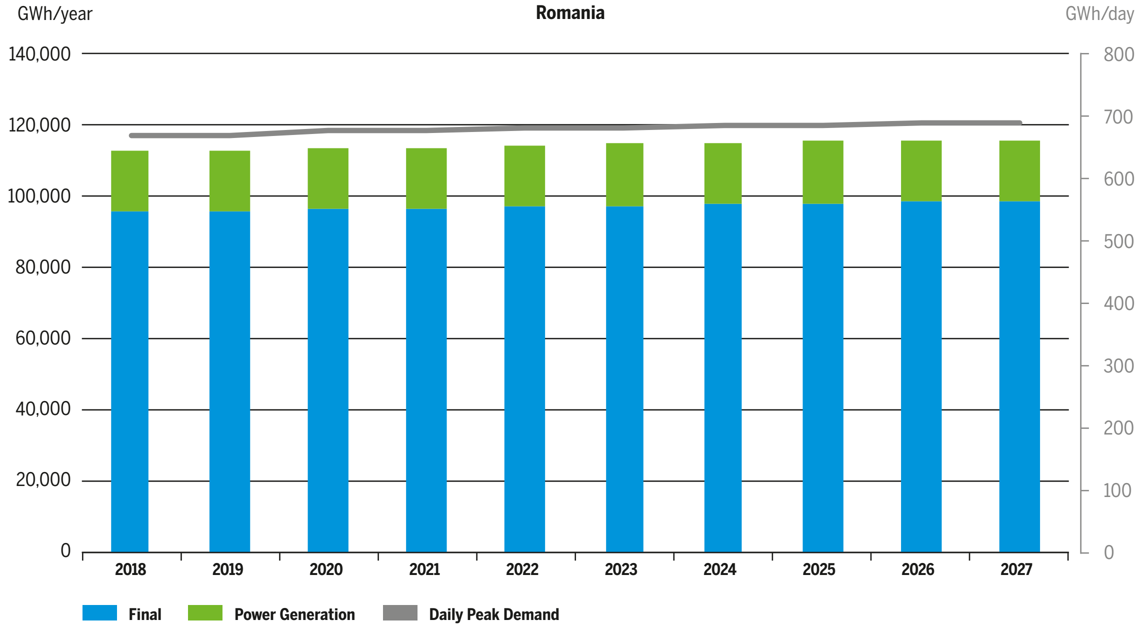
Evolution of annual demand: 4 %
Evolution of power generation: 47 %
Evolution of Final demand:-3 %
Evolution of peak demand: 4 %

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



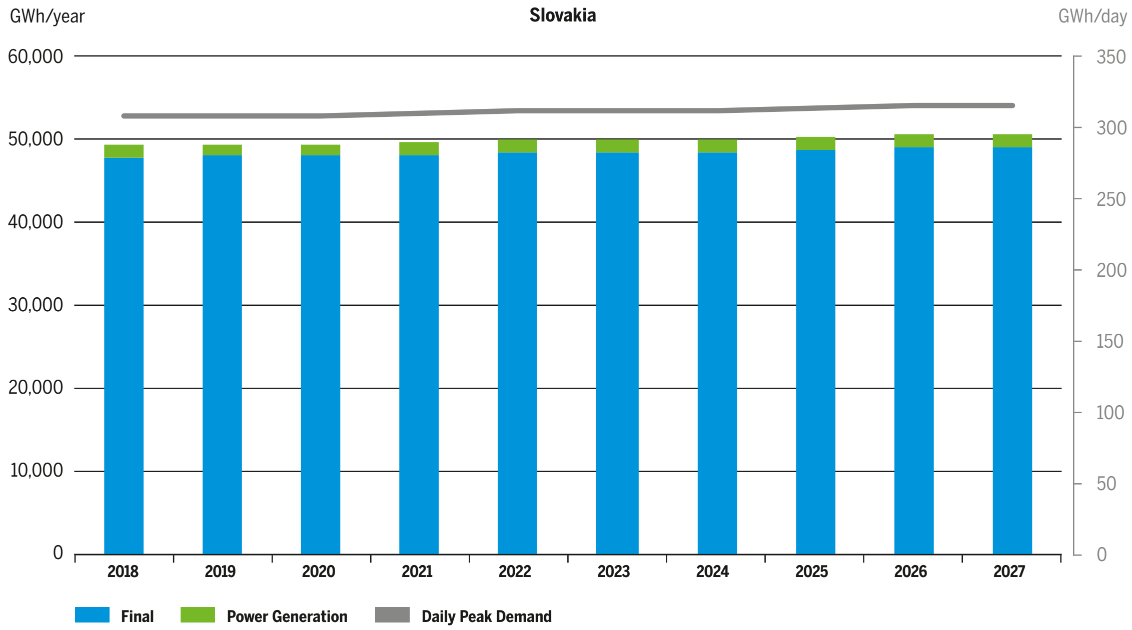
Evolution of annual demand:14 %
Evolution of power generation: 32 %
Evolution of Final demand:6 %
Evolution of peak demand:5 %

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



Evolution of annual demand: 3 %
Evolution of power generation: 3 %

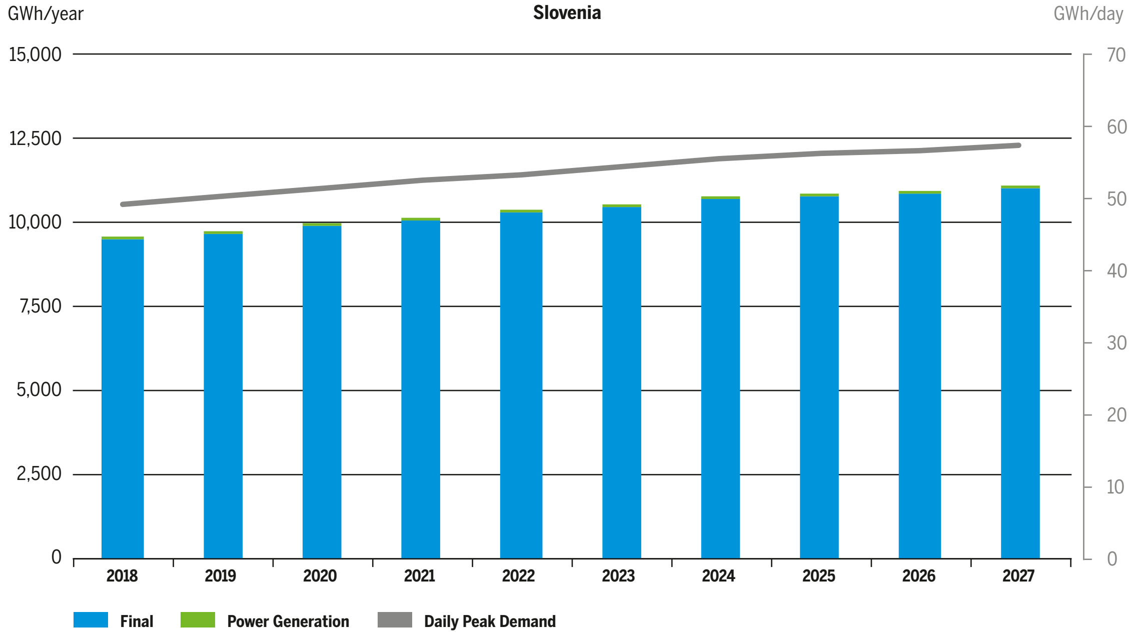
Evolution of Final demand: 3 %
Evolution of peak demand: 3 %



Evolution of annual demand: 3 %
Evolution of power generation: 3 %

Evolution of Final demand: 3 %
Evolution of peak demand: 3 %

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



Evolution of annual demand: 16 %
Evolution of power generation: 17 %
Evolution of Final demand: 16 %
Evolution of peak demand: 16 %

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

The above 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.

3.5 THE IMPACT OF RENEWABLES ON GAS DEMAND IN THE SOUTHERN CORRIDOR COUNTRIES

According to the past years ENTSO-E data we can see that Power production from RES is fairly constant in the period from 2013 to 2017 in all SC region countries but with different levels and even more different composition, explained mainly by geographical factors.

The higher production, in absolute terms, is the one of Italy (more than 100 TWh/y) followed by Austria (around 45 TWh/y). Romania with more than 25 TWh/y and Greece with a production near 15 TWh/h, close the group of countries producing more the 10 TWh/ from RES. The lower production is found in Hungary (just above 3 TWh/y in 2016 and 2017). In total the region's countries produced an average of 215 TWh/y in the period from 2013 to 2017.

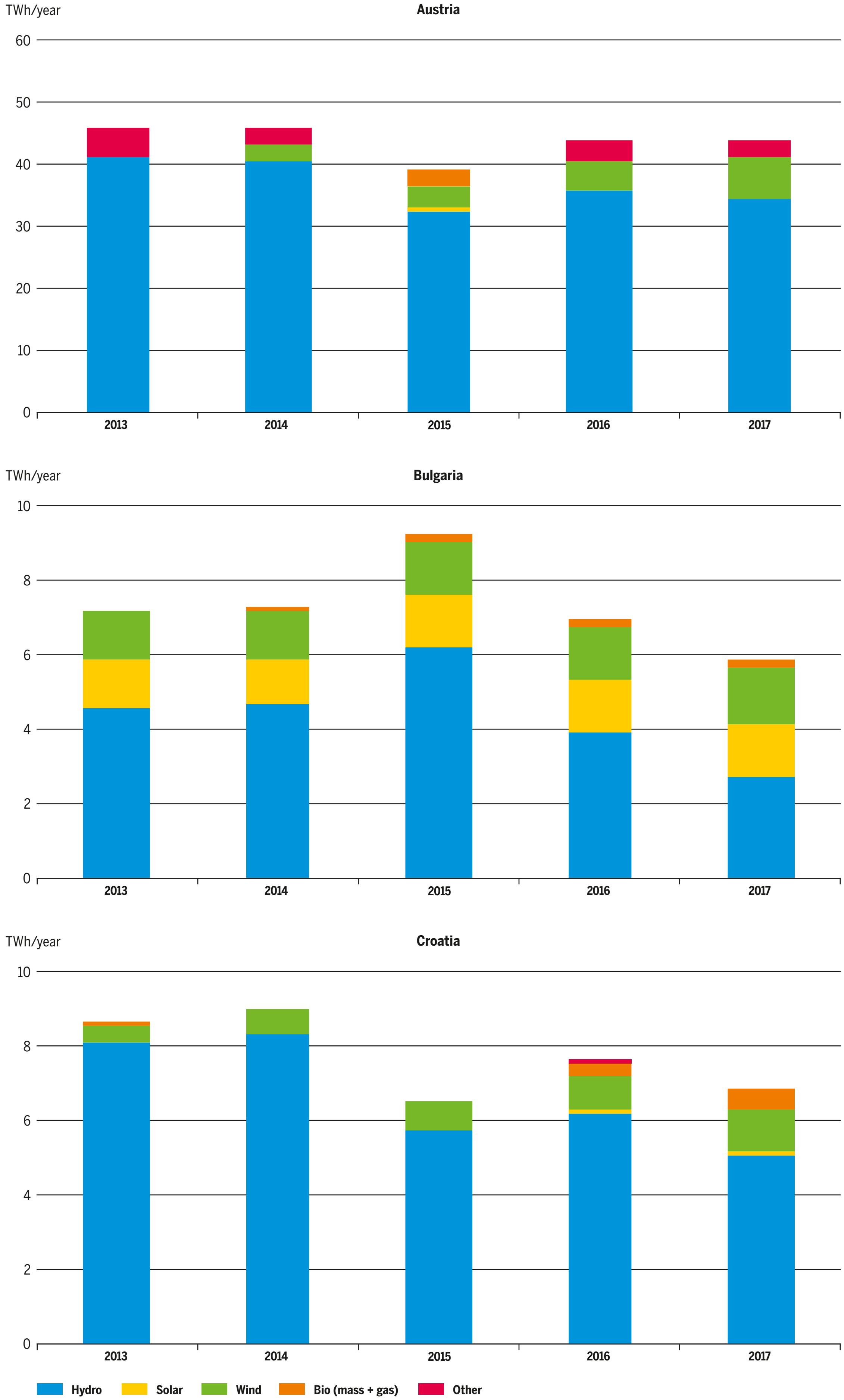


Figure 3.12: Electricity Production from RES (historical) per country

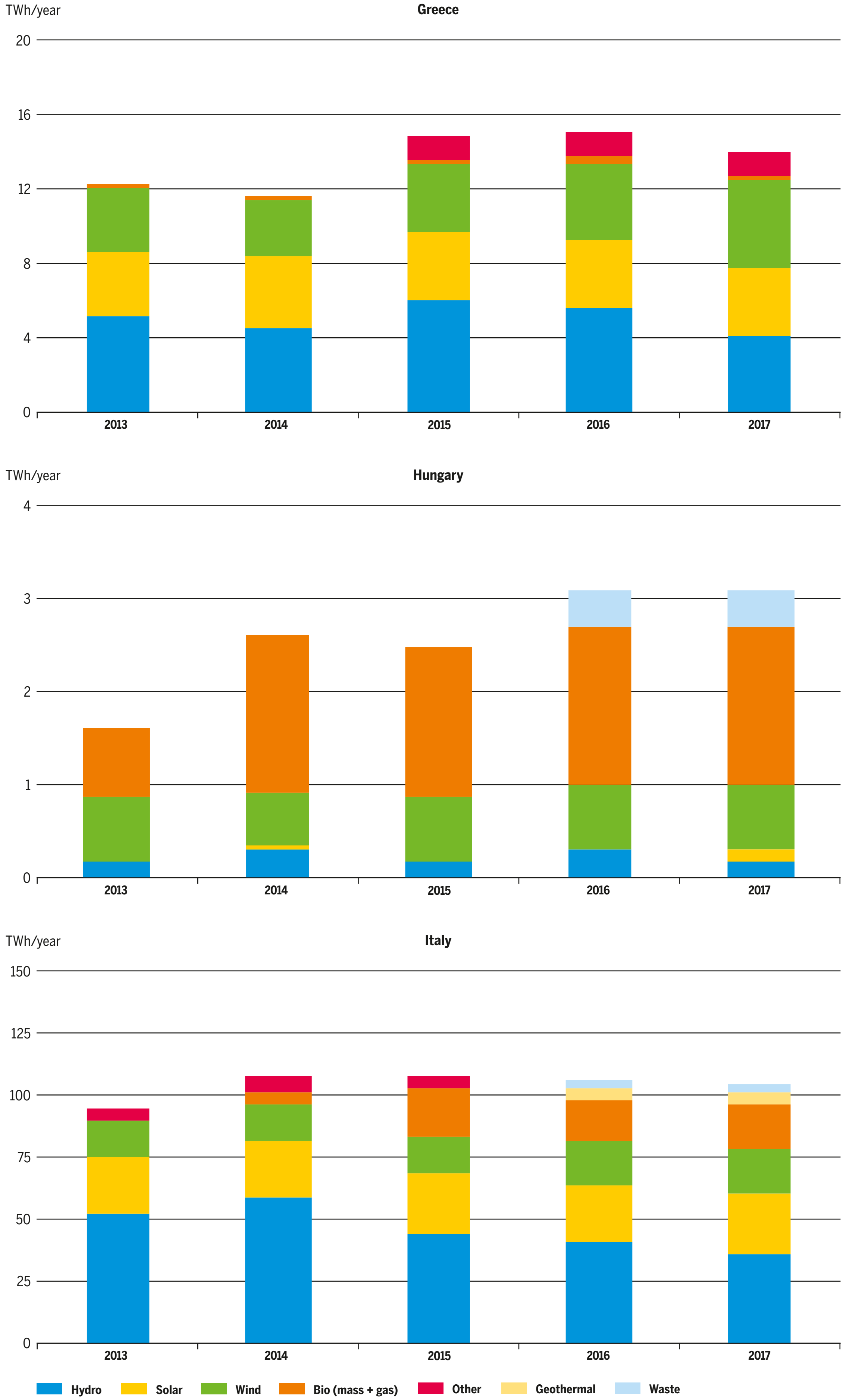


Figure 3.12: Electricity Production from RES (historical) per country

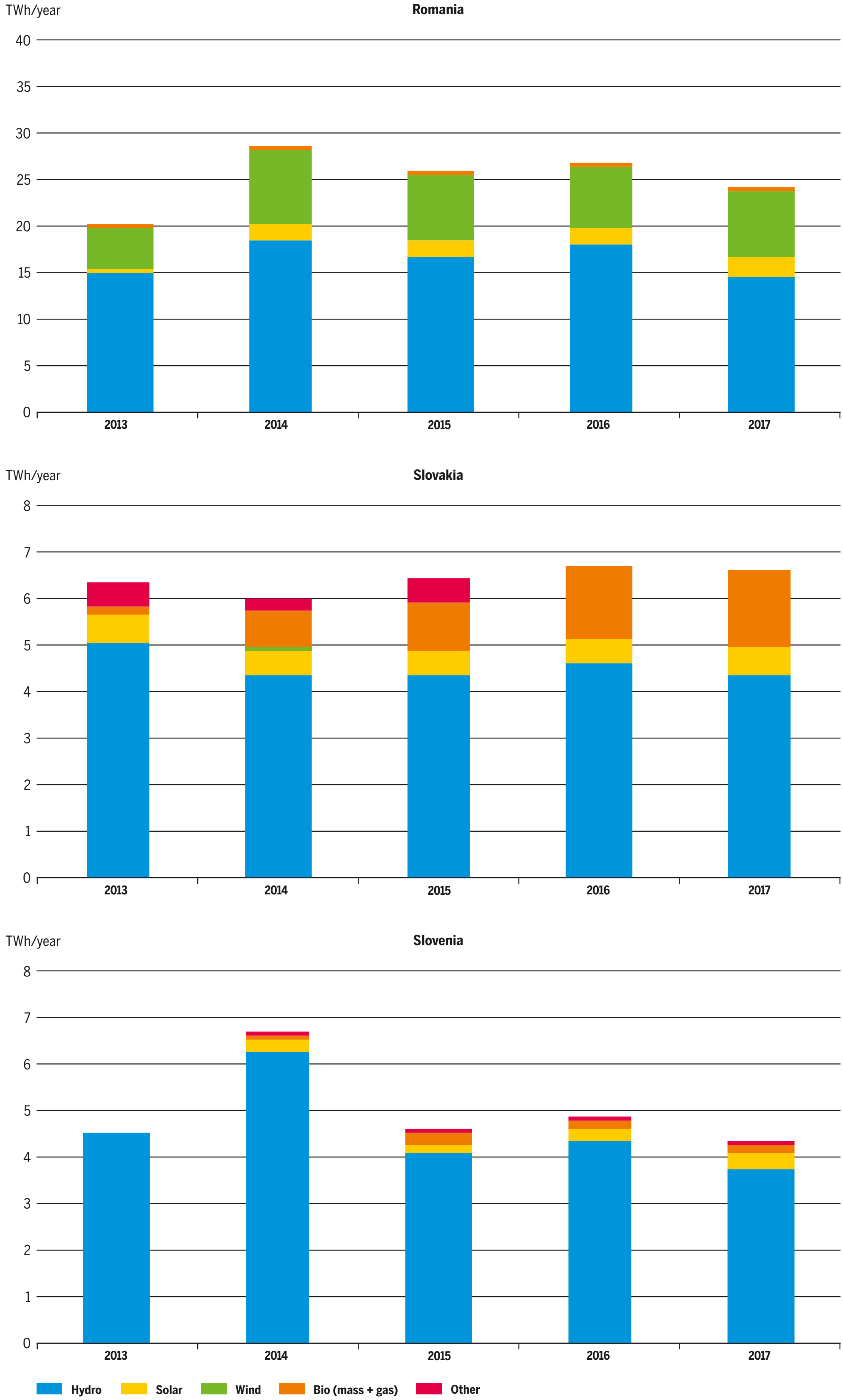


Figure 3.12: Electricity Production from RES (historical) per country

According to the forecast, from the same source (ENTSO-E), the future is much more promising for RES since their contribution in power generation is expected to reach 316 TWh/y in 2020 and 537 TWh/y in 2040 (in the Sustainable Scenario of ENTSO-E's TYNDP 2018), corresponding to a CAGR, between 2020 and 20140, of 2.7 %.

The higher increase is expected to take place in Greece, with an estimated CAGR of 9.1 %, followed by Italy with a CAGR of 3.3 %. Romania is the only country to show a slight decrease between 2020 and 2040.

