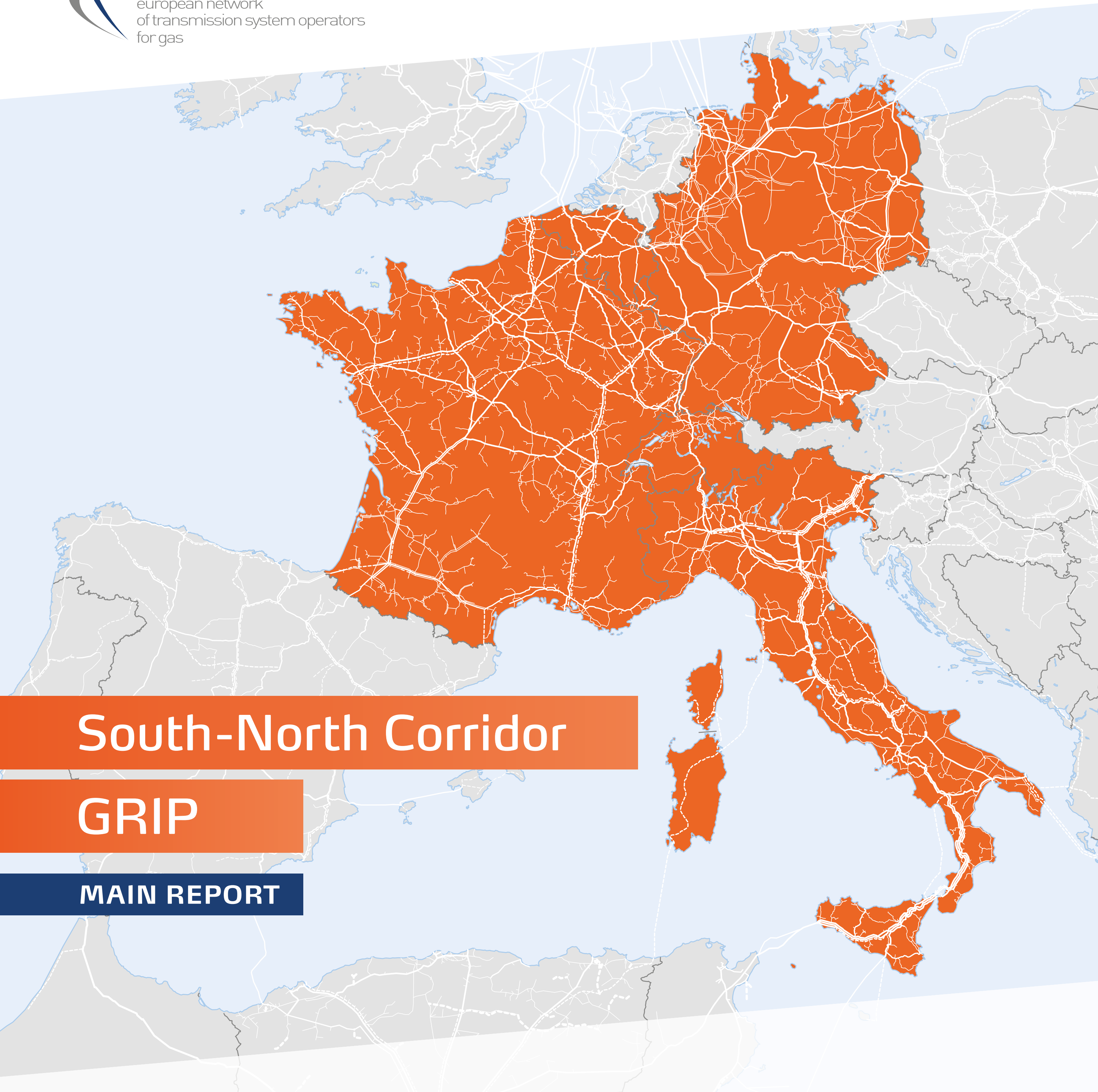
european network
of transmission system operators
for gas

GAS REGIONAL INVESTMENT PLAN 2017



South-North Corridor

GRIP

MAIN REPORT

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GRTgaz Open Grid Europe The Gas Wheel SNAM RETE GAS SWISSGAS terranets bw

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Foreword

On behalf of the Transmission System Operators (TSOs) of the Region, we are pleased to introduce the South-North Corridor Gas Regional Investment Plan (SNC GRIP) 2017. This is the third edition, building further on the previous editions of the SNC GRIP, while also complementing the Ten-Year Network Development Plan (TYNDP) 2017 published by ENTSOG in December 2016.

The SNC GRIP is the result of close cooperation between TSOs in the six countries of the European region made up of Italy, Belgium, France, Germany, Luxembourg and Switzerland (the SNC Region). The coordination of this document was facilitated by Fluxys and Snam Rete Gas (Regional coordinators).

This South-North Corridor GRIP aims at giving stakeholders a deeper understanding of existing infrastructure and possible future market and project developments within the Region. Special attention is paid to the evolution towards commissioning of the so-called South-North Corridor Reverse Flow projects in Italy, Switzerland, Germany and France aiming at opening the South-North Corridor and making available new sources of gas to Europe as a whole.

The TSOs of the Region believe that this document will provide useful information to stakeholders to support an informed discussion on assessing the ability of investment projects to answer specific Regional and overall European market needs, and welcome further comments from them aiming at improving future editions of this report.

Marco Alverà

CEO, SNAM

Pascal De Buck

Managing Director & CEO, Fluxys

Executive Summary and Conclusions

The 3rd South-North Corridor Gas Regional Investment Plan (SNC GRIP) highlights the progressive advancements of the Reverse Flow projects completing the link between Southern and Northern Europe in a bi-directional, commercially effective and physically secure way. The first SNC GRIP edition (2012) introduced the initiatives needed to complete the interconnections between South and North Europe and while the second SNC GRIP release (2014) fully described the advancements of these projects, this third SNC GRIP accompanies the Reverse Flow infrastructures in Italy, Switzerland, Germany and France along the remaining steps towards a near future commissioning.

The South-North Corridor Region (SNC Region) spans from Italy to Belgium and Luxembourg while crossing the backbone of the continent along the Swiss route towards Germany and France. Considering its position at the heart of the European Union, the SNC Region is vital for the creation of the internal gas market. Therefore, **the realisation of the South-North Corridor, as a bi-directional interconnector at the crossroads of the major current and future gas import routes, marks the accomplishment of a main milestone for the completion of the internal energy market.**

Image courtesy of Fluxys

In comparison with the previous editions of the SNC GRIP, additional efforts have been made to improve the quality level of the different analyses, summarised here below according to the structure of the publication:

- **Chapter 2** provides an overview of the **supply sources** available to the SNC Region, with indications of their historic weights and trends, as well as their potential developments driven by the decline of indigenous production in North-West Europe, and potential developments related to the new Southern Corridor route, Nord Stream enhancements and LNG market evolutions. In the same chapter, the report analyses the potential **infrastructural advancements** based on the ENTSOG TYNDP 2017 projects planned in the next 20 years.
- **Chapter 3** captures the main elements related to the evolution of the natural gas markets in the countries belonging to the South-North Corridor. The analysis hinges on the national historical and forecasted **demand trends** (based on the same data set as the ENTSOG TYNDP 2017 and the scenario storylines identified therein), and the **market zone performances** in terms of volumes and prices registered at the hubs in the Region.
- **Chapter 4** represents the most innovative section of this 3rd GRIP edition, recalling the common **European energy strategy** dimensions and the individual **national energy policy frameworks**. This section acts as a bridge between the market and infrastructure elements of the first part of the SNC GRIP and the second part of the Report, dedicated to the role that the Region and the South-North Corridor projects can play in fulfilling the internal energy market objectives.
- **Chapter 5** frames the dimensions of the EU energy policy in a Regional context. Specifically, this section illustrates how the SNC Region can help to materialise the benefits identified at European level as references for the evaluation of the gas infrastructure, in particular security of supply, market integration and competitiveness. **The role of the South-North Corridor as a bridge between new needs and new sources** is crucial since it represents a connecting axis between the NW Region – affected by an accelerated decrease of the national productions – and the Southern Corridor Region – having the potential for supplying Europe with new routes and sources – as witnessed also by the **Projects of Common Interest** planned in the Region.
- Consistent with both previous SNC GRIP editions, **Chapter 6** starts with the identification of the **rationales behind the South-North Corridor**, identifying its specific benefits in terms of security of supply, competition and gas markets integration, and the need for complementing the historic North-South flow patterns. The chapter continues with the **description of the Reverse Flow projects in Italy, Switzerland, Germany and France**, highlighting their major characteristics and advancements towards commissioning.
- **Chapter 7** is dedicated to **network modelling** with specific simulation exercises carried out using the ENTSOG Network Modelling tool (NeMo) and the same input data as in TYNDP 2017. Simulations are always performed at a European-wide scale, but closer attention is given to the South-North Corridor assessment, taking a deep dive in those specific cases which show different reverse-flow configurations of the South-North Corridor infrastructure.
- Finally, **Chapter 8** is dedicated to the **planned country-specific infrastructure developments** over the next years, including descriptions of recent developments and progress of major market and network development projects. Some of the described initiatives appear complementary to the South-North Corridor and might be necessary for the full exploitation of its potential, as concluded also by the simulation cases presented in chapter 7.

This 3rd SNC GRIP report again welcomes all stakeholders' possible suggestions for further improving the next edition. For this purpose, a specific feedback form closes the publication.

1 Introduction

Image courtesy of Snam Rete Gas

This report represents the 3rd Gas Regional Investment Plan (GRIP) produced by the Transmission System Operators (TSOs) from the countries currently composing the South-North Corridor (SNC) Region: Italy, Belgium, France, Germany, Luxembourg and Switzerland.

This SNC GRIP 2017 builds on the Ten Year Network Development Plan 2017 produced by the European Network of Transmission System Operators for Gas (ENTSOG TYNDP 2017) and existing National Plans within the SNC Region.

The document aims at providing a specific overview of the infrastructure evolution (pipelines, storage facilities and LNG plants) of the SNC Region together with an outlook on regional supply and demand as fundamental elements of the European gas market.

The projects description covers in detail the initiatives constituting the South-North Corridor by allowing physical reverse flow transmission capacity from Italy through Switzerland to Germany and France, complemented by a country-based overview presenting other projects of regional relevance. The list of infrastructure projects belonging either to regional TSOs or third party promoters and the Report itself have been developed ensuring the highest degree of consistency possible with the Community-wide ENTSOG TYNDP 2017, national TSO development plans and other Regions' GRIPs.

Compared to the previous editions and considering the energy transition plans under development for the progressive decarbonisation of European economies, a special focus to the energy policy frameworks has been dedicated, where the key role of natural gas for an economically and environmentally sustainable future clearly emerges.

LEGAL BASIS

The publication of this Gas Regional Investment Plan is a legal obligation for TSOs of establishing regional cooperation within ENTSOG, based on the European Directive 2009/73/EC Article 7 and further detailed by Regulation (EC) 715/2009 Article 12.

STRUCTURE OF THE REPORT

The report is structured according to the following main sections:

- Supply and Infrastructure
- Demand and market analysis
- The European energy strategy and the National energy policy frameworks
- The role of the Region in the development of EU gas infrastructure and the internal market
- The South-North Corridor projects
- Network modelling
- Other TSO transmission projects in the Region


Image courtesy of Swissgas

TSOs CONTRIBUTING TO THE SNC GRIP

The following table lists the TSOs that actively participated to the drafting of this report ("co-authors").

INVOLVED TSOs		
BELGIUM	Fluxys Belgium SA	FLUXYS BE
FRANCE	GRTgaz	GRTgaz
GERMANY	Fluxys Deutschland GmbH	FLUXYS NEL
	Fluxys TENP GmbH	FLUXYS TENP
	Open Grid Europe GmbH	Open Grid Europe The Gas Wheel
	terranets bw GmbH	terranets bw
LUXEMBOURG	Creos Luxembourg S.A.	creos
ITALY	Snam Rete Gas S.p.A.	SNAM RETE GAS
SWITZERLAND	FluxSwiss Sagl	FLUXSWISS
	Swissgas – Schweizerische Aktiengesellschaft für Erdgas	SWISSGAS

Table 1.1: The list of TSOs contributing to the South-North Corridor GRIP 2017

The works on the 3rd edition of the South-North Corridor Grip have been jointly coordinated by Fluxys and Snam Rete Gas.

2 Supply and Infrastructure

Image courtesy of Snam Rete Gas

2.1 Introduction

This chapter is divided in two main sections:

The first contains an overview of the supply sources available to the Region, with indications of their weights in the past years followed by envisaged high level overview of potential future evolutions according to major elements which may alter the current flow patterns.

The second summarises the projects planned in the next 20 years in the Region based on ENTSOG TYNDP 2017, split up for the three traditional infrastructure categories – transmission, storages and LNG terminals – and analysed according to different perspectives, such as development status and main technical features.

2.2 Supply Sources

Thanks to its favourable position at the heart of Europe, the SNC Region can benefit from a high diversification of supply sources, with gas imports both through pipeline and LNG tankers.

LNG terminals allow by nature the arrival of gas from different parts of the world, while the pipeline imports into the Region are mostly coming from the following countries:

- Russia
- Libya
- Algeria
- Norway
- Netherlands
- United Kingdom

In this subchapter, the weight of these supply contributions to the SNC Region is evaluated, and a comparison between the previous SNC GRIP (based on volumes in 2012) and the current situation (based on the calendar years 2014 and 2015) is provided.

The graph in Figure 2.1 illustrates the breakdown of the total amount of natural gas imports with reference to the above-mentioned supply sources, based on net aggregated volumes entering the Region in 2014 and 2015.

Image courtesy of Creos

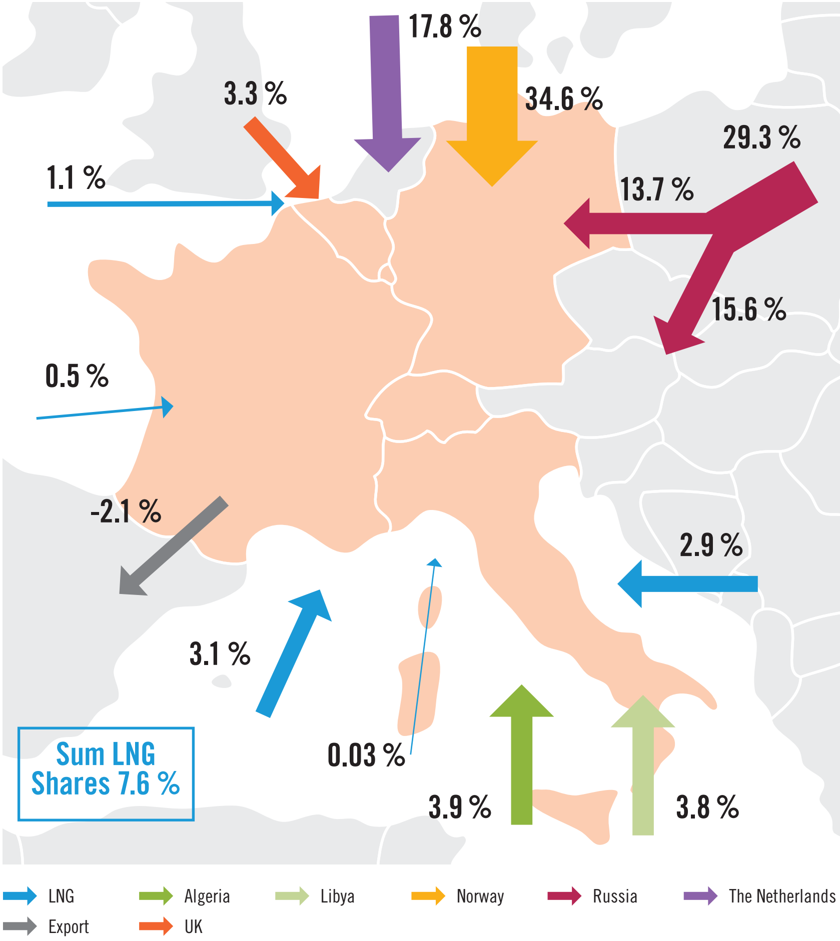


Figure 2.1: Geography and supply sources of the SNC Region in years 2014–2015
(Source: ENTSOG data collection based on information from TSOs)

In order to create the above supply diagram, the following assumptions have been made:

- For each supply source shown, the netted flows entering the region were determined.
- The figure for Russia is split up into the net flows to Germany (northern part) and to Italy (southern part) through Austria.
- The figure for Norway covers the direct supply from the Norwegian fields to Germany, Belgium and France minus the exits to Denmark.
- The figure for the Netherlands represents the gas entering Belgium and Germany through the different IPs connecting them with the Netherlands. These volumes comprise both high calorific and low calorific gas.
- The figure for the United Kingdom corresponds to the net flows through the Interconnector from the United Kingdom to Belgium.

Norway, Russia and the Netherlands are historically the countries that contribute most to the external supply of the Region, covering over 80 % of total imports. For the period 2014-2015, volumes from Norway covered around 36 % of total import into the Region, while Dutch imports represented around 18 %. Total imports from Russia remained stable over the last years (around 29 %), with the southern route to Italy (through Ukraine) taking over some share (around 4 %) from the northern route to Germany (through Belarus and Nord Stream) compared to the volumes represented in the previous GRIP edition (2012).

Imports from Northern Africa (Algeria and Libya) have declined over the last years, with a shift from over 12 % in 2012 to 7.7 % for the period 2014–2015. This decrease can be completely attributed to the Algerian imports, with Libya remaining stable.

Looking at LNG imports, the share of gas volumes coming from this source to all terminals in the Region combined, showed a slight decrease from 9 % in 2012 to 7.6 % in the period 2014–2015. This reduction is mainly related to a decrease of LNG deliveries in Western Italy (Panigaglia and Livorno terminals) and Western France (Montoir de Bretagne terminal).

The supply share distribution depicted above gives an interesting view of the supply dynamics for the SNC Region over the observed period of 2014 to 2015. Whether this picture will remain the same will depend on elements like the evolution of market signals, infrastructure developments, source reserves and external events, which could realistically change over the next few years. Some specific topics worth mentioning that could have an impact on the future supply composition of the Region are:

- Declining indigenous production in the Netherlands and the United Kingdom, requiring replacement by alternative sources.
- Project developments related to the connection of the Region with new supply sources like Azerbaijan, the Black Sea and the Middle East, enabling South-North Corridor/Southern Corridor flows.
- The Nord Stream 2 project as a potential doubling of the direct supply capacity from Russia to Germany (although probably as a replacement of the Ukrainian route).
- Evolutions in the global LNG market, specifically related to the United States becoming a net exporter of gas and, in general, to the new liquefaction capacity going to be commissioned in other producing countries, causing a potential wave of cheap LNG for the whole of Europe.

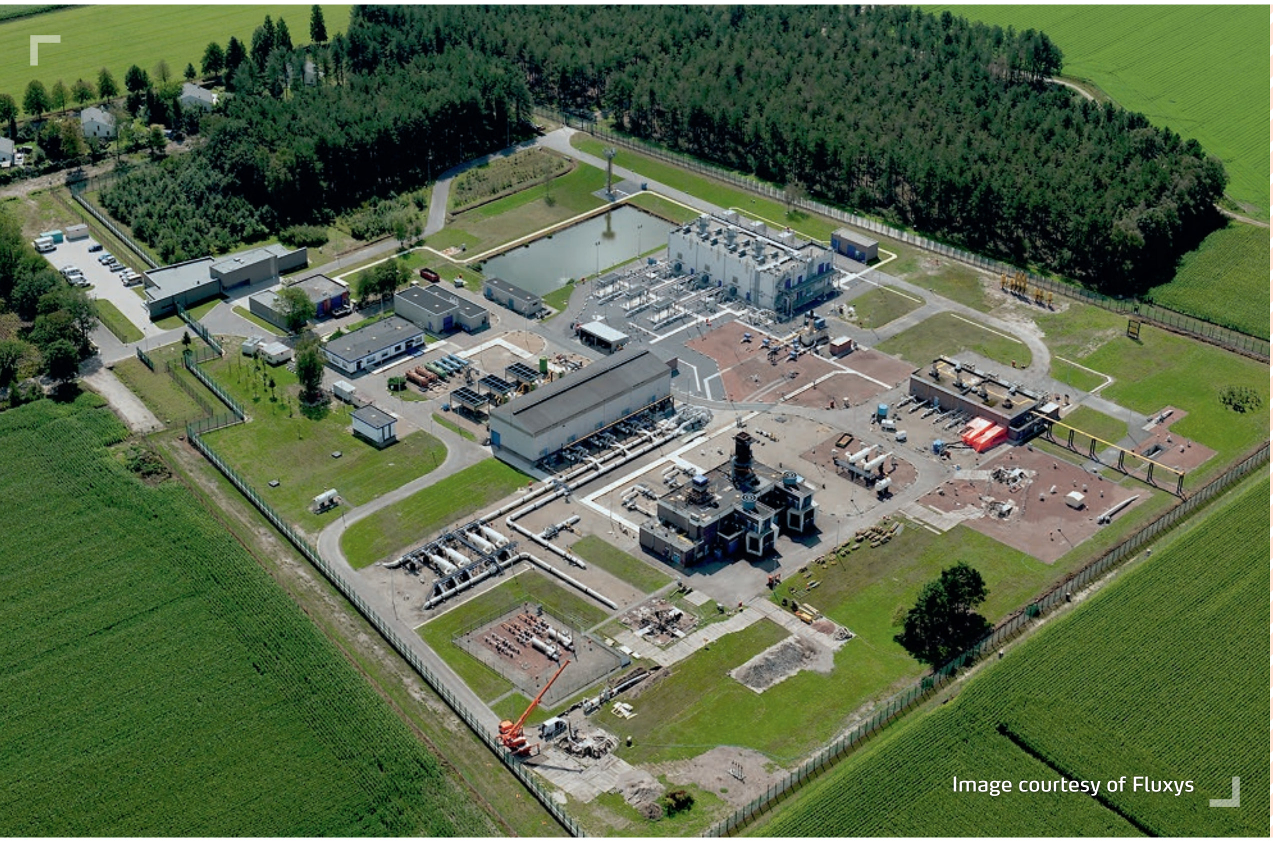


Image courtesy of Fluxys

2.3 Infrastructure Projects in the Region

On the basis of the data collected by ENTSOG from April to May 2016 for TYNDP 2017 on infrastructure projects in Europe, the countries of the South-North Corridor Region are expected to host 54 investment projects in the next two decades, 23.1% of the total number of projects forecast in the whole EU (234).

Looking at the breakdown per country and asset type shown in Figure 2.2, it is possible to observe how Germany is the country with the higher number of projects (22), followed by Italy (16) and France (12). A smaller number of projects is foreseen also in Belgium (3) and Switzerland (1), while no initiatives are currently planned in Luxembourg. Storage infrastructural development is foreseen only in Italy, while LNG projects are equally shared between Belgium, France and Italy.

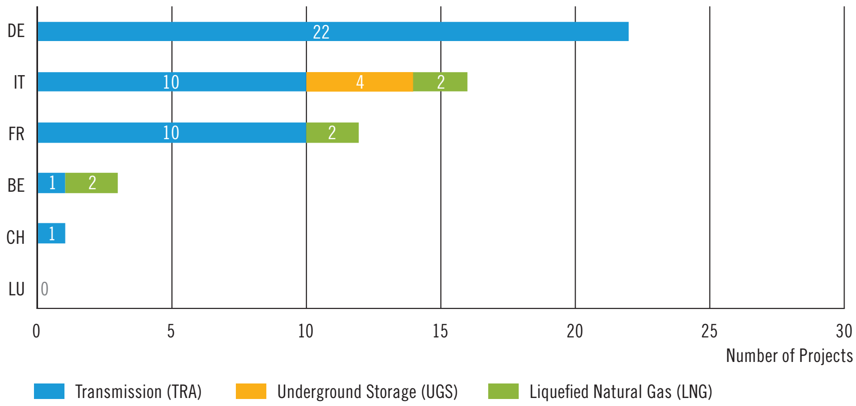


Figure 2.2: Country distribution of projects in the South-North Corridor Region (Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

Using the terminology of ENTSOG TYNDP, the projects can be further divided into three different categories related to their development status:

- "FID projects" – Final Investment Decision taken;
- "non-FID advanced projects" – in case 1) the project will be commissioned by the 31st December 2022 at the latest and 2a) the permitting phase of the project has started before the 1st April 2016 or 2b) FEED has started or the project has been selected for receiving CEF grants for FEED before the 1st April 2016;
- "non-FID less-advanced projects" – non-FID projects, not fulfilling all conditions for the "advanced projects" status.

According to this classification, the pie chart in Figure 2.3 illustrates the number of projects in the South-North Corridor Region, combined with the category of asset (transmission networks, storage sites, LNG regasification plants) and the development status.

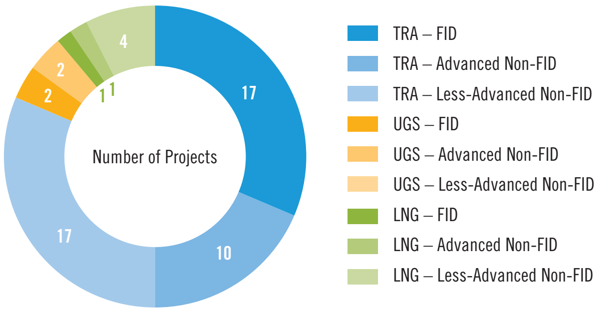


Figure 2.3: Number of infrastructure projects per class (LNG, storages, pipelines) and status (FID, advanced non-FID and less-advanced non-FID) in the South-North Corridor Region (Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

Transmission networks projects cover 81,5 % of the total amount (44 projects), while storage and LNG regasification show lower percentages, 7.5 % (4 projects) and 11 % (6 projects) respectively.

In general, the projects are equally distributed among the different statuses, although "FID" projects cover a higher percentage in transmission network and storage projects, while the most frequent status for LNG projects is "Less advanced non-FID".

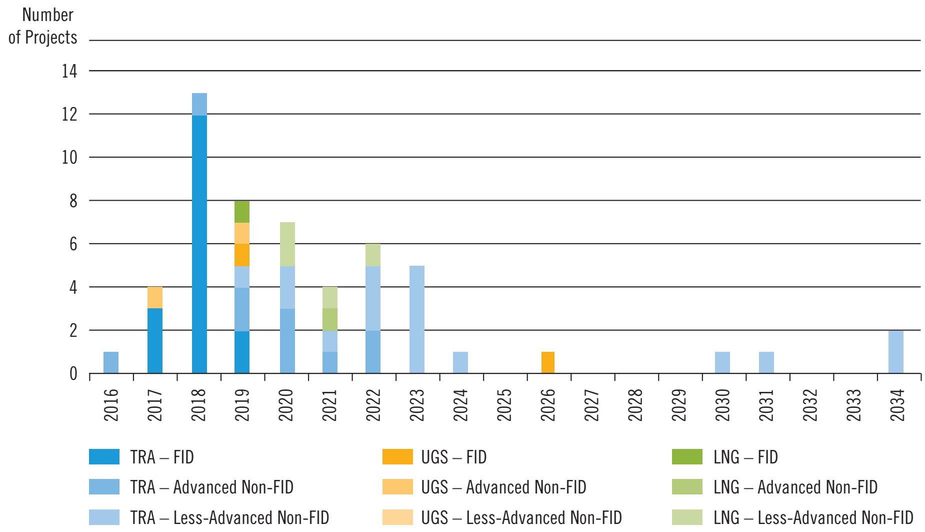


Figure 2.4: Temporal distribution of infrastructure the projects per class (LNG, storages, pipelines) and status (FID, advanced non-FID and less-advanced non-FID) in the South-North Corridor Region (Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

Considering the expected commissioning date for each project, Figure 2.4 shows that 2018 will be the year in which the highest number of projects is foreseen to go into operation (corresponding to the year of commissioning of the reverse flow project between Italy, Switzerland, France and Germany). The expected commissioning dates for LNG terminals or expansion projects range from 2019 to 2022, while storage facilities are declared to become operational within a broader time span (2016–2026). Transmission projects are positioned in an intermediate time horizon, with FID and more advanced projects obviously being closer to commissioning.

2.3.1 TRANSMISSION NETWORKS

The greatest part of the projects planned in the next two decades in the South-North Corridor are related to the development of the transmission networks (new pipelines, compressor stations, adaptation of existing infrastructure, etc.).

A detailed list of the projects belonging to this asset category is compiled in Table 2.1. This table is filled using information collected by ENTSOG by May 2016 for TYNDP 2017 purposes.

TRANSMISSION PROJECTS

Project Promoter	Name	TYNDP Code	FID Status	Commissioning
bayernets GmbH	MONACO section phase I (Burghausen-Finsing)	TRA-F-241	FID	2017
	VDS Wertingen	TRA-N-340	Non-FID (L. Adv.)	2019
FluxSwiss	Reverse Flow Transitgas Switzerland	TRA-F-230	FID	2018
Fluxys Belgium	L/H Conversion	TRA-N-500	Non-FID (Adv.)	2020
Fluxys TENP GmbH & Open Grid Europe GmbH	Reverse Flow TENP Germany	TRA-F-208	FID	2018
Galsi S.p.A.	GALSI Pipeline Project	TRA-N-012	Non-FID (Adv.)	2019
GASCADE Gastransport GmbH	NOWAL – Nord West Anbindungsleitung	TRA-F-291	FID	2017
	EUGAL – Europaeische Gasanbindungsleitung (European Gaslink)	TRA-N-763	Non-FID (Adv.)	2019
Gastransport Nord GmbH	Oude(NL)-Bunde(DE) GTG H-Gas	TRA-N-949	Non-FID (L. Adv.)	2020
Gasunie Deutschland Transport Services GmbH	Embedding CS Folmhusen in H-Gas	TRA-N-951	Non-FID (L. Adv.)	2020
	Transport of gas volumes to the Netherlands	TRA-N-808	Non-FID (Adv.)	2021
	Additional East-West transport NL	TRA-N-809	Non-FID (L. Adv.)	2023
	GUD: Complete conversion to H-gas	TRA-N-955	Non-FID (L. Adv.)	2030
Gasunie Deutschland, NEL Gastransport, Fluxys Deutschland	Expansion NEL	TRA-N-807	Non-FID (Adv.)	2020
GRTgaz	Val de Saône project	TRA-F-43	FID	2018
	Reverse capacity from CH to FR at Oltingue	TRA-F-45	FID	2018
	Gascogne-Midi: adaptation of stations in Cruzy and St Martin	TRA-F-391	FID	2018
	Reverse capacity from France to Germany at Obergailbach	TRA-N-047	Non-FID (L. Adv.)	2022
	Developments for Montoir LNG terminal 2.5 bcm expansion	TRA-N-258	Non-FID (L. Adv.)	2022
	Developments for Fosmax (Cavaou) LNG 8.25 bcm expansion	TRA-N-269	Non-FID (L. Adv.)	2022
GRTgaz and TIGF	Iberian-French corridor: Eastern Axis-Midcat Project	TRA-N-256	Non-FID (L. Adv.)	2024

TRANSMISSION PROJECTS				
Project Promoter	**Name**	**TYNDP Code**	**FID Status**	**Commissioning**
GRTgaz Deutschland GmbH	CS Rothenstadt	TRA-F-337	FID	2018
	West to East operation of the IP Waidhaus	TRA-F-753	FID	2018
	CS Rimpar	TRA-N-755	Non-FID (L. Adv.)	2023
GRTgaz, GRDF and Storengy	Adaptation L- gas - H-gas	TRA-N-429	Non-FID (Adv.)	2018
Natural Gas Submarine Interconnector Greece–Italy Poseidon S.A	Poseidon Pipeline	TRA-N-010	Non-FID (Adv.)	2020
NEL Gastransport, Fluxys Deutschland, Gasunie Deutschland	Extension Receiving Terminal Greifswald	TRA-F-768	FID	2017
Nord Stream 2 AG	Nord Stream 2	TRA-F-937	FID	2019
ONTRAS Gastransport GmbH	Upgrade IP Deutschneudorf and Lasow	TRA-N-814	Non-FID (Adv.)	2016
Open Grid Europe GmbH	Pipeline project “Schwandorf-Finsing”	TRA-F-343	FID	2018
	Compressor station “Herbstein”	TRA-F-344	FID	2018
	Compressor station “Werne”	TRA-F-345	FID	2018
	ZEELINK	TRA-N-329	Non-FID (L. Adv.)	2021
	Compressor station “Legden”	TRA-N-825	Non-FID (L. Adv.)	2023
Snam Rete Gas S.p.A.	Support to the North West market and bidirectional cross-border flows	TRA-F-214	FID	2018
	Development for new import from the South (Adriatica Line)	TRA-N-007	Non-FID (L. Adv.)	2023
	Interconnection with Slovenia	TRA-N-354	Non-FID (L. Adv.)	2023
	Import developments from North-East	TRA-N-008	Non-FID (L. Adv.)	2034 *
	Additional Southern developments	TRA-N-009	Non-FID (L. Adv.)	2034 *
Società Gasdotti Italia	LARINO - RECANATI Adriatic coast backbone	TRA-N-974	Non-FID (Adv.)	2022
	Sardinia Gas Transportation Network	TRA-N-975	Non-FID (L. Adv.)	2031
TIGF	South Transit East Pyrenees (STEP) – TIGF	TRA-N-252	Non-FID (Adv.)	2022
TIGF – GRTgaz	Gascogne Midi	TRA-F-331	FID	2018
Trans Adriatic Pipeline AG	Trans Adriatic Pipeline	TRA-F-051	FID	2019

*assumed by ENTSOG for TYNDP modelling purposes

Table 2.1: List of transmission projects [Adv.: advanced; L. Adv.: less-advanced]
(Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

Figure 2.5 illustrates the geographical distribution of the pipeline projects within the South-North Corridor in terms of number and length (expressed in km). It shows that the greatest extension of the transmission network is expected in Italy (almost 50 % of the total length), while Germany and France equally share the remaining half of the new pipelines length. In Belgium and Switzerland, the planned transmission network projects don't entail the installation of new pipelines.

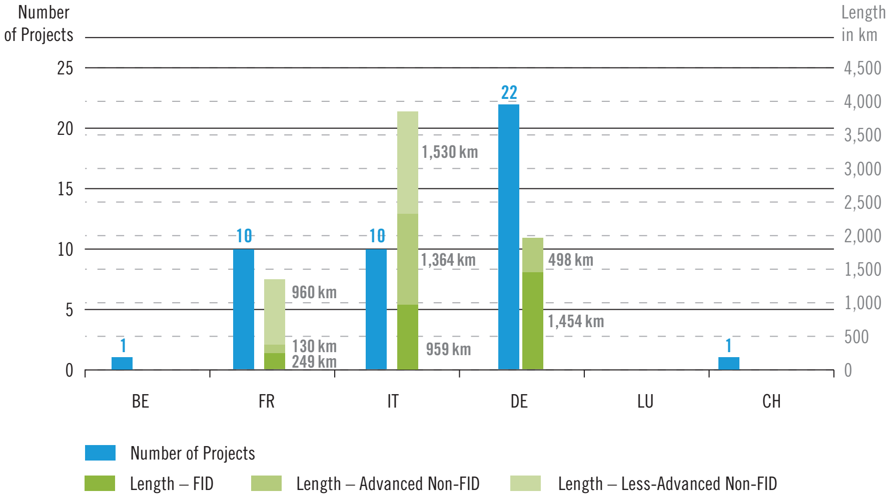


Figure 2.5: Number and length of transmission projects in the South-North Corridor Region per status (Source: ENTSOG data collection based for TYNDP 2017 on information submitted by TSOs and other project promoters)

2.3.2 STORAGE SITES

With regard to storage facilities, Italy is the only country of the Region that is expected to host infrastructure developments in the next decades.

The detailed list of the projects is available in Table 2.2.

STORAGE PROJECTS

Project Promoter	Name	TYNDP Code	FID Status	Commissioning
STOGIT S.p.A.	Bordolano Second phase	UGS-F-1045	FID	2019
	System Enhancements - Stogit - on-shore gas fields	UGS-F-260	FID	2026
Edison Stoccaggio S.p.A.	Nuovi Sviluppi Edison Stoccaggio	UGS-N-235	Non-FID (Adv.)	2017
	Palazzo Moroni	UGS-N-237	Non-FID (Adv.)	2019

Table 2.2: List of storage projects [Adv.: advanced; L. Adv.: less-advanced]
(Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

The total working gas volume that will be obtained through these projects amounts to around 2.9 bcm.

2.3.3 LNG REGASIFICATION PLANTS

For LNG related projects, the 6 planned projects are equally distributed between Belgium, France and Italy.

The detailed list is reported in Table 2.3.

REGASIFICATION PROJECTS				
Project Promoter	**Name**	**TYNDP Code**	**FID Status**	**Commissioning**
Fluxys LNG	Zeebrugge LNG Terminal – 5th Tank & 2nd Jetty	LNG-F-229	FID	2019
	Zeebrugge LNG Terminal – 3rd Jetty	LNG-N-742	Non-FID (L. Adv.)	2022
Nuove Energie S.r.l.	Porto Empedocle LNG	LNG-N-198	Non-FID (Adv.)	2021
Gas Natural Rigassificazione Italia	Onshore LNG terminal in the Northern Adriatic	LNG-N-217	Non-FID (L. Adv.)	2021
Elengy	Montoir LNG Terminal Expansion	LNG-N-225	Non-FID (L. Adv.)	2020
Fosmax LNG	Fos Cavaou LNG Terminal Expansion	LNG-N-227	Non-FID (L. Adv.)	2020

Table 2.3: List of LNG projects [Adv.: advanced; L. Adv.: less-advanced]
(Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

Figure 2.6 illustrates the distribution of the new potential regasification capacity among the countries of the Region, with the biggest number for Italy (52 %), followed by France (35 %) and Belgium (12 %). A similar trend can be seen analysing the projects in terms of storage capacity, with very similar percentages for the three countries (50 % for Italy, 34 % for France and 15 % for Belgium).

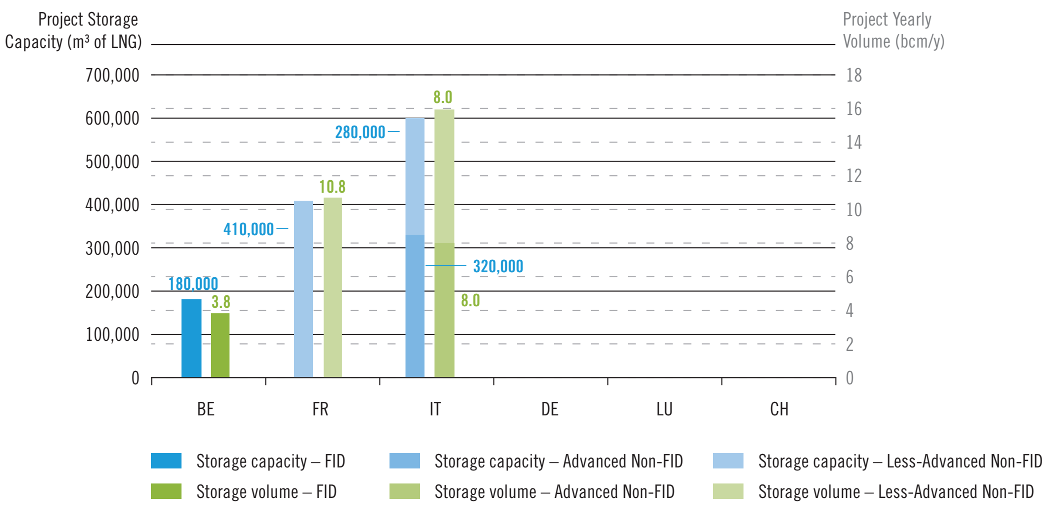


Figure 2.6: Regasification capacity and storage capacity of LNG projects in the South-North Corridor Region
(Source: ENTSOG data collection for TYNDP 2017 based on information submitted by TSOs and other project promoters)

3 Demand and Market Analysis

Image courtesy of Fluxys

3.1 Introduction

The aim of this chapter is to provide useful elements to understand the evolution of the natural gas market in the countries belonging to the South-North Corridor.

The analysis of historical data and of future market trends, both at a regional and continental level, represents the basis for the planning and construction of new infrastructures. Consequently, a proper interpretation of these data is one of the key factors to understand the current configuration of the gas infrastructure as well as future enhancements of transmission networks, storage facilities and LNG plants.

The chapter is structured as follows:

- In the first section, **historical data** related to the annual average demand are shown, with a description of the current situation and a comparison with previous years; data are presented in order to highlight both trends concerning all the countries of the Region, and also the demand breakdown into different consumption sectors (residential/industrial and power generation).
- In the second part, a natural gas **demand forecast** for the next twenty years is given, both in terms of annual average demand and annual peak demand.
- A third final section deals with the analysis of the **markets** in the Region, focusing on different hub performances in terms of volumes and prices.

All the data used for the demand analysis have been sent by the TSOs to ENTSOG in 2016 for the data collection for TYNDP 2017. The data are not temperature-corrected.

3.2 Historical Demand Analysis

3.2.1 ANNUAL DEMAND

Figure 3.1 illustrates demand data for the calendar year 2015, with the aggregated demand of the South-North Corridor Region representing approximately 50 % of the total demand of the EU-28 countries. The same graph shows the consumption of the South-North Corridor countries as a percentage of the total European consumption, while the Regional demand breakdown between the six countries of the Region is illustrated in Figure 3.2.

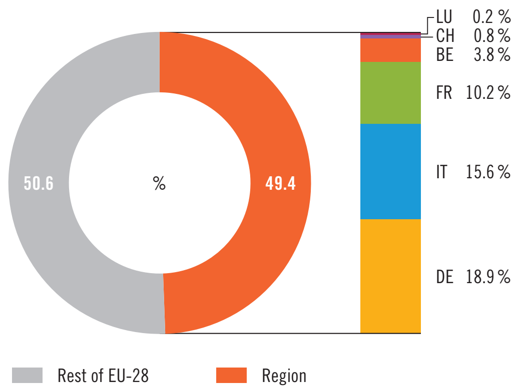


Figure 3.1: Relative weight of Regional gas demand in 2015
(Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs)

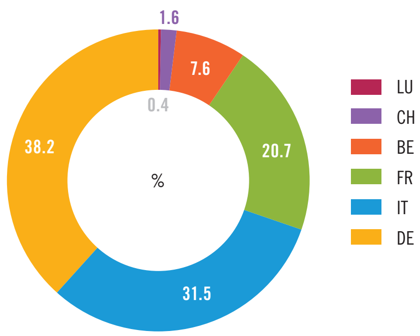


Figure 3.2: Relative breakdown of Regional gas demand in 2015
(Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs)

Figure 3.3 indicates the consumption of most of the European countries for calendar years 2014 and 2015 as a percentage of the total European demand. A slight increase can be observed in the percentage of total EU demand between the two years for the countries of the South-North Corridor, while some countries of Eastern Europe (i.e. Austria, Poland, Romania and Croatia) and Northwestern Europe (the United Kingdom, Ireland, the Netherlands and Denmark) saw a slight decrease in share between 2014 and 2015.