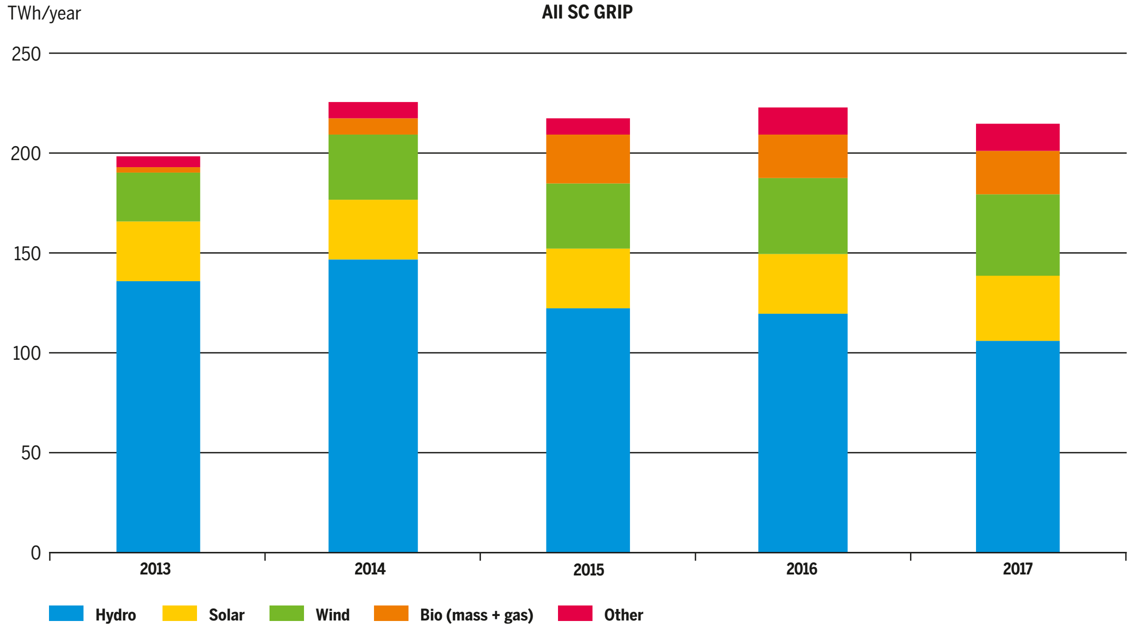


Figure 3.13: Electricity Production from RES (historical) in the SC region

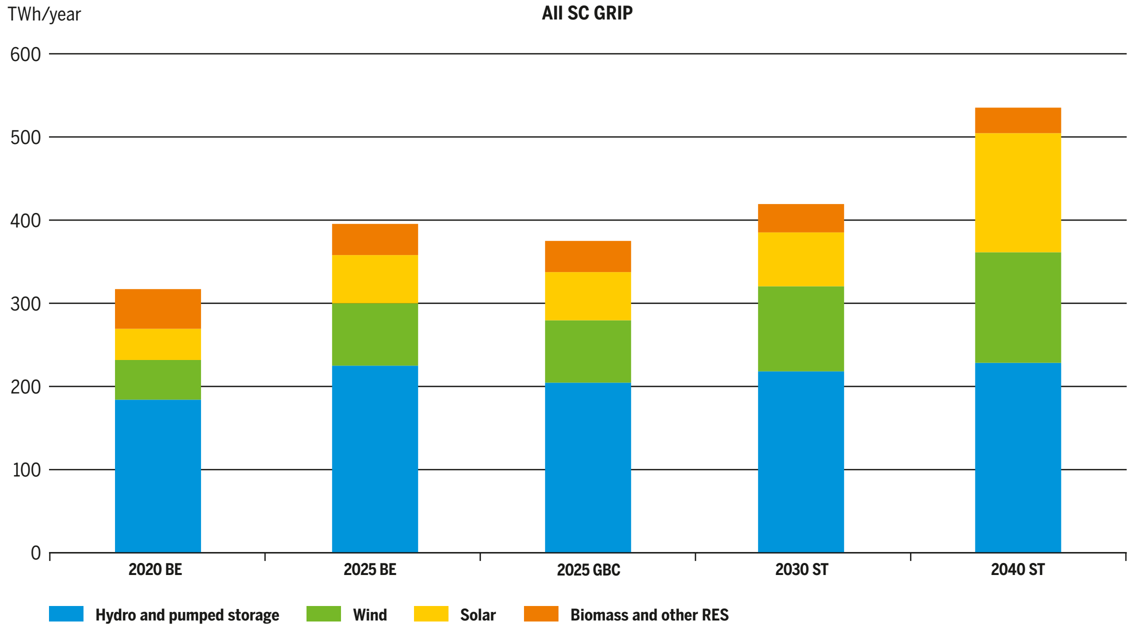


Figure 3.14: Electricity Production from RES (forecast) in the SC Region

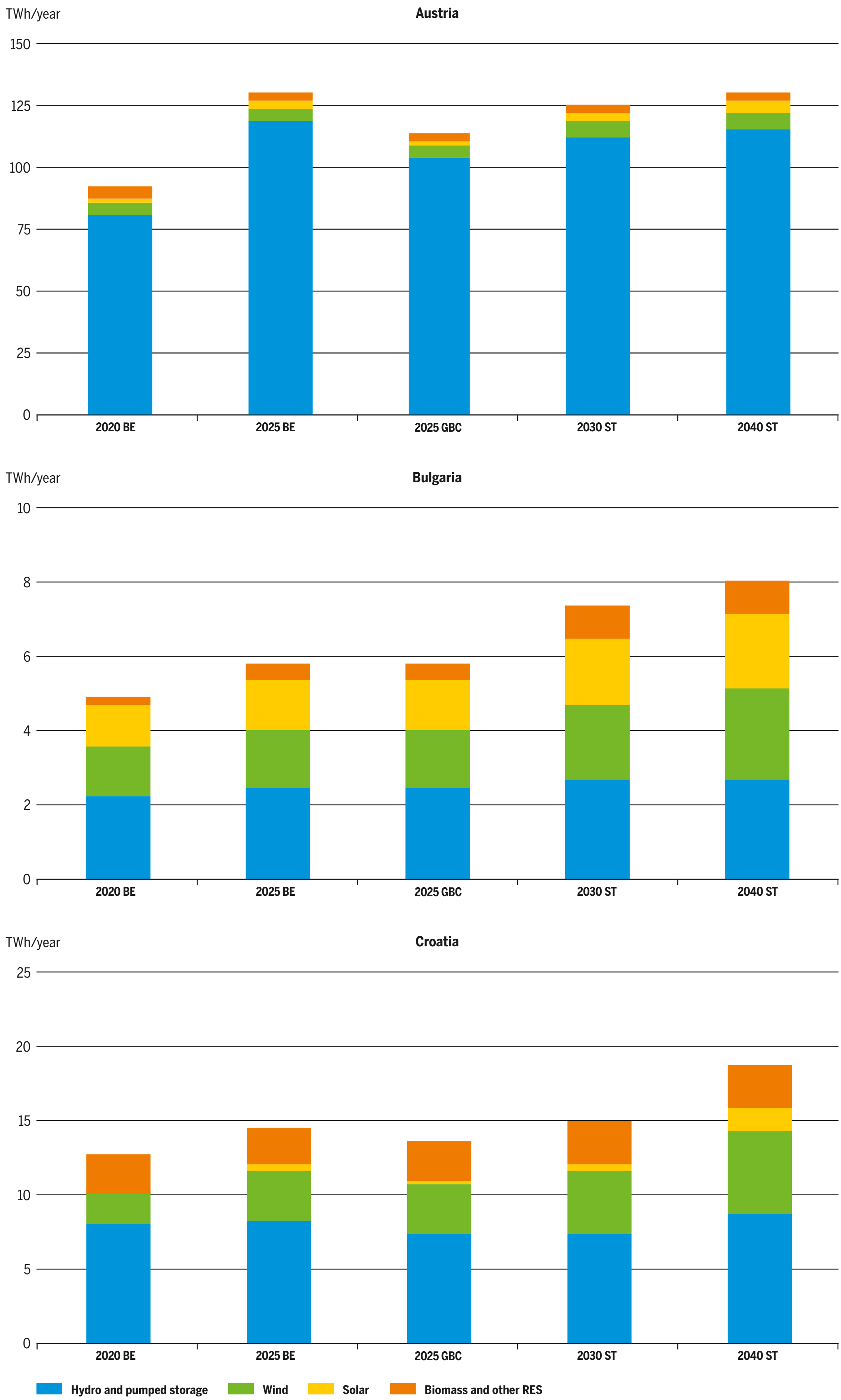


Figure 3.15: Electricity Production from RES (forecast) per country

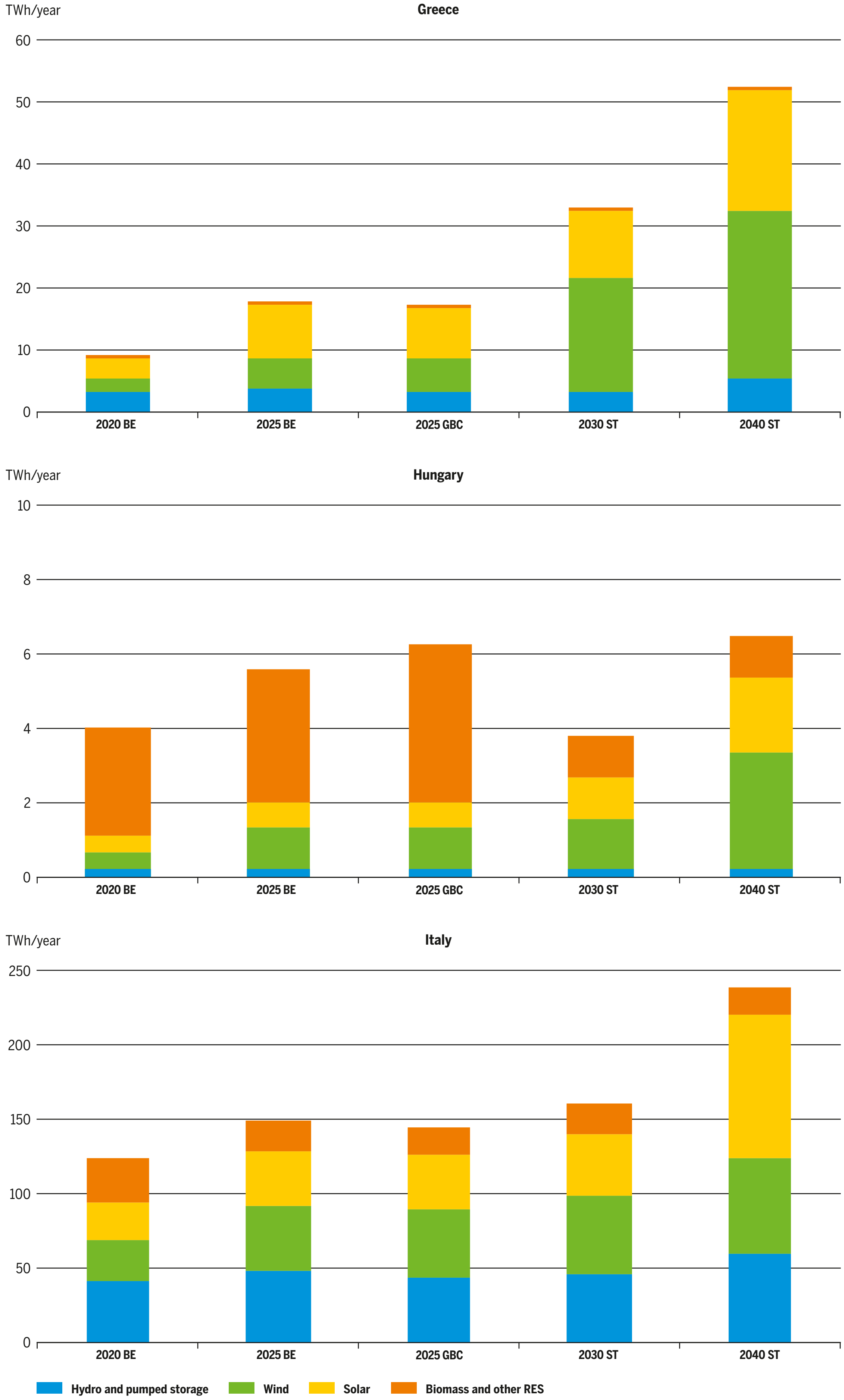


Figure 3.15: Electricity Production from RES (forecast) per country

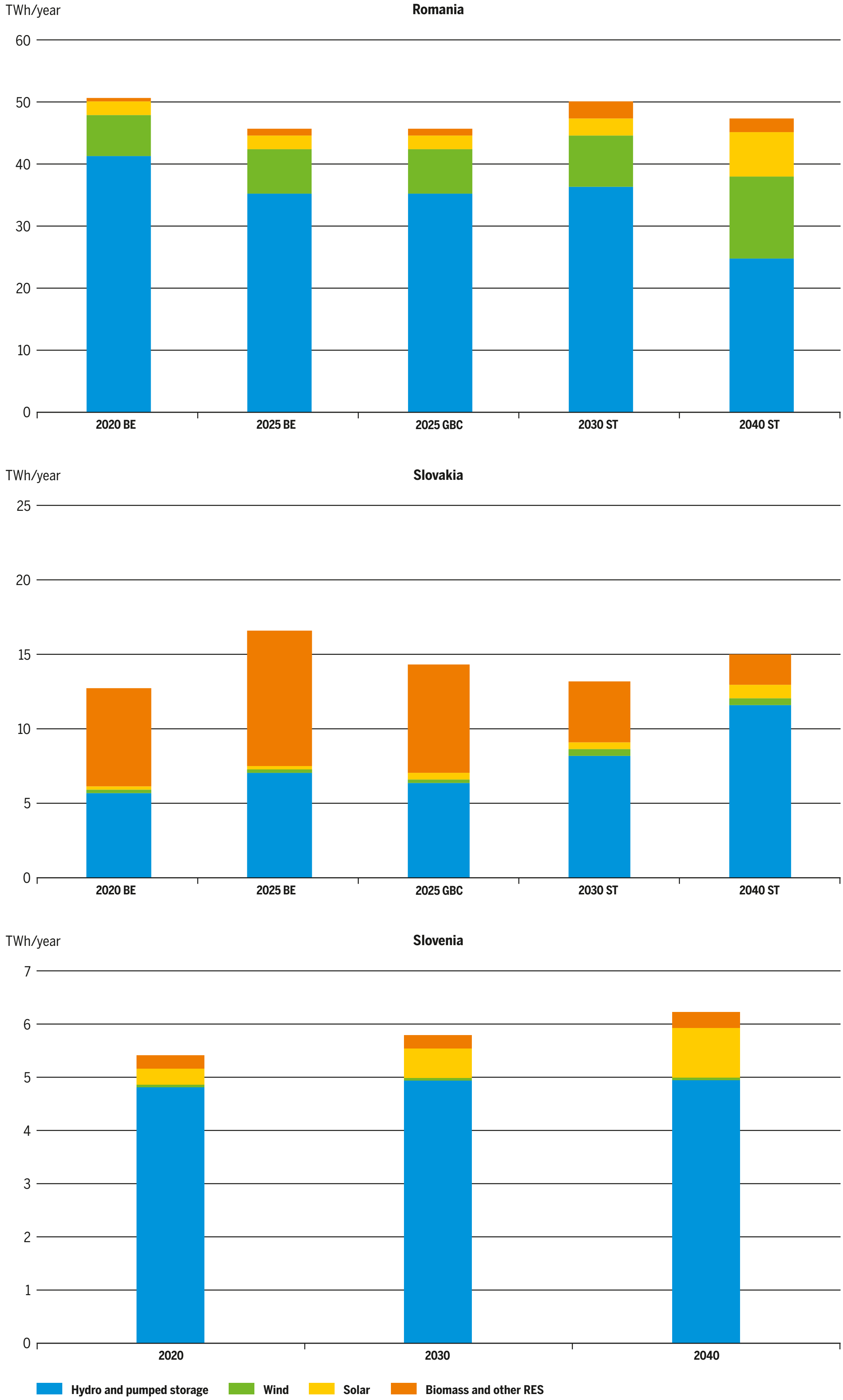


Figure 3.15: Electricity Production from RES (forecast) per country

Regarding the sources used per country, the diagrams show an important difference, mainly due to geographical factors.

- Southern countries, like Greece and Italy, rely more on Solar and Wind.
- Austria and Slovakia have the least reliance on these two sources, as expected.
- Countries with important hydraulic recourses, mainly mountainous ones, like Austria and Slovenia but also Croatia and Romania have a higher use of hydraulic energy.
- In Slovakia and Hungary, the expected use of biomass for power generation marks the higher part in the countries' balances, however, the major part will be used in Italy, due to the overall importance of the power production in this country.

Countries differ even more in the part that RES represent or are expected to represent in the power mix. Austria and Croatia start from more than 70 % in 2020 for Austria to reach 83 % in 2025 while Croatia will remain stable. Italy and Greece start from 35 % in 2020 to reach 48 % in 2040 for Italy and more than 80 % for the more ambitious Greece. Romania is expected to start from a 29 % penetration rate which, according to the forecast, will be slightly reduced within the period examined. Finally, Bulgaria, Slovakia[6] and Hungary seem to have more modest targets since the RES penetration is expected to remain below 10 % all along the 20-year period.

The general increase in the part of RES could, in the long term, compete with the use of natural gas in power generation. On the other hand, it consolidates the position of both natural gas and the decarbonised forms of gas as they are the only power generation source capable of supporting the intermittency in the availability of the RES.

3.6 NATURAL GAS AS A FUEL FOR THE TRANSPORTATION SECTOR

3.6.1 HISTORY

The first natural gas vehicles (NGVs) were built in the USA in the 30's. Gas vehicles were used during WWII in Europe due the shortage of oil. Following important gas field discoveries in Italy, starting from the mid-40s, Italian car manufactures presented gas fueled models and, in parallel an important network of compressed gas distribution stations was created.

Developing over time a consolidated and evolving technology both for vehicles and refilling stations, Italy became the European champion of automotive use of natural gas, even before other countries turned to this fuel for environmental reasons.

Since the 90's, the growing of environmental concerns gave a new boost to the use of CNG especially by public transportations vehicles since these contribute to a large extent to the air quality in city centers.

After 2000, a new sector and a new form of natural gas made their appearance: LNG, primarily used by the shipping industry but also by heavy trucks.

3.6.2 REASONS FOR THE RECENT INTEREST IN ALTERNATIVE FUELS

The main sectors of use of alternative fuels[7] are road and sea/river transportation.

The EU issued a Directive (94/2014) requesting all Member States to ensure the possibility of refueling along the road network or at the main sea or inland ports with fuels with limited impact in terms of air pollution. The primary motivation of the European Commission is environmental.

The advantages that natural gas as a transportation fuel may provide to users (in its two forms CNG and LNG) are not exactly the same in each sector for the users:

Road transportation

CNG is used by many car owners and corporate fleets of vehicles, mainly for economic reasons as it is a lower cost fuel for the final consumer. CNG is also used by many urban transportation companies mainly for environmental reasons. The lower cost of

6 Slovakia has a very high share of nuclear in power generation as its primary target is the CO_2 reduction rather than the RES ration in the energy mix.

7 Alternative fuels include also electricity and hydrogen in addition to natural gas.

the fuel together with financial incentives of national and EU authorities have made such projects possible in many European cities. Given the generation of boil-off gas and considering its high energy content, LNG is used exclusively by heavy duty vehicles that are being used intensively. Operators of truck fleets mention, beside the low fuel cost, the low maintenance cost and the low noise level that enables the trucks to be used even during the night at city centers. These advantages which can be further boosted by the perspectives bio-LNG will open in the near future , quickly offset the higher initial investment cost.

Sea/River transportation

The use of LNG by the shipping industry started in 2000 for air pollution reduction in Norway, a country where ferries are used to reduce the road distances due to the many fiords. 11 years later the North Sea and the Baltic were declared Sulfur Emission Central Areas (SECA), later just ECA. In ¬2011 the IMO requested that all vessels (above 400 GT) reduce their emissions, by 2020, to levels that can be achieved either with the use of LNG, either with additional equipment either with low sulfur fuel oil. (see Resolution MEPC.203 (62) adopted on 15 July 2011)

Some more areas are candidate for becoming ECAs in the future, as shown in the above map. Among them is the Mediterranean Sea. Such an evolution would further encourage the use of LNG in the shipping industry in the SC GRIP area.

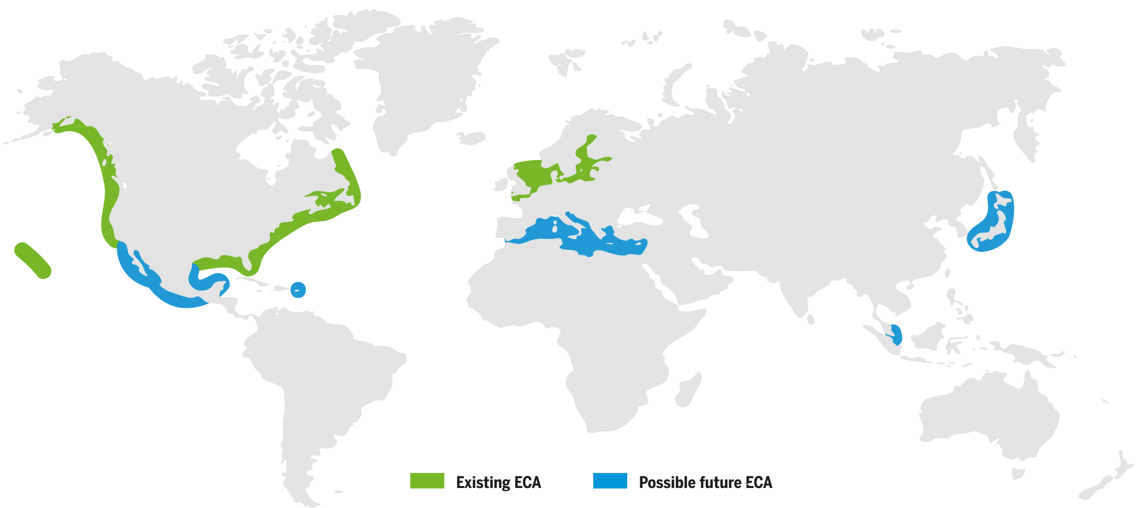


Figure 3.16: Existing and possible future ECA

3.6.3 ALTERNATIVE FUELS LEGISLATION

The main texts encouraging the use of natural gas as a fuel are the following:

Directive 2016/802/EU, which codified the various amendments of Directive 1999/32/EC, last of which with Directive 2012/33. According to this Directive the marine fuel should have a sulfur content (by mass) of less than 3,50 % sulfur from 18.6.14 and 0,50 % sulfur from 1.1.20 in territorial seas, exclusive economic zones and pollution control zones. Especially in SOx Emission Control Areas the limits applied are: 1,0 % until 31.12.14 and 0,1 % from 01.01.15. While at berth all ships shall use marine gas oil not exceeding a sulfur content of 0,1 %.

Directive 2014/94/EU on the deployment of alternative fuels infrastructure. This Directive stipulates the date and extent of availability of points of supply of alternative fuels.

These fuels are: electricity, hydrogen biofuels, synthetic & paraffinic fuels, natural gas (CNG and LNG), LPG. Regarding natural gas, the Directive request that Members States ensure that an appropriate number of

- refueling points for LNG are put in place at maritime ports by end of 2025
- refueling points for LNG are put in place at inland ports by end of 2030
- refueling points for LNG, accessible to the public are put in place along the existing TEN-T core network for heavy duty motor vehicles, by end of 2015
- Refueling points for CNG, accessible to the public, so that CNG motor vehicles can circulate in urban/suburban agglomerating and other densely populated areas, by end of 2020 and along the existing TEN-T C Core Network by end of 2025.

- MARPOL Annex VI, developed through the International Maritime Organization (IMO), a UN agency that deals with maritime safety and security as the prevention and security of pollution from ships.

The Annex VI establishes:

- Limits on NOx emissions from marine diesel engines with a power output of more than 130 kw
- Limits on the sulfur content of marine fuels. More specifically this cap is -3,5 % after 01.01.2012 and -0,5 % after 01.01.2020

In the ECAs lower limits already apply i.e. 1,0 % after 01.03.2010 and 0.1 % after 01.01.2015

3.6.4 APPLICATIONS AND PROSPECTS

Road transportation

Regarding road transportation there is a relatively large number of cars in various countries as well as an established network of CNG supply stations in the same contexts. Many cities have also fleets of urban buses, garbage collection tracks etc. The use of LNG in road transportation is a more recent development that concerns a small part of the road transportation market, as explained in para. 5.2 above.

According to NGVA, in 2016 there were in Europe (EU +EFTA) 1.316.000 natural gas fueled vehicles. Most of them (76 %) are located in Italy, the leading European market for methane fuel consumption, with over 1 billion cubic meters consumed in 2017 and around 1 million vehicles currently in circulation.

Other large fleets exist in Germany (7.1 %), Bulgaria (5.3 %) and Sweden (4.1 %). The penetration is higher in the bus segment (16 % in Sweden) and lower in the truck segment however the car segment dominates this market. As may be seen in the following graphs, Italy has the lion's share of CNG powered light vehicles and trucks while the distribution of buses is more even.

Italy, despite already having the largest diffusion of CNG for transportation use, is promoting a series of initiatives in order to encourage the use of CNG on an even wider scale with substantial investments looking at the further development of new CNG stations. However, Austria and Bulgaria have important numbers too.

According to the NVGA Board Meeting (Nov. 2017) various countries have different responses to the targets set by Directive 2014/94. Italy, Slovakia, and Hungary show the willingness to achieve better results than the minimum targets.

Italy intends to reach 2,000 CNG filling stations by 2030 and increase CNG demand for transportation by 5 to 8 times. By 2020, the market share of CNG in Italy should reach 6 %.

Slovakia intends to reach 30,000 CNG vehicles by 2030 and a market share of 0,3 % by 2020.

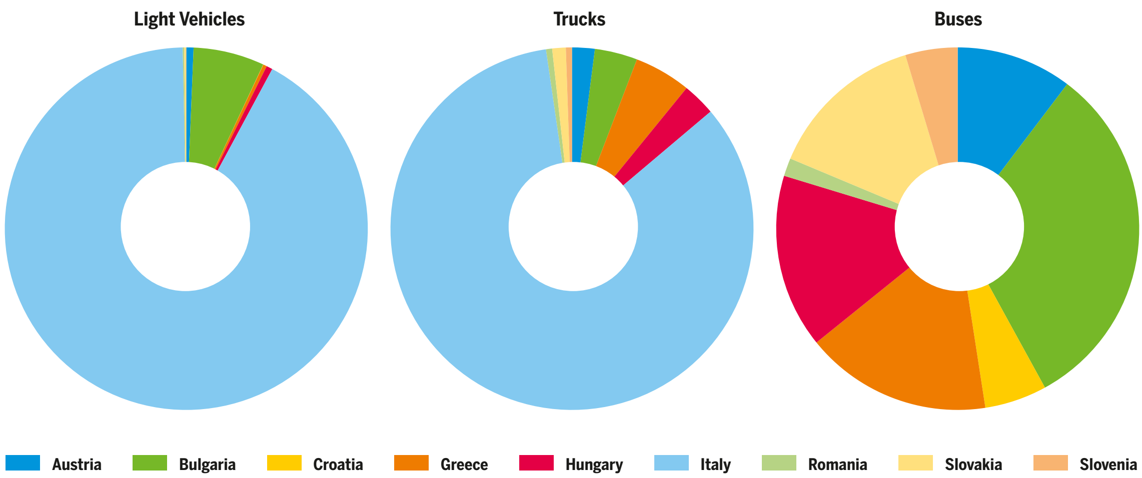


Figure 3.17: Distribution of LNG fueled vehicles among the SC region countries

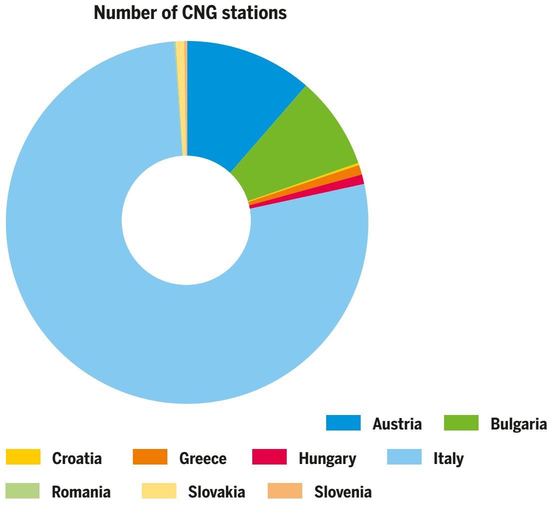


Figure 3.18: Distribution of CNG fuel stations among the SC region countries

Hungary intends to increase the number of filling stations to 300–350 by 2030 (of which 25–40 will be L/CNG stations) and the number of CNG vehicles to 300,000. CNG market share in 2020 is expected to reach 1 %.

Italy is equally ambitious regarding LNG for road transportation, since 800 LNG filling stations and a demand of 0.6 mcm of LNG by 9,000 heavy duty trucks is forecasted at the 2030 horizon.

Sea transportation

The ECA limitations, exposed above, make LNG the most interesting fuel for the shipping industry for the few next decades. LNG faces competition from lower cost alternatives, like the installation of scrubbers to many of the existing vessels. It also faces competition from other technologies like the electrification of propulsion with the use of batteries and the use of hydrogen. However, these technologies are not yet mature neither is it sure they would provide a more effective results in terms of environmental benefits. For these reasons it is estimated that LNG will be the fuel of the next ship generation, i.e. new built vessels, many of which are already built "LNG ready", taking into account all the provisions that will allow the adoption of LNG without important conversion cost and will serve as bridge to the technology that will move the ships of the middle of the current century. The advantages of LNG are its availability at contained costs, the low environmental impact and the mature technology for its supply, storage and use. The main disadvantage is the non-availability of an adequate number of supply locations which is due in turn to the low number of vessels (so called "chicken and egg" dilemma, which is equally valid for car and trucks diffusion). By the way, for this last aspect gas infrastructure operators are already providing solutions and an important number of small-scale LNG and bunkering facilities are planned, if not already in operation.

In the SC region, Italy and Greece are the two countries planning to invest in this sector. Entities from both countries participate in the Poseidon-Med II Action which provides grants, over the period 2015–2020, to co-finance the engineering design of small scale LNG infrastructure, conversion of ships, design of bunker vessels, revision of legal and regulatory texts, drafting of training manuals etc. In Italy a feeder vessel that will serve the North Adriatic area is under construction. In Greece, DESFA is currently designing a new jetty at the Revithoussa LNG terminal that will be dedicated to the loading of small scale LNG carriers (1,000 to 20,000 m³). It has also tendered the construction of a Truck Loading Station at the same terminal. At the same time SNAM is considering the development of its Panigaglia terminal to make available LNG for road transportation.

Despite the dilemma mentioned above, there are indications showing that a critical point has already been reached. The cruising business is leading the tendency as a cleaner LNG fuel may serve as a marketing tool towards both the environment minded clients and the critics at the locations visited by many cruisers that protest against the impact on the environment by the emissions of such large vessels. Carnival Corp. has ordered nine cruisers using LNG for their propulsion. The first of them, AIDAnova, has been delivered and started commercial service in November 2018. These ships will have 3,600 m³ LNG tanks. MSC Cruises, Disney Cruise Lines, Royal Caribbean and TUI Cruises had ordered, until 2018, 19 newbuilds. Moreover, the container transportation company CMA CGM ordered nine ultra large LNG fueled containerships of 22,000 TEUs who will be the first to have a membrane tank for their LNG fuel (18,600 m³).

The landscape is expected to develop quicker and even further, considering the increased weight that green choices have in the investment plans of the gas infrastructure operators.

Forecasts for the development of LNG as a marine fuel cover a wide range. It seems however that although LNG will not become the unique marine fuel, in the way HFO has been, it will fuel a significant part of the world fleet, especially if one takes into account the prospects for production of renewable natural gas. Marine LNG is expected to have a growing place in the shipping sector, alongside other fuels that have started receiving much attention, like hydrogen or ammonia, but who still need to mature, both from the technical and the commercial point of view.

4 SUPPLY

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 it covers about 85 % of the demand and Croatia where it covers close to half of it. Two countries, Greece[8] and Slovenia, do not have any national production and are not expected to have any in the 2027 horizon. At the regional level the demand coverage by national production is about 15 % and it is expected to stay the same in 2027 despite the important changes that are forecasted on a country level. In fact, Hungary is expected to see its national production be reduced by more than half, Croatia by about 75 % and Slovakia close to zero.

On the other hand, Bulgaria and Romania hope to exploit new fields in the Black Sea that will enable Romania to become a net exporter of natural gas and Bulgaria to cover about one third of its needs. In case these projects will be developed indeed, Romania will strengthen its position as the larger gas producer of the region, reaching a share of almost 65 %, followed by Italy with 20 % and Bulgaria with about 7 %.

In case the gas fields already discovered in Cyprus enter the production phase the overall gas production of the region will increase considerably and if the EastMed pipeline will be built the region's dependence from imports outside the EU will be reduced. However, unlike the national production of the other European countries, where this is primarily used to satisfy national demand, 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 in the early 20's[9], and any other use that will be developed. Therefore, there are still various options regarding the final destination of the Cyprus gas, including its exportation outside the EU.

8 Greece has issued licenses for exploration in the western part of the country (both on and offshore) and in the offshore area south of Crete.

9 Operation should be first based on imported LNG

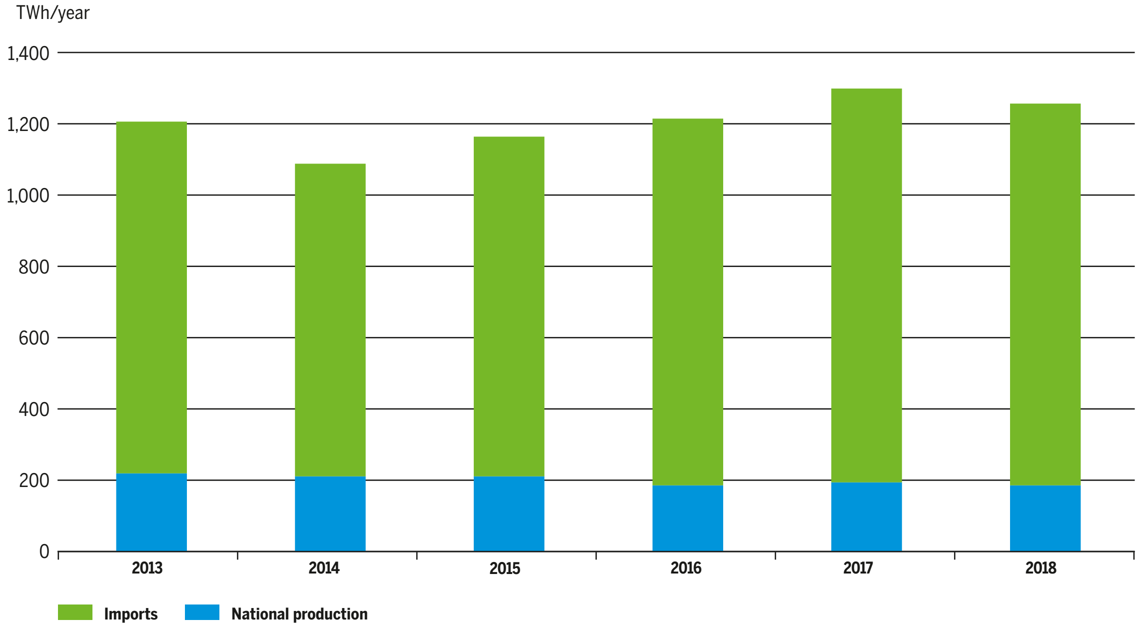


Figure 4.1: Part of gas imports in total demand-Historic. Source TSOs

Figure 4.2: Share of national production on the total Regional indigenous productions by country in 2018 and in 2027-Source TYNDP 2018, ENTSOG

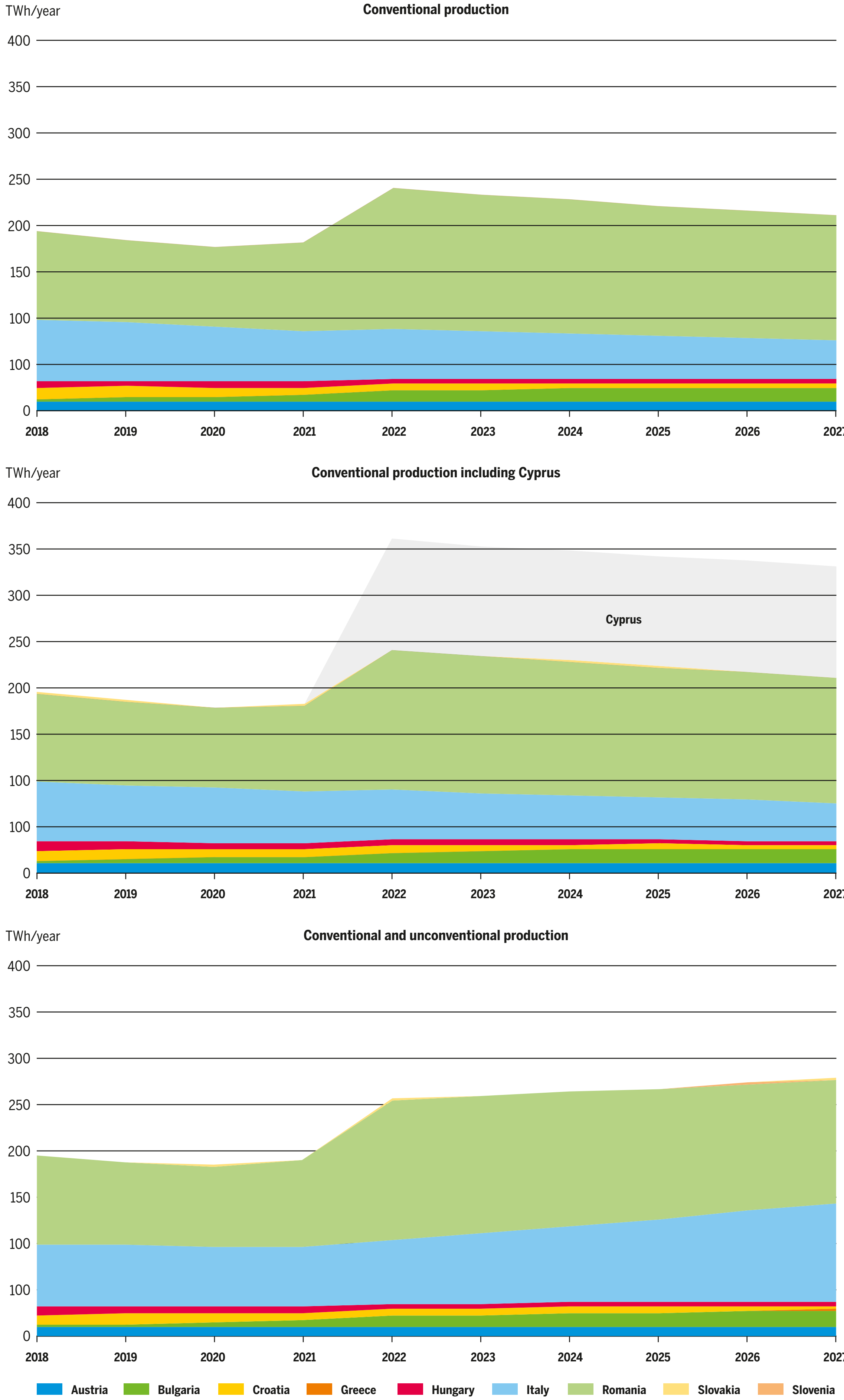


Figure 4.3: National production forecast per country

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 %.

A further increase of national production can come from the introduction of biogas (as in the case of Italy).

Figure 4.1. shows the historic share between national production and imports in the Southern Corridor region. Figure 4.2 shows the forecasted participation of each country in the national production of the Region in 2018 and 2027, including or not unconventional gas sources and including or not Cyprus.

Figure 4.3 shows the forecasted evolution of the national Production per country within the period covered by the present GRIP, including or not unconventional gas sources and including or not Cyprus.

Cyprus is included as an option in this set of graphs given the uncertainties existing on the destination of the gas produced from its fields. 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 of the Zhor gas field in Egypt) and a pipeline to Crete and then to continental Greece (EastMed pipeline, connecting finally also Italy, via an offshore pipeline between Greece and Italy). 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 evolution of this option uncertain. In the present GRIP the non-FID EastMed project, 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 and is expected to become an additional source for Croatia. Figure 4.4 that shows the relative importance of the infrastructure in place and the one planned (such as the the Krk LNG terminal in the Adriatic (with FID status since January 2019, the LNG terminal in northern Greece/Alexandroupolis, and the Porto Empedocle LNG – both of them non FID[10]), 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 the increase of LNG exports by the USA and Australia, are factors which might work in opposite directions to the current picture characterised by abundant and relatively low priced LNG resources. (see also paragraph 4.3).

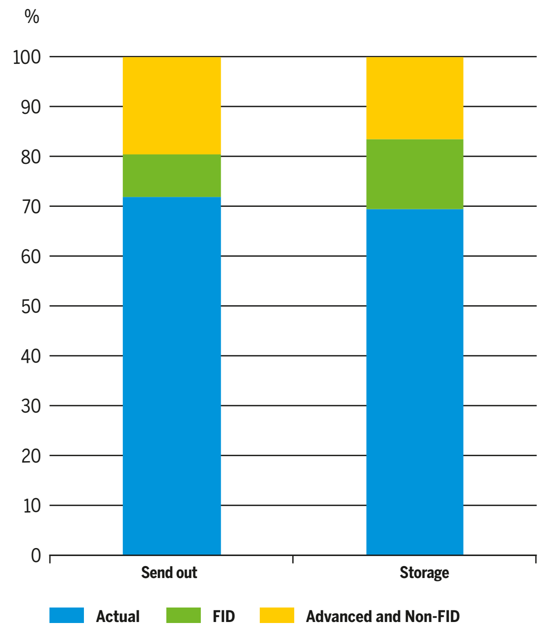


Figure 4.4: Relative capacity of existing, FID and non-FID LNG terminals in the Region

10 A less mature FSRU project in southern Greece, not included in TYNDP 2018, is not mentioned here

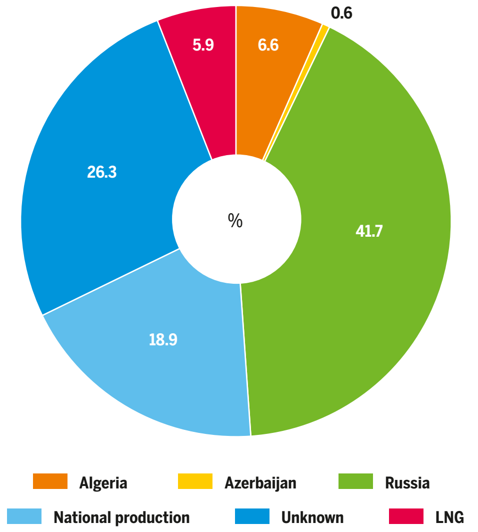


Figure 4.5: Diversification of supply in the Southern Corridor Region in 2018

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 should not conceal the fact that four countries (Bulgaria, Croatia, Hungary and Slovakia) depend on Russian gas for more than 80 % of their supply.

After a period of four years (2011 to 2014) during which the gas demand in the SC Region had stopped increasing and marked a slight decrease, the demand marked an increase in 2015 to 2017 followed by a light decrease in 2018. The series of years with decreasing demand was due to 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.

The reverse of the trend is 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 and also to the decrease of the LNG price brought by the increase of USA LNG imports to Europe. The forecast for the next 10-year period shows also a continuation of the demand increase, considering also the relative immaturity and the related opportunity for demand growth in the regional gas market. This trend is different from the one observed in NW Europe and other mature gas markets where the decarbonisation policies imply a substitution of the natural gas by other energy sources with lower carbon content.

Indeed it should be taken into account that especially in Central and in Southeastern Europe the increase in the use of gas will be a key factor in the decarbonisation of the region since natural gas has a huge potential for immediately replacing more pollutant fuels in the electricity and transportation sectors as well as the use of oil in the residential/commercial/transport sectors.

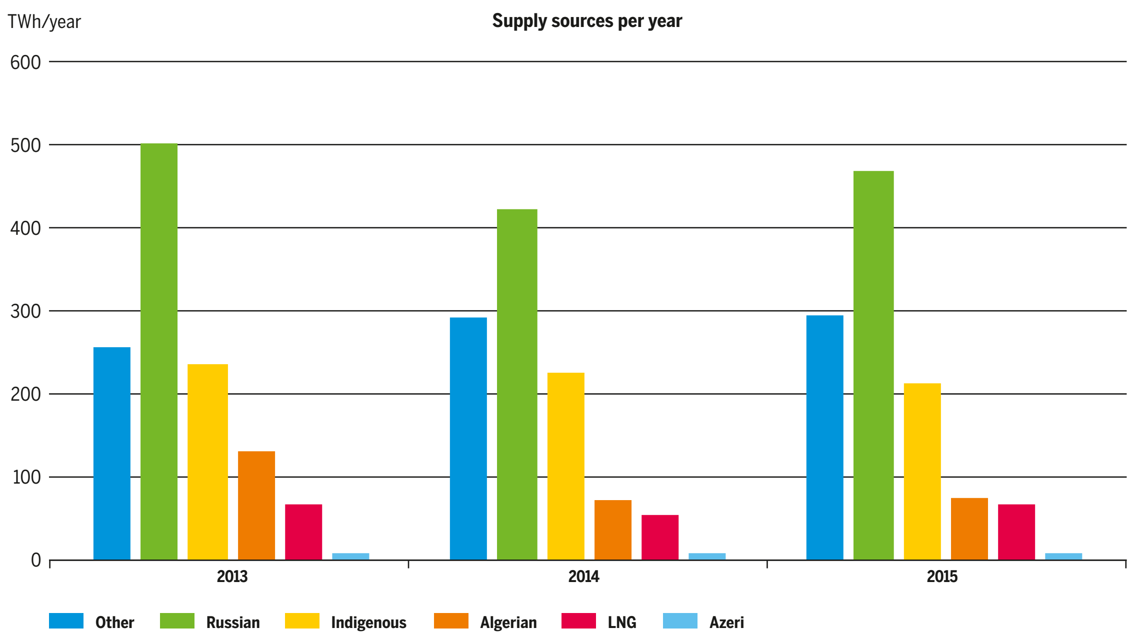


Figure 4.6: Evolution of gas supply by source ("Other" means imports from sources that cannot be identified. These include a part of the imports to Italy and Slovenia and the sum of the imports to Austria)

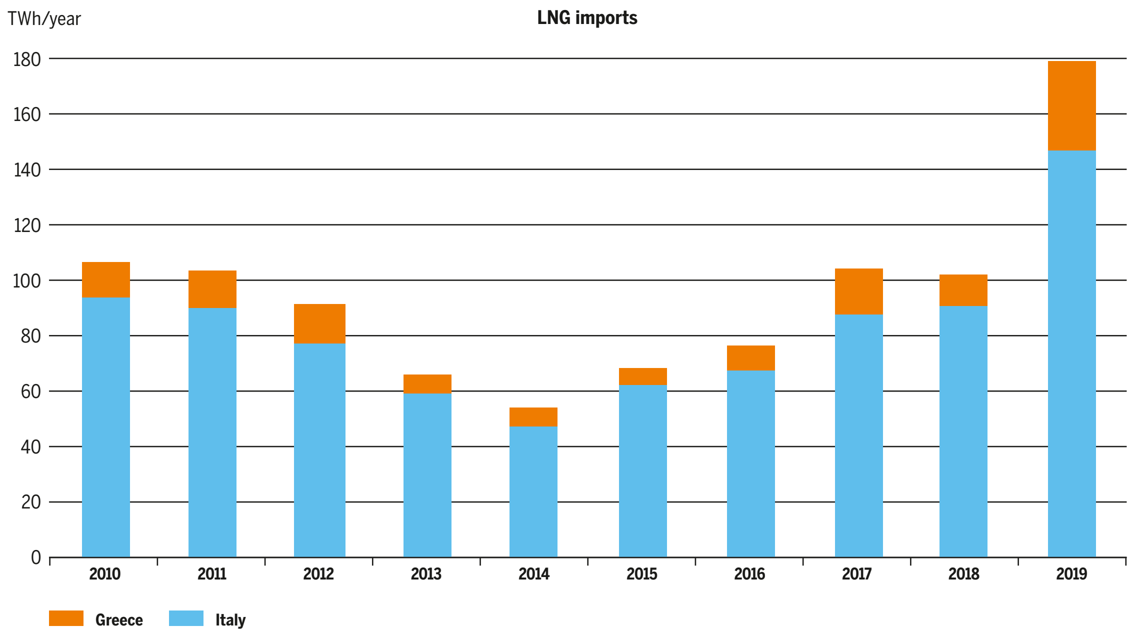


Figure 4.7: Evolution of LNG imports in Italy and Greece

The split among the various sources of supply did not change substantially, in the last 4 years, as shows Figure 4.6. The main variations concern the return of Algerian (pipe) gas to the previous level, and even higher, after a decrease in 2014-5, an increase in LNG, which was intensified in 2019 (Greece covered more than 50 % of its natural gas needs from LNG, compared to average historical value of 20 %), and the gradual decrease of National Production. The main reason for the increase of LNG is the increase in supply and mainly the increase in exports from the USA as further described in paragraph 4.3.

4.3 PRICES

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

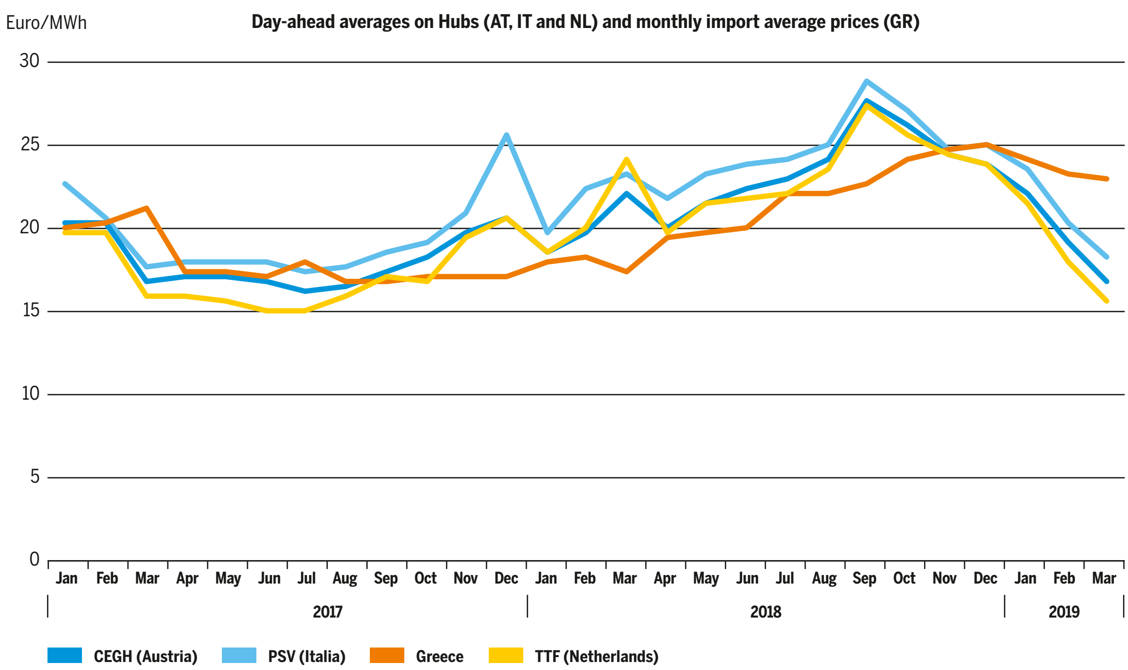


Figure 4.8: Comparison of gas prices in the SC region

Figure 4.8 shows more in detail the differences between the three main regional gas markets providing the historical evolutions of prices from January 2017 to March 2019, with monthly granularity.

In continuity with the behavior recorded in the last part of the time horizon 2014–2016 – taken into consideration for the previous GRIP edition – the Greek market was substantially in line with the more liquid regional western hubs (Italy and Austria). For the most part of the period considered in this GRIP edition (January 2017– March 2019) and in particular for the Gas-year 2017/2018, the Greek prices were not only aligned but even lower than the Italian and Austrian hubs levels.

Other major behaviors detected during the period are hereby summarized:

- The maximum difference between prices monthly average was around 8 €/MWh, recorded in December 2017 between Italy and Greece. On the same month it has been observed also the highest deviation between the Italian and the Austrian hub, with a gap of around 5 €/MWh, significantly high considering that the average monthly difference on the analyzed period was around 1.4 €/MWh. This peak could have been linked to the market reaction generated by the temporary outage at Baumgarten, in December 2017.
- A negative price position in the Greek market compared to the other two hubs during all the Gas-year 2017/2018. This trend can probably be explained by the oil prices downfall happened from the start of 2017 and persisting for all the 2018 and then transferred - with the typical 6-month time-lag – to Greek gas prices (mainly set on the basis of long-term-oil-linked import contracts), while EU gas prices remained at sustained levels. From November 2018 a trend reversal can be noticed, with European hubs prices generally falling for strong LNG arrivals and soaring regasification rates across the continent coupled with a generally mild winter (gas demand in February 2019 was depressed by temperatures as much as 10 degrees above seasonal normal). This made again the Western EU hubs more competitive versus oil-indexed Russian gas contracts, bringing again positive the gap between the Greek market and the western parts of the region until around 4.6 €/MWh (versus Italy) and near 6 €/MWh (versus Austria) in March 2019.
- A 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, as can be seen in the Figure 4.7 especially for the period from February–March 2018 characterized by temperatures much lower than the average, ("Burian"/ "Beast from the East" effect) which brought again spreads between Italy/Austria and Greece to values similar to the ones registered in December 2017. Future planned interconnections should partially export price oscillations linked to climatic conditions, having a bi-directional stabilizing role on gas quotations.
- The average difference between the Italian and the Greek markets during the period considered has been around 2.6 €/MWh, structurally higher than the average difference between Austrian and Greece markets (around 1.9 €/MWh). Also this trend is expected to be at least smoothed when Italy and Greece will be interconnected through TAP.

By broadening to a European scale the analysis scope, it is possible to appreciate even more clearly the wider alignment of prices already detected above for the three regional markets, as well as to see a visible decrease of prices starting in the first months of 2019, against the trend of 2018.

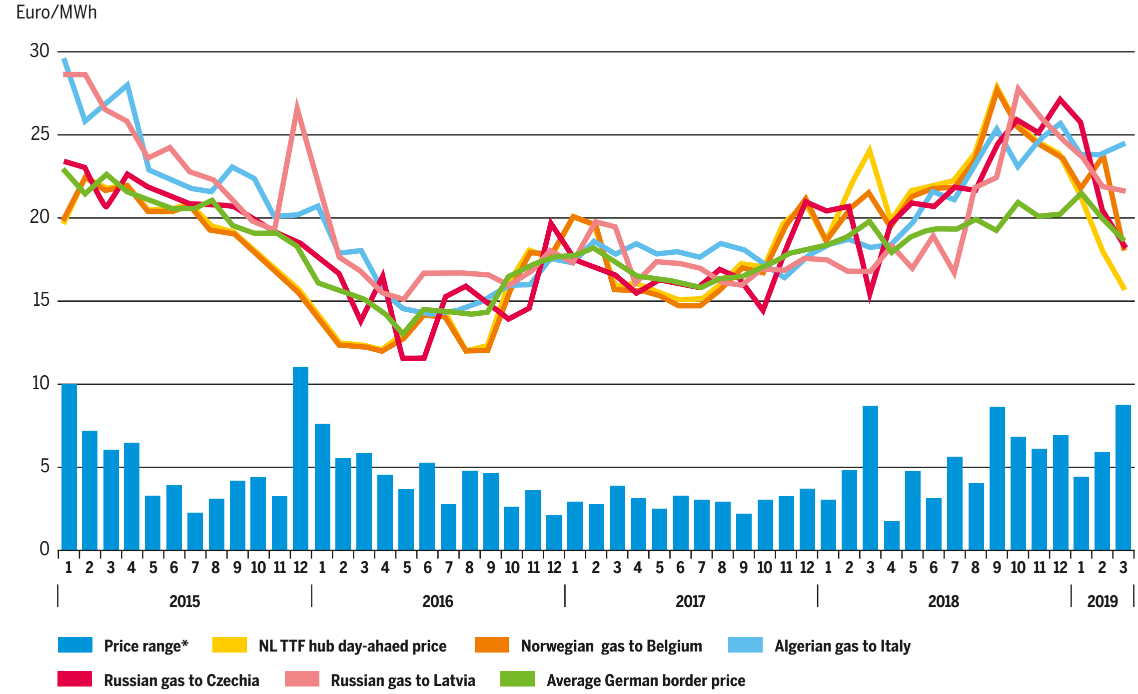


Figure 4.9: Comparison of EU wholesale gas price estimations
(Source: EU Quarterly Report on European Gas Markets, 1Q 2019 (page 27) https://ec.europa.eu/energy/sites/ener/files/quarterly_report_on_european_gas_markets_q1_2019_final.pdf)
*The difference between the highest and lowest price depicted on the graph

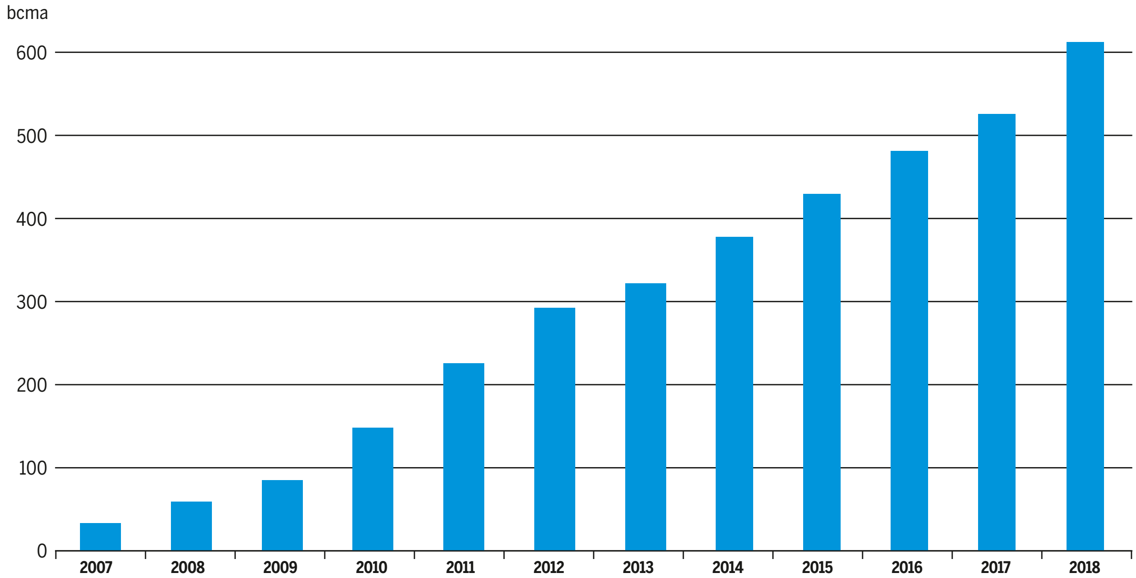


Figure 4.10: Production of shale gas in the USA (Source: USA Energy Information Administration)

Figure 4.9 compares a selection of estimated border prices of gas deliveries from the main exporters to the EU: Russia, Norway, and Algeria. For a better comparison, the evolution of the day-ahead prices on the Dutch TTF hub is also presented. Over the last few years, most of the European gas contracts remained well aligned. However, in the periods of rapid price changes on the energy markets (e.g.: decrease at the end of 2016 and beginning of 2019 or increase in the second half of 2018), characterised generally by higher volatility levels, price differentials among different contracts tended to increase as well. This mainly stems from slower responsiveness in time of oil-indexed contracts to market developments, compared to hub-based pricing.