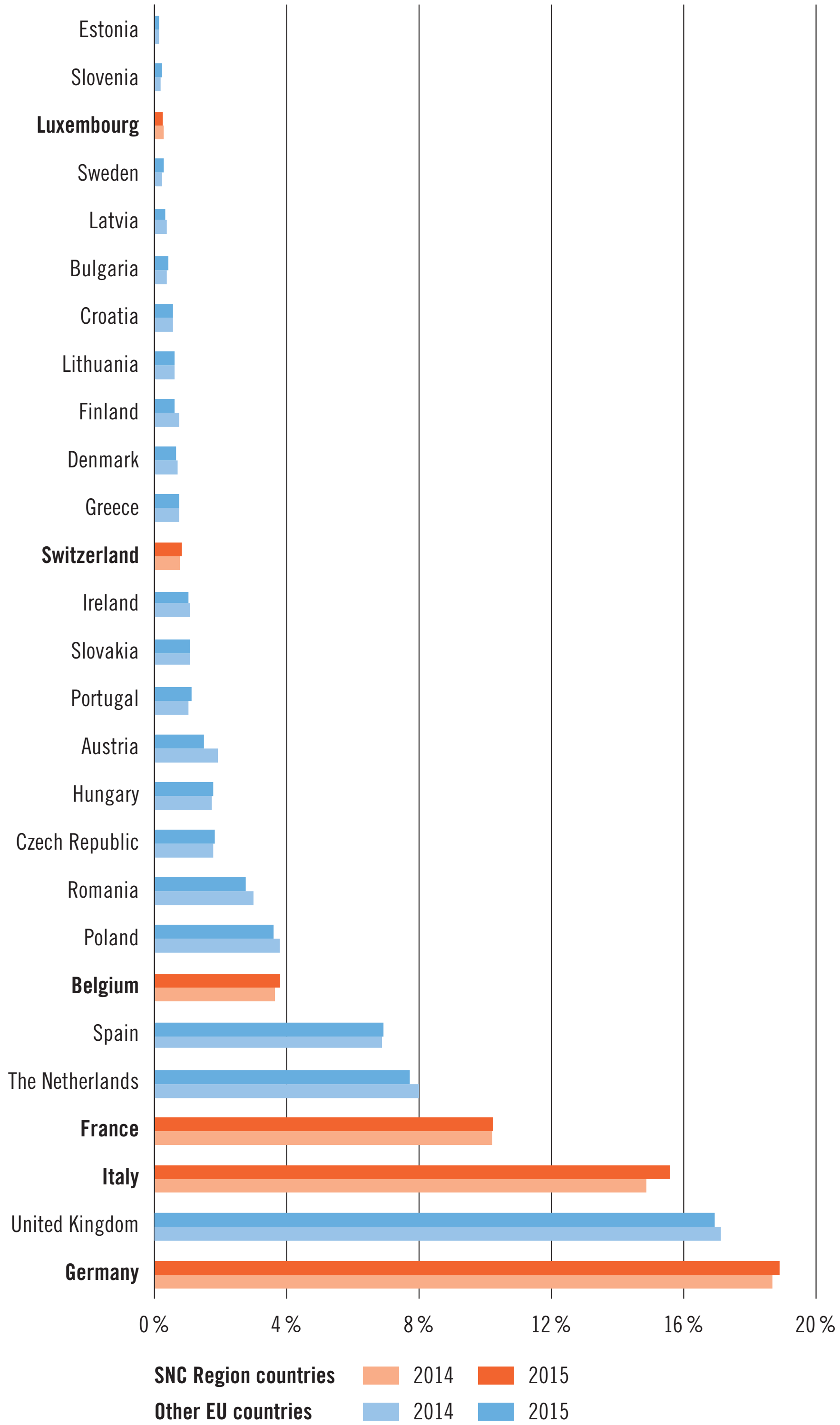


Figure 3.3: Country-based gas demand in 2014 and 2015 as percentage of total EU demand (Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs)

Figure 3.4 illustrates the trend of total annual demand between 2010 and 2015, for both the countries of the South-North Corridor and the rest of EU-28 countries. A general consumption decrease occurred over the entire period, with demand shrinking from about 6,000 TWh/y in 2010 to approximately 4,500 TWh/y in 2015 (–19 %), with a slight recovery in the last year of the time span.

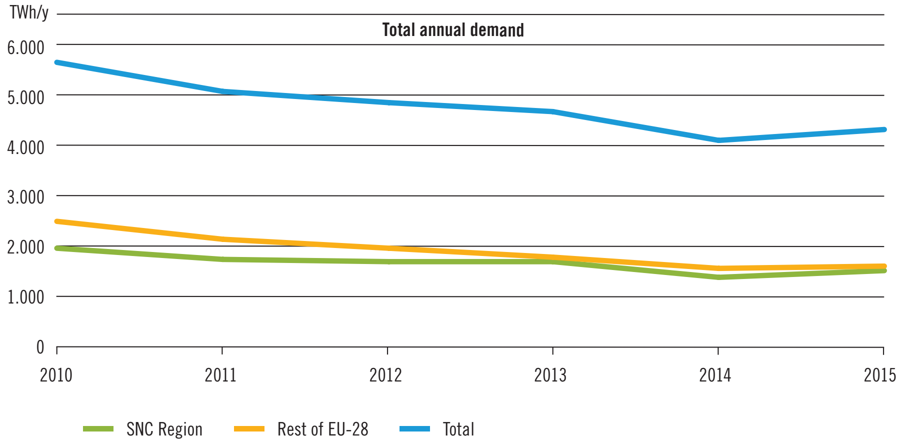


Figure 3.4: Evolution of total annual demand between 2010 and 2015
(Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs, without temperature correction)

Nevertheless, the percent variation of the total annual demand at European level reached positive values between 2014 and 2015, as illustrated by the graph in Figure 3.5. This upward trend was driven primarily by the South-North Corridor consumption, which registered a 6 % increase in demand over the last two-year period, being significantly above the average demand growth of the rest of EU-28.

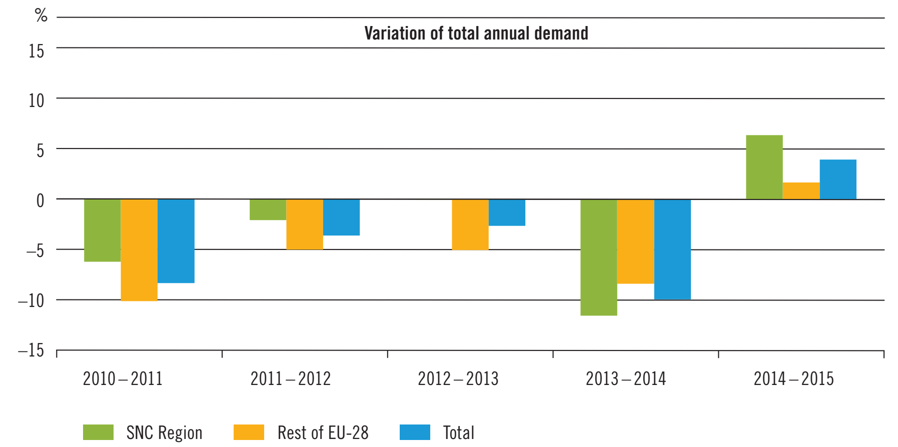


Figure 3.5: Yearly variation of total annual demand between 2010 and 2015
(Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs, without temperature correction)

This trend is confirmed by analysing the evolution of the total demand for all the countries of the South-North Corridor (Figure 3.6). It is possible to identify a trend reversal between 2014 and 2015, with a general increase in total demand for all the countries considered (with the slight exception of Luxembourg).

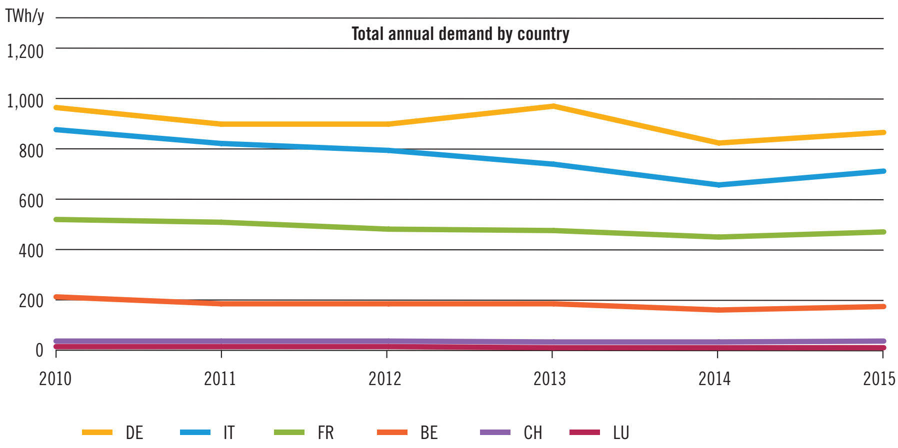


Figure 3.6: Evolution of total annual demand between 2010 and 2015 for the countries of the South-North Corridor Region (Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs, without temperature correction)

3.2.2 DEMAND BREAKDOWN

In this paragraph, the data regarding the total annual demand for the period 2010–2015 are analysed splitting them into different consumption sectors. Accordingly with the data gathered by ENTSOG for TYNDP 2017, the following two categories have been considered:

- final demand (residential, commercial, industrial and transportation)
- power generation demand

The graphs in Figure 3.7, Figure 3.8 and Figure 3.9 illustrate the total annual demand breakdown into the above-mentioned categories, for the South-North Corridor countries, the rest of EU-28 countries and the whole of EU-28, respectively.

Based on the graphs to the right, the amount of gas used for power generation in the South-North Corridor has been relatively higher than the one consumed for the same purposes in the other EU-28 countries. Furthermore, in the last years the demand for power generation in the South-North Corridor decreased with a very small rate, if compared to the considerable decline registered by the demand for power generation in the other EU-28 countries.

Image courtesy of Fluxys

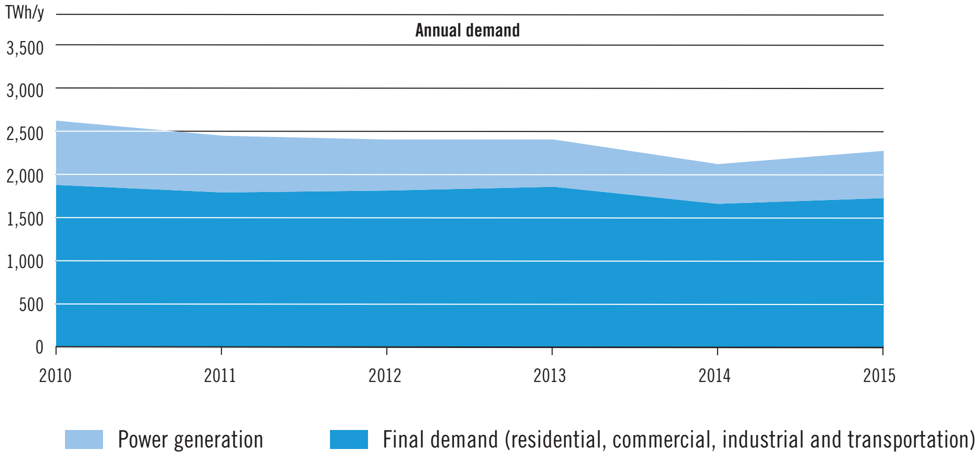


Figure 3.7: Breakdown of total annual demand between consumption sectors in the countries of the SNC Region (Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs, without temperature correction)

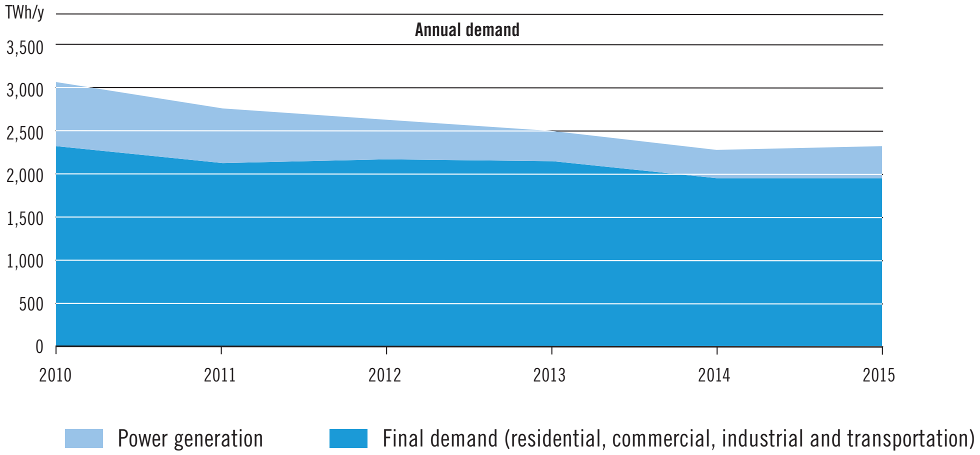


Figure 3.8: Breakdown of total annual demand between consumption sectors in the other EU-28 countries (Source: ENTSOG data collection for TYNDP 2017 based on information from TSOs, without temperature correction)

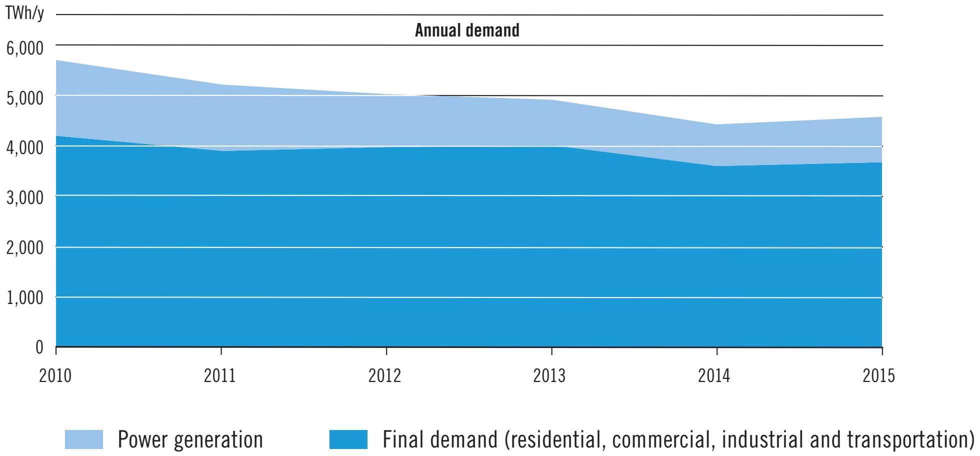


Figure 3.9: Breakdown of total annual demand between consumption sectors in the countries of EU-28 (Source: ENTSOG data collection based for TYNDP 2017 on information from TSOs, without temperature correction)

The graph in Figure 3.10 shows the evolution between 2010 and 2015 of the share of demand used for power generation, as a percentage of the total annual demand, in the South-North Corridor, in the other EU-28 countries and in all of EU-28. This percentage saw a sharp decline in the previous years, and decreased from 26 % in 2010 till 18 % in 2013 at European level. Starting from 2015, it then registered a trend reversal with an increase to 19.5 % of total demand.

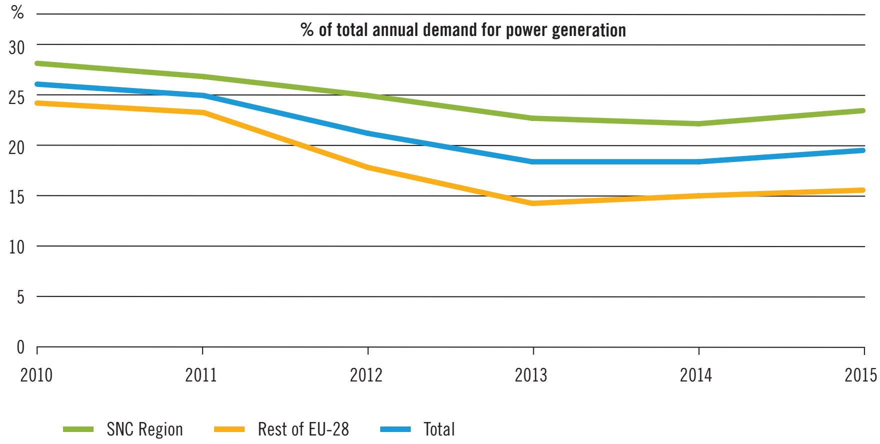


Figure 3.10: Evolution of the share of total demand used for power generation between 2010 and 2015 (Source: ENTSOG data collection based for TYNDP 2017 on information from TSOs, without temperature correction)

Figure 3.11 shows the breakdown between the share of demand used for final customers and for power generation in 2015 among the South-North Corridor countries. It can be seen that Italy was the country that used a larger share of its consumption in order to produce electricity (31 %), due to the absence of nuclear plants, the relatively low reliance on coal and to the relatively recent building-up of last generation combined-cycle gas turbine (CCGT) power plants. A slightly lower share (26 %) is registered in Belgium and Germany, that can be explained considering that these two countries can also use nuclear energy and/or coal in addition to gas as traditional electricity generation sources. For power generation Luxembourg used a share of about half of that used by the previous countries (13 %)[1)], mainly because the percentage of electricity importation, especially from German side covers an important share. France stood at 9 % thanks to its great use of nuclear as base load power source, while, for similar reasons, Switzerland is the only country in the Corridor that did not use natural gas for power generation. The average of the other EU countries in 2015 reached 16 %.

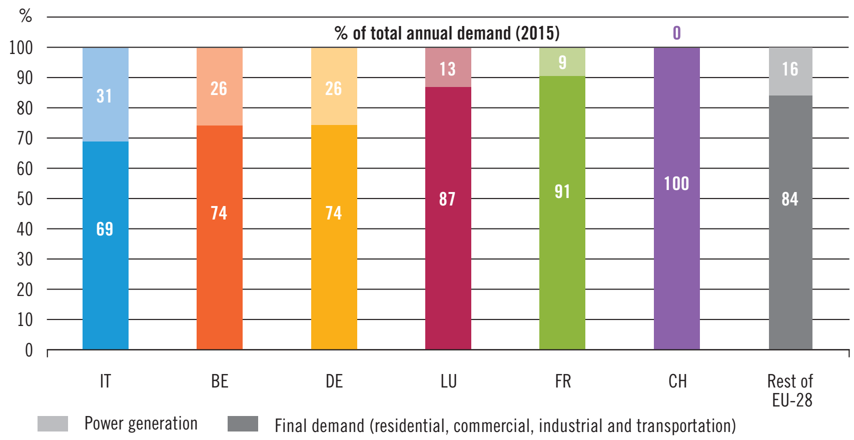


Figure 3.11: Breakdown of total demand between the share of demand used for final customers and for power generation in 2015 (Source: ENTSOG data collection based for TYNDP 2017 on information from TSOs, without temperature correction)

1) This percentage refers to 2015. In 2016 the percentage of electricity generated by gas-fired power plant went close to zero since the only CCGT has been shut-down.

3.3 Demand Forecast

This section reports the results of the demand forecasts for the period 2017-2037, based on the data gathered by ENTSOG for TYNDP 2017 purposes. Estimates on the demand for the next twenty years have been produced by the relevant TSOs, for both the yearly demand and the peak demand, according to four different scenarios:

- **Slow Progression**
  The economic growth is limited in this scenario. Green ambitions are the lowest and so the energy generation mix stays generally the same as today.
- **Blue Transition**
  This scenario shows efficient achievement in terms of green ambitions under a context of moderate economic growth.
- **Green Evolution**
  This scenario is characterised by favourable economic conditions and high green ambitions with high RES development.
- **European Green Revolution**
  The storyline for the Green Revolution scenario is largely based on the same assumptions as Green Evolution, however the EU 2050 climate targets are reached earlier.

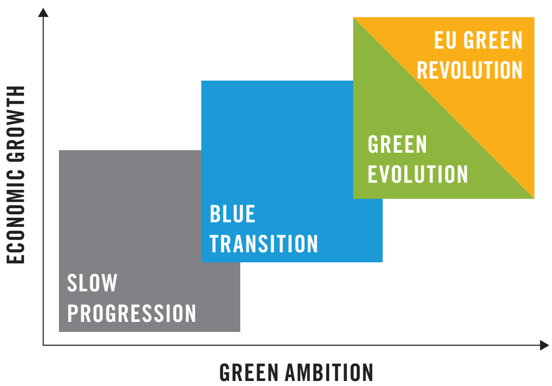


Figure 3.12: ENTSOG TYNDP 2017 scenario storylines (Source: ENTSOG TYNDP 2017)

These scenarios have been defined by ENTSOG[2] and depend mainly on the relationship between the evolution of the economic growth within the EU and the development and implementation of green practices, thus giving ENTSOG the reasonable extremes within which to assess the existing and future European gas system infrastructure.