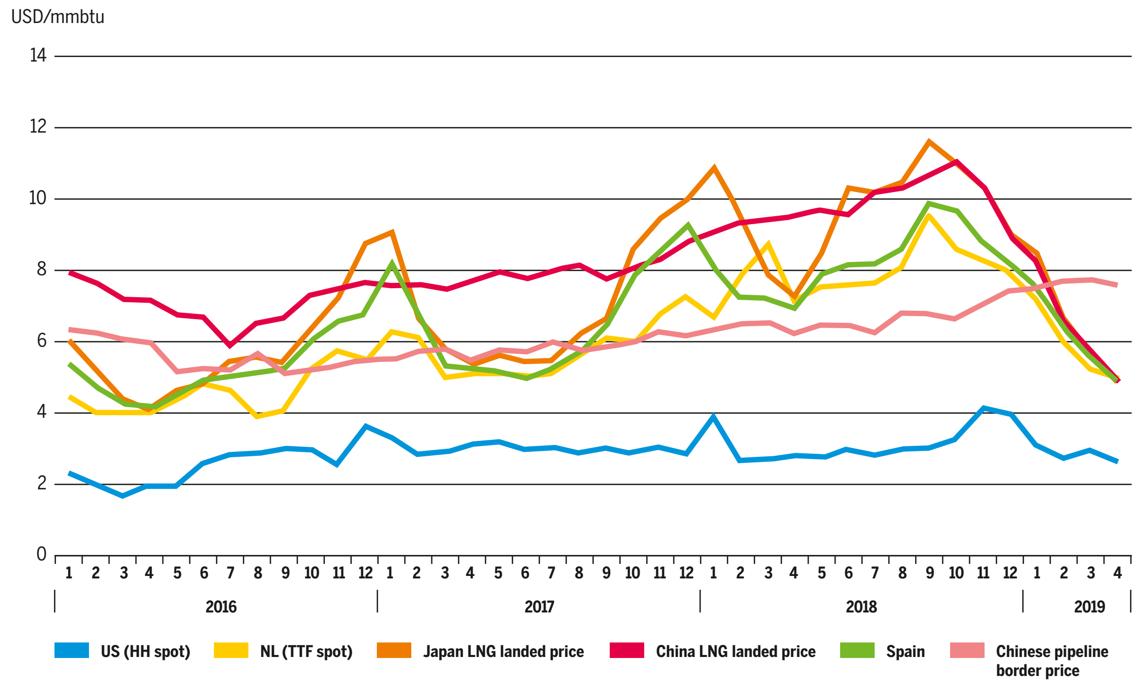


Figure 4.11: International Comparison of wholesale gas price
(Source: EU Quarterly Report on European Gas Markets, 1Q 2019 (page 20) https://ec.europa.eu/energy/sites/ener/files/quarterly_report_on_european_gas_markets_q1_2019_final.pdf)

Opening even more the scope of the analysis to worldwide trends, it is possible to observe a progressive alignment of prices extended to the Far East, with a greater correlation of the overall global natural gas quotations. Only US market seems to keep a relative isolation from the rest of the world, due to the shale gas revolution (see Figure 4.10) and following gas glut, combined with the distance-effect between US production location and the other possible destination markets.

Figure 4.11 shows a measurable decrease in Q1 2019 of Asian prices compared to the previous quarter (note that the highest value occurred in September 2018). The average Japanese LNG price was 21.39 €/MWh in Q1 2019, down from 31.50 €/MWh in Q4 2018 and by around 25 % compared to the same quarter of 2018. Japan prices are considerably aligned towards the main European market references, as likely indication that the strong pressures started after 2011, due to the Fukushima nuclear accident, have now disappeared. Also quarterly average LNG import prices in China are currently comparable with Japanese prices in the first quarter of 2019.

After the temporary upturn at the end of 2018, the Henry Hub price fell back again in the first quarter of 2019, and in March 2019 the monthly average price was around 9 €/MWh (down from 12.40 €/MWh in December 2018). This downturn trend continued to the point that in April low price levels not seen since mid-2016 have been reached.

Since autumn 2018 the premium of Japanese and Chinese landed LNG prices started to shrink vis-à-vis the European peers, and by March 2019 Asian premiums to the TTF and Spanish LNG prices practically disappeared. Bearing also in mind lower transportation costs to Europe related to Asia, this meant a great opportunity to LNG exporters in the Atlantic Basin and the Middle East to direct their cargos towards the European markets in Q1 2019, continuing the trend of the last months of 2018.

In the first quarter of 2019, 35 LNG cargoes arrived from the US, unloading 3.4 bcm of LNG (in the Q1 2018 only 2 cargos arrived, carrying only 180 mcm LNG). LNG exports to the EU represented 32 % of total US LNG exports in Q1 2019. In the first quarter of 2019 the five most important EU destinations for the US LNG exports were Spain, the United Kingdom, France, Italy and Portugal. However, other countries, such as the Netherlands, Poland and Greece also imported substantial LNG volumes from the US, showing the relevant diversification rate of US LNG exports.

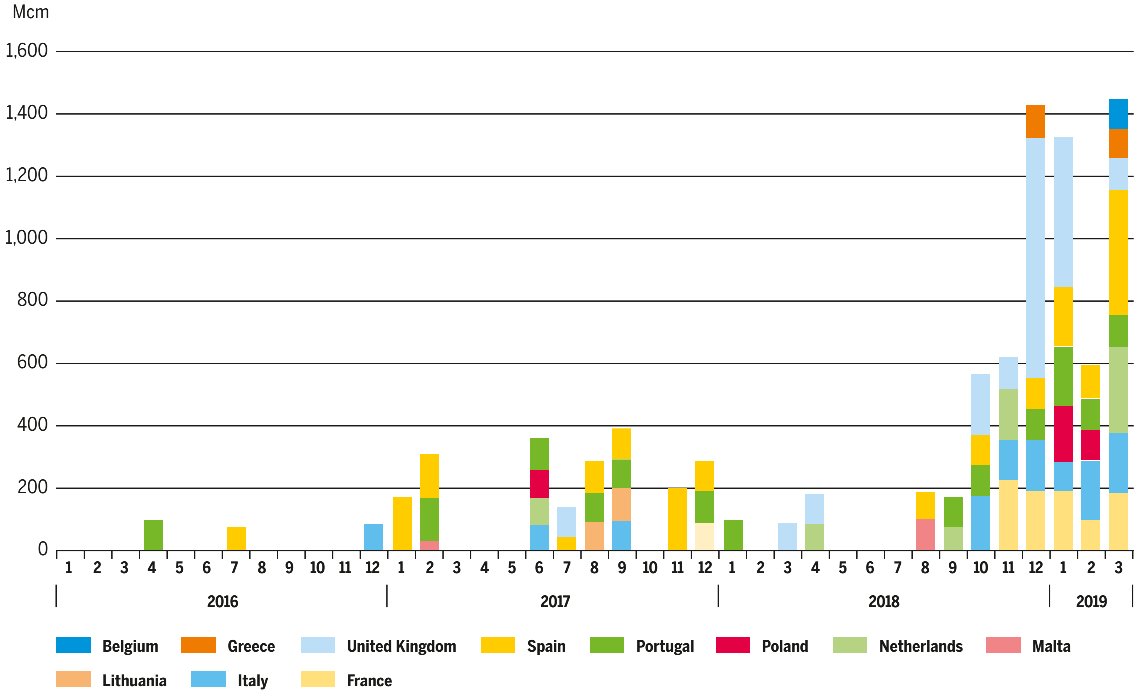


Figure 4.12: EU LNG imports from the US
(Source: EU Quarterly Report on European Gas Markets, 1Q 2019 (page 15) https://ec.europa.eu/energy/sites/ener/files/quarterly_report_on_european_gas_markets_q1_2019_final.pdf)

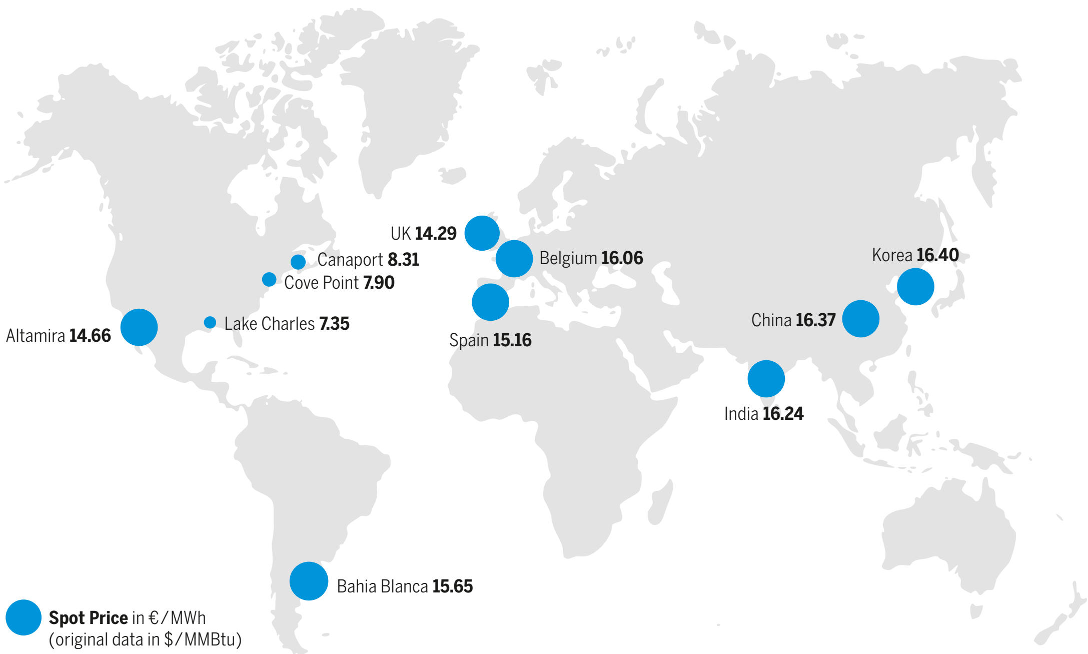


Figure 4.13: Estimated World LNG spot prices
Source: Waterborne Energy, Inc. Monthly average of the weekly landed prices for the listed month. Landed prices are based on a netback calculation (Data in Euro/MWh, converted from USD/Mbtu with the following rates: USD=0,9091 €; Mbtu=0,293071083 Mwh) - Federal Energy Regulatory Commission • Market Oversight
www.ferc.gov/oversight

The Figure 4.13 shows the estimation of LNG prices marked referred to September 2019, where the Asian prices were at around 16 €/MWh, European prices at 14/15 €/MWh and US prices substantially lower at around 8 €/MWh. This decrease was resulting also from the gradual start-up of nuclear reactors in Japan together with the exports from US, having stabilizing effects on prices.

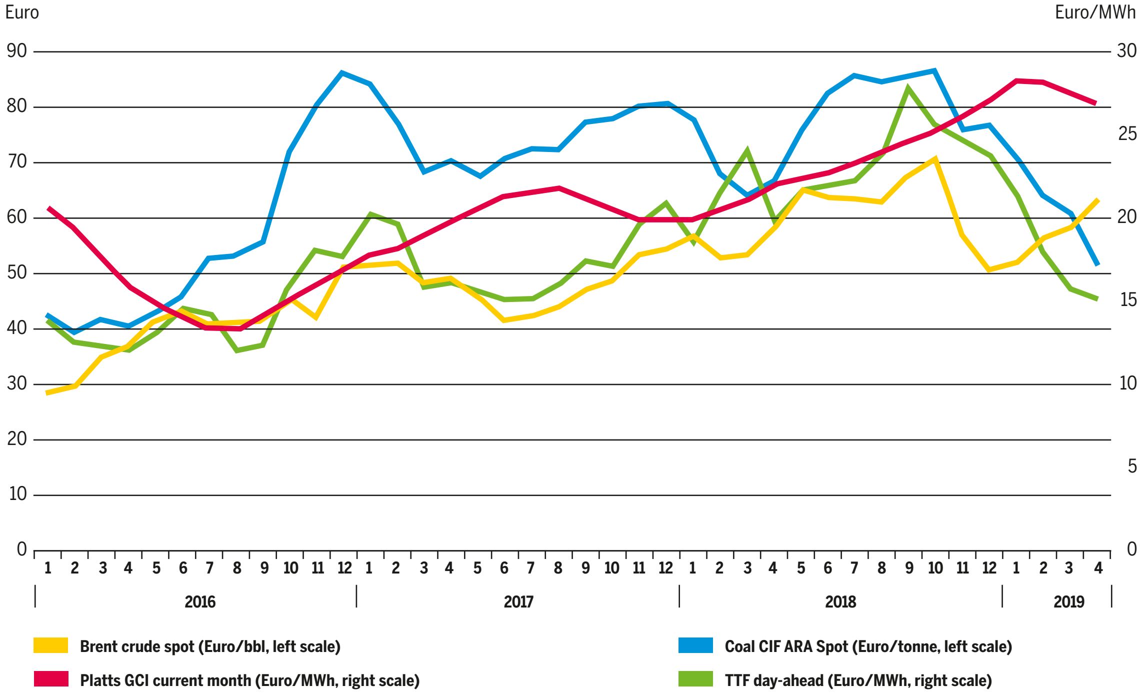


Figure 4.14: Spot prices of Oil, Coal and Gas in the EU
(Source: EU Quarterly Report on European Gas Markets, 2Q 2013 http://ec.europa.eu/energy/observatory/gas/gas_en.htm)

After undergoing a steep fall in Q4 2018, Brent crude price (Figure 4.14) showed a steady recovery in the first quarter of 2019. Spot coal prices fell to 53 €/Mt by the end of March 2019 from 75 €/Mt at the end of December 2018, which was the lowest since September 2016, as coal stocks at the Dutch import terminals remained close to multi-year maximums and low prices of gas resulted in falling demand for coal in electricity generation in Europe.

By March 2019 the TTF spot gas price averaged 15.7 €/MWh, which was the lowest since July 2017, and fell measurably compared to December 2018 (when it stood at 23.8 €/MWh). On the demand side decreasing EU gas consumption, owing to mild weather conditions, put a lid on heating related gas demand in Q1 2019, and other the supply side abundant LNG imports in the EU, all contributed to the measurable decrease in the European gas hub prices in the first quarter of 2019.

Picture courtesy of Snam Rete Gas S.p.A.

5 ASSESSMENTS AND MARKET ANALYSIS

5.1 IP CAPACITIES OFFERED, BOOKED AND USED

In this paragraph we examine the capacities of all Region's Interconnection Points (IPs) and we draw conclusions on the relation between technical capacities, booked capacities and actual flows. These data are presented graphically for all IPs in Annex C (Contrary to the last GRIP 2017–2026, in this edition we present the data from both sides of each IP). In the main report we have kept the graphs that help illustrate the comments and conclusions drawn.

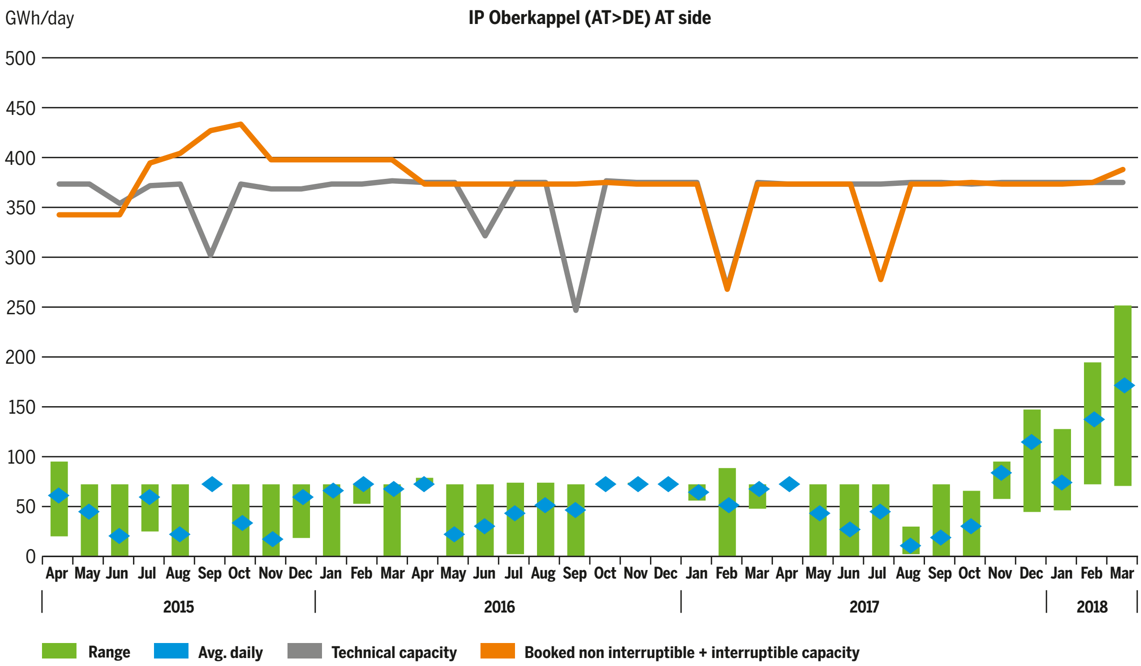
Regarding the sufficiency of technical capacity and the use made of it, the Region's IPs belong in different categories:

Several IP's present a very different view at their two sides. Moreover, some IPs show a different pattern in shippers' behavior before and after a certain date. Usually a more or less constant booking is replaced, after such date, by a booking pattern closely following the actual flows.

The above are illustrated by the IPs of Oberkappel (AT>DE) and Mosonmagyaróvár (AT>HU, Austrian side).

In the former, we notice that the technical capacity offered at the Austrian side is double than the one offered at the German side. Moreover, while the capacity bookings at the Austrian side are, in general, equal to the technical capacity, at the German side they are much lower and close to the actual flows.

In the latter, we notice that until September 2016 the capacity bookings (including interruptible capacity) are, in general, above the technical capacity, while after this point they follow more closely the actual flows.



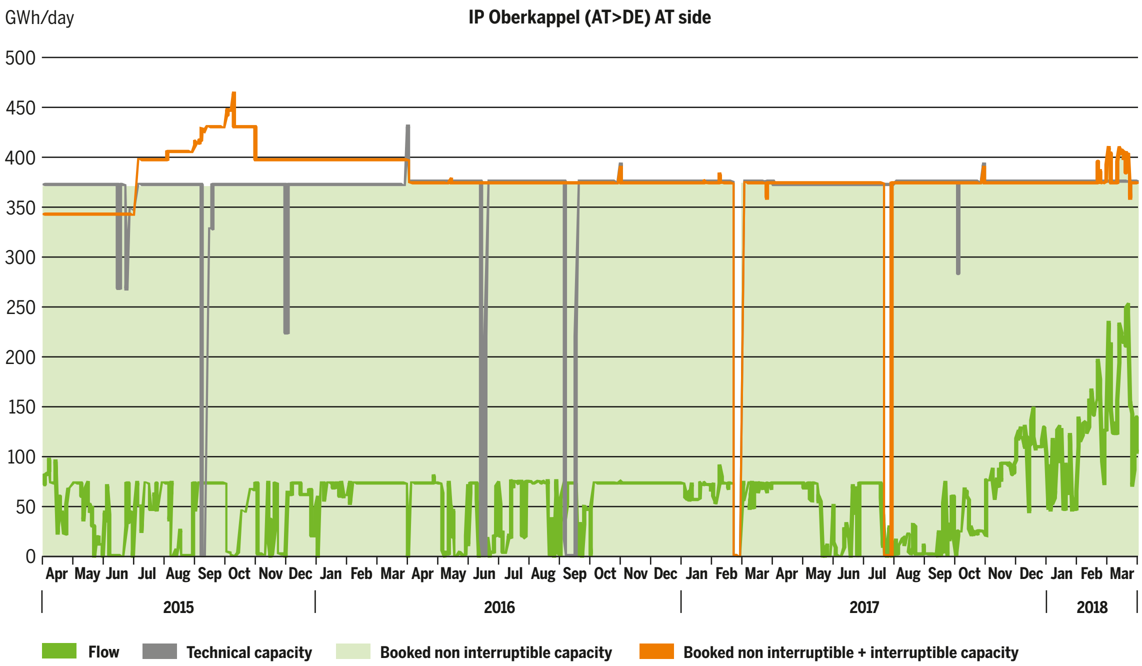


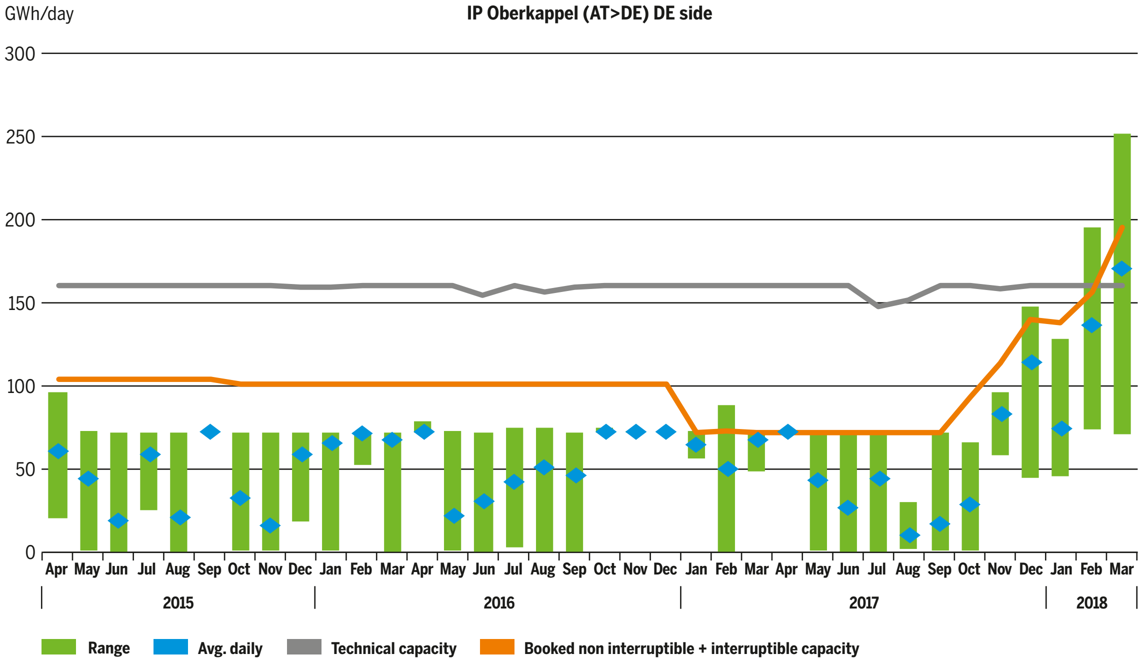
Figure 5.1.1: IP Oberkappel, AT side

The reason of these behaviours is usually the existence of legacy bookings which used to saturate the technical capacity. With the entry into force of the Tariff and the CAM Network Codes and the offering of bundled products only, it is expected that the booking at both sides of the same IP will converge.

Some IPs present a relative stability of flows within each month (case of IP Beregdaróc UA>HU) while other have a much higher volatility (case of IP Kulata/Sidirokastro BG>GR)

The latter may be, in part, the result of:

- the existence of an LNG terminal supplying the same Transmission system, where shippers reduce the imports of pipeline gas whenever they need to release storage space at the terminal and
- of the high part of CCGTs in the gas demand of Greece that makes the imports depend on the daily electricity demand and the merit order of the various units supplying the electricity grid.