2) For a full description of each scenario, see the following link:
http://www.entsog.eu/public/uploads/files/publications/TYNDP/2016/entsog_tyndp_2017_main_report_web.pdf

Each scenario foresees a different role for natural gas in the various sectors (i. e. heating, transport, industry and power generation), with consequently a different expected evolution of the EU overall demand for the four storylines, as illustrated in the graph in Figure 3.13 for the whole EU-28 area and for the countries of the South-North Corridor.

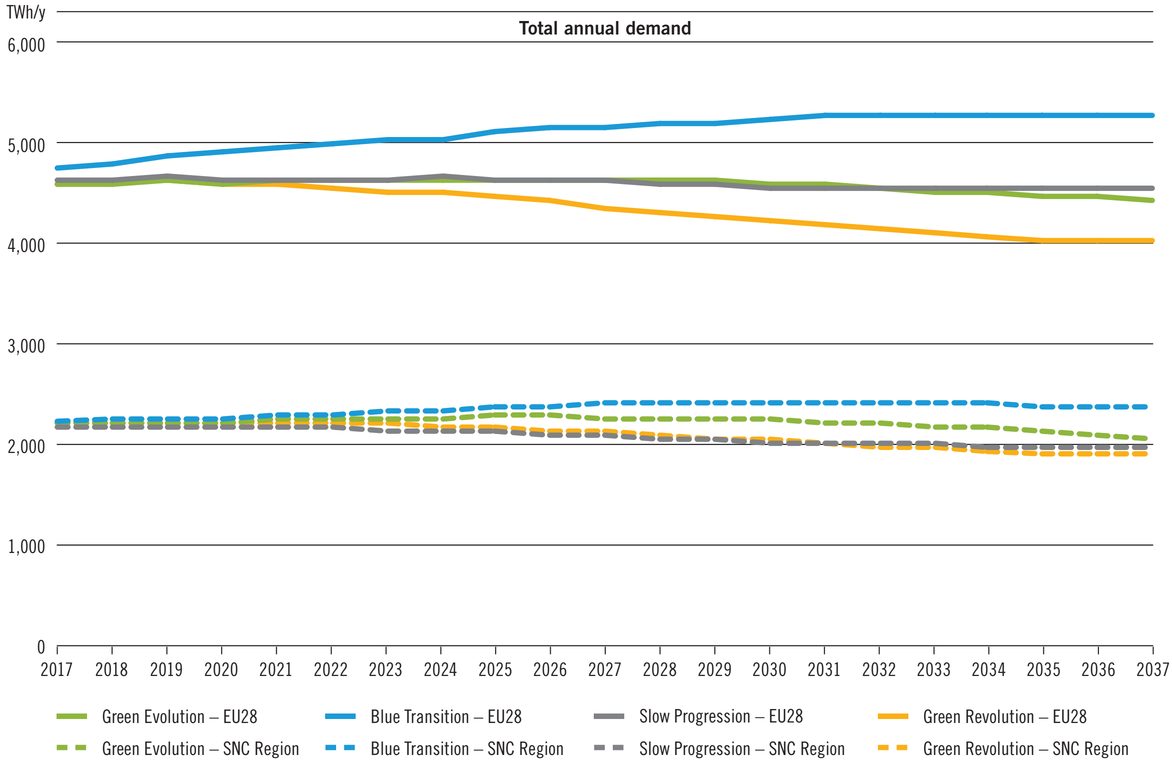


Figure 3.13: Evolution of total demand between 2017 and 2037 for EU-28 and South-North Corridor countries according to different scenarios (Source: projection based on data from TSOs collected by ENTSOG)

At European level, the EU Green Revolution scenario envisages a decrease in terms of total demand while the Slow Progression and Green Evolution scenarios foresee a general stable evolution. The Blue Transition storyline on the other hand is the only scenario predicting a moderate increase in natural gas demand in the coming years, mainly driven by the utilisation of this energy source both in substitution of other more carbon-intensive fuels and as an ideal partner for renewable energy sources (RES) full development.

For the countries of the South-North Corridor, according to all the scenarios a general stability in gas demand is expected over the next two decades, with a positive growth rate only for the Blue Transition scenario, and a slightly negative trend for the other scenarios.

The Blue Transition scenario, as defined by ENTSOG, assumes conditions of moderate economic growth for the near future, with a relevant development of RES and with the presence of policies at European level that will allow to be substantially on track with carbon targets set by the European Commission.

The adoption of the estimates included in the Blue Transition scenario has been considered as the most appropriate choice for the purposes of this publication as a reference to guarantee the adequacy of the infrastructure basis also in the future years, therefore all the estimates reported in the following paragraphs have been calculated accordingly to the assumptions summarised above.

3.3.1 ANNUAL DEMAND

As far as the annual average demand is concerned, the graph in Figure 3.14 shows the expected trend for the countries of the South-North Corridor, the remaining EU-28 countries and all of EU-28. A slight increase in demand can be observed over this period, even though the growth rate is expected to decrease.

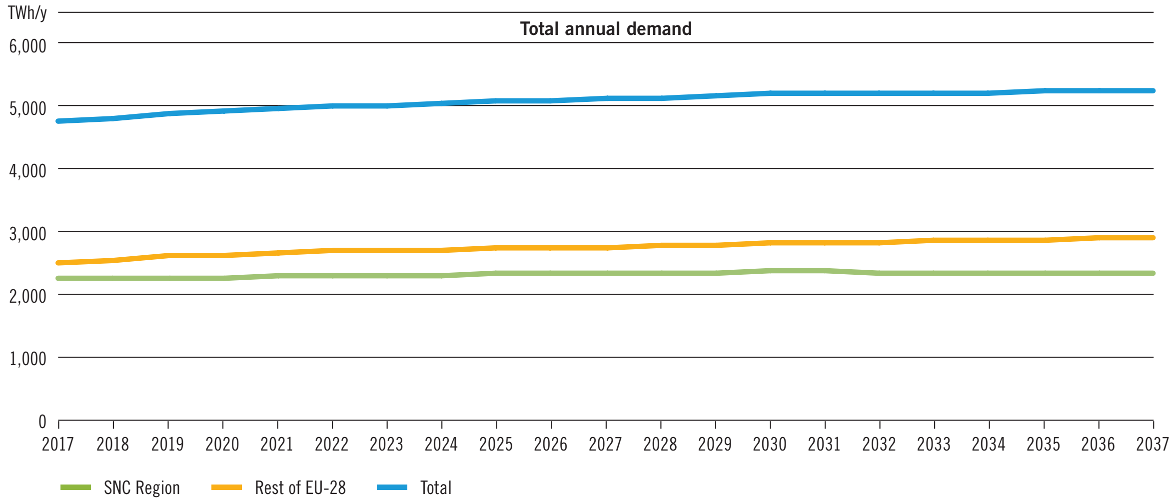


Figure 3.14: Evolution of the annual demand according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

The ratio of the demand in the countries of the South-North Corridor to the total EU-28 demand decreases gradually from 47.2 % in 2017 to 44.6 % in 2037. This trend can be related to the higher degree of maturity that characterises the countries of the area with respect to other markets in the rest of EU, which have relatively younger gas markets and, therefore, higher growth potentials.

Figure 3.15 shows the forecasts for each country of the South-North Corridor, with Italy expected to have the highest demand, overcoming Germany after 2020. A slight increase in demand is expected in France, while in Germany, Belgium, Luxembourg and Switzerland the demand should remain fairly stable to slightly decreasing.

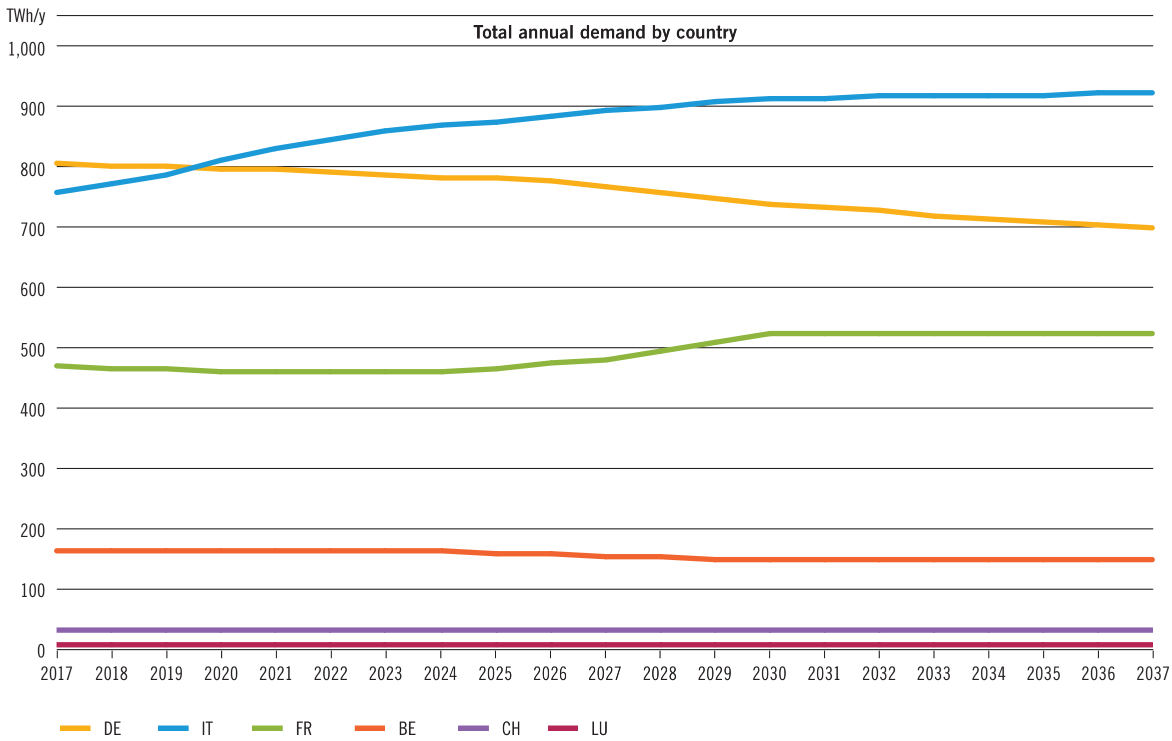


Figure 3.15: Evolution of the total annual demand between 2017 and 2037 for the countries of the South-North Corridor Region according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

While figures for most countries are stable to slightly decreasing, in Italy and France an increasing trend is expected mainly linked to power generation.

The annual forecast is then further analysed by splitting the demand into the consumption sectors previously indicated, namely final customers (residential, commercial, industrial and transportation) and power generation.

The graphs in Figure 3.16 and Figure 3.17 show the results obtained for the 2017–2037 period.

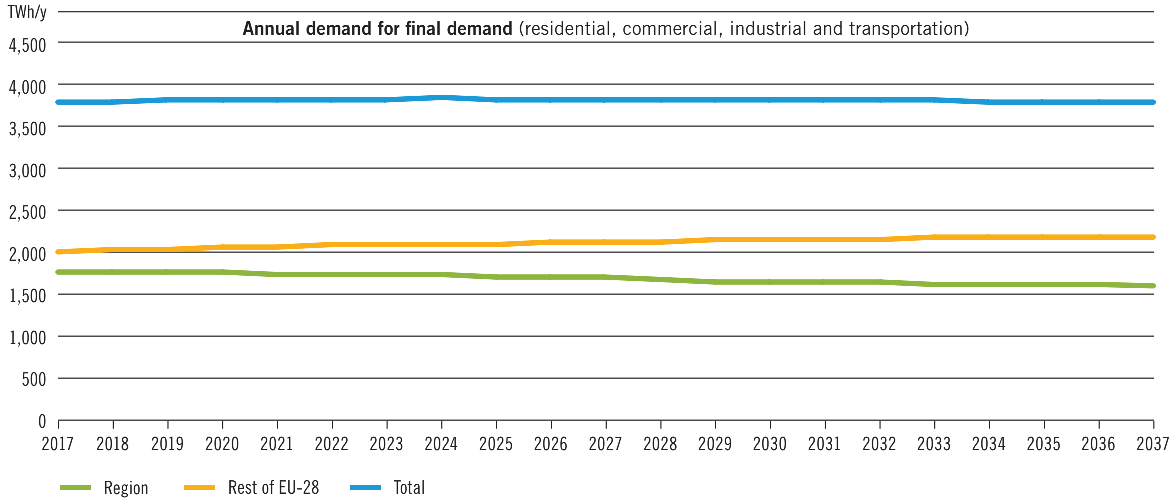


Figure 3.16: Evolution of the annual demand for final demand (residential, commercial, industrial and transportation) between 2017 and 2037 according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

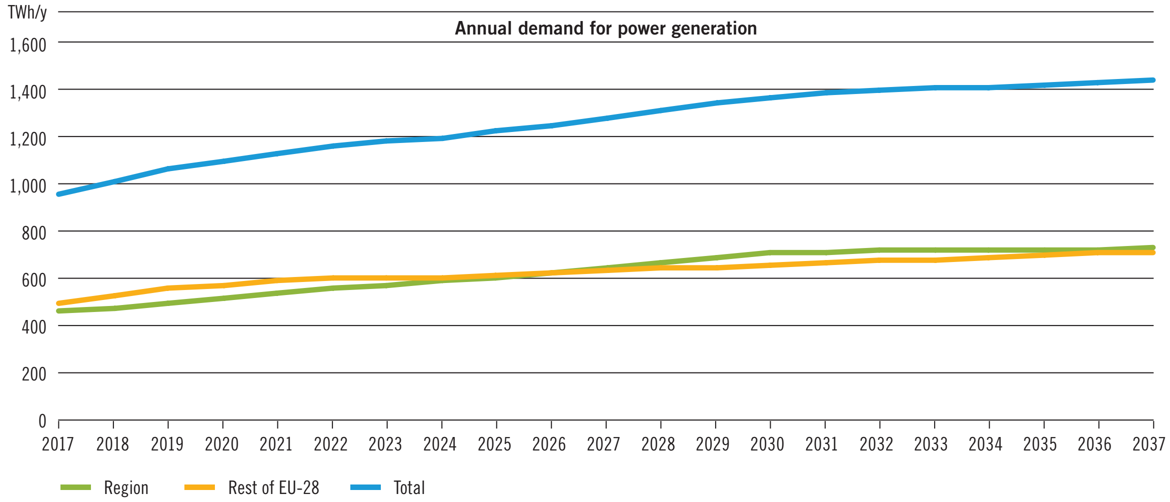


Figure 3.17: Evolution of the annual demand for power generation between 2017 and 2037 according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

It is clear how the general stability in demand in the next two decades depends mainly on the increasing share of demand for power generation, with a growth rate constantly above zero, unlike the final demand, that is expected to begin decreasing after 2023 at European and Regional level.

These trends reflect a double push towards CO_2 emissions reduction, stemming from efficiency measures undertaken in the residential segment from one side and the substitution of coal with gas in the power generation sector from the other side.

Figure 3.18 shows the share of power generation in the total annual gas demand in the countries of the South-North Corridor, the remaining EU-28 countries and all of EU-28.

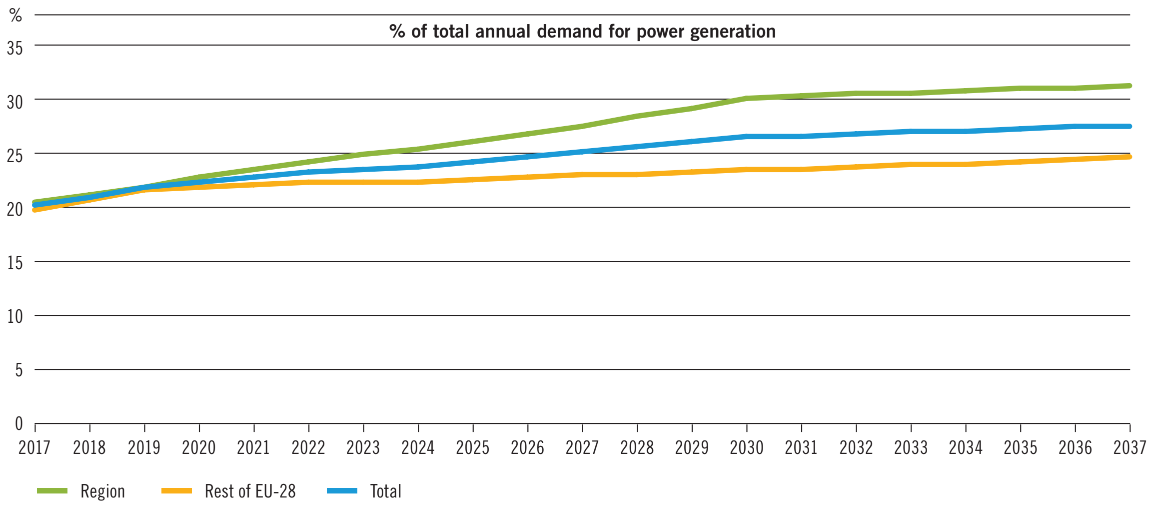


Figure 3.18: Evolution of the share of total demand used for power generation between 2017 and 2037 according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

As is illustrated by the previous graph, the share of power generation is expected to increase in all EU-28 countries. This observation is even more pronounced in the South-North Corridor countries, as the estimates foresee an overall increase in the annual demand component for power generation of more than 10 % over the next twenty years.

3.3.2 PEAK DEMAND

In addition to the forecast of the average annual demand, estimates of the peak demand between 2017 and 2037 have been analysed, as being particularly significant for the network planning in the different countries ("design case").

Figure 3.19 shows how the peak demand is expected to remain almost stable in the next twenty years, with a slight increase in the first 10 years and a slow decrease over the following 10 years, reaching again current values.

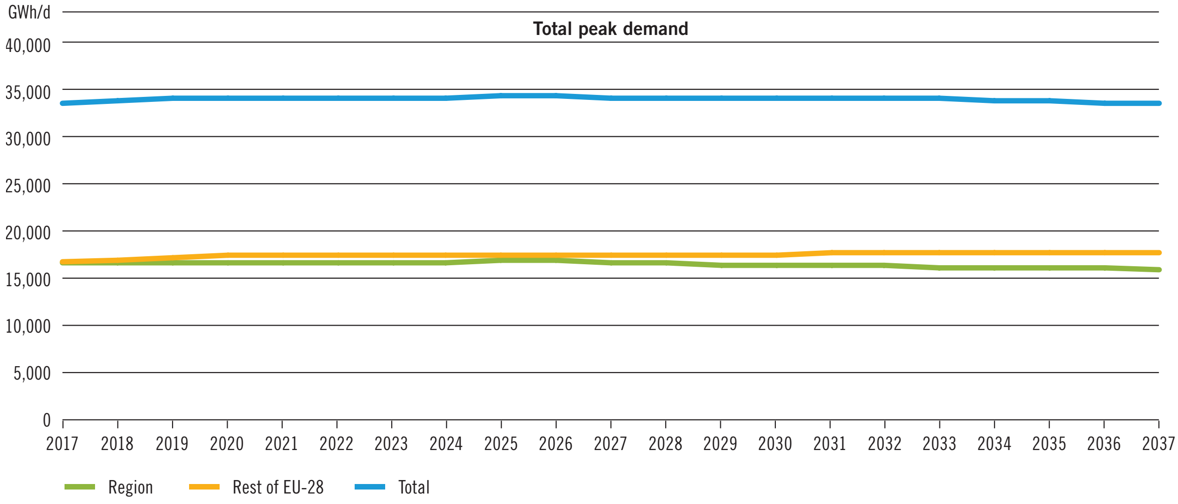


Figure 3.19: Evolution of total peak demand according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

The South-North Corridor countries account for about 50 % of the peak demand at European level, with a slight decline expected in the following years. This trend reflects the relative reduction of the overall annual gas demand of the Region compared to the rest of EU-28, already described in the previous section (see §3.3.1).

Figure 3.20 shows the expected evolution of the peak demand between 2017 and 2037 for the individual South-North Corridor countries.

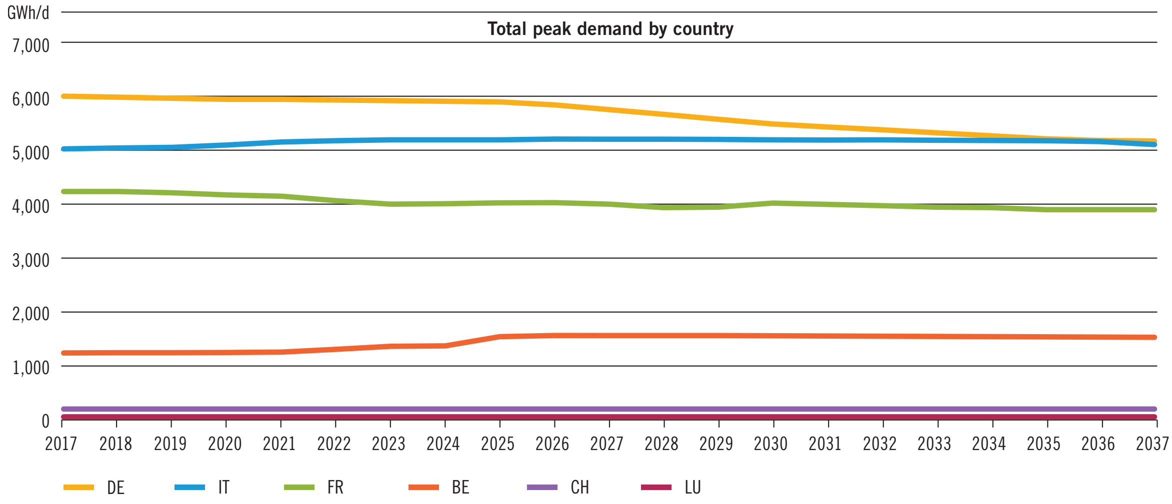


Figure 3.20: Evolution of the total peak demand between 2017 and 2037 for the countries of the South-North Corridor Region according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

The graph indicates how in general the peak demand is expected to remain fairly constant over the period, with a slight decrease in France and a more steady reduction rate in Germany (average rate of decline lower than 1 %) and a small increase in Italy. An interesting increase is then expected for Belgium, related to the announced nuclear phase-out, while Luxembourg and Switzerland should remain basically stable over the next two decades.

The graphs in Figure 3.21 and Figure 3.22 show the results for the different consumption sectors (final customers – residential, commercial, industrial and transportation – and power generation) obtained for the 2017–2037 period.

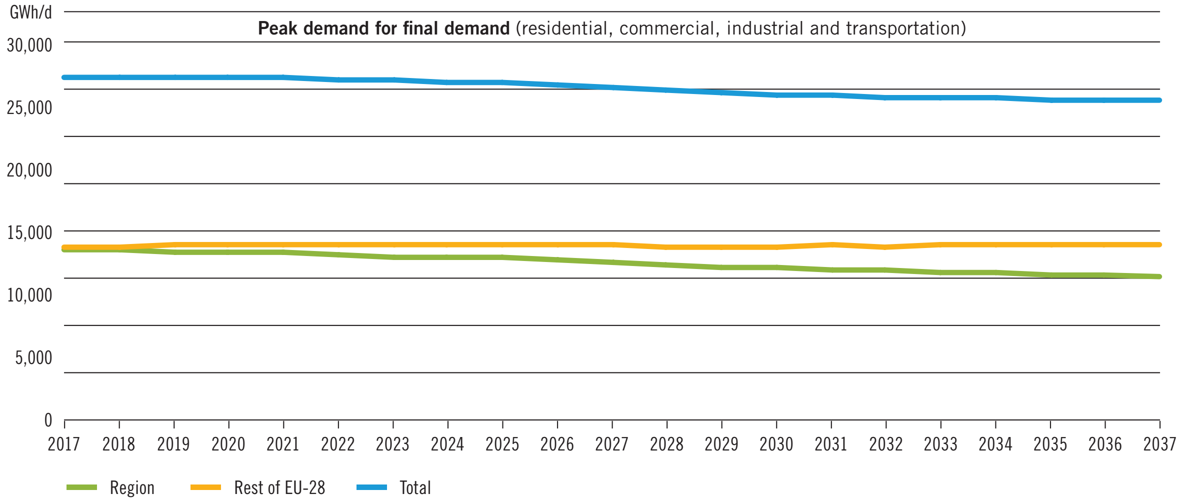


Figure 3.21: Evolution of the peak demand for final demand (residential, commercial, industrial and transportation) between 2017 and 2037 according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

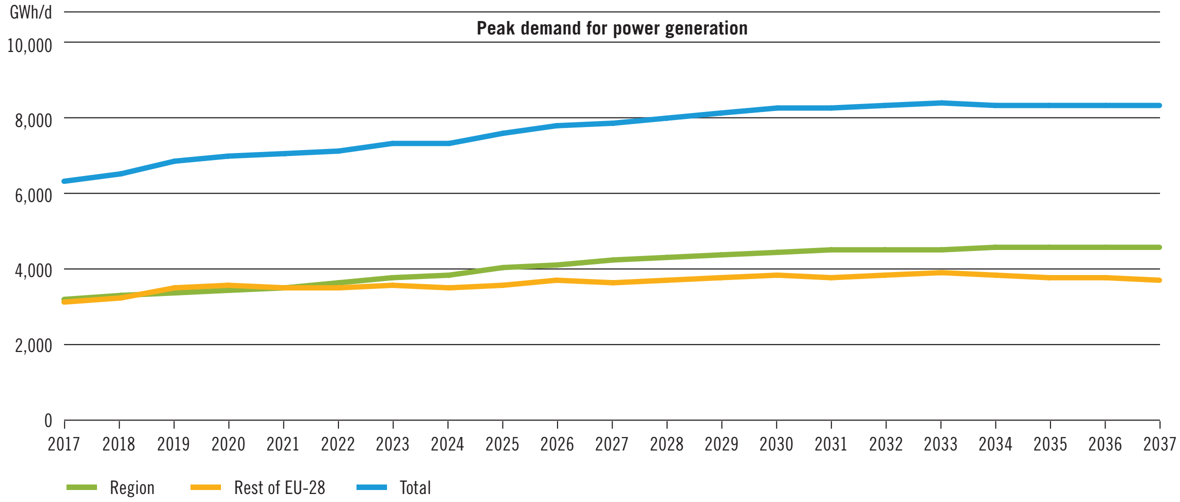


Figure 3.22: Evolution of the peak demand for power generation between 2017 and 2037 according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

The stable trend foreseen for peak demand for the next two decades is balanced by an increasing demand for power generation and a decreasing final demand. For both categories, the respective positive and negative growth rates are more emphasised for the countries of the South-North Corridor compared to the rest of the EU countries.

Figure 3.23 shows the percentage of the peak demand reserved for power generation in the countries of the South-North Corridor, the remaining EU-28 countries and all of EU-28.

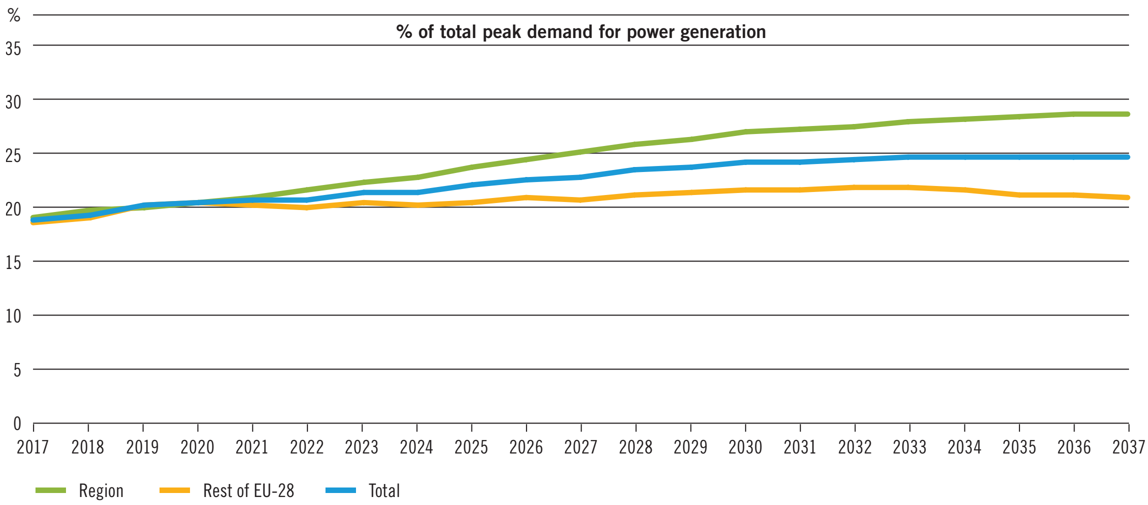


Figure 3.23: Evolution of the share of peak demand used for power generation between 2017 and 2037 according to the Blue Transition scenario (Source: projection based on data from TSOs collected by ENTSOG)

As illustrated by the graph above, the share of power generation is expected to increase in all countries; in particular, in line with projections for annual demand, the South-North Corridor show an overall increase in the power generation component of almost 10 % over the next twenty years.

3.4 Market Analysis

In the following section the Regional market developments have been analysed reporting the trends of the national hubs in term of evolutions of traded volumes between 2013 and 2015, first individually and later on aggregate scale.

The section is concluded with a price correlation survey extended to other main EU hubs (TTF and NBP) where the main trends and possible explanations related to evolution of prices among hubs and between gas and other energy commodities are reported.

3.4.1 MARKET DEVELOPMENT

The gas hubs covered in this SNC GRIP have continued to experience growth in traded volumes and number of transactions over the past years, despite an overall decrease in the demand for gas. Furthermore, the region has also made great strides in terms of increasing market integration and liquidity, thus becoming one of the main drivers behind the implementation of the European Gas Target Model (GTM). First developed at the 18th Madrid Forum in 2011, the January 2015 revised GTM presents the regulators' vision for a competitive and secure European gas market. Means of achieving this goal include the development of liquid virtual trading points, increased market integration, and diversification of upstream gas suppliers.

The following paragraphs show the trends of the South-North Corridor gas hubs.

3.4.1.1 Belgium and Luxembourg

The physical hub Zeebrugge Beach in Belgium is also one of the most mature hubs on the continent. It serves as a gateway to Europe for gas coming in from Norway, the United Kingdom, and LNG from the Zeebrugge LNG Terminal. As of the end of 2015, it has also been connected to the Dunkirk LNG terminal, commissioned in 2016 in France. The ZTP (the virtual Zeebrugge Trading Point) has continued to grow since its inception in October 2012. In October 2015, ZTP became the gas trading point for the new BeLux balancing zone, the integrated gas market for Belgium and Luxembourg.

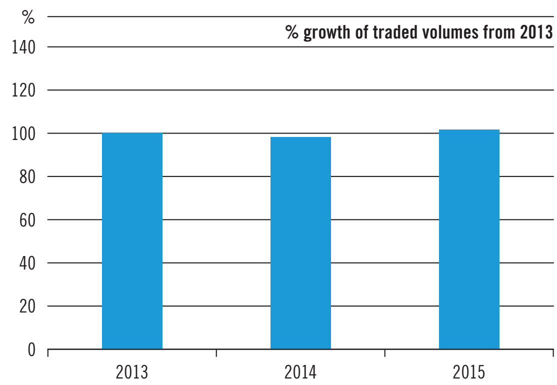


Figure 3.24: Growth of Zeebrugge Beach traded volumes from 2013 (Source: IHS Energy European gas hub tracker)

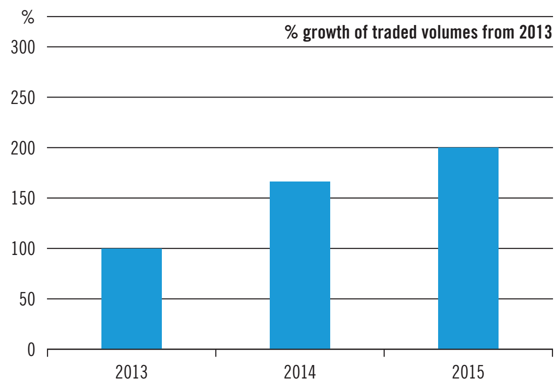


Figure 3.25: Growth of ZTP traded volumes from 2013 (Source: Huberator.com)

3.4.1.2 France

The PEG Nord hub ("Point d'Echange de Gaz") is the largest of the two trading regions in France. The TRS hub (Trading Region South) was launched on 1 April 2015, and is the product of the merger between the PEG Sud and the TIGF trading points in the South of France. The TRS was established with the aim of increasing the liquidity and depth of the southern French market, and is one of the first cases of successful market integration between gas hubs.

In 2018, the PEG Nord and TRS hubs will be merged into a unified trading zone for France. This will mark the final step in a multi-year effort overseen by the French national regulator CRE to simplify the transmission market in France via a combination of investments and market mechanisms.

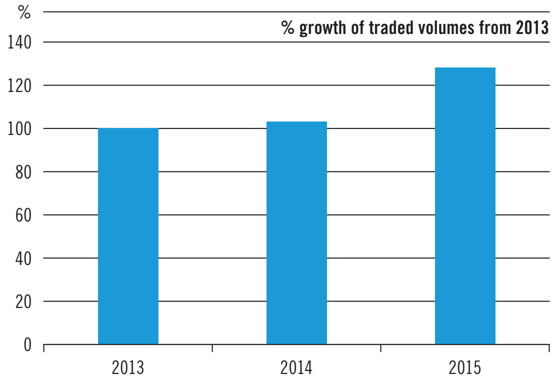


Figure 3.26: Growth of PEG Nord traded volumes from 2013 (Source: IHS Energy European gas hub tracker)

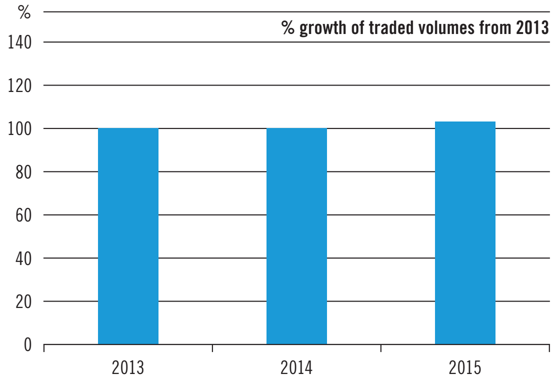


Figure 3.27: Growth of PEG Sud/TRS traded volumes from 2013 (Source: IHS Energy European gas hub tracker)

3.4.1.3 Germany

The two German hubs are the GASPOOL hub and the NCG (Net Connect Germany) hub. These hubs are among the most relevant European gas trading hubs[3]. BNetzA commissioned a study on potentials for further national or cross-border market integration and conducted a public consultation on the expert opinion from 20/09/2016 to 18/11/2016[4]. 21 consultation responses were received. BNetzA announced to publish further information in winter 2017.

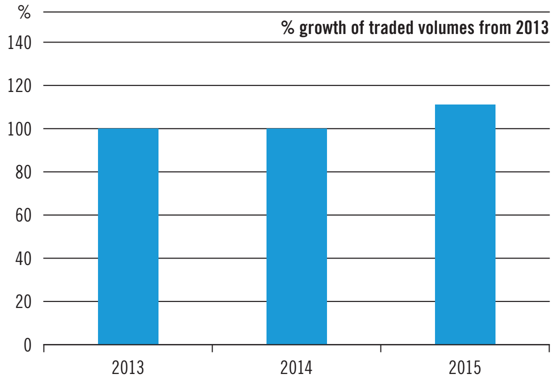


Figure 3.28: Growth of NCG traded volumes from 2013 (Source: IHS Energy European gas hub tracker)

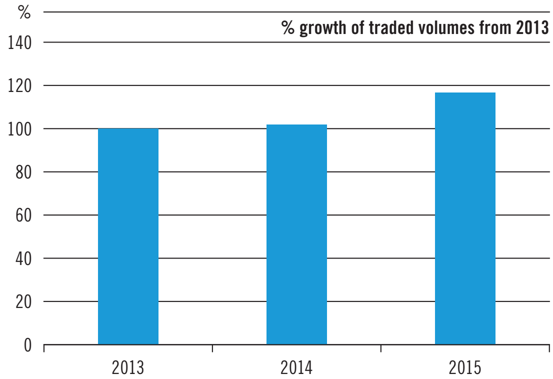


Figure 3.29: Growth of GASPOOL traded volumes from 2013 (Source: IHS Energy European gas hub tracker)

3) In 2016 NCG and Gaspool ranked respectively 3rd and 4th for total OTC volumes after TTF and NBP (Source: London Energy Brokers' Association OTC Energy Volume Report – December 2016).

4) https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/HandelundVertrieb/MarktgebieteGas_KOV/gas-node.html

3.4.1.4 Italy

The PSV (Punto di Scambio Virtuale) is a virtual point, conceptually located between the Entry and the Exit Points of the Italian network, where shippers can trade gas already entered in the main national grid, on a daily basis. PSV constitutes the single Italian gas hub and its borders correspond to the ones of the entry-exit system, being therefore the reference national balancing zone.

Currently, the PSV represents one of the main European gas marketplaces[5], having a unique position in terms of availability of gas from different sources, like Russia, Northern Europe (mainly Norway and The Netherlands), North Africa (Algeria and Libya), LNG imports (3 regasification plants) as well as of storage facilities (around 17 bcm of storage capacity).

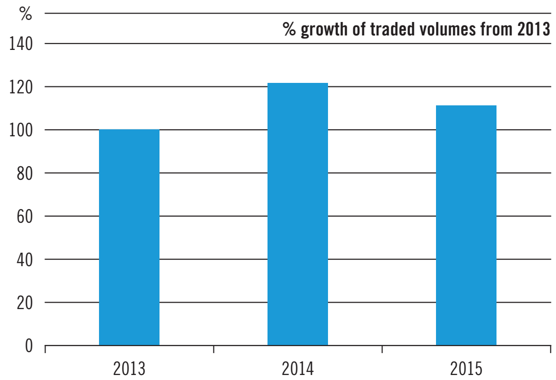


Figure 3.30: Growth of PSV traded volumes from 2013 (Source: IHS Energy European gas hub tracker)

5) In 2016 PSV ranked 5th for total OTC volumes after TTF, NBP and the two German hubs (source: London Energy Brokers' Association OTC Energy Volume Report – December 2016).

3.4.1.5 Highlights from the year 2013 to 2015

- **Belgium:**
  the Zeebrugge traded volumes remained stable, with the ZTP hub showing a steady increase
- **Germany:**
  the NCG traded volumes increased by 16 % and the GASPOOL traded volumes increased by 18 %
- **France:**
  the sum of the PEG Nord and TRS traded volumes increased by 20 %
- **Italy:**
  the PSV traded volumes and the related number of transactions increased by 16 %

Considering the overall evolution of traded gas volumes, the European gas hubs have increased rapidly since their creation in 2000. Market and regulatory improvements such as the early implementation of Network Codes have kept traded volumes growing. Traded volumes keep on growing, although at a slower rate since 2013. Around 500 bcm are traded each year in the gas hubs from the South-North Corridor, representing almost a triple of gas demand. These hubs are nevertheless far smaller than the reference hubs TTF (around 1,700 bcm) and NBP (around 1,000 bcm).

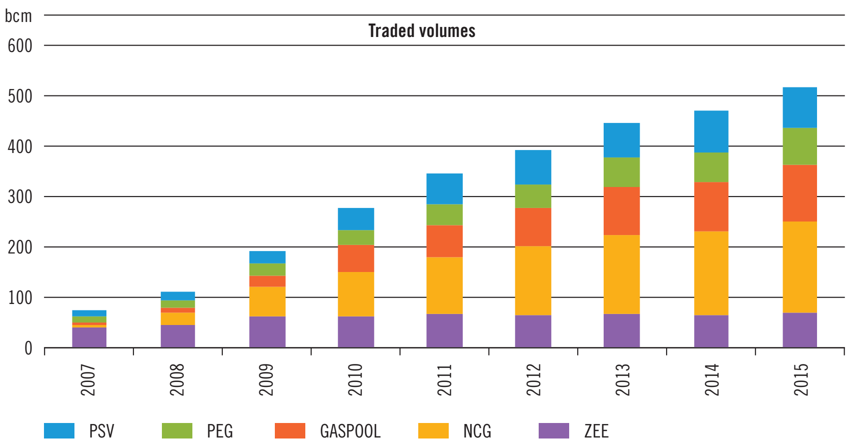


Figure 3.31: Evolution of traded volumes in the main European gas hubs in the South-North Corridor (Source: IHS Energy European gas hub tracker)

3.4.2 PRICE CORRELATION

Price correlation of the European gas hubs serves as an indicator for market integration, liquidity and competitiveness. By definition, in the absence of physical and/or regulatory barriers to free trade, gas prices at the various hubs are expected to converge. Furthermore, hub price correlation is necessary for efficient and competitive market pricing.

Figure 3.32 shows the day-ahead price average trends on the seven South-North Corridor hubs and the two major European hubs (TTF and NBP).

The overall analysis of price evolution over the last three years points to a high degree of price correlation, except for TRS/PEG Sud in the South of France and to a lesser extent PSV in Italy, and therefore suggests that the North-South Corridor hubs are on the good track towards a well-integrated market area. In that sense, their prices may serve as a reliable benchmark for gas prices in Europe.

The price spread between PEG Nord and TRS has experienced large variations, from 0, most of 2015 and 2016 to more than 10 €/MWh in December 2013, and recently in January 2017. Because of its dependence on LNG deliveries, gas prices in the South of France are reflecting marginal prices for LNG supply, and as a consequence the variation of worldwide LNG prices. The North-South Link has been marked by continuous significant usage of capacity.

PSV prices remain normally higher than those of the rest of the region, with an average 1.8 €/MWh premium in average in 2015 and 2016 compared to NCG, but the evolution of prices follow closely the other hubs.

Several points can be made in regards to the evolution of gas prices since mid-2013:

- An overall decrease in gas prices, from a SNC GRIP average high of 29.2 €/MWh in December 2013 to a low of 12.4 €/MWh in April 2016. Explanations for this decreasing trend include:
  - reduction in gas demand, particularly following the very mild 2013–2014 winter
  - decrease in worldwide petrol prices (see Figure 3.33)
  - convergence of worldwide LNG prices, notably due to falling LNG prices in Asia until mid-2016, which could lead to a return of LNG exports to Europe
- Increasing gas prices since summer 2016, notably following increasing LNG prices.