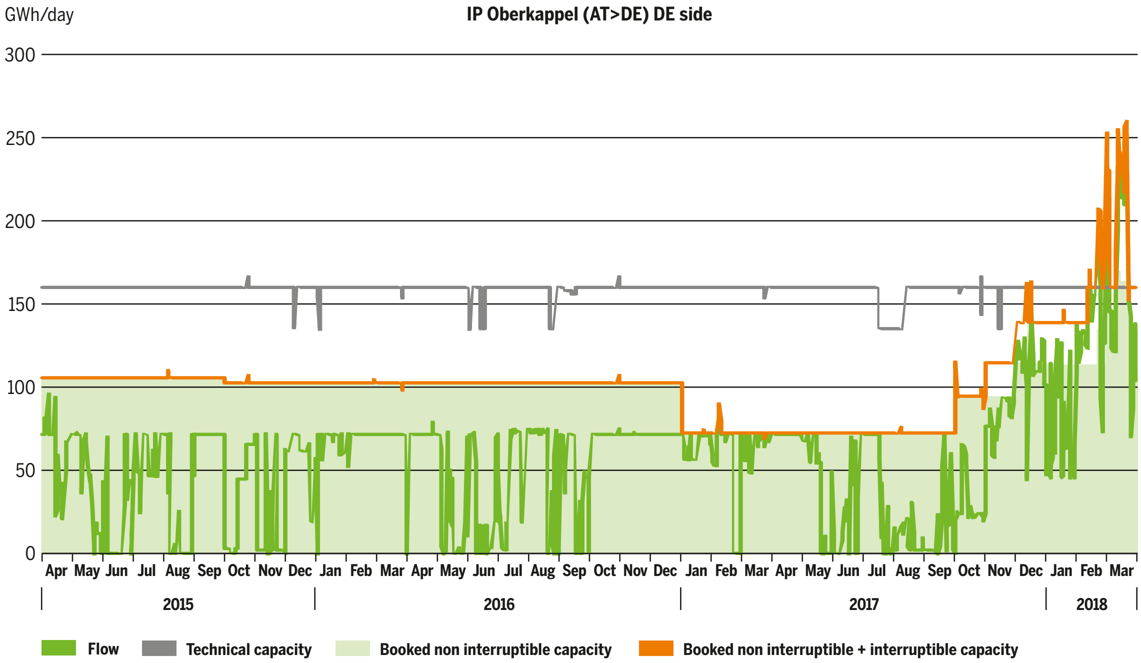
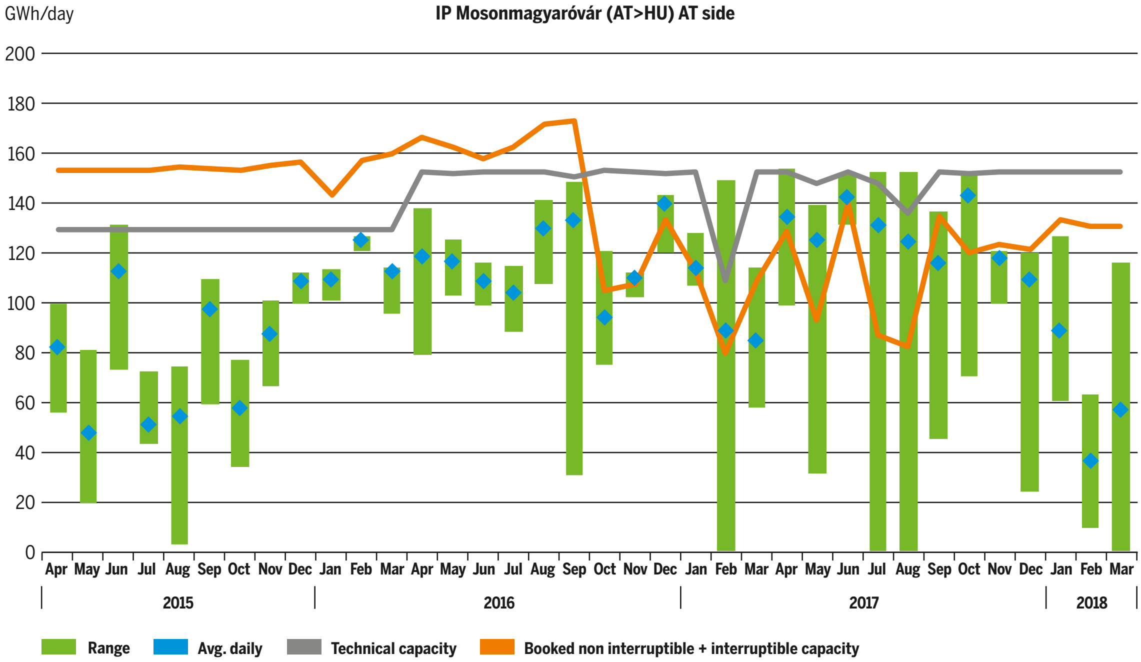


Figure 5.1.2: IP Oberkappel, DE side

Several IPs present a high degree of utilization, close to the technical capacity while other are used at a very low rate or during short periods only. In the first category we find the IPs of Oberkappel, Baumgarten, Arnoldslein, Malkoclar, Negru Voda 2,3.

In the second we have IPs like Gorizia/Šempeter, Velké Zlievce, Csanádpalota and Lanžhot.

However, many IPs present a maximum use close to or even exceeding the declared technical capacity in peak demand situations.



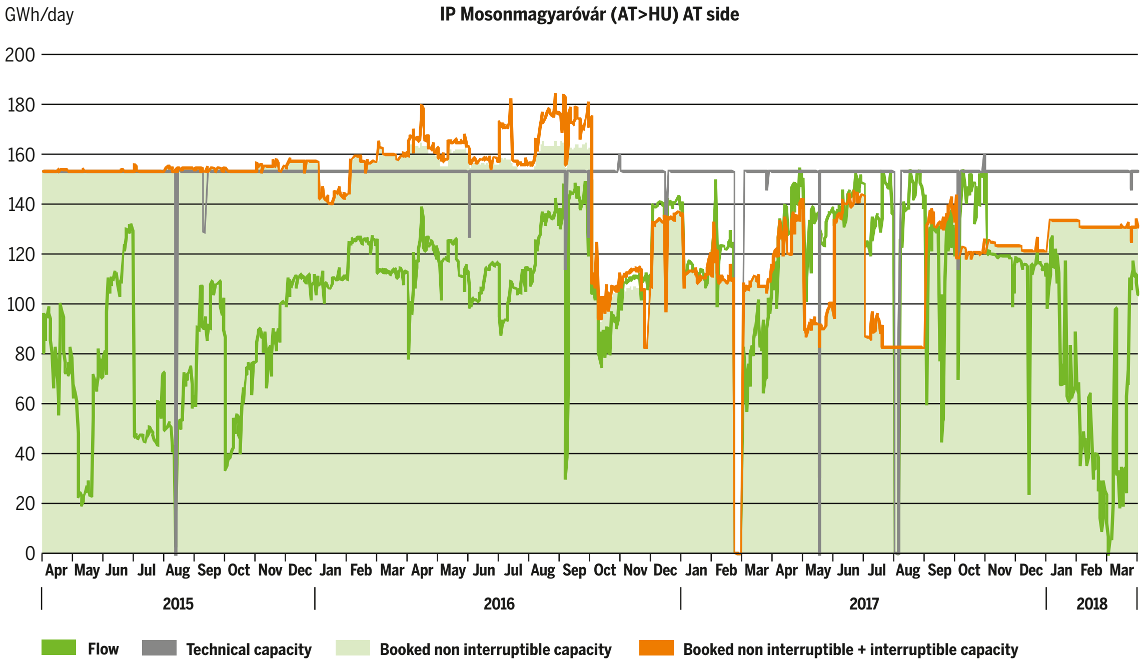
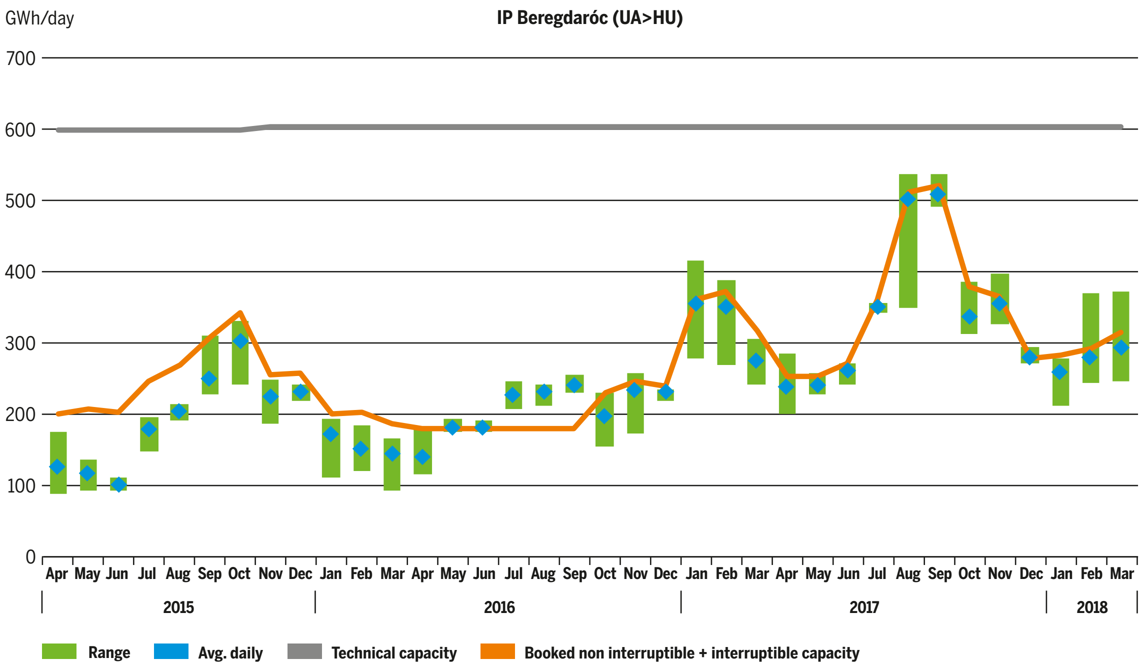


Figure 5.2: IP Mosonmagyaróvár, AT side



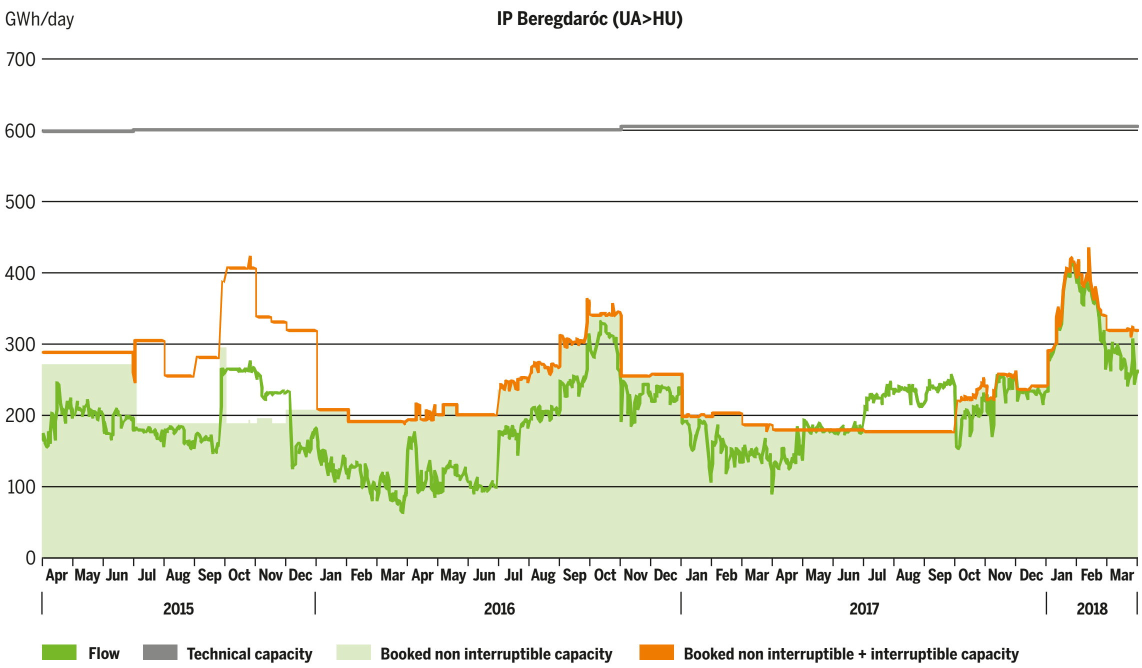
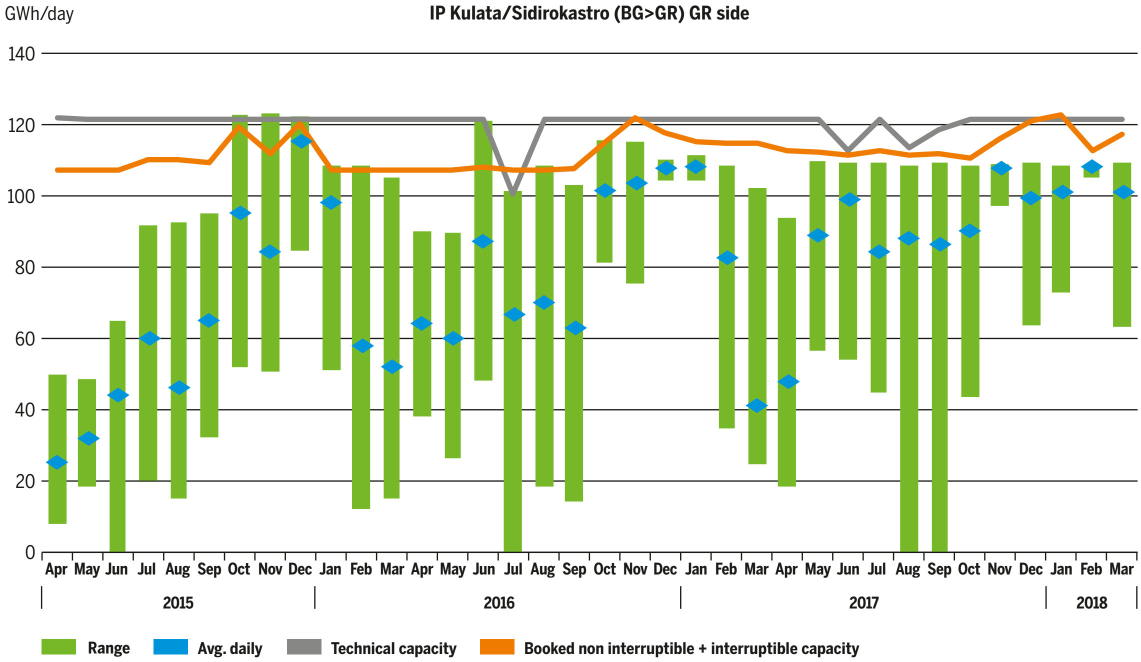


Figure 5.3: IP Beregdaróc



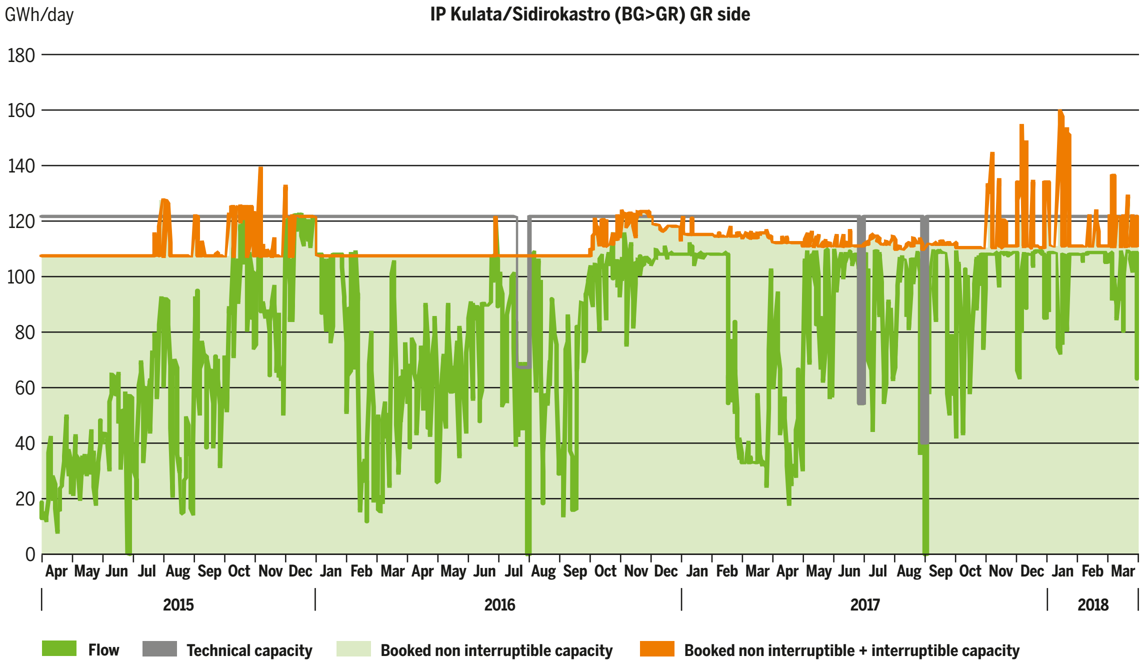
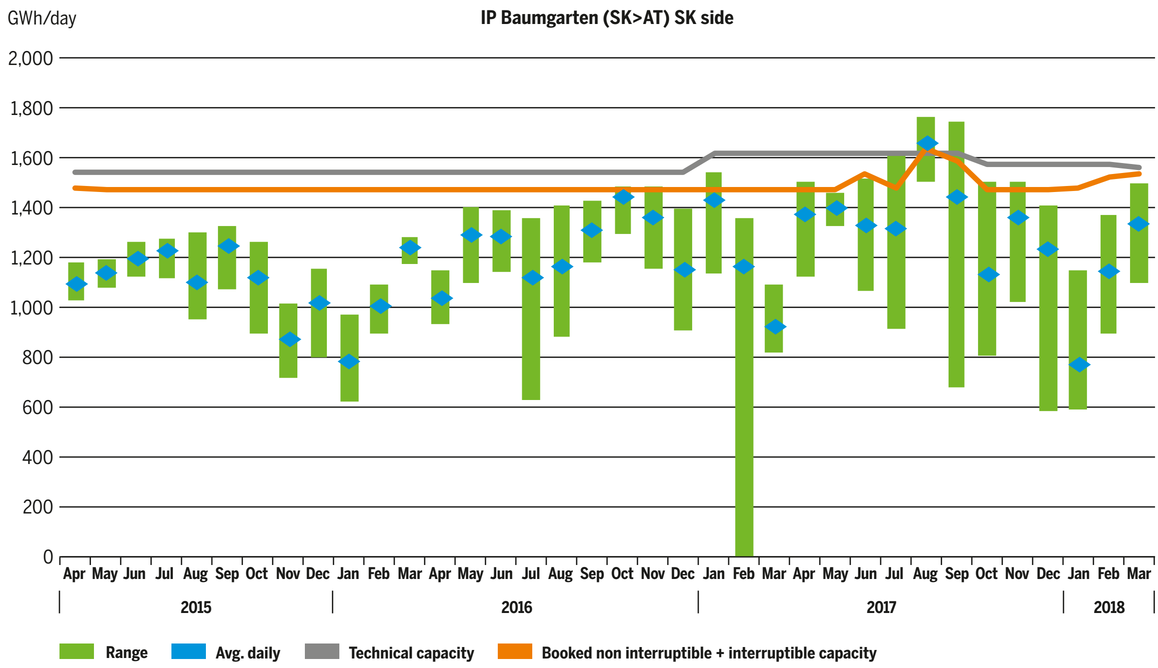


Figure 5.4: IP Kulata/Sidirokastro, GR side



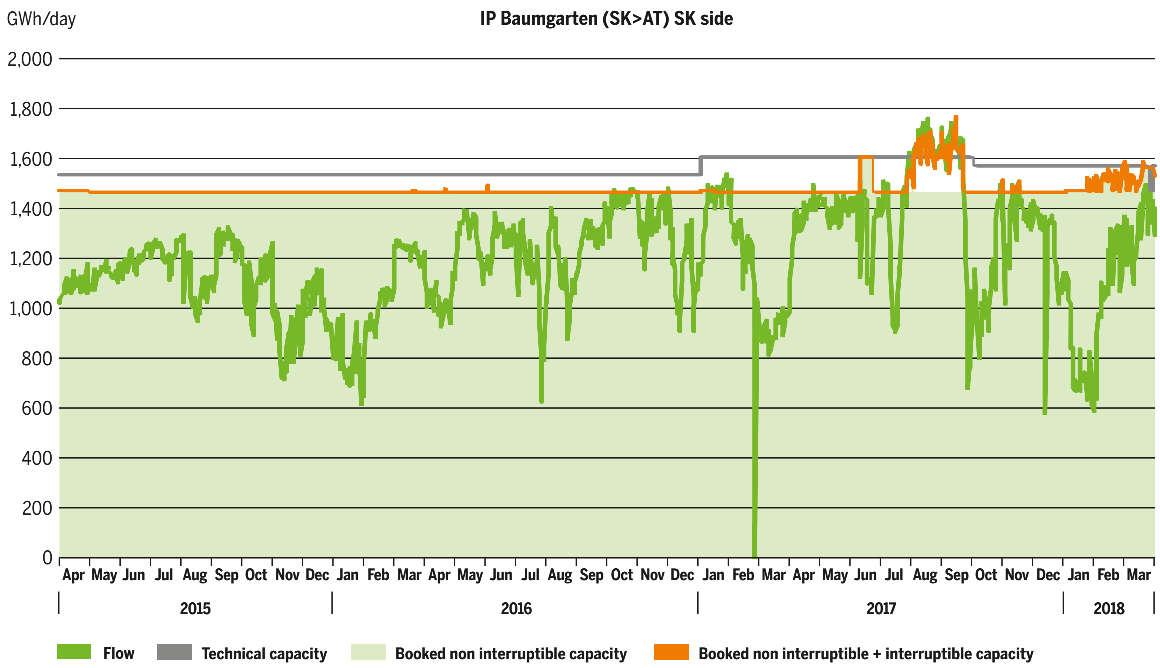
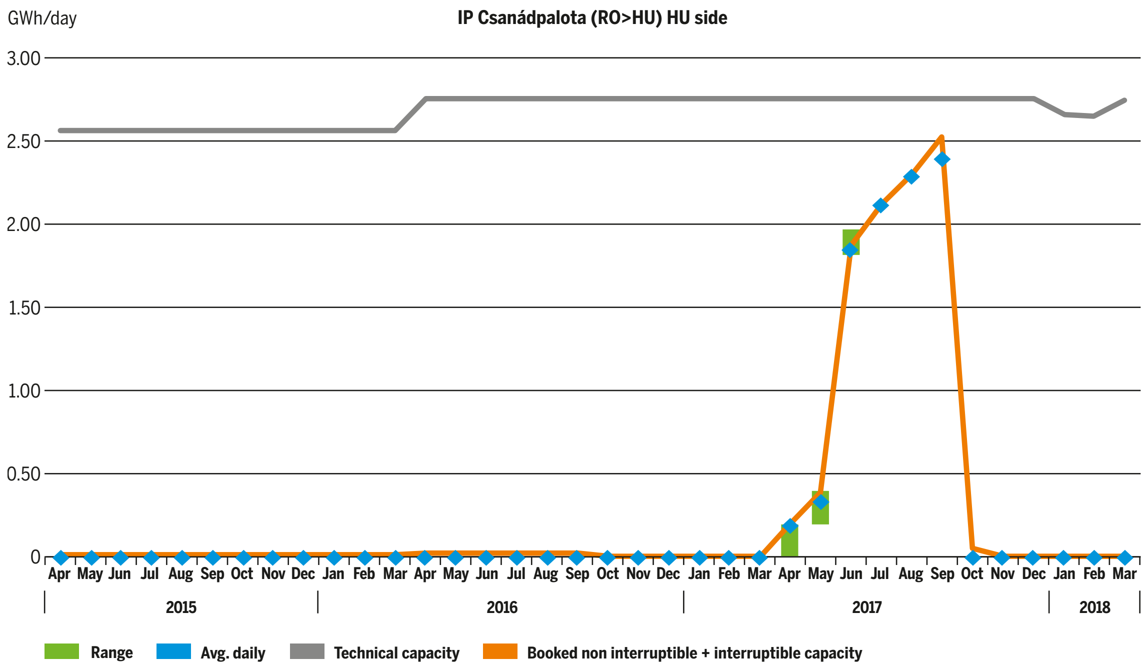