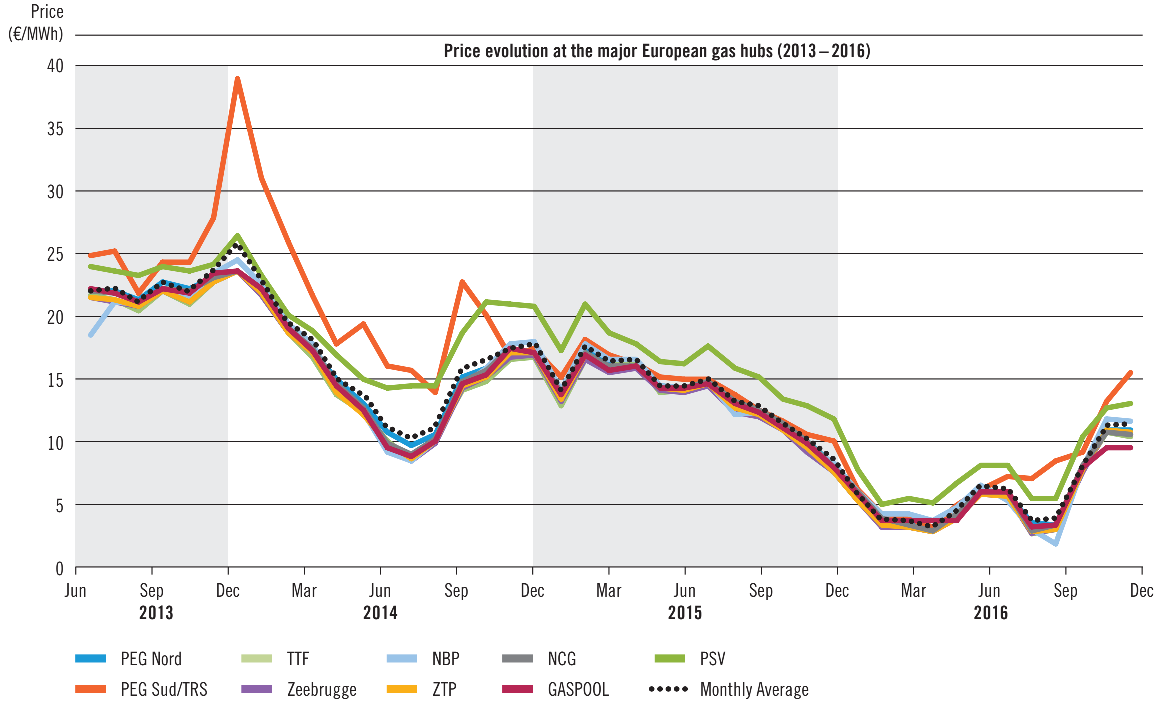


Figure 3.32: Price evolution at the major European gas hubs (2013 – 2016) (Source: Bloomberg, Powernext)

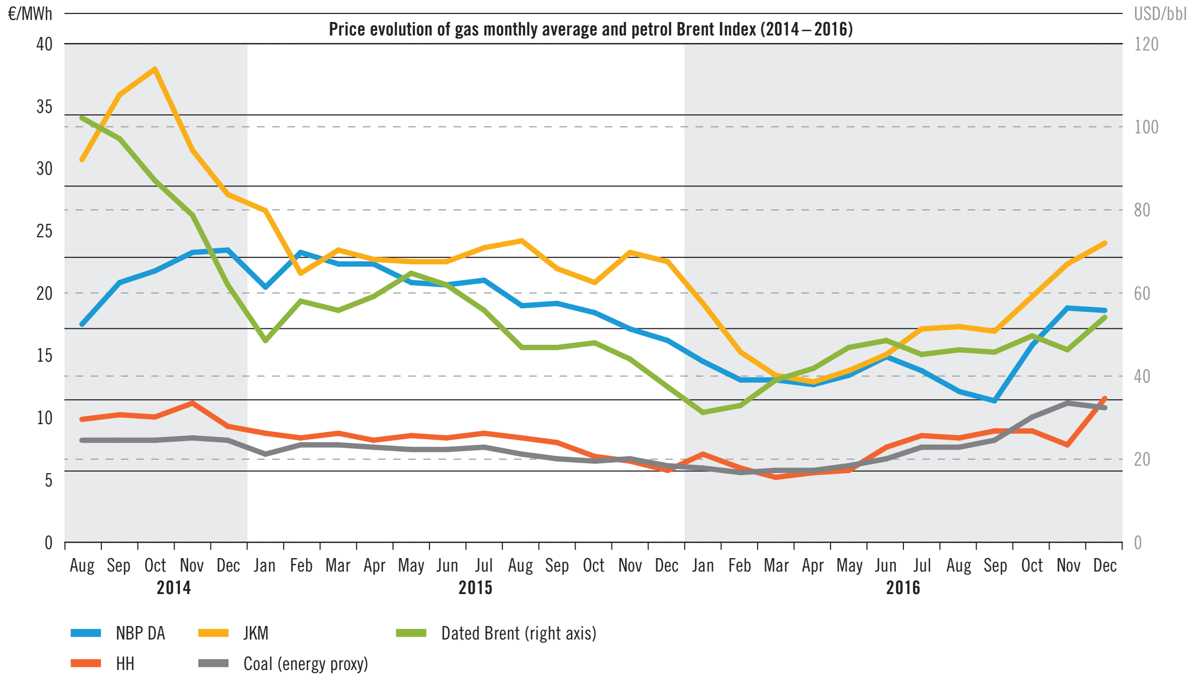


Figure 3.33: Price evolution of gas monthly average and petrol Brent index (2014–2016)

4 The European Energy Strategy and the National Energy Policy Frameworks

Image courtesy of Fluxys

4.1 The EU Energy Strategy

The European Energy Strategy is based on the pursuit of the following three main objectives:

- **Security of supply**
- **Competitiveness**
- **Sustainability**

These objectives have been modeled on the fundamental challenges Europe has to cope with, specifically:

- **Dependence on external energy sources:** imports cover more than half of the overall energy consumption, with an expected upward trend which could increase the vulnerability to supply disruptions.
- **Increasing energy costs** for households and industry, linked to a rising global demand and to the necessity of restructuring the energy market.
- **Global warming** and the need to decarbonise the European economy without affecting its competitiveness on the international markets.

A series of policy tools and related actions have been designed in order to reach the European primary energy goals. The most significant developments are expected to be driven by the following key policy areas:

- The creation of a *European Energy Union*, in order to ensure secure, affordable and climate-friendly energy supplies, able to freely flow across national borders within Europe.
- The definition of a *European Energy Security Strategy* which presents short- and long-term measures to ensure the security of supply of the Member States, including the support to the internal energy production.
- The establishment of the *Internal Energy Market* as a resilient, integrated and competitive energy market across the EU, supported by adequate infrastructural enhancements and regulatory arrangements.
- The development of renewable energy sources and promotion of energy efficiency, by formulating targets for 2020 *(2020 Energy Strategy[1])*, 2030 *(2030 Energy Strategy[2])* and 2050 *(Energy Roadmap 2050[3])*, and adopting a challenging long-term strategy with progressively tougher objectives.

In the following paragraphs each of the main EU energy strategy objectives is examined, with particular attention to natural gas and the related infrastructure as key components of the current and future European energy mix.

1) So-called 20-20-20 targets: reduction of GHG by at least 20 %, increase of the share of renewable energy to at least 20 % of consumption, improvement of energy efficiency by at least 20 %.

2) Objectives by 2030: 40 % cut in GHG emissions compared to 1990 levels; at least a 27 % share of renewable energy consumption; increase of energy efficiency of at least 27 %, to be potentially raised to 30 %.

3) EU targets for 2050: reduction of GHG of 80 % to 95 % compared to 1990 levels.

4.1.1 SECURITY OF SUPPLY

As many Member States rely mainly on a limited number of suppliers for their natural gas – with many Eastern European countries entirely dependent on Russian exports – and considering the increased vulnerability to supply disruptions and infrastructure failure that a condition of limited supply diversification creates, the European Commission released in May 2014 its *Energy Security Strategy*. The aim of the short and long term measures included in the document is to ensure a stable and abundant supply of energy for citizens and the overall EU economy.

Short-term measures have been identified through a series of security of supply stress tests carried out in 2014 and they were mainly focused on possible prolonged disruption situations of Russian gas imports to Europe. Identifying substantial impacts especially on Eastern EU countries, the fundamental recommendation valid in the short-term framework is that cooperation and solidarity between countries can play an effective role in mitigating the impacts of a potential supply crisis.

In terms of long-term challenges addressed in the *Energy Security Strategy*, the following key action areas are identified with particular relevance for gas infrastructure operators:

- The completion of the internal energy market and implementation of missing infrastructure links to allow a swift response to supply disruptions and redirecting of energy across the EU to where it is needed.
- The increase of energy production in the EU, including renewables and sustainable production of fossil fuels.
- An increased diversification of supply sources and routes, including effective negotiation with current major energy partners, such as Russia and Norway, as well as new partners in the Caspian Basin.
- The strengthening of emergency and solidarity mechanisms and protection of critical infrastructure, which entails more coordination between EU countries to use existing storage facilities, develop reverse flows, conduct risk assessments and implement security of supply plans at regional and EU level.

4.1.2 COMPETITIVENESS

A fully integrated internal market represents the most effective and efficient way to ensure secure and affordable energy supplies on equal conditions across Europe. To build an internal competitive and interlinked environment for energy production and exchanges, harmonised market rules (so-called *"software"*) and essential infrastructure (so-called *"hardware"*) are reciprocally beneficial and therefore both essential.

The main achievements in this direction are represented by market legislation (Unbundling Directives) and Regulations (Network Codes and transparency rules, as REMIT, together with the TEN-E regulation for Projects of Common Interest). On the one hand, EU legislation makes sure that energy companies cannot exclude competitors from access to pipelines or withhold the construction of important infrastructure. On the other hand, EU Regulations establish and enforce the implementation of harmonised rules for the access to and the efficient usage and enhancements of energy networks.

The final goal of an integrated market is to guarantee that energy can flow across EU countries following price signals, without administrative or infrastructural obstacles. In this way, gas and electricity supplies would be delivered to each EU citizen at the most favorable conditions.

4.1.3 SUSTAINABILITY

A historic bridge between current policies and climate-neutrality to be reached before the end of this century was set in December 2015 at the Paris climate conference (COP21), where 195 countries adopted the first-ever universal, legally-binding global climate agreement, due to enter into force in 2020.

The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2 °C above pre-industrial levels.

EU Member States have committed themselves to following the Paris agreement and to putting in place the energy-related actions that will be needed at a European, regional, national and local level. To organise and make the contributions of Member States effective, in the context of the *Energy Union*, the Commission set up an integrated governance and monitoring process, also related to the actions necessary for achieving the environmental targets[4)]. Consequently, in the next years, each Member State will be required to develop its *National Energy and Climate Plan*, setting out the direction and policies to pursue the national energy and climate objectives in a way consistent with the commonly agreed targets (in particular the 2030 targets).

The first edition of the National Plans, covering the period from 2021 to 2030, should be submitted to the Commission by 2018, and developed according to the Commission's *Guidance on Integrated National Energy and Climate Plans*, presented as part of the *State of the Energy Union* in November 2015.

Since the *National Plans*, as envisaged in the context of the *Energy Union Strategy*, are not yet required, in the following part of this Chapter different national energy policy frameworks are presented as best available outlines to understand the expected evolution of the energy landscapes in the countries belonging to the South-North Corridor Region.

4) Commission's Communication on a Framework Strategy for the Energy Union – 25 February 2015

Image courtesy of Snam Rete Gas

4.2 The National Energy Policy Frameworks in the Context of Energy Transition

4.2.1 BELGIUM

Currently the federal government and the three Regions are developing within their competencies an *Energy Vision/Energy Pact* defining the legal framework for the energy transition. The *Energy Pact* is foreseen for 2017.

The General Belgian Energy Policy & Priorities for 2017, as prepared by the Federal Public Services of Economy, lie in the preparation of the energy transition in Belgium (based on security of supply and the nuclear phase-out) and the finalisation of the energy pact.

In its 2016 review for Belgium, IEA acknowledged Belgium's recent progress in several areas of energy policy, but stressed the need for a national long-term energy strategy without delay, in order to respond to the challenge of decarbonising the economy while ensuring security of supply and affordability of energy. A major issue to be addressed is the country's nuclear phase-out policy and its consistency with its objectives regarding electricity security and climate change mitigation.

In November 2016, the Flanders region was the first Belgian entity to ratify the Paris Climate Agreement, shortly followed by the Walloon parliament. The Federal Minister of Energy, Environment and Sustainable Transition confirmed at the 22nd UN climate conference in Marrakesh the ambition of a Belgian ratification of the Paris Agreement in the first half of 2017.

Image courtesy of Fluxys

4.2.2 FRANCE

The legal perspective
In France the framework is set by a 2015 law on *Energy transition towards a sustainable growth*.

This text defines binding targets such as:

- reducing the share of nuclear production down to 50 % by 2025
- reducing final energy consumption of fossil fuels by 30 % by 2030
- reaching a 23 % share of renewable energy in the final energy consumption by 2020, and 32 % by 2030 (this target is broken down by energy: biomethane should represent 10 % of gas consumption by 2030)

It should be noted that natural gas is recognised as producing the lowest levels of CO_2 emissions among fossil fuels under equivalent use. It comes with two associated tools:

- the low-carbon national strategy describing processes and tools
- the multi-annual program for energy defining intermediate targets

The last replaces all former energy-specific programs in order to ensure a cross-energy consistency and it tackles each sector (production, consumption, network) and dimension (security of supply, emission reduction, competitiveness). The first program covers the 2016–2018 and 2019–2023 periods with binding targets for 2023.

The initial multi-annual programs
Considering the overall uncertainty about the future energy mix, 2023 targets take the form of ranges compared to the situation in 2012:

- a final energy consumption decreasing by 3.1 % to 12.6 % through further energy efficiency
- an accelerated decrease of fossil fuel consumption based on their emission factor as a result from the willingness to move away from them:

REDUCTION TARGET FOR FOSSIL FUEL CONSUMPTION BY 2023, COMPARED TO 2012, FRANCE

Source	2023 LOW SCENARIO	2023 HIGH SCENARIO
COAL	–37 %	–30 %
OIL	–23 %	–9.5 %
NATURAL GAS	–16 %	–9 %

Table 4.1: Reduction target for fossil fuel consumption by 2023, compared to 2012, France (Source: Decree n°2016-1442, October 27, 2016 on Multiannual Program for energy)

- a further development of RES amounting for 24.9 % of the primary energy mix
- the production of 8 TWh of biogas facilitated by national tenders and an easier access to grid injection for biomethane
- a bio-CNG production reaching 2 TWh (20 % of CNG consumption) through supporting scheme aiming at complementing electrical vehicles

Beyond these quantitative targets, there will be no development of new coal power plants (except if equipped with CCS) while the running hours of existing ones will go decreasing in anticipation of the coal phasing-out around 2023.

Regarding natural gas, the program focuses on security of supply with the possible revision of existing standards after 2018 while an underground gas storage strategy and demand-side management (200 GWh/d) will be developed. It also maintains the ban on hydraulic fracking and asks suppliers transparency on natural gas origin.

From a financing perspective the plan anticipates around 10 billion € of public spending on the 2016–2023 period. It also calls for scrutiny of the cost-benefit ration of any new interconnection project in gas.

4.2.3 GERMANY

On 14 November 2016 the German government adopted the Climate Action Plan 2050, laying down the principles and goals of the German government's climate policy[5]. The Climate Action Plan 2050 provides guidance on all areas of action in the process of achieving the German domestic climate targets in line with the Paris Agreement. The long-term targets are based on the guiding principle of extensive greenhouse gas neutrality in Germany by the middle of the century.

The areas of action defined in the Climate Action Plan 2050 are energy, buildings, transport, trade and industry, agriculture and forestry. Based on the climate targets for 2050, the Climate Action Plan formulates milestones and measures for all areas of action. The 2030 emission reduction targets for the areas of action are given in Table 4.2.

2030 EMISSION REDUCTION TARGETS FOR THE AREAS OF ACTION, GERMANY

Area of action	1990 (in million tonnes of CO_2 equivalent)	2014 (in million tonnes of CO_2 equivalent)	2030 (in million tonnes of CO_2 equivalent)	2030 (reduction in % compared to 1990)
ENERGY SECTOR	466	358	175 – 183	62 % – 61 %
BUILDINGS	209	119	70 – 72	67 % – 66 %
TRANSPORT	163	160	95 – 98	42 % – 40 %
INDUSTRY	283	181	140 – 143	51 % – 49 %
AGRICULTURE	88	72	58 – 61	34 % – 31 %
SUBTOTAL	**1,209**	**890**	**538 – 557**	**56 % – 54 %**
OTHER	39	12	5	87 %
TOTAL	**1,248**	**902**	**543 – 562**	**56 % – 55 %**

Table 4.2: 2030 emission reduction targets for the areas of action (Source: German Climate Action Plan 2050, BMUB)

The German gas transmission and distribution systems provide an ideal basis for supporting the German energy policy. In this context the following main legislative measures are currently in place and are expected to be further developed:

1. **Renewable energy sources act (EEG)** and the gas network access regulation (GasNZV) covering among others the integration of biogas into gas transmission and distribution networks[6]
2. **Combined heat and power act (KWKG)** covering among others the support of gas-fired combined heat-and-power systems[7]
3. **Energy tax act (EnergieStG)** covering among others a mineral oil tax reduction on CNG use in the transport sector[8]
4. **Federal immission control act (BImSchG)** and **13th federal immission control regulation (13. BImSchV)** under which the German TSOs implement technical measures to reduce immissions of the gas transmission facilities, e.g. compressor stations[9]

5) Source: http://www.bmub.bund.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzplan_2050_kurzf_en_bf.pdf

6) Source: https://www.gesetze-im-internet.de/gasnzv_2010

7) Source: http://www.bmwi.de/DE/Service/gesetze,did=22130.html

8) Source: https://www.gesetze-im-internet.de/energiestg/BJNR153410006.html

9) Source: https://www.gesetze-im-internet.de/bimschg

4.2.4 ITALY

The Italian energy policy framework is broadly designed by an Interministerial Decree, called National Energy Strategy (also known as "SEN" – *Strategia Energetica Nazionale*) approved in March 2013 after a wide consultation launched in the previous year. The SEN has not currently the character of a law and its role is to set targets and draw directions for the development of the Italian energy sector, to be implemented via other specific measures.

The main goal of the document is the improvement of the Italian energy sector in terms of competitiveness, sustainability, security of supply and diversification of sources. In the short period ("2020 horizon"), the modernisation of the energy industry is expected to be driven by the following factors:

- strong investments both in the new "green and white" economies (RES and efficiency) as well as in the traditional sectors, including electricity and gas networks, regasification plants and storages
- reduction of CO_2 emissions and energy efficiency measures, both exceeding the EU 20-20-20 targets set for Italy
- growth of renewable energy sources, so that they will become by 2020 the primary energy source in the electricity sector together with natural gas

The SEN identifies specific measures for the gas market to enhance its competitiveness, to improve security of supply and to reduce the dependence on import via source diversification. More specifically with regards to gas infrastructure, the document lists a series of new strategic projects, including particular references to storage capacity, LNG terminals and other import infrastructure.

The need to develop storage capacity is clearly highlighted in the SEN, which indicates the need to increase the system capacity margin by expanding existing storage facilities and commissioning new sites. These enhancements are aimed to increase the flexibility of the gas supply mix, preventing emergency situations during peak demand conditions and/or supply interruption.

About the LNG market, the SEN states that regasification capacity is to be expanded to improve LNG access to the Italian market, to further improve supply diversification and to exploit potential market opportunities.

For other import infrastructure, a key role is played by project(s) which will enable Italy and Europe to receive energy supplies from the Southern Corridor. The import of gas from the Caspian region would be in particular facilitated by the Trans-Adriatic Pipeline (TAP), although new gas import projects from the Mediterranean area are not excluded. The SEN also promotes the availability of virtual and physical reverse flow capacity towards the markets of Central and Northern Europe.

All the above mentioned measures are aimed to support the concept of a Southern European hub, making the Italian gas market liquid, competitive and well integrated with the other developed hubs, with prices in line with the main European countries.

The SEN is covering with more indicative objectives also a longer time span ("2050 horizon"), foreseeing even stronger efforts in terms of energy efficiency and RES penetration to sustain a decarbonised economy. Notwithstanding expectations of decrease in terms of annual consumption, also in this wider time horizon the key role of gas for the energy transition is clearly recognised.

An update of the SEN has been undertaken at beginnings of 2017[10] mainly to align the strategy with the new market context and the evolutions experienced between 2013 and 2016 at European level. The revision of the strategy should follow the main lines defined in the previous document with the ultimate target to increase the liquidity and the competitiveness of the Italian gas market, expected to become the Southern Europe gas hub. A special attention is expected to be provided to the following aspects:

- development of new regasification capacity and cross-border interconnections, in line with the increased flexibility and security of supply requirements of the EU gas markets
- ending the isolation of the areas still not reached by natural gas (in particular, Sardinia island)
- diffusion of new uses of gas in the transport sector (both as CNG and LNG)
- development of a biomethane chain to increase green gas volumes and utilisations

4.2.5 LUXEMBOURG

Luxembourg is firmly embedded in Central Western Europe. An analysis of Luxembourg's energy future can therefore not be made without understanding the key drivers changing Europe's energy landscape and its direct neighbours.