Figure 5.5: IP Baumgarten, SK side



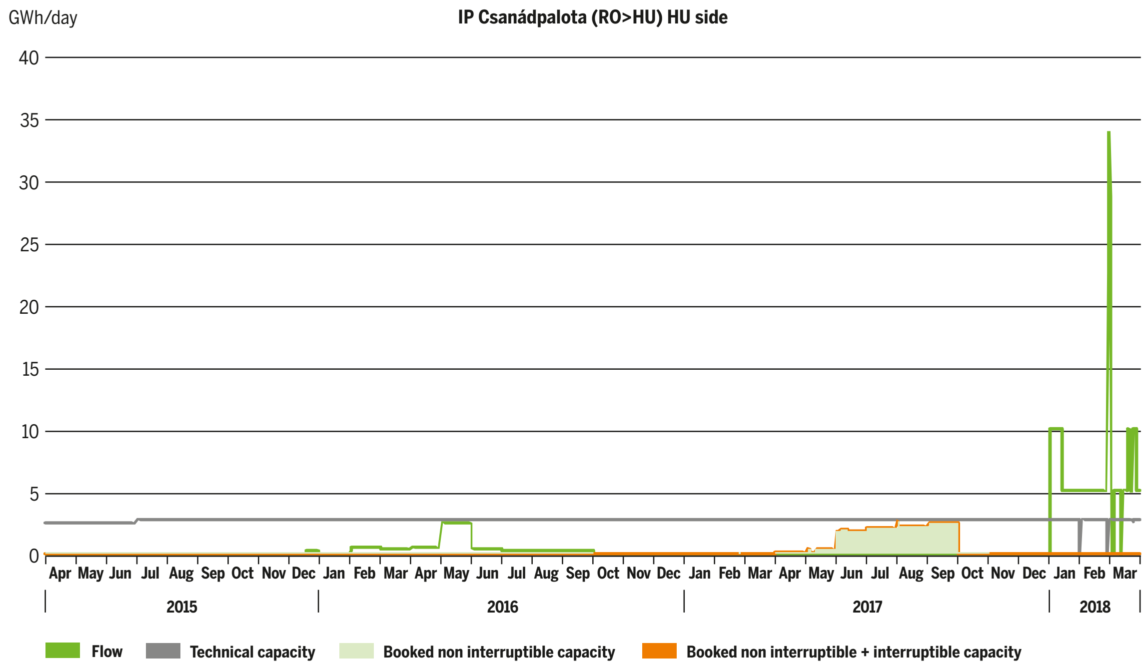
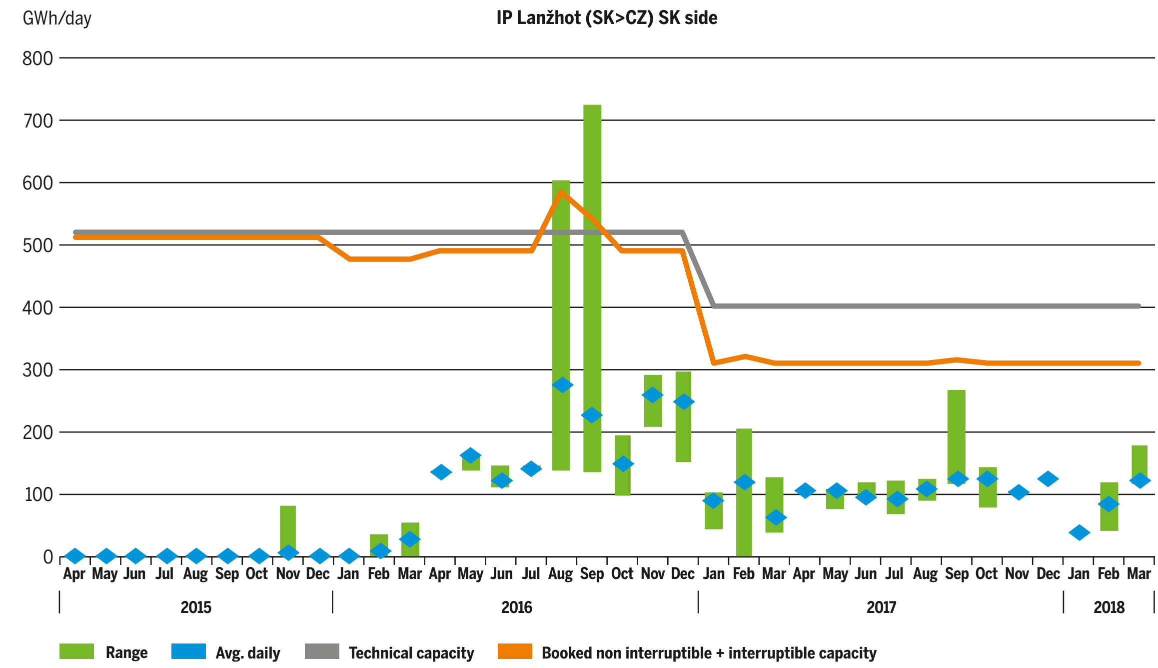


Figure 5.6: IP Csanádpalota, HU side



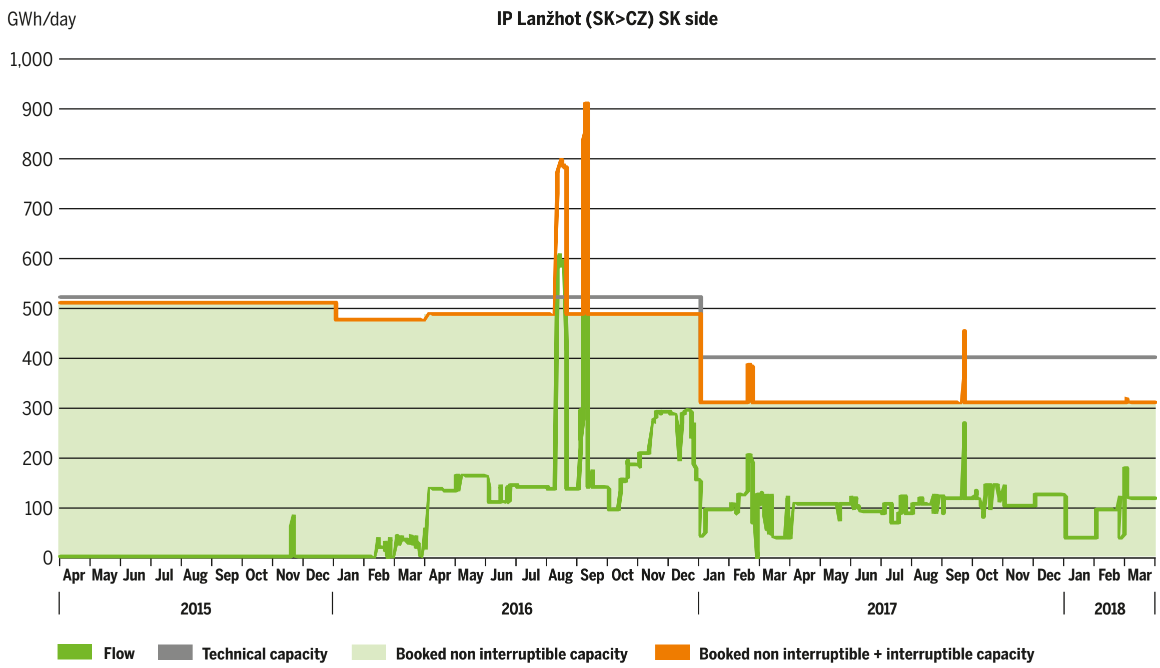


Figure 5.7: IP Lanžhot, SK side

5.2 CONCLUSION ON THE EXISTENCE OF CONGESTION AT THE REGION'S INTERCONNECTION POINTS

The graphs and data presented in the previous paragraph 5.1 and those presented in Annex C, indicate that, although in specific cases the Region's IPs may present a high booking rate and even, in some cases, flows exceeding the technical capacities, in general they do not give signs of congestion and they seem sufficient to cover the Region's supply needs.

Picture courtesy of Plinovodi

6 THE ROLE OF THE SOUTHERN CORRIDOR REGION

6.1 GENERAL

Meeting the needs of customers and market participants is the starting point for developing new gas infrastructure and the key for its success. A flexible and market driven gas infrastructure stimulates market activity and contributes to creating liquid and competitive gas markets. It brings different markets together in an easy and cost-efficient way and represents an essential contribution towards reaching principal objectives of European energy policy: market integration, security of supply, competition and sustainability. This includes a competition of routes and sources which is beneficial for the market and contributes to maximizing possibilities for shippers.

The European gas infrastructure has seen decades of development and the existing infrastructure basically ensures a high level of market integration across most of Europe. The gas transmission infrastructure, LNG terminals and gas storages also provide safe, reliable and affordable low carbon energy to European citizens.

However, over the coming years, European domestic natural gas production is set to decline in a number of countries, in particular with the production restriction of the Groningen field and the depletion of the North Sea fields. While Russian gas and LNG have the ability to address increasing supply needs, maintaining supply diversification requires attracting new supplies. Norway has the potential to deliver significant volumes by connecting the Barents Sea to the existing offshore network, but the necessary investments are in competition with potential LNG developments, among which the increasing USA LNG exports, targeting the world market. Therefore, alongside existing routes, an important role is played by new transport routes and sources of natural gas, which will help to further diversify the supply of energy.

6.2 THE SOUTHERN CORRIDOR REGION– A PRIORITY FOR EUROPE

The Southern Corridor will provide Europe with a new route to secure natural gas supplies from the gas-rich Caspian Sea Basin. Moreover, it is designed to be expanded as additional natural gas becomes available in Azerbaijan and as Turkmenistan seeks access to European markets to diversify its own exports by adding a third route alongside those to Russia and China.

Additionally, the Southern Corridor Region opens a new route for Europe to ship natural gas from new sources within the EU such as Black Sea Gas. This could help those countries in Central and South East Europe which are dependent on a single supplier for most or all of their natural gas to diversify their supplies. Many of them are transit countries, while infrastructure in other regions has a more balanced role, being mostly destined to handle internal consumption.

Ongoing priority gas projects for the Southern Corridor Region are: the Trans-Adriatic Pipeline, the Interconnector between Greece and Bulgaria; the Interconnector between Bulgaria and Serbia; the reinforcement of the Bulgarian transmission system; the reinforcement of the Romanian transmission system (part of the "BRUA" corridor); the LNG terminal in Krk, Croatia; the LNG evacuation system towards Hungary; Ionian Adriatic Pipeline (IAP) and EastMed pipeline.

Other possible projects include a connection of offshore Romanian gas to the Romanian grid and enhancement of the national system; a new Greek LNG terminal; and the interconnections between Croatia and Serbia and between Greece and North Macedonia.

Clearly, this region hosts new transmission projects with larger capacities than planned infrastructure in other regions. Therefore, new potential volumes will have a high influence on security of supply and diversification of routes and/or sources in the region and all over Europe.

6.3 THE SOUTHERN GAS CORRIDOR REGION AND THE EUROPEAN UNION

For the European Union the infrastructure projects of the Southern Corridor Region are a top-priority. EU funding has been granted to many projects in the Region. Europe therefore aims at keeping the infrastructure projects needed for the Corridor on the EU's list of Projects of Common Interest (PCI) so that they can benefit from streamlined permitting process, receive preferential regulatory treatment, and apply for EU funding from the Connecting Europe Facility. The EU also cooperates closely with gas suppliers in the region including Azerbaijan, Iraq and Turkmenistan. Finally, negotiations with transit countries including Azerbaijan, Georgia and Turkey discussing with Turkmenistan on a Trans-Caspian pipeline to transport gas across the Caspian Sea are ongoing.

In 2014 the Commission's 'stress tests' revealed a region extremely vulnerable to a cut in gas supply by its largest, and often sole, supplier. To solve this problem, the Commission launched the CESEC Initiative in 2015, with the aim of guaranteeing that all countries in Central and South Eastern Europe (Austria, Bulgaria, Croatia, Greece, Hungary, Italy, Romania, Slovakia and Slovenia) have access to a more varied mix of energy sources and are properly interconnected both between them and to the rest of Europe. CESEC has proven instrumental in the process of integrating the region's gas markets and has thus become a central channel for further consolidation across the energy sector and the promotion of the Southern Corridor.

6.4 KEY TRANSMISSION PROJECTS OF THE REGION

6.4.1 THE SOUTHERN GAS CORRIDOR

This Corridor is one of the most complex gas value chains ever developed in the world. Stretching over 3,500 kilometres, crossing seven countries and involving more than a dozen major energy companies, it is comprised of several separate energy projects representing a total investment of approximately € 35 bn: Shah Deniz 2 development (drilling wells and producing gas offshore in the Caspian Sea), expansion of the natural gas processing plant at the Sangachal Terminal on the Caspian Sea coast in Azerbaijan and three pipeline projects South Caucasus Pipeline, Trans Anatolian Pipeline and Trans Adriatic Pipeline (TAP).

The Southern Corridor is complemented by major additional projects in the Southern Corridor Region which has the potential to incorporate natural gas from the Eastern Mediterranean as well as Iraq, and perhaps even from Iran. The latter holds the world's second largest gas reserves, although the related geopolitical and commercial challenges are daunting.

Initially, approximately 10 billion cubic meters (bcm) of gas will flow along the Southern Gas Corridor when TAP opens in 2020. Given the potential supplies from the Caspian Region, the Middle East and the East Mediterranean, however, the EU aims to increase this to 80 to 100 bcm of gas per year in the future.

TAP, as part of the SGC, is a natural gas pipeline project, which will transport natural gas from the giant Shah Deniz II field in Azerbaijan. Connecting with the Trans Anatolian Pipeline (TANAP) at the Greek-Turkish border, TAP, approximately 878 km long, will cross Northern Greece, Albania and the Adriatic Sea before coming ashore in Southern Italy, where it will connect to the Italian natural gas network. TAP's highest elevation will be 2,100 metres in the mountains of Albania while its lowest depth offshore will be approximately 810 metres beneath the Adriatic Sea Along its route, TAP can facilitate connections to a number of existing and proposed pipelines, ensuring that the SGC opens up to many different energy markets. This will enable the delivery of Caspian gas to destinations throughout South Eastern, Central and Western Europe.

Furthermore, while TAP will initially transport approximately 10 bcm per year, it can expand up to 20 bcm per year, depending on supply and demand.

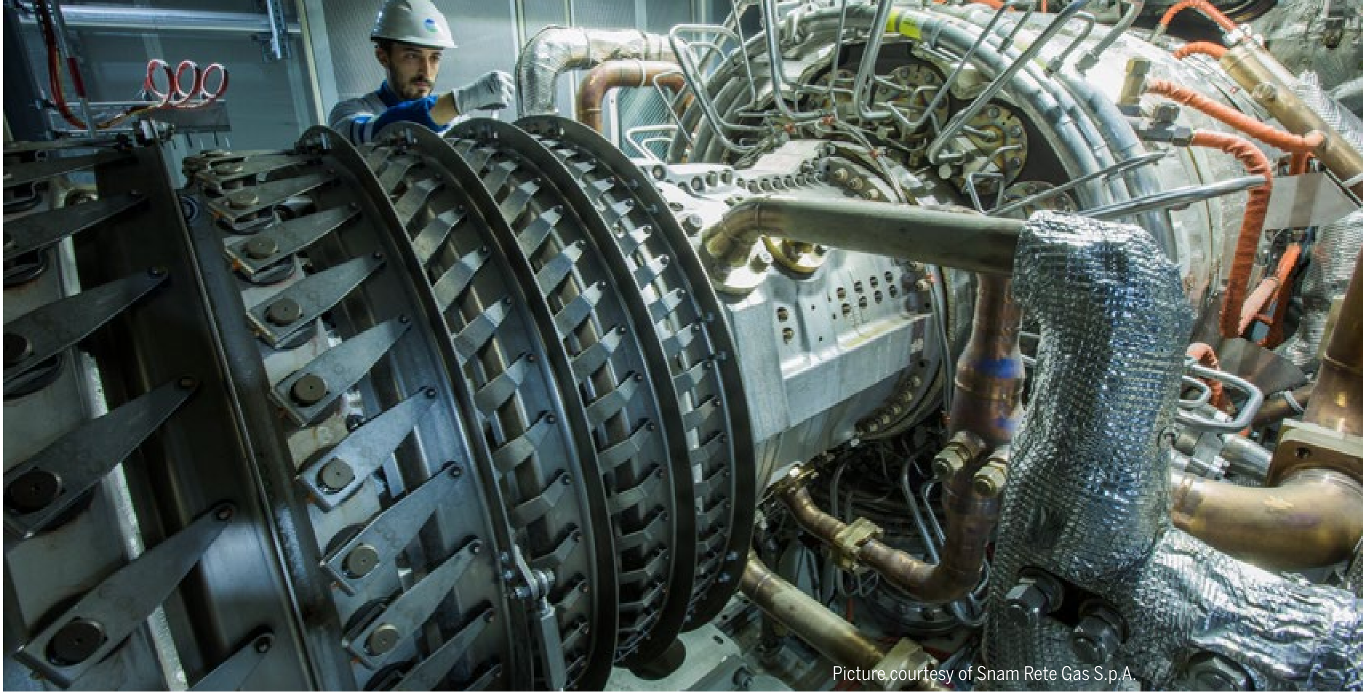
TAP represents the shortest (and most direct) link from the Caspian Region to the European markets. One of the main benefits of the TAP project is securing future energy supply, which supports a strategic goal of the European Union. TAP will have a positive effect on security of supply for Greece and Bulgaria, assisting Greece in meeting the required N-1 security of supply criterion. It will also contribute to the development of a local gas infrastructure and supply (e.g. in Albania which does not yet have a gas market) and further north, in case IAP will be implemented.

TAP is included in the EU list of Projects of Common Interest (PCI). As the EU institutions recognize TAP's role in in addressing the energy policy objective of ensuring security and diversification of supply to Europe, they have granted TAP the PCI status three consecutive times, being currently included also in the 4th PCI list. The strategic importance of the project has been underscored in the European Energy Security and Energy Union Strategies and was reiterated in the Second Report on the State of the Energy Union. In addition to its PCI status, in 2013, the Energy Community has named TAP as a Project of Energy Community Interest (PECI).

The project is in its construction phase which started in 2016. In terms of overall project progress, at the end of December 2019, TAP was 91 % complete, including all engineering, procurement and construction scope.

In 2019 TAP run a non-binding Market Test, in cooperation with SRG and DESFA, in order to allow for the expansion of the pipeline capacity from 10 to 20 bcma.

The Trans Anatolian Natural Gas Pipeline Project (TANAP), along with the South Caucasus Pipeline (SCP) and TAP which form the Southern Gas Corridor, aims to bring natural gas produced in Azerbaijan's Shah Deniz-2 gas field, and in the other areas of the Caspian Sea, to Turkey and on to Europe. Contruction started in March 2015 and the first gas delivered to Turkey in June 2018.


Picture courtesy of Snam Rete Gas S.p.A.

6.4.2 BLACK SEA GAS

Additional European sources have a key role to play. There are prospects for conventional gas production in the Black Sea and as a result, special importance is placed on the Black Sea corridor. This has already been explicitly acknowledged by previous Gas Regional Investment Plans (GRIPs).

Whereas the infrastructure of other European countries is closely aligned with domestic consumption, the countries belonging to the Black Sea corridor play a major role in transit. Thus, utilising this infrastructure to transport new potential gas volumes could have a positive impact on security of supply in Europe.

New gas routes however also enhance the security of supply of the transit countries themselves, considering that countries such as Romania and Hungary would in some cases be hard hit by any disruptions in supply. This could result in irregular peak loads – and the infrastructure has to be able to manage such peak loads. As this is currently not the case everywhere, it is of major significance to develop the corridor.

Balkan Gas Hub

The opening of a Black Sea Corridor will further enhance the efforts of Bulgartransgaz to create a Balkan Gas Hub that will serve the natural gas markets of the member states in the region – Bulgaria, Greece, Romania, Hungary, Croatia, Slovenia and crossing their territory to the member states from Central and Western Europe and the countries of the European community – Serbia, North Macedonia, Bosnia and Herzegovina and others, thus contributing to achieving the major priorities of the European energy policy. Natural gas from various sources will enter the hub – Russian natural gas through new offshore gas pipelines and the route currently in operation, natural gas, produced in the Black Sea shelf – the Bulgarian shelf (from Khan Asparuh, Silistar, Teres blocks) and the Romanian shelf, natural gas from sources of the Southern Gas Corridor (the Caspian region, the Middle East and the Eastern Mediterranean) and LNG from terminals in Greece and Turkey.

A feasibility study for the Balkan Gas Hub, awarded by BULGARTRANSGAZ in 2018 and co-funded by the EU's Connecting Europe Facility program, has been completed in November 2018. Based on its results, the realization of the Balkan Gas Hub concept continues in two main directions: the establishment of a trade and regulatory framework including a gas exchange (on January 2019 "Bulgartransgaz" EAD registered the subsidiary "Balkan Gas Hub" EAD) and the construction of the necessary infrastructure (optimization of existing infrastructure, modernization and expansion of the existing network, construction of interconnections with neighbouring countries, etc.).

Developing the infrastructure in this area is subject to the European legal framework. This is expected to guarantee reliability and legal certainty in planning and implementation.


Picture courtesy of FGSZ

6.4.3 GAS TRANSMISSION CORRIDOR FROM BULGARIA TO AUSTRIA

In connection with the aforementioned upstream exploration projects in the Black Sea region, concerned Romanian, Hungarian and Austrian Transmission System Operators have received non-binding expressions of interest for the corridor route from the Black Sea to the Austrian hub Baumgarten (BRUA).

The initial proposal to meet the indicated market demand was to follow an alternative allocation mechanism procedure for gas transportation from Romania to Austria via Hungary (ROHUAT Open Season). Shortly after the Hungarian side had withdrawn from the ROHUAT Open Season procedure, two new capacity allocation procedures, independent from the one for ROHUAT, were proposed. An Open Season Procedure for the Romanian – Hungarian Interconnection Point (ROHU) and an incremental capacity procedure for the Hungarian – Austrian Interconnection point (HUAT). None of these has arrived to a conclusion yet (as of June 2019).

A further project to bring gas from the Black sea region via Hungary and Slovakia to the liquid Baumgarten hub was envisaged by the development of the HUSKAT allocation procedure. The allocation procedure resulted in no capacity allocation. Hence, the HUSKAT project was closed in May 2019.

6.4.4 IAP PROJECT

The IAP project has been based on the idea of connecting the existing gas transmission system of Croatia via Montenegro and Albania with the TAP gas transmission system (Trans Adriatic Pipeline). The total length of the gas pipeline from Split (HR) to Albanian Fieri is 511 km according to the accepted feasibility study.

The initial capacity of 5 bcm/y has been planned for natural gas supply of Albania (1 bcm/y), Montenegro (0.5 bcm/y), the south of Bosnia and Herzegovina (1 bcm/y) and Croatia and further to CEE and CE (2.5 bcm/y). From Croatia, there is a possibility to transport the gas in two directions: 1) by existing interconnection HR-HU to Hungary and further 2) by new interconnection HR-SLO via Slovenia to Austria and Italy.

The implementation of this project would enable the gasification in Albania and Montenegro, as well as in the southern part of Croatia and Bosnia and Herzegovina. The implementation of the entire IAP project provides opening of the new energy corridor for the region within the Southern Gas Corridor, for the purpose of establishing a new natural gas supply route from the Middle East and Caspian region. The project can provide the Security and Diversification of Supply for the SEE region.

IAP will have a potential to provide bi-directional gas flow. This gives the LNG project on the island of Krk a significant importance since it could be a source of gas for IAP, which means that IAP is fully compatible with the LNG project on the island of Krk.

6.4.5 CROATIAN LNG CORRIDOR

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. The FID for the Krk FSRU project was taken in January 2019 and commitioning is expected in 1Q 2021.

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)

6.4.6 EASTRING

The project's economic feasibility is based on a positive, non-binding market survey and analyses of future market development. EASTRING is a project that offers direct routing between the developed EU markets and the South-East Europe region. As Turkey becomes a major gas hub with excess import capacities (Caspian & Middle East Gas, Turkish Stream, LNG), it will look for a way to export surplus gas, while the same applies to the Balkan Gas Hub project in Bulgaria. However, there is currently no infrastructure to transfer this excess natural gas further into Europe. Therefore, EASTRING becomes a required infrastructure to cover the needs of this region.

The EASTRING Pipeline is planned to be bi-directional, which would not only open up alternative import routes to the EU markets for gas transmitted through Turkey, but also create a way of supplying South East Europe and Turkey in the event of gas disruptions. A new route of 1,208 km between Veľké Zlievce (Slovakia/Hungary border) and Malkoçlar (Bulgaria/Turkey border) has been designed as the outcome of the feasibility study.

The bi-directional pipeline of a diameter of 1,400 mm and an operating pressure of 100 bar will have a capacity of up to 20 bcm/y in its first stage, with a potential upgrade up to 40 bcm/y in the next phase. The estimated CAPEX of the Phase I of the project is € 2.6 bn. If a positive investment decision is made, the new pipeline can be operational at the beginning of 2025 to meet future market demands.

The detailed Feasibility Study for the EASTRING pipeline has been completed. It offers unique and workable solutions for a Single European Market. Connecting the main European Gas Hubs with the Black Sea and Turkey region will secure future deliveries from new alternative natural gas sources. It will enhance the European Union's energy security and strengthen the competitiveness of its natural gas market.

The Feasibility Study was co-funded by the EU's Connecting Europe Facility program. It was elaborated by the EUROIL consulting and engineering company with the active participation of all involved gas TSOs from Slovakia (Eustream), Hungary (FGSZ Zrt.), Romania (SNTGN Transgaz SA) and Bulgaria (Bulgartransgaz EAD). EASTRING is part of the Ten Year Network Development Plan and is a Project of Common Interest 2017.

6.4.7 EASTMED

The discoveries of important gas fields in the Eastern Mediterranean (Levantine basin) in the last years are at the basis of the rationale for this technically challenging pipeline project. This 1,900 km long pipeline, mostly (1,300 km) offshore and at depths reaching more than 2,000 m would have an initial capacity of 10 bcma, extendable in a second phase to 20 bcma.

The project has received political support from Greece, Cyprus and Israel and having been recognised by the European Commission as a Project of Common Interest it has received EU grants through the CEF program for the pre-FEED activities. The pre-FEED study, performed by international engineering (Intecsea and C&M consortium) and global consultancy (IHS-CERA) firms, reached the conclusion that the project is technically feasible and economically viable. More recently project developers agreed to carry out a front end engineering design (FEED) study to support the tender process ot the construction of the offshore segment of the Eastmed pipeline. The FEED study has also received EU financial support to cover half of its costs.

Gas to feed the pipeline could come from the phase two of the Leviathan field (with estimated reserves of 605 bcm) and/or any new discoveries that could be made in the area as exploration activities are still being carried out.

Israel currently has 200 bcm of proved gas reserves according to BP Statistical Report 2016 but the two offshore fields Leviathan and Tamar in the Eastern Mediterranean Sea could reach total estimated reserves of almost 1 Tcm).

Israel's current priority is to protect its energy security and, in June 2013, it approved an export cap of 40 % of the country's natural gas reserves as an estimation to supply the national domestic demand for 25 years. At the same time, Israel is open to export additional gas to neighbouring countries like Egypt with which a agreement to supply 85 bcm in 15 years has been concluded and Jordan through a natural gas pipeline scheduled to begin operation in 2020 to which Levantine partners have already agreed to supply 45 bcm during the next 15 years.

Other export option for Israeli gas would be to supply gas directly to Turkey or the EU via Greece, the latter through the East-Med project.