Luxembourg has a highly developed economy, with the 2nd world's highest GDP per capita[11]. Despite the fact that Luxembourg's population is expected to almost double by 2050, from currently 560,000 to almost 1,100,000 in 2050, the total final energy consumption in electricity and gas is expected not to further grow by 2050.

Energy transition in Luxembourg towards 2050 horizon is driven by energy efficiency and integration of renewables in the distribution networks. Drivers such as the COP21 Paris Agreement and the various European Union energy targets and directives, as well as global trends in energy sector transformation and technology deployment, especially digitalisation, will have a significant impact on the final energy consumption, mainly driven by electricity. Nevertheless, natural gas will play an important role in the energy transition until 2050 and gas demand even shows moderate growth for 2025. Industrial gas consumption is projected to be stable, but the consumption in the residential heating sector is projected to further increase mainly due to the switch from heating oil to gas of the customers still awaiting this switch.

Since 2008, Luxembourg's energy policy has also been focused on reducing CO_2 emissions in transport, as a large labour-work force is coming from the neighbouring countries (France, Belgium, Germany), generating a high energy consumption and CO_2 emissions related to the transport sector.

10) The final text of the SEN 2017 was not published when this Report has been sent off to the editor.

11) Source: www.imf.org/external/pubs/ft/weo/2016/02/weodata/index.aspx

4.2.6 SWITZERLAND

Energy policy is in Switzerland subject of the federal institutions, of the cantons (states), and of the municipalities – each level in the framework of its competence. But the decisions on the level of the federal institutions have the highest influence on the future energy supply.

Federal institutions
In 2007 the Federal Council based its energy strategy on four pillars: energy efficiency, renewable energies, replacement and new construction of large power stations for electricity production (also nuclear power stations), and external energy policy.

Following the reactor disaster of Fukushima in 2011 the Federal Council and Parliament decided on Switzerland's progressive withdrawal from nuclear electricity production. This decision, together with further far-reaching changes in the international energy environment, requires a change of the Swiss energy system. For this purpose the Federal Council has developed the *Energy Strategy 2050*. This continues and intensifies the strategic thrust of the *Energy Strategy 2007* with new objectives. What is basically new is that the existing five nuclear power stations are to be shut down at the end of their technically safe operating lifetime and not replaced.

In September 2016, the Parliament approved the first set of measures in the *Energy Strategy 2050*. The Council wishes to significantly develop the existing potential for energy efficiency and exploit the potential of water power and the new renewable energies (sun, wind, geothermal, biomass).

The Parliament has already strengthened the development of renewable energies through an amendment to the Energy Law that came into force at the beginning of 2014.

In a second stage of the *Energy Strategy 2050* the Federal Council wishes to replace the existing support system by a management system to steer energy supply and emissions. Goals and measurements needs still to be defined.

A new CO_2-law which is currently in discussion will be crucial for the future gas demand in Switzerland. In the first draft climate protection and CO_2 reduction are prioritised over questions of economic viability, competitiveness, and social acceptance.

Cantons
Cantons have their own goals: increasing use of renewables, better isolations of buildings, and increasing amount of decentralised electricity generating units (on housetops). These goals should be reached by standards which do not differentiate between oil and natural gas. Furthermore, these standards do not recognise biogas as renewable energy. For several cantons the implementation of the standards is expected in 2018.

Municipalities
Some (bigger) municipalities have very ambitious goals and they focus strongly on ecology and support minimum energy houses and privilege renewable energies and district heating based on geothermal energy, waste heat, and wood. On the other hand municipalities implement incentives for the change from petrol and diesel to natural gas in the mobility sector.

Outlook
Thus, the current energy policy in Switzerland is not supportive for the gas demand: gas supply for heating purposes is getting more and more under pressure and also the industry is urged by high CO_2-taxes to reduce CO_2 emissions.

If the CO_2-law which is currently in discussion will be implemented not considering enough economic viability and competitiveness and if the gas demand in the mobility sector will not increase the gas demand will be reduced substantially by a quarter of the current demand until 2050 (according to the study *Energieperspektiven 2050* by the Swiss Federal Office of Energy).

5 The Role of the Region in the Development of EU Gas Infrastructure and the Internal Market

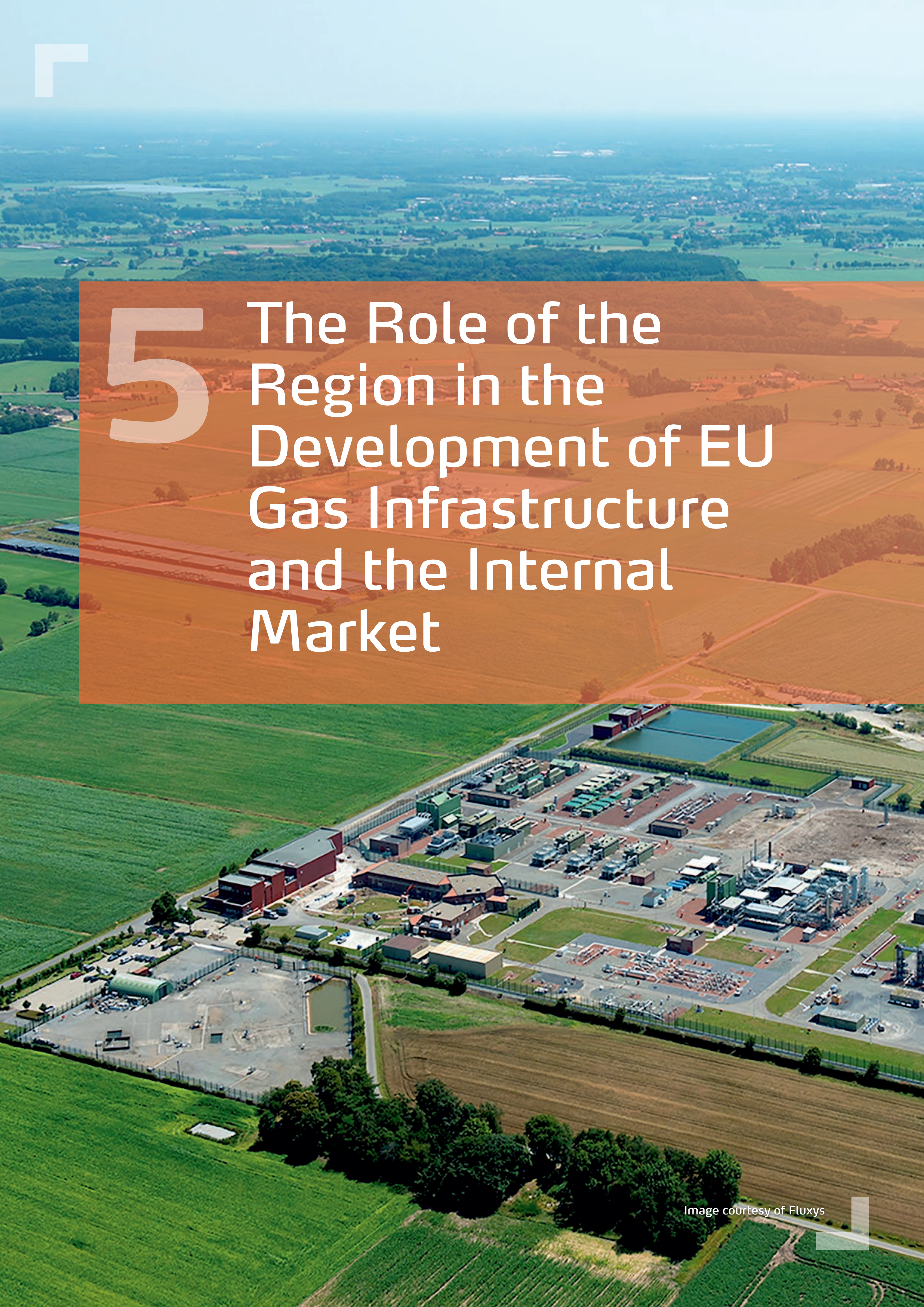


Image courtesy of Fluxys

5.1 Introduction

The SNC Region already plays a significant role as a physical and commercial bridge for the most relevant European gas markets. The commissioning of the remaining infrastructure developments, still needed to complete and strengthen the EU internal energy market, will further reinforce its interconnection role between the main gas hubs.

5.2 The Dimensions of the EU Energy Policy in a Regional Context

The SNC Region covers a key function with relation to the criteria identified by the Regulation 347/2013 as references for the evaluation of the gas infrastructure benefits:

- **Security of Supply,** with relation to the evolutions of internal European supply and demand patterns, which show additional importation needs for the future under most of the supply adequacy scenarios (see Figure 5.1 below). The sharpened decrease expected in the North-Sea and Dutch productions, both underlying the extra-EU supply need evolution, will be a main driver for infrastructure adaptations across the Region and future flow pattern changes across Europe.

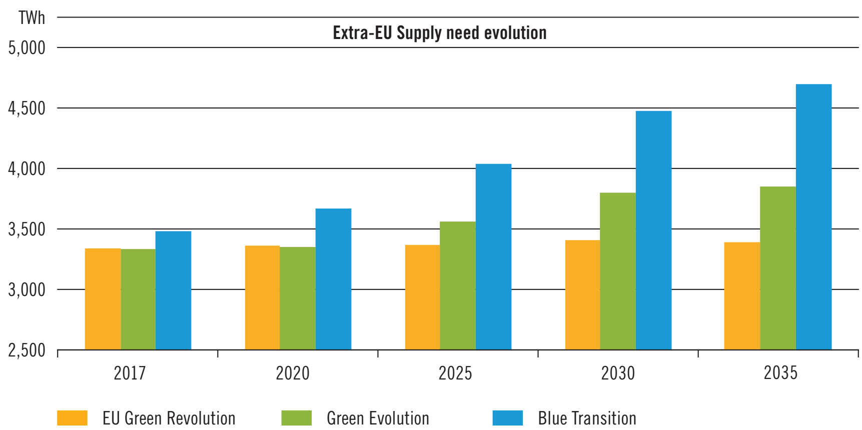


Figure 5.1: Evolution of extra-EU supply needs in the different scenarios included in ENTSOG TYNDP 2017 (Source: ENTSOG TYNDP 2017)

- **Market Integration,** providing a flexible gas route along the major gas market places, which will even improve an already high degree of price convergence of the interconnected gas hubs (Figure 5.2 shows that the major EU gas hubs, e.g. the ones providing reliable market signals, are stretching along the Region with a clear price convergence setting).

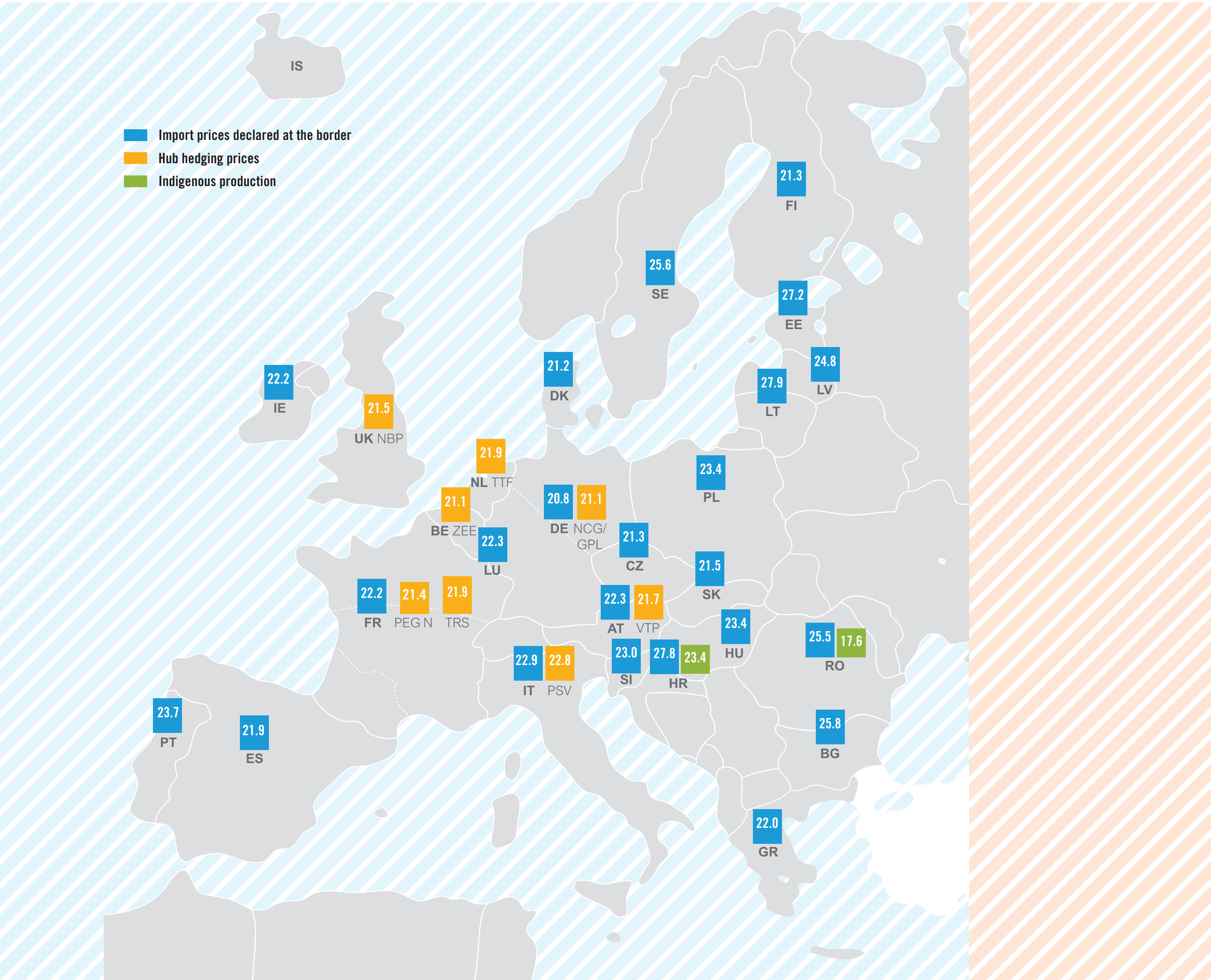


Figure 5.2: EU Member States assessed gas suppliers' sourcing prices – 2015 yearly average (map) €/MWh (Source: ACER Market Monitoring Report 2015 – GAS)

- **Competition,** made possible by a well-diversified mix of supply sources, which will be further enriched in the near future by the new gas flows from the Southern Gas Corridor (as shown in Figure 5.3 building further on the EC map with gas PCIs).

Figure 5.3: Graphical representation of the second PCI list (2015), with an indication of relevant potential flows for the South-North Corridor (Source: SNC GRIP TSOs based on EC publication, Energy DG Interactive Map: http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/)

Regional gas systems are already reaping the benefits stemming from the fulfillment of these criteria, which all together represent the dimensions of a well-functioning and secure gas market.

The advantages for the SNC Region are underpinned by a range of gas infrastructures not limited to a well-developed network of cross-border and internal transmission lines, but including also a unique landscape in terms of storage resources availability and LNG terminals regasification capacities. Further targeted enhancements will enrich these already outstanding asset characteristics, therefore permitting the full deployment of benefits at Regional and EU-wide scale.

Indeed, considering the position of the Region, the spread of these benefits to the neighboring Regions would be a natural and positive evolution for the overall EU internal gas market.

5.3 EU Priority Corridors and Projects of Common Interest (PCIs)

The role of the Region as a geographic area at the heart of continental gas flows and main gas markets has been recognised by the European Commission in the adoption of the Regulation 347/2013.

Four priority corridors for the EU gas infrastructure have been identified by the Regulation and the Region is placed at the cross-road of three of them: South-North gas interconnections in Southwestern Europe (NSI West), South-North gas interconnections in Central-Eastern and Southeastern Europe (NSI East) and Southern Gas Corridor (Caspian region).

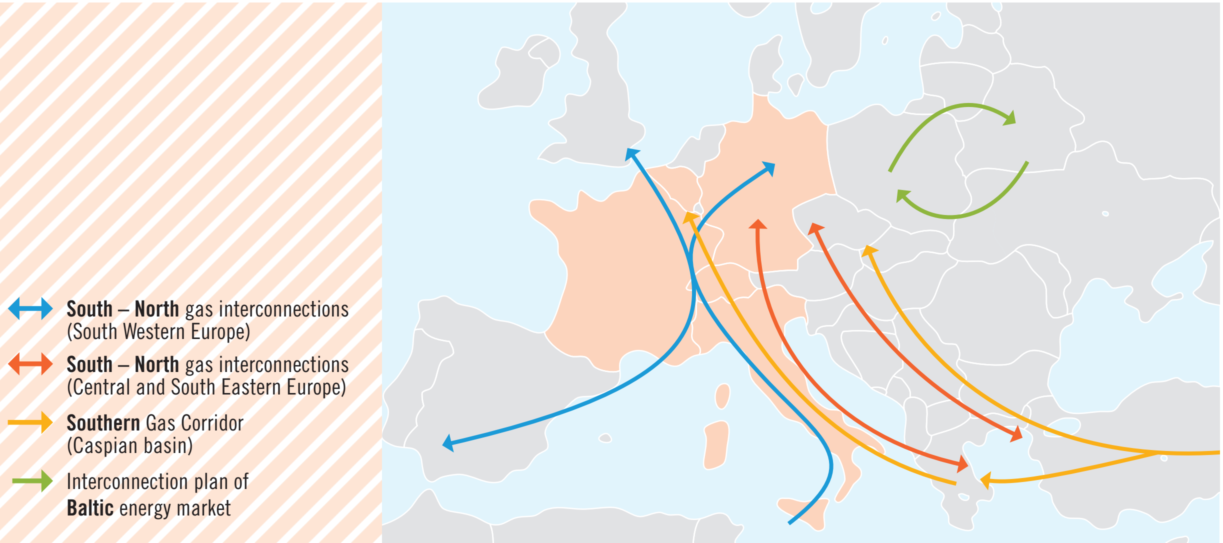


Figure 5.4: European priority corridors for natural gas infrastructures (Source: elaboration on European Commission publication)

With reference to priority corridors, the implementing acts to Regulation 347/2013, issued in November 2015[1], have adopted the second Union list of Projects of Common Interest (PCIs). These infrastructures have been labeled by the European Commission as priority initiatives for the benefits they can bring to the internal gas market under several criteria, namely market integration, security of supply, competition and sustainability.

Projects of Common Interest comprised in the South-North Corridor Region have been substantially confirmed in the second list[2] as backbone for the future European gas infrastructure developments, as also clearly visible in Figure 5.3 ("Graphical representation of PCIs").

1) Commission Delegated Regulation (EU) 2016/89 of 18 November 2015 (OJ publication of 27 January 2016)

2) PCI 5.10 "Reverse flow interconnection on TENP pipeline in Germany" and PCI 5.11 "Reverse flow interconnection between Italy and Switzerland at Passo Gries interconnection point". Reverse flow interconnection between Switzerland and France is no longer PCI (FID decision taken by GRTgaz) as well as the project "Reverse flow interconnection on TENP pipeline to Eynatten interconnection point".

The first part of the initiative "Reverse flow interconnection between Italy and Switzerland at Passo Gries interconnection point" has been successfully commissioned in October 2015 (TRA-F-2013 "Support to the North-West market").

5.4 The South-North Corridor: A Bridge Between New Needs and New Sources

As indicated at the beginning of this chapter, EU supply needs, defined as the difference between the EU demand and the indigenous production, are very likely to increase under most of the future scenarios. In particular, the combination of the different demand scenarios with decreasing expectations for the indigenous production leads to increasing supply needs over time in the ENTSOG TYNDP 2017 Blue Transition and Green Evolution scenarios.

The requirement for extra supply needs appears specifically stringent in the North-West Europe Region, affected by the accelerated cut of the L-gas production from the Groningen field (in the Netherlands), as decided by Dutch authorities for earthquake-related motivations. If the decline of the European production is an EU-wide concern, this issue is even more significant with regard to L-gas production due to the fact that L- and H-gas are not immediately substitutable[3]. In Germany, Belgium and France (the main countries using L-gas besides the Netherlands), a continuous and impacting process of converting areas currently supplied by L-gas to H-gas is already ongoing, in order to get the systems progressively adapted and fully supplied with H-gas by 2030, when the end of the Dutch L-gas exports to these countries is planned.

3) For a complete description of the L- to H-gas conversion subject, please make reference to the North West GRIP 2017, available at the webpage: http://www.entsog.eu/publications/gas-regional-investment-plan-grips.