Cyprus has discovered one important gas field (Aphrodite) and further exploration is underway. The first option of Cyprus was the implementation of a liquefaction plant but the gas quantities discovered so far do not support this option and it seems it has not reached an agreement with Israel to also liquefy Israel's gas. Therefore the export through pipeline, to its neighbours and possibly through the EastMed are the presently prevailing options. However recent discoveries (February 2019) of an important new field (Glaukos) might lead Cyprus to reconsider the first option again.

6.5 OTHER POTENTIAL SOURCES

6.5.1 TURKISH STREAM TO EUROPE

At the first application of the Incremental capacity procedure, in 2017, two non-binding demand indications were received by European TSOs, for the transportation of Russian gas quantities to be made through the Turkish stream project. One involved the four TSOs of Bulgaria, Serbia, Hungary and Austria (Balkan route) and the other the TSOs of Greece and Italy Mediterranean route). Following the procedures foreseen by Regulation 459/2017, the TSOs concerned in both cases published a Demand Assessment Report (DAR) and a Public Consultation Document and started discussions to study the technical, regulatory, legal and financial questions related to the possibility to design and realize the corresponding project. In the case of the Balkan route a bi-directional gas transmission corridor is considered, along the countries of BG-SRB-HU-AT. In the main direction this corridor allows for physical flow from Bulgaria to Austria through Serbia/Hungary with a capacity to Austria of approximately 9 bcm. In the case of the Mediterranean route, the project considered would be an extension of the Komotini-Thesprotia pipeline (TRA-N-014) with an offshore section from the west coast of Greece to Italy for a capacity of approximately 12 bcma.

6.5.2 ROSPECTS FOR GAS FROM TURKMENISTAN

Turkmenistan ranks among the countries with the largest gas reserves in the world. The idea of exporting gas from Turkmenistan through a Southern corridor to Europe is widely dicussed but transmission infrastructures are still missing. A possible opportunity is the Trans Caspian Pipeline (TCP) which would connect Turkmenistan with Azerbaijan across the Caspian Sea, an area with a particular legal status that until recently prevented such projects. The agreement of the five littoral states, signed in August 2018 in Aqtau, seems to make such a project possible, should Turkmenistan wish to pursue this venture against the possibility to supply markets to the east. The White Stream Pipeline project or the Southern Gas Corridor (provided the latter has the necessary free capacity), could then transport the gas through the Black Sea or through Turkey respectively, to the European border.


Picture courtesy of Snam Rete Gas S.p.A.

6.5.3 EGYPT

According to the 2019 BP Statistical review of World Energy, Egypt is currently the second largest producer (behind Algeria) and has the third (behind Nigeria and Algeria) largest proven reserves of natural gas in Africa. However, production has declined in recent years. Development of natural gas discoveries has been delayed due to a lack of investment driven by economic and political factors. LNG exports from Egypt stopped in 2014 as reported by IGU (International Gas Union) 2016 World LNG Report and the country became an importer in 2015 to cope with increasing domestic demand, particularly in the power sector, as the population grows by almost 2 % per year and at the same time petroleum usage is replaced. Exports started again in 2016 to reach 2.0 bcm in 2018, equally shared by Europe and Asia/Pacific areas, but Egypt remained a net importer since, in the same year, imports of LNG reached 3.2 bcm, almost half of it coming from Qatar. The giant Zohr gas field in the Mediterranean Sea, with estimated reserves of around 850 bcm, could grant energy independence to Egypt for many years). Egypt has an exportation pipeline, the Arab Gas Pipeline (AGP) which connects it to Jordan, Syria and Lebanon. At the same time, in 2020 it started importing natural gas from the Israeli offshore fields.


Picture courtesy of DESFA

7 NETWORK ASSESSMENTS

7.1 INTRODUCTION

This chapter presents the assessments of 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. 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[11] 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[12]. Each arc is associated with a cost representing the transmission tariff applied by the two adjacent zones, in order to make the model results as close to the conditions imposed by the market as possible. 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 on the mitigation of the consequences of supply disruptions.

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

12 Under the "lesser of" rule, when the export capacity of a country and the import capacity of its neighbour are not the same, the lower of the two values is considered as capacity of the corresponding arc.

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 2018 [13].

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

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 on decisions made by the shippers who take into account gas prices, use of system tariffs and other commercial conditions of the transportation contracts, which cannot be anticipated 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 parametres:

- Demand: Regarding Demand, several levels have been considered.
- In the disruption cases[14] the Design Case (DC) was considered. 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 that makes evident the impact of the maximum stress on the infrastructure.
- In the non-disruption cases, the Two-Week peak was used,

Finally, in the "Flow under price variation" cases the Average Winter day was used.

- **Infrastructure level:** Regarding this parameter two values were used:
  - Low: including the existing infrastructure and the projects which have already a Final investment decision taken.
  - PCI: including, on top of the Low infrastructure level, the projects included in the 2017 PCI list:
- **Years:** Results of years 2020 and 2030 were used.
- **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. This also includes the disruption of flows to Spain which does not have a major impact on the SC Region.

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" recognized 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 5 €/MWh compared to the Reference price. These sources are:
  - Russian gas,
  - LNG and
  - Azeri gas

13 https://www.entsog.eu/sites/default/files/2019-02/ENTSOG_TYNDP2018_Annex_D_Methodology.pdf

14 In TYNDP 2018 we also use the Advanced level comprising projects to be commissioned before 2025 which have started permitting process or FEED, before the TYNDP 2018 data collection.

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

The following table summarizes the scenarios and the corresponding values of the parametres used

Security of Supply				
Year	**Infrastructure Level**	**Demand**	**Disruption**	**Price**
2020	Low	2W	None	Reference
2020	Low	DC	UA	
2020	Low	DC	Algerian Pipe	
2030	Low	2W	None	
2030	Low	DC	UA	
2030	Low	DC	Algerian Pipe	
2020	PCI	2W	None	
2030	PCI	DC	UA	
2030	PCI	DC	Algerian Pipe	
2020	PCI	2W	None	
2020	PCI	DC	UA	
2020	PCI	DC	Algerian Pipe	
Flow patterns under price variation				
Year	**Infrastructure Level**	**Demand**	**Disruption**	**Price**
2020	Low	Average Winter (AW)	None	Reference
2020	Low			RUMax
2020	Low			AZMax
2020	Low			LNGMax
2030	Low			Reference
2030	Low			RUMax
2030	Low			AZMax
2030	Low			LNGMax
2020	PCI	Average Winter (AW)	None	Reference
2020	PCI			RUMax
2020	PCI			AZMax
2020	PCI			LNGMax
2030	PCI			Reference
2030	PCI			RUMax
2030	PCI			AZMax
2030	PCI			LNGMax

Note: In the Price Variation cases the average winter demand is considered while in the cases with disruption the Design Case demand is considered. Moreover, in the Non Disruption cases of the Security of Supply chapter, the Two Week maximum demand is used. These differences have to be taken into consideration when comparing the various results.

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 sources as 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 Curtailment Rate and where flows are represented by arrows: the thickness of the arrows corresponds to flow, and the utilization of available capacity is indicated by traffic lights.

The remaining flexibility level is indicated by the following colours:

< 20 %	20–40 %	> 40 %

and the curtailment rate level by the following colours

< 10 %	10–20 %	> 20 %

The arrows correspond to the following legend:

0–50 GWh/d	0–80 % of capacity
5–250 GWh/d	80–99 %
250–600 GWh/d	99–100 %
600–1100 GWh/d	
>1100 GWh/d	

At all borders, one single arrow represents the aggregated flow in both directions. This is also valid for the LNG imports where one arrow represents the aggregated inflow to all terminals of all countries. There are however three exceptions to this rule:

- The Slovakia/Ukraine border where separate arrows represent the Export flow from Slovakia to Ukraine and the Ukraine Transit Pipeline flow of Russian gas to Slovakia.
- The Romania/Bulgaria border where separate arrows represent the flow from Indigenous Romanian production using the interconnection between these 2 countries and the flow from Bulgaria to Romania using EastRing pipeline.
- The Greece/Bulgaria border where separate arrows represent the flow from the Trans Balkan Pipeline to Greece and the flow from Greece to Bulgaria via TAP and the IGB.

Picture courtesy of Plinovodi

7.3.1 NON – DISRUPTION CASE

7.3.1.1 Remaining Flexibility and Flows in Non-disruption case

As shown in the following Figures, all countries, with the exception of Croatia in the 2030 low infrastructure scenario, have positive Remaining Flexibility in non-disruption cases. Austria and Slovakia mark the higher values while Croatia has the lower, at the Low infrastructure level case.

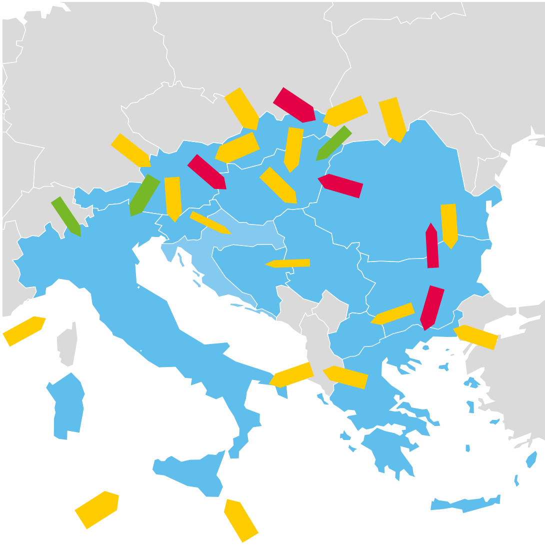
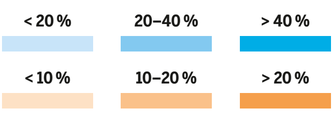


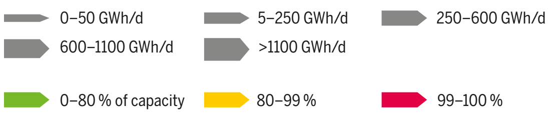
Figure 7.3.1: 2020 Low Non disruption

Figure 7.3.2: 2030 Low Non disruption

Figure 7.3.3: 2020 PCI Non disruption

Figure 7.3.4: 2030 PCI Non disruption





Contrary to the last SC GRIP report where, the Remaining Flexibility was reduced from 2020 to 2030 under the same infrastructure level due to increasing demand and decreasing national production, in the present report we see that in general the Remaining Flexibility increases. This is due to the fact that there are projects having reached the FID status but not due to be commissioned earlier than 2020. Comparing the same year results between the LOW and PCI infrastructure levels, it is the PCI one that shows an increase of the Remaining Flexibility as most of the PCI projects are expected to be commissioned after 2020. In the LOW case, Croatia experiences the lower Remaining Flexibility in 2020 and a substantial Curtailment Rate (CR) (-23 %) in 2030. This is reversed in the PCI case where, compared to the same year LOW case, the Remaining Flexibility increases (2020) or becomes positive again (2030) due to the commissioning of the Krk LNG facility.

Regarding flows, we see that in the non-disruption cases there are cases where the infrastructure is fully utilized, contrary to the results of the previous GRIP where full use of capacity was only noted in the connections between Romania and Hungary, in 2020 and between Bulgaria and Serbia in the 2020 Low case. This difference is mainly due to the change of the demand basis from Average Winter (in the previous SC GRIP) to Two Week (adopted in the current SC GRIP) which assumes higher demand values.

7.3.2 UKRAINE DISRUPTION

The Ukraine disruption case is the one that would have most important consequences on the gas supply of the SC Region as well as further west and 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.

Of the five projects listed in the last SC GRIP, as the ones that would enhance the regional security of supply in case of a Ukraine disruption, one has been commissioned, (2nd upgrade of the Revithoussa terminal – LNG-F-147), one is expected to be operational by end 2020 (TAP – TRA-F-051)[15] while the other three (Interconnection Bulgaria-Serbia – TRA-F-137, Expansion of the Interconnection Slovenia-Croatia – TRA-N-390 and IGB – TRA-F-378) have reported their commissioning dates further forward.

We present here the Ukraine disruption simulation case although the new agreement announced between Russia and Ukraine main gas companies, reached on 30th December 2019 (just one day prior to the expiration of the former long term contract), has considerably diminished the probability of its occurrence, at least for the coming years. Indeed, according to the terms of the deal, 65 bcm have been contractualised to flow through Ukraine in 2020 and then at least 40 bcma from 2021 to 2024. As further element of the agreement, helping to stabilize relationships between the involved parties, there was also the unbundling of Ukraine gas transportation activities, with the creation of a separated TSO (GTS operator of Ukraine) from Naftogaz, in charge of signing Interconnection Agreements at both East and West Ukrainian IPs.

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, according to simulation results, some of the Region's countries lose entirely their Remaining Flexibility and experience Demand Curtailments. 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 relevant additional infrastructure result to lower Remaining Flexibility.

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

Further details are given below, together with the analysis of the flows, for the Low Infrastructure case.

15 In this chapter, TAP is assumed to enter in operation in 2019, in accordance with the TYNDP 2018 data. It is therefore taken into consideration in the assessment of the 2020 cases.

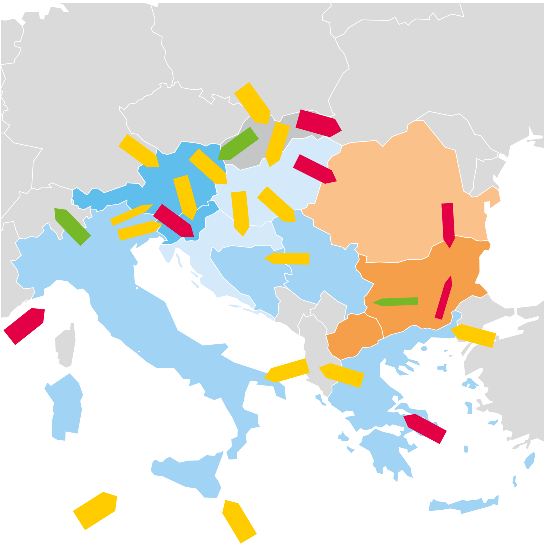


Figure 7.3.5: 2020 Low UA disruption

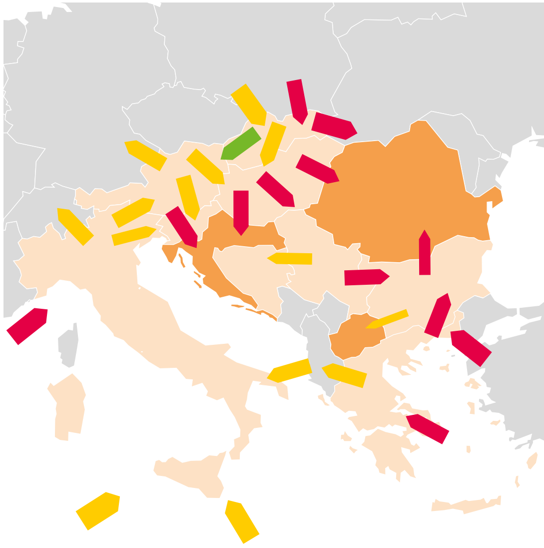


Figure 7.3.6: 2030 Low UA disruption

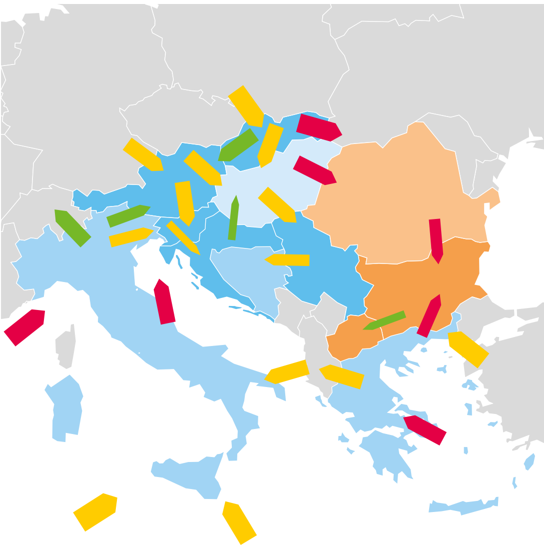


Figure 7.3.7: 2020 PCI UA disruption

Figure 7.3.8: 2030 PCI UA disruption

< 20 % | 20–40 % | > 40 %

< 10 % | 10–20 % | > 20 %

0–50 GWh/d | 5–250 GWh/d | 250–600 GWh/d
600–1100 GWh/d | >1100 GWh/d

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

In comparison with the previous edition of the SC GRIP, we can see that the effect of the Ukrainian disruption, in 2020, is more mitigated.

While in the previous SC GRIP 2017 edition and in the 2020 Low case, seven countries were expected to experience Demand Curtailments, in the present edition this number is reduced to three (Bulgaria and North Macedonia with a CR of 66 % and Romania with a CR of 15 %). There are many factors that have contributed to this mitigation, some of them being the greater flows of gas in Italy, from North Africa and TAP and from the strengthening of the use of LNG (also in Greece) which may have helped to support the Balkan countries with respect to the previous edition of the SC GRIP. Hungary also played a key role in this simulation, with gas flow to Serbia, Croatia and Romania.

In the Low Infrastructure level case the situation worsens in 2025 and even more so in 2030 due to the combination of higher demand and decreased National Production while in the 2030 PCI case all countries show a positive Remaining Flexibility with the exception of North Macedonia. This exception is however due to the Interconnector between Greece and North Macedonia being a PMI project[16] and not a PCI one, therefore it is not considered in the simulations. More specifically, the results per country or group of countries in the Region are as follows:

Bulgaria and North Macedonia

These are the two countries harder hit in case of a Ukraine Disruption, with a Curtailment Rate (CR) of 66 %. In 2025 although the situation worsens in average, it is significantly improved for Bulgaria thanks to the IGB (CR is reduced to 6 %) and marginally for North Macedonia (CR reduced to 59 %). Supply to North Macedonia is considered to take place only through Bulgaria – see footnote No. 16 below).

In the PCI infrastructure level, Bulgaria has a comfortable Remaining Flexibility already in 2025, thanks to the Eastring project[17].

Romania

In 2020 Romania is the third most affected country with a Curtailment Rate of 15 %. In the Low Infrastructure level, the situation would worsen and in 2030 Romania would be the most affected country of the Region, with a CR of 29 % (with the exception of North Macedonia).

In the PCI infrastructure level, thanks to the implementation of the Vertical Corridor projects[18] (in particular BRUA) and the supply from White Stream (TAR-N-053), Romania is expected to have a large Remaining Flexibility.

Serbia

In 2020 Serbia is shown to have a low Remaining Flexibility, in case of a Ukrainian disruption, which is subsequently reduced to the point that Serbia would experience curtailments of demand in 2025 and 2030, in the Low infrastructure level case. However, in the PCI level case, Serbia would have a large Remaining Flexibility thanks to imports from Bulgaria through the new interconnection Bulgaria – Serbia.

Bosnia and Herzegovina, Croatia, Hungary

In 2020 and in the Low Infrastructure level, these three countries are shown to have low but positive Remaining Flexibilities. In 2025 and 2030, Bosnia & Herzegovina remains close to a supply-demand equilibrium but the other two countries would experience demand curtailments (28 % for Croatia and 6 % for Hungary, in 2030).

The situation is inversed in the PCI infrastructure level case, where Croatia receives LNG from the Krk terminal (LNG-F-082) and Hungary receives high capacity flows from Romania.

Italy, Greece

Both countries would have in 2020, in the Low Infrastructure level case, relatively low Remaining Flexibilities. The flexibility margins would no longer exist in 2030 with both countries experiencing possibility of flow curtailments (results from simulation cases indicate low levels of Curtailment Rate).

In the PCI infrastructure level case the picture is better since Greece would have a Remaining Flexibility of 46 %, in 2030, and Italy one of 26 %. This improvement is due to the commissioning of large PCI projects.

Austria, Slovenia, Slovakia

These three countries have the higher Remaining Flexibility in the Region, in 2020 and 2025, even in the Low case. This are however reduced to 6 % in 2030.

In the PCI infrastructure level, they all three have comfortable Remaining Flexibilities, along the period 2020 to 2030, despite the fact that Slovakia supplies Ukraine, as it receives at the same time gas from Poland and the Czech Republic.

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16 PMI: Project of Mutual Interest between a EU member and a member of the Energy Community

17 The Eastring project has a phased commissioning starting in 2023 and finishing in 2028, according to TYNDP 2018

18 The Vertical Corridor is the name of the infrastructure allowing the flow of gas through Greece, Bulgaria, Romania to Ukraine, Moldova, Hungary, Austria as per the MOU signed among X TSOs in the framework of the CESEC initiative

7.3.3 ALGERIAN PIPELINE DISRUPTION CASE

The disruption of the supply from Algeria through the Transmed pipeline[19] does not have an important overall impact on the Region, since it primarily affects Italy with limited knock-on effects on the neighbouring countries.

7.3.2.1 Remaining Flexibility and Flows in Algerian pipe 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 and in the Low case, from 56 % to 36 %.

The lack of gas supplied by the Transmed is replaced, without causing demand curtailments, given that Italy is the country with the higher number of supply options in the SC Region.

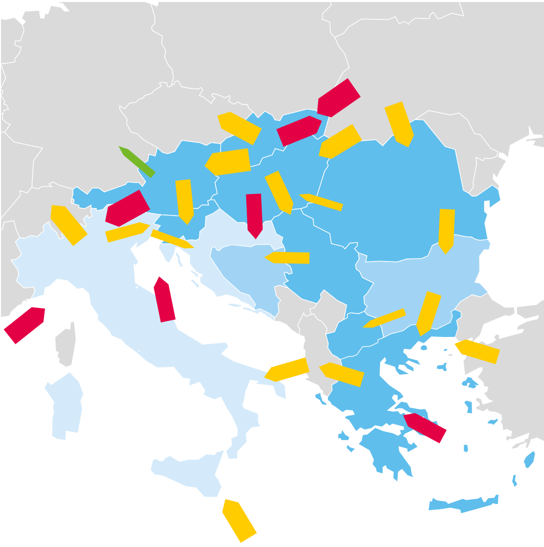

Figure 7.3.9: 2020 Low Algerian pipe disruption

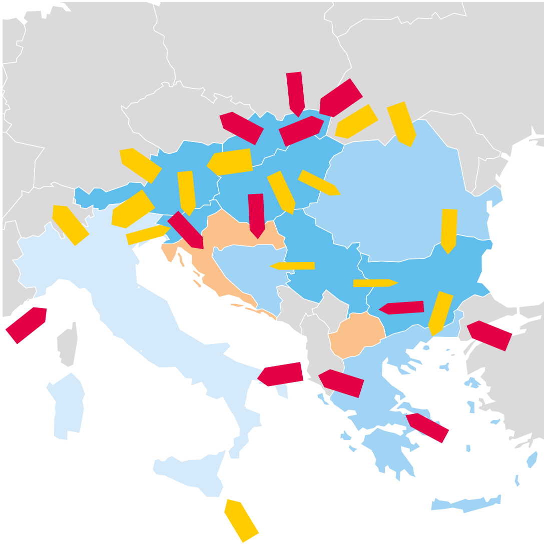

Figure 7.3.10: 2030 Low Algerian pipe disruption

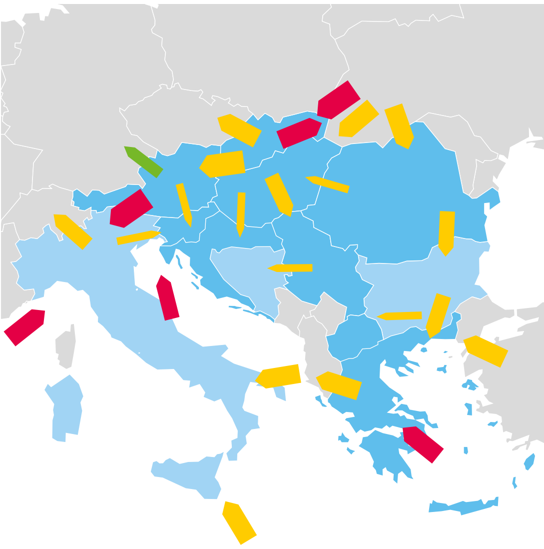

Figure 7.3.11: 2020 PCI Algerian pipe disruption

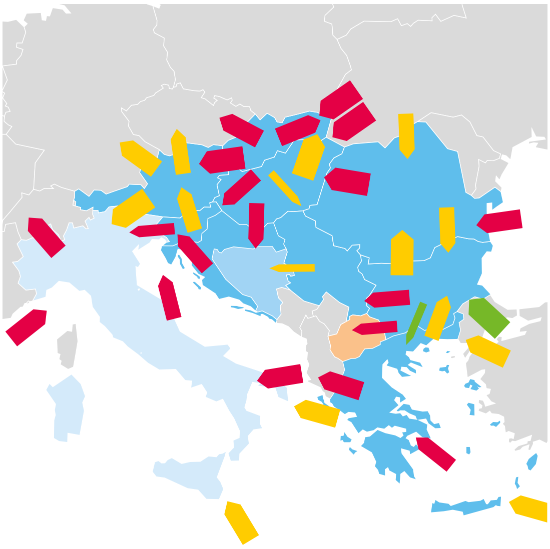

Figure 7.3.12: 2030 PCI Algerian pipe disruption

19 The results take also into account the disruption of the deliveries of Algerian gas through the MEG and MEDGAZ pipelines to Spain

In the Low infrastructure case, mainly Russian gas and LNG replace the Algerian gas. LNG deliveries are maximized to Italy and Greece and, in the PCI infrastructure level case, also to Croatia. On the other hand, flows from Ukraine to Slovakia and from Austria to Italy reach their maximum capacity.

In 2030, the capacity of TAP is fully used in the Low case. In the PCI infrastructure level case we see the entry in operation of the EastMed project, of the White Stream, delivering gas to Romania, and two flow reversals (in comparison with the Low case):

- One, allowing gas delivered in the Krk terminal, in Croatia, to reach Austria, Slovenia and Italy.
- One, showing the operation of the Vertical Corridor with gas flowing from Greece and from Russia (through a southern route) to Bulgaria and from there to Romania and Hungary.

7.4 RESPONSE TO PRICE SIGNALS

In this paragraph we examine how the flows in the Region could change when the supply source prices are modified with comparison to the reference case. The gas sources examined are Russia, LNG and Azerbaijan. The price of one source at a time is maximized by reducing that source's price by the same increment of a standard default amount of 5 €/MWh by then recalculating the flows using the ENTSOG NeMo tool which minimizes 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).

In addition to the flows, the 2018 edition of the TYNDP includes a Market layer in the model, which allows us to also check the impact of infrastructure tariffs and Marginal Price per country, i. e. the price of the last (and hence more expensive) unit of natural gas needed to satisfy that country's demand.

7.4.1 FLOWS

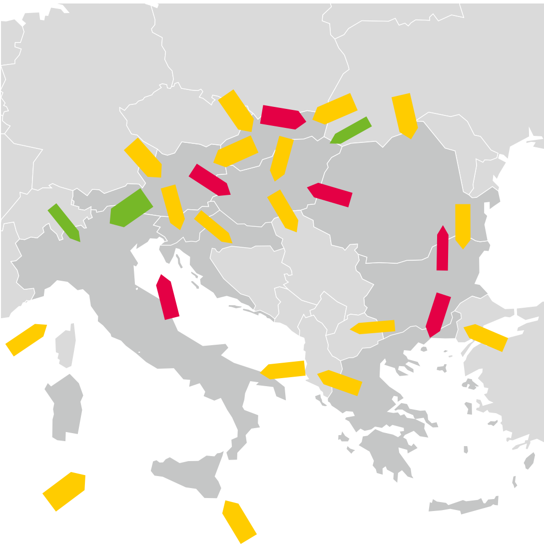

Figure 7.4.1: 2020 Low Reference

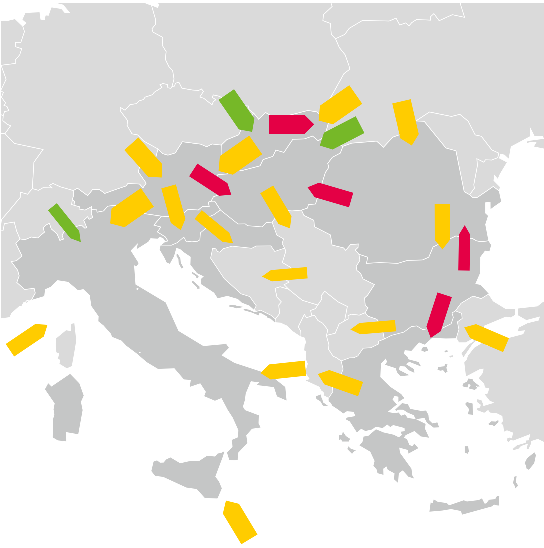

Figure 7.4.2: 2020 Low RU max

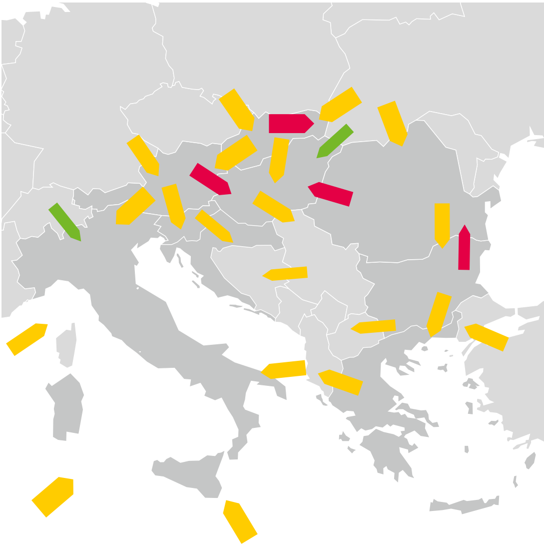

Figure 7.4.3: 2020 Low AZ max

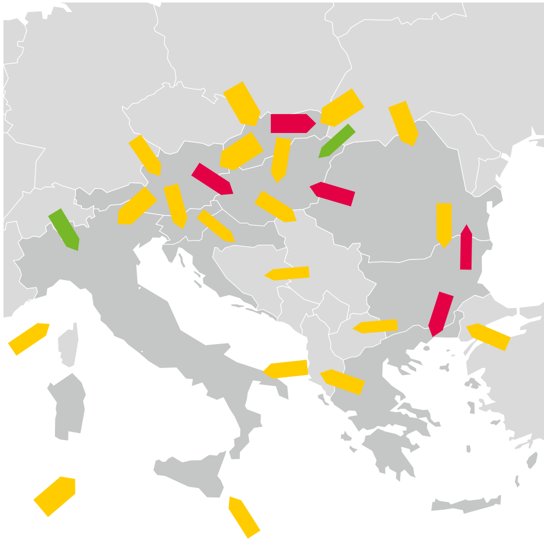

Figure 7.4.4: 2020 Low LNG max

0–50 GWh/d | 5–250 GWh/d | 250–600 GWh/d | 600–1100 GWh/d | >1100 GWh/d

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

Comparing the Reference Case with the three max cases (RU, AZ, LNG), we note that:

- In the case of RU max, we see, in all periods, a reduction of the LNG deliveries to Italy and Croatia and an increase of the flows from Ukraine via Slovakia to Austria and Italy. In the 2020 PCI case the Algerian pipe gas flow to Italy is reduced to zero while in all 2020 cases there is no LNG supply to Greece.

  In 2030 the increase of flows from Austria to Italy is less increased as (in the PCI case) the deliveries from the Levantine basin, through the Poseidon pipeline, compete with the Russian gas deliveries. Moreover, (in the PCI case) there is a decrease of the deliveries of Turkmen gas, via the White Stream project, to Romania.
- In the case of AZ max, we do not see a relevant impact in 2020, given the relatively low capacity of the Trans-Adriatic Pipeline in ramp-up phase, while more effect can be detected when the route will reach its current maximum potential (e.g. reductions of flows from Norther EU to Italy).
- In the case of LNG max, we see (in the PCI cases) an increase of the LNG imports to Greece, explained by the addition of the FSRU terminal in Northern Greece.

Some of the simulation flows appear less straightforward to apprehend than in the previous TYNDP, mainly due to the introduction of tariffs. This leads in some cases to simulated flows that are equal to zero, as the cheapest route is chosen in priority. There is a major assumption with the tariffs, which are maintained equal to today's value, for the full period of the assessment. This does not factor in potential evolution due to economic adaptation. The modelling also does not take into account potential renewal of long-term capacity booking after their expiry, or new long-term capacity booking that could be signed in the future.

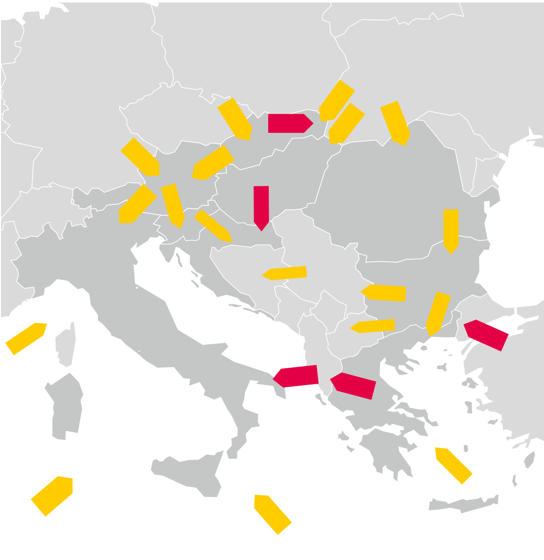

Figure 7.4.5: 2030 Low Reference

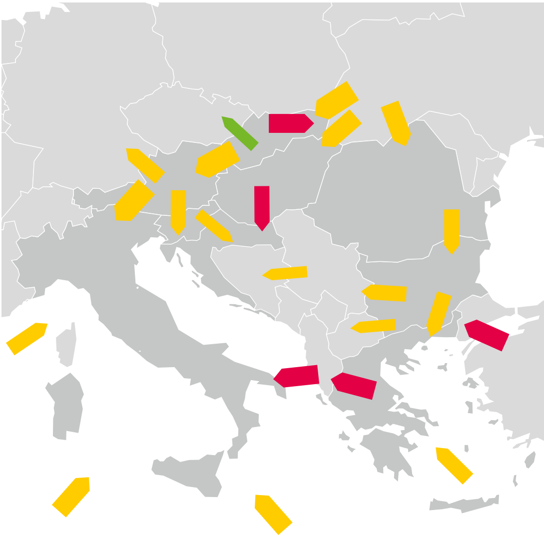

Figure 7.4.6: 2030 Low RU max

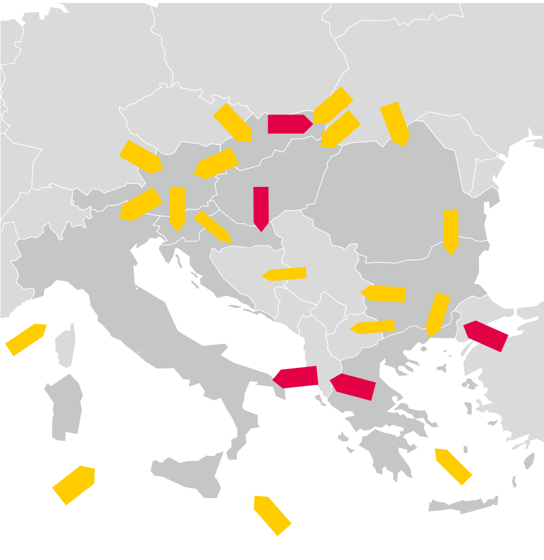

Figure 7.4.7: 2030 Low AZ max

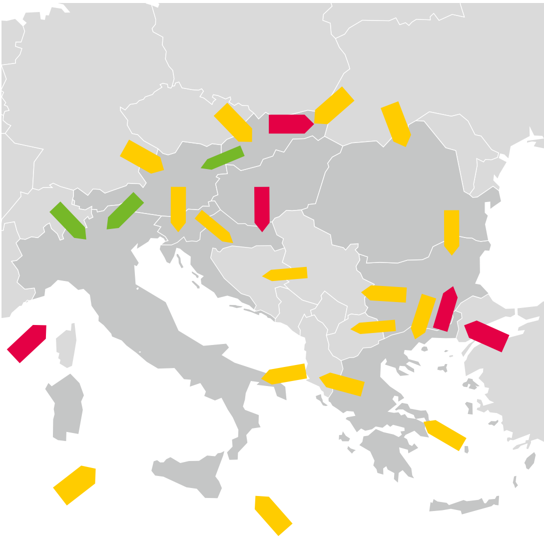

Figure 7.4.8: 2030 Low LNG max

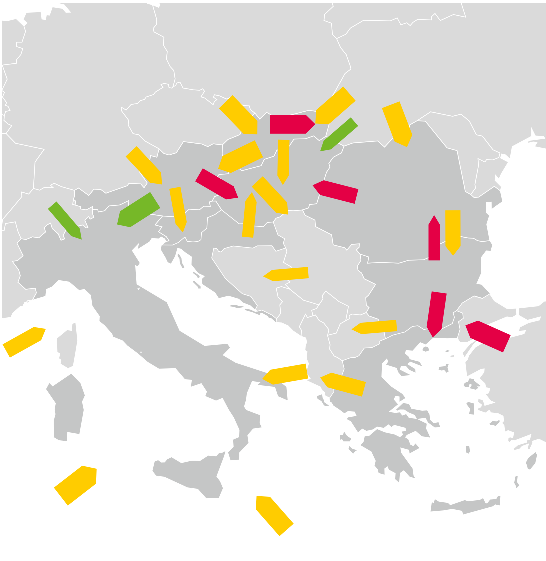

Figure 7.4.9: 2020 PCI Reference

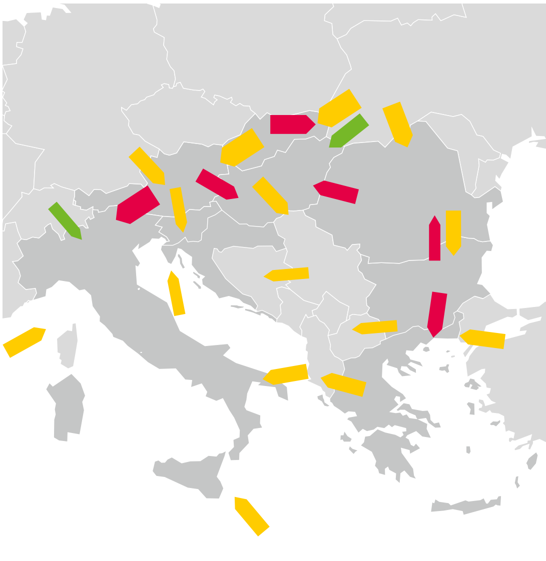

Figure 7.4.10: 2020 PCI RU max

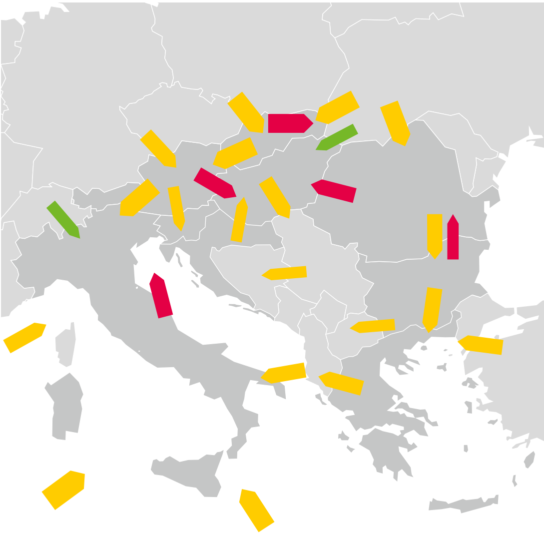

Figure 7.4.11: 2020 PCI AZ max

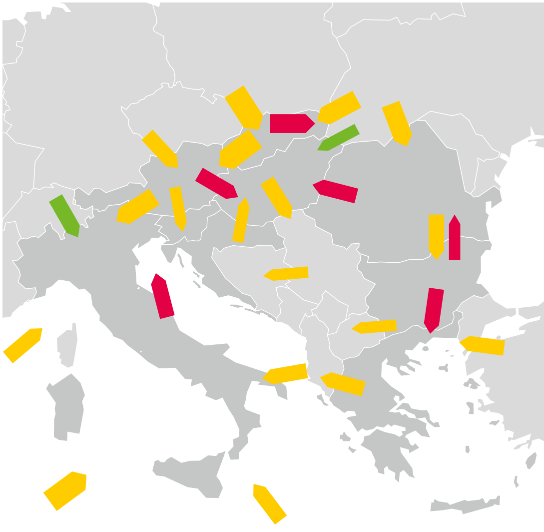

Figure 7.4.12: PCI LNG max

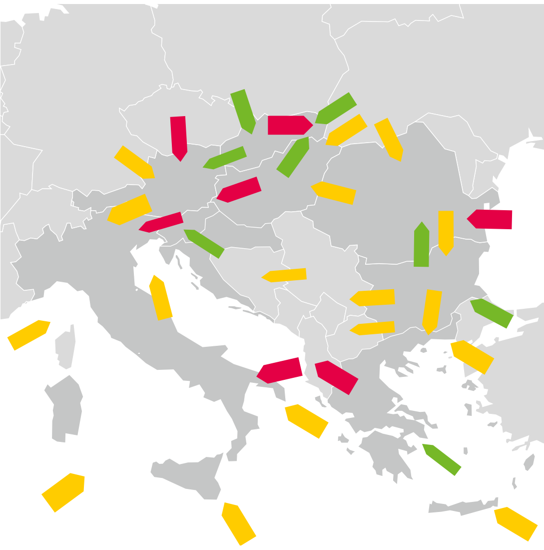

Figure 7.4.13: 2030 PCI Reference

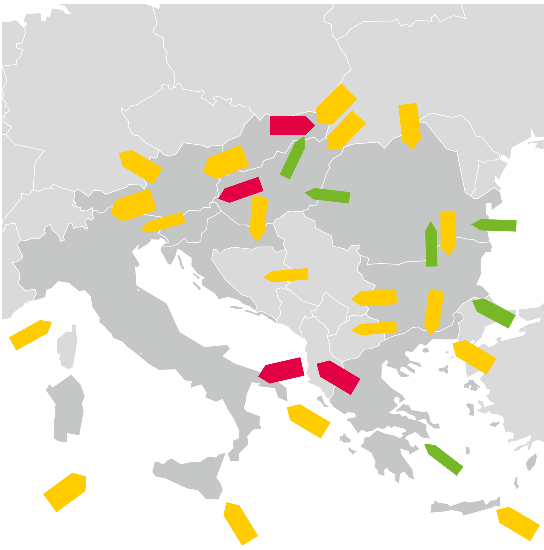

Figure 7.4.14: 2030 PCI RU max

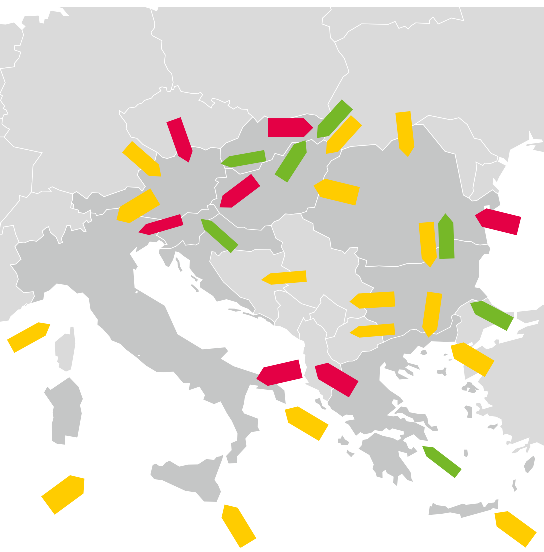

Figure 7.4.15: 2030 PCI AZ max

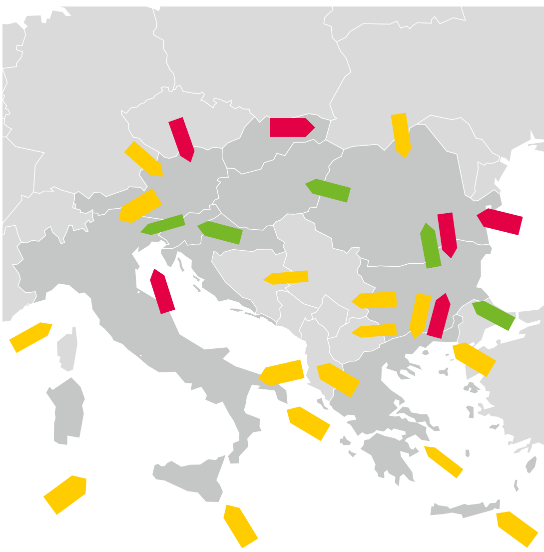

Figure 7.4.16: 2030 PCI LNG max

7.4.2 MARGINAL PRICES AND MARKET INTEGRATION

The Marginal Price in each country is affected, in the cases examined in two ways:

- With the reduction of the price of one source.
- With the increase of the interconnections ensured by the completion of more projects, either by changing the Infrastructure level or by extending the time horizon thus allowing more projects to reach their commissioning date.

The price reduction may or may not affect the Marginal Price of one country depending on whether the source in question is the one that provides the last cubic meter of gas needed to satisfy the needs of a country ("marginal source"). As the value of the Marginal Price also depends on the level of the transportation tariffs of the systems used, by the source concerned, the reduction in the Marginal price is always lower than the 5 €/MWh. It is even possible, on an individual country level to have an increase of the Marginal Price in case the reduction in price of a selected source will make that source more attractive to neighbouring countries, obliging the system in question to import, even small quantities, of more expensive gas to balance its demand. Given the above, we propose to use, the Average Standard Deviation of the Marginal Prices Difference in all countries of the region as an indicator to assess the impacts on the degree of Market Integration resulting from the different Network infrastructure and price configurations analyzed (presented in the following graph).

The conclusions we can draw from this graph are the following:

- The average standard deviation of the marginal prices is reduced when the Infrastructure Level is increased thanks to more projects being progressively commissioned.
- The same value is even more decreased for the more distant time horizon, where again the number of project reaching the operations phase increases.

Both these reductions indicate a higher degree of market integration brought by the commissioning of more interconnection projects. As there are few PCI project expected to be in operation in 2020, in accordance with the TYNDP 2018, the impact of the 2030-time horizon is more pronounced than that of the Infrastructure level.

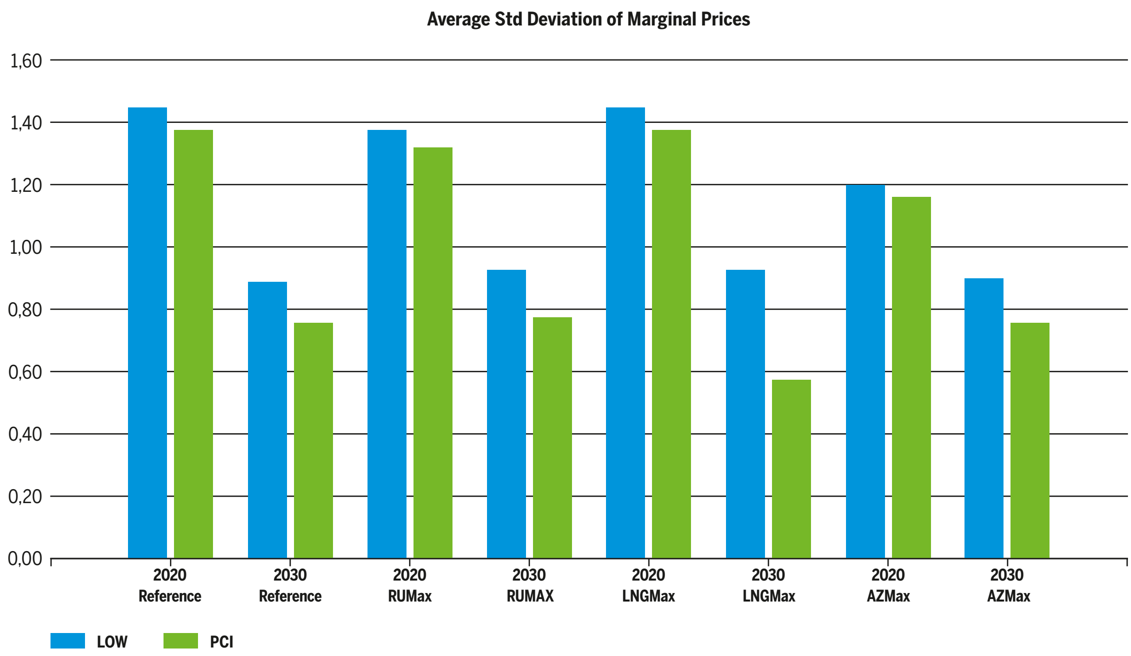

Figure 7.4.17: Average Standard Deviation of Marginal Prices for the SC countries plus Norh Macedonia, Serbia and Bosnia & Herzegovina

8 CONCLUSIONS

The present publication of the "Southern Corridor Gas Regional Investment Plan" is the fourth 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 third 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 the "Network Assessments" chapter, where we show modelling results relevant to evaluate the Regional security of supply levels and the potential 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 a 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 national 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. Nevertheless, the gas production volume in all producing countries of the Region follows a decreasing trend, if we do not take into account the prospects for the discovery of new fields in the Black Sea (Bulgaria and Romania) as well as the prospects for supplying Europe with the gas from new fields already discovered (Cyprus).

- 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 will be strongly affected by the construction of any of the big transmission projects and are prepared to adapt their infrastructure investments to such possibilities.

Furthermore, the present GRIP is providing a complete overview of the gas demand trends in the past few years and those expected in the next 10 years, analysing the current situation. We notice stable to slight increase in total gas demand in the region in both areas – final demand and power generation. In many countries the gas can immediately replace more polluting energy carriers as a quick contribution to the climate ambitions. This positive effect can be enhanced in the medium term thanks to an increased use of natural gas in the energy mix providing the flexibility needed to integrate progressively higher shares of variable renewable energy sources such as wind and solar into the electricity system. Finally, renewable and decarbonised gases (such as hydrogen, biomethane and synthetic methane) will be part of the future hybrid energy mix to achieve the 2050 decarbonisation targets in a cost-efficient way thanks to the use of existing and planned gas infrastructure.

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 is expected to be commissioned in 2020 and with any project that will serve the same rationale.

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 some of the non-FID projects are also needed to ensure a complete redress as well as improved levels of supply diversification. 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 and overall Europe’s markets new sources of gas, are the most promising since they would increase supply diversification with positive effects in terms both of Security of Supply and Market Integration.

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 while contractual congestion is a very limited phenomenon, expected to progressively improve with the expiration of legacy contracts.

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.

DEFINITIONS

Term	Definition
Number formatting , .	 Coma (,) is used as a 1000 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 occur-rence 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 situa-tion, 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 pro-moter(s) has(have) taken the Final Investment Decision.
Import	means the supply of gas at the entry of the Europe-an network as defined by this GRIP or gas delivered at the entry of a Zone.
Interconnection Point	means a point of interconnection between two dif-ferent 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 a notion related to the assessment of Net-work Resilience; it refers to the ability of a Zone to offer additional room for supply arbitrage; the value of the Remaining Flexibility is bench-marked 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 de-velopment which is the basis for generating con-crete value sets covering demand or supply.

Term	Definition
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	BOTAS Petroleum Pipeline Corporation (Turkey)
CAM	Capacity Allocation Mechanisms
CCGT	Combined Cycle Gas Turbine
CEE	Central Eastern Europe
CEGH	Central European Gas Hub
CESEC	
CMP	Congestion Management Procedures
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CR	Curtaiment Rate
CS	Compressor Station
DC	Design Case
DN	Nominal Diameter
DSO	Distribution System Operator
EC	European Commission
ENTSO-G	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
RF	Remaining Flexibility
RES	Renewable Energy Sources
SC	Southern Corridor
SCP	South Caucasus Pipeline
SOCAR	State Oil Company of Azerbaijan Re-public
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

COUNRY CODES (ISO)

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	North Macedonia
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

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 2018. The Southern Corridor GRIP contains TSOs' own assumptions and analysis based upon this information.

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