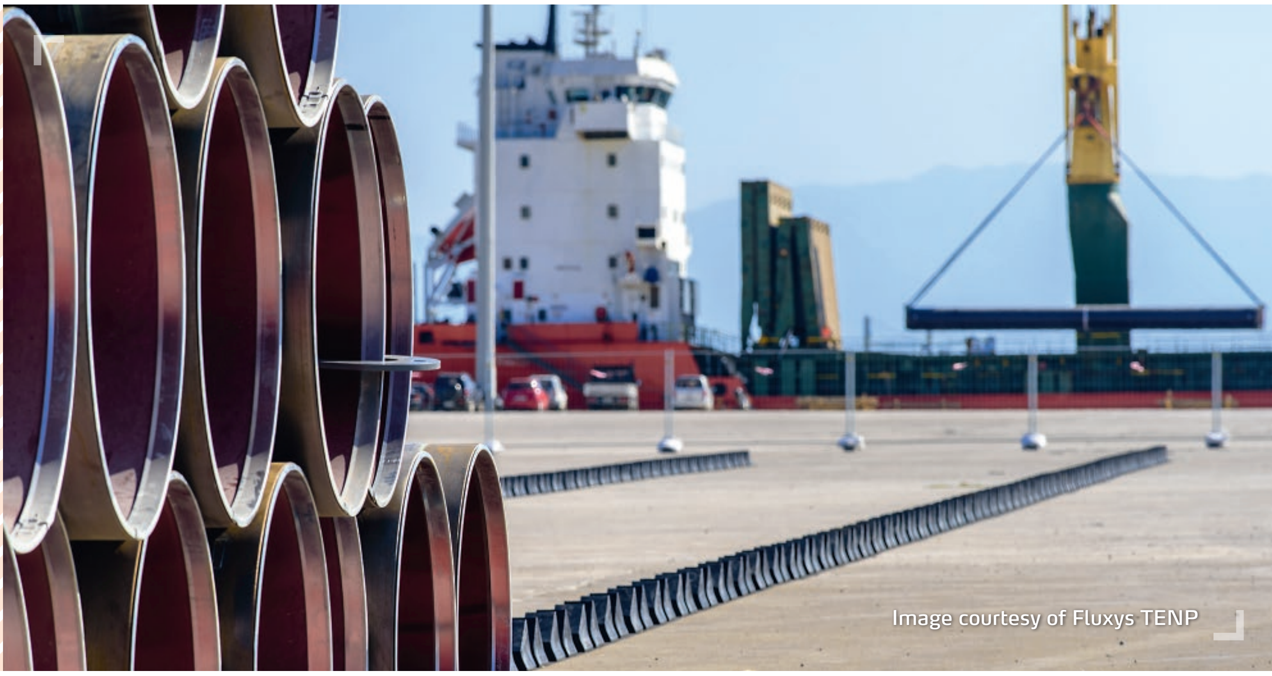
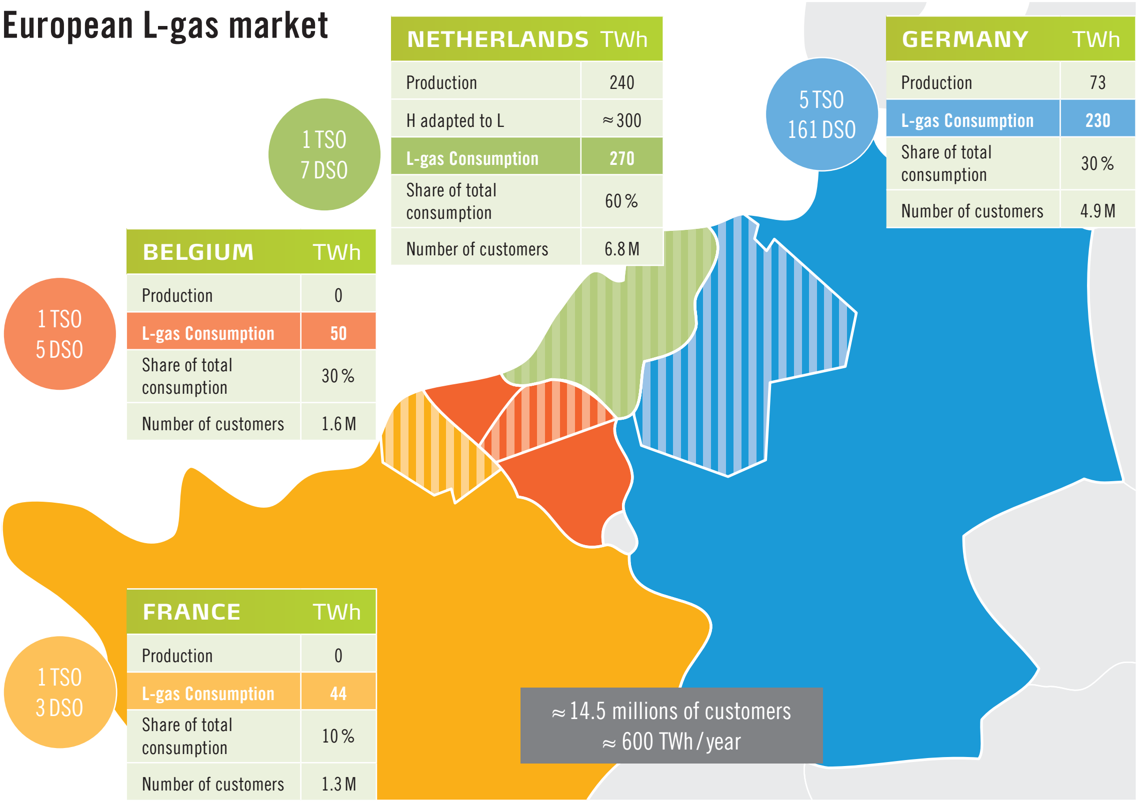


Image courtesy of Fluxys TENP

European L-gas market



NETHERLANDS	TWh
Production	240
H adapted to L	≈ 300
L-gas Consumption	**270**
Share of total consumption	60 %
Number of customers	6.8 M

GERMANY	TWh
Production	73
L-gas Consumption	**230**
Share of total consumption	30 %
Number of customers	4.9 M

BELGIUM	TWh
Production	0
L-gas Consumption	**50**
Share of total consumption	30 %
Number of customers	1.6 M

FRANCE	TWh
Production	0
L-gas Consumption	**44**
Share of total consumption	10 %
Number of customers	1.3 M

Figure 5.5: The European L-gas market (Source: NW GRIP TSOs)

As reported in Figure 5.5, the current amount of L-gas consumed in North-West Europe is about 600 TWh/y (~ 55 bcm/y), with the share of Belgium, France and Germany that needs to be converted to H-gas with priority totaling around 330 TWh/y (~ 30 bcm/y).

In the South-North Corridor context, a special role for accommodating the supply needs just highlighted is played by the new gas flows destined to reach Europe via the Southern Gas Corridor (Caspian, Middle East and East-Mediterranean sources)[4].

In fact, if the supply gap generated by the decline of the European indigenous production could be covered using already established flow patterns – through existing and/or new infrastructure – it is undeniable that this scenario would see an increase of the traditional sources weight, with a potential loss of benefits evaluated under all the energy policy dimensions as described in the first section of this Chapter. A lower sources diversification is indeed likely to affect market competition and, at the same time, would not improve security of supply levels, at least in terms of dependence from a relatively low number of supplies.

New gas sources are expected to flow from the Southern Corridor to Europe through TAP (Trans Adriatic Pipeline), an onshore and offshore pipeline of around 870 km in length crossing Greece (550 km), Albania (215 km), the Adriatic Sea (105 km) and finally reaching Italy[5]. The first gas to be delivered from Azerbaijan into the European gas grid is planned for 2020.

4) For a better description of the Southern Corridor Region, including infrastructure and flows potential, please refer to the Southern Corridor GRIP, available at the following webpage: http://www.entsog.eu/publications/gas-regional-invest-ment-plan-grips.

5) See section 8.4.1 as reference for the project "TAP Interconnection" in Italy.

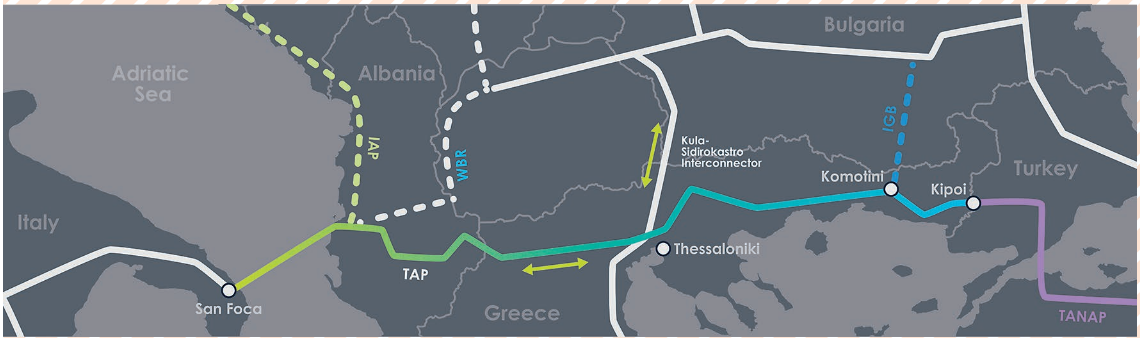


Figure 5.6: TAP's planned route (Source: TAP website)

The map above depicts the planned track of TAP from the Turkey-Greece border to the Italian coast.

TAP capacity is designed to expand from an initial 10 bcm/y till at least 20 bcm/y, integrating the possibility for future physical reverse flow. The pipeline has links with other infrastructures in South-Eastern Europe, where it will significantly improve the security of supply, and is destined for delivering gas to and interconnecting of multiple markets in Western and Central Europe. All these features make the project particularly aligned with EU's energy policy objectives.

The potential for this new gas corridor – to which the South-North Corridor is clearly complementary for spreading its benefits to the overall European continent – is huge in consideration of the size of the gas sources to be interconnected to EU end markets. The capacity of the pipeline is initially destined to be fed by the Shah Deniz field but can be further used to interconnect other Azeri reserves[6] and other producing countries.

6) Azerbaijan has proven gas reserves amounting to 2.55 trillion cubic meters. Including forecasted resources, Azeri potential can reach 6 trillion cubic metres (Source: SOCAR).

6 The South-North Corridor

Image courtesy of Snam Rete Gas

6.1 Introduction

Historically, the transmission flows through the TSOs' relevant pipeline systems along the Corridor are oriented from north to south: from Belgium and the Netherlands into Germany, Switzerland, France and Italy.

Nevertheless, forward-flows especially in the part for the Corridor towards Italy have recently shown a reduction trend[1] (annual import flows at IP between Italy and Switzerland decreased by 40 % between 2014 and 2016). Looking at short-term flow behaviour at the beginning of 2017, gas flows along the axis became more and more reactive to short term price signals generated by the main hubs of Northern and Southern Europe. The flows patterns registered in the first two months of 2017, characterised by exceptionally persistent cold conditions across Europe, show that Italian daily imports have hit a high near to 60 mcm/day on 11 January – when the premium between PSV and TTF reached a maximum of 7.6 €/MWh – and jumped down till near zero flows less than one month later (7 February, when the PSV premium to TTF was down to 0.4 €/MWh, see Figure 6.1 for an example referred to the period January-February 2017)[2].

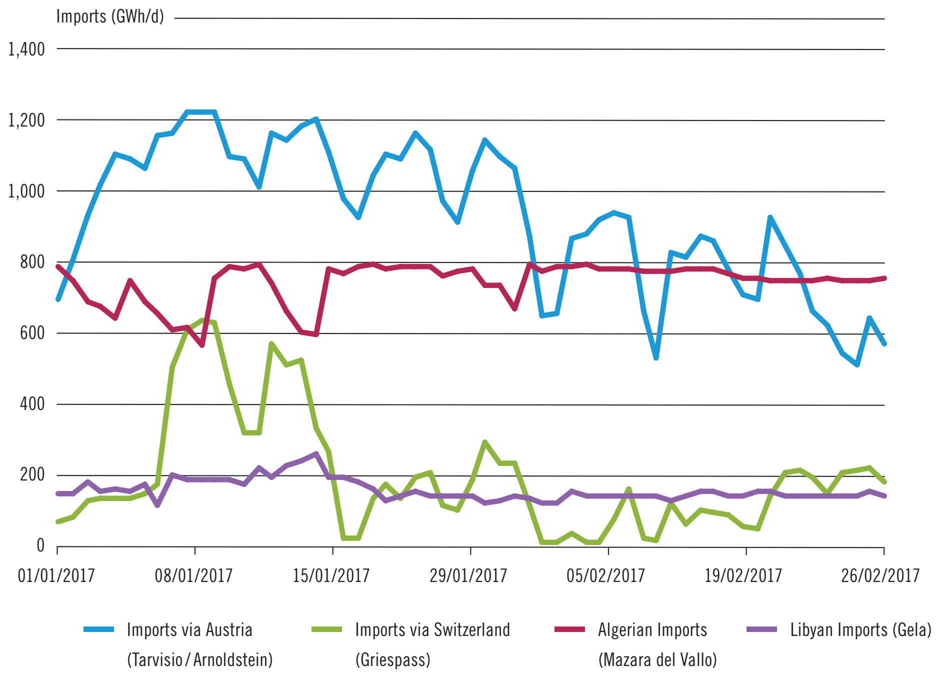


Figure 6.1: Import flows to Italy at cross-border IPs during early 2017 (January cold snap and following period) (Source: Snam Rete Gas)

1) Annual import flows to Italy at Griespass IP fell down from around 11.5 bcm (2014, year of the last GRIP edition) to a historical minimum of 6.7 bcm (2016, last available full year), recording a –40 % in this time horizon.

2) According to market participants polled by ICIS, flows from North Africa – and potentially from other sources as the ones from Southern Corridor – could "bring a change to Italian import profiles. In particular, flow from northern Europe, which are the most flexible of Italy's sources of supply, were expected to be most affected" (Source: ICIS ESGM, 17 March 2017).

The possibility for the SNC Corridor to function in a fully-fledged "interconnector mode" is still partially constrained by the lack of physical reverse flow capacity along the whole route[3]. The final step for the completion of the Corridor allowing physical bi-directionality will be achieved by 2018, when the technical reverse flow capacity along the whole route will be made available to the market with the commissioning of the projects described further on in this Chapter.

The purpose of Chapter 6 is indeed to illustrate in detail the projects and their development in the Region dedicated in particular to the opening of the "South-North Corridor", creating technical transmission capacity from Italy through Switzerland to Germany and France by enabling physical reverse flows.

3) On 6 February the spread between TTF and PSV was negative (gas was exchanged on the two hubs respectively at 23 €/MWh and 22.55 €/MWh (Source: *ICIS Heren European Spot Gas Markets Closing Prices Update*) opening the door for arbitrage in the reverse flow direction.

6.2 Project Rationales

The potential for a new pattern of flows, from the south to the north of Europe, and for the transmission capacity enabling them is strictly linked to the drivers for the role of the Region, introduced in Chapter 5. The South-North Corridor reverse flow projects constitute the physical assets connecting the main European gas markets allowing to grasp benefits both in terms of security of supply and competition.

From a **security of supply** point of view, the advantages which will arise from the completion of the Corridor are linked to:

- The filling-up of Northern European decreasing gas productions. Traditionally there has been a substantial southward-oriented flow from gas producers in the North Sea and the Netherlands across Switzerland to Italy. With stable to declining Norwegian sources, UK and Dutch productions already going down at a steeper pace than projected, more gas will need to come from other sources. The related infrastructure will have to be put in place to connect new sources of gas with the markets in need of filling the gap between demand and depleted supplies.

  Probably the most natural and cost-effective option for diversifying supply sources is to create reverse flows, which are mostly using the infrastructure already in place, therefore minimising the economic and environmental impacts.

- The diversification from remaining existing suppliers. As highlighted by ENTSOG TYNDP 2017[4)], the number of supply sources available to European countries is decreasing along time, mainly since the relevance of the indigenous production is expected to significantly fall down. The supply source dependence on a limited number of producers is at the same time going to increase.

Also improving **competition** and the positive effects on the EU **gas markets integration** constitute valid drivers for the accomplishment of the South-North Corridor projects:

- In fact, the diversification of gas sources and routes is not limiting its effects on security of supply, but positively impacts also the competitive environment. In particular Italy, at the southern side of the Corridor, will experience a further increase of import diversification when Azeri gas reaches the country via TAP. The additional demand-supply margins built-up by this new source, together with both North African flows currently benefiting only a few interconnected countries[5)] and the potential represented by East-Mediterranean and Middle-East basins can all represent resources that once made available via South-North Corridor capacities can contribute to the enhancement of the level of flexibility and competitiveness of the overall European gas market.

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4) The ENTSOG TYNDP 2017 relevant sections in this regard are 6.3.3.1 "Access to supply sources" and 6.3.3.2 "Supply source dependence". A worsened diversification rate is detected moving from 2020 to 2030 for near all EU countries (page 170, Figure 6.12 ENTSOG TYNDP 2017), accompanied by an increased dependence on Russian, LNG and Norwegian supplies (excerpts from page 174 ENTSOG TYNDP 2017: *"Norwegian, Russian or LNG supplies [which] show an European-level dependence, indicating these sources are needed to achieve the European supply and demand balance. High dependence to Russian supply is both a security of supply and a competition issue"*).

5) *"Italy has infrastructure in place allowing the higher diversification degree, which only Slovenia and Croatia can currently benefit from. In the case of Algerian gas, infrastructures in Italy allow Slovenia and Croatia to significantly benefit from this source"* (Source: ENTSOG TYNDP 2017, pages 170–171)

- Finally, the progressive expiration of long-term take-or-pay contracts and the increased interconnectivity level between hubs are likely to cause gas flow dynamics to become increasingly unpredictable and multi-directional. Flow reversals and shifts in flow patterns will be likely in the future, following price spreads signals, and a truly interconnected European gas grid should be able to promptly react. The South-North Corridor reverse flow projects enhance the interconnectivity of the European gas network, making possible a full-directional connection of the main European gas hubs currently still missing for the completion of the internal gas market. The South-North Corridor will make it possible to exploit also seasonal or just temporary supply-demand equilibria gaps providing the opportunities to ship gas in a bi-directional way from Northern to Southern Europe and vice versa.

Figure 6.2: South-North Corridor in the context of other major existing, under construction or planned EU import transmission infrastructure

Currently, along the gas transmission route between the United Kingdom and Italy, only the UK Interconnector pipeline and the network in Belgium can accommodate gas flows in both directions. The TENP and Transitgas systems in Germany and Switzerland can move physical flows from north to south only, while the route from France to Switzerland and Italy is also only from north to south. The Italian network to date can offer only small amounts of technical capacity in an exit direction along the Corridor. To exploit the full "South-North Corridor" potential as flexible and EU-long interconnector and to unleash the above depicted benefits, the projects described in the following section have therefore to be implemented.

Further considerations supporting the above project rationales can be found in Chapter 7 "Network Modelling".

6.3 Projects Description

Since the launch of the reverse flow initiative in 2012, all the involved TSOs started a cooperation process which brought the set of projects composing the South-North Corridor progressively from a design phase to an FID status with subsequent construction works already in an advanced stage.

Some sections of the initiative are even fully realised and already in operation. Below an overall representation of the different South-North Corridor related projects and foreseen reverse flow possibilities is provided.

Figure 6.3: Overall schematic representation of the reverse flow projects
(Source: Elaboration of SNC GRIP co-authors on ENTSOG Capacity map)

This section continues with a more detailed description of various projects composing the South-North Corridor, building upon the well-established and appreciated "Interconnection Point approach" adopted in the two previous GRIP editions.

6.3.1 IN ITALY: SUPPORT TO THE NORTH-WEST MARKET AND BIDIRECTIONAL CROSS-BORDER FLOWS

The Snam Rete Gas project to support flows to the Northwestern Italian market and to create exit flow towards Griespass IP is divided in two phases:

- The first phase of the project, denominated “Support to the North-West market” (TRA-F-213), has been finalised in 2015. The commissioning of the projects in October 2015 allowed the creation of an initial availability of flows for export from October 2015. The completion of this phase ensured exports of 5 MSm³/d (around 54 GWh/d) at Griespass IP from Italy to Switzerland and up to 18 MSm³/d (around 191 GWh/d) at Tarvisio IP from Italy to Austria.
- The second phase of the project, defined as “Support to the North-West market and bidirectional Cross-Border flows” (TRA-F-214) continues on from the first phase and integrates the expansions to facilitate an increase in export capacity by 2018. The capacity at the exit point of Griespass will increase to up to 40 MSm³/d (around 429 GWh/d), or up to 22 MSm³/d (around 238 GWh/d) with a simultaneous exit flow at the Tarvisio exit point of up to 18 MSm³/d (around 191 GWh/d).

6.3.1.1 Support to the North-West market

The first phase, ended in 2015, consists in expanding the capacity of the line from the east to the west of the Po Valley, through the construction of pipelines in Cremona–Sergnano (50 km – DN 1200), Poggio Renatico-Cremona (149 km – DN 1200) and Zimella–Cervignano (172 km – DN 1400) as well as a new node in Sergnano and Minerbio. It also includes upgrades to the compressor plants at Istrana and Masera, as well as work on the measurement equipment at Masera, which enables management of the exit flows at Griespass and Tarvisio IPs. The Cremona–Sergnano pipeline and the upgrade of the compression plant in Istrana are in operation since the end of 2011.

The works on the compressors and measurement equipment at Masera were commissioned in July 2013, and the Poggio Renatico-Cremona pipeline was commissioned in October 2013.

The construction of the aforementioned new pipelines also allows the replacement of the existing pipelines: Minerbio–Cremona, Cremona–Sergnano, Zimella–Sergnano and Sergnano–Cervignano, for a total extension of approximately 315 km, which improves the overall transmission system and reduces potential impacts in the urbanised area of the Northern Italian regions (Emilia, Veneto and Lombardy).

The construction of the Cremona-Sergnano pipeline will also connect the new storage field of Bordolano (included in ENTSOG TYNDP 2017 with the identification codes UGS-F-259 and UGS-F-1045) to the national network.

The project “Support to the North-West market” was included in ENTSOG TYNDP 2015–2024 with the identification code TRA-F-213.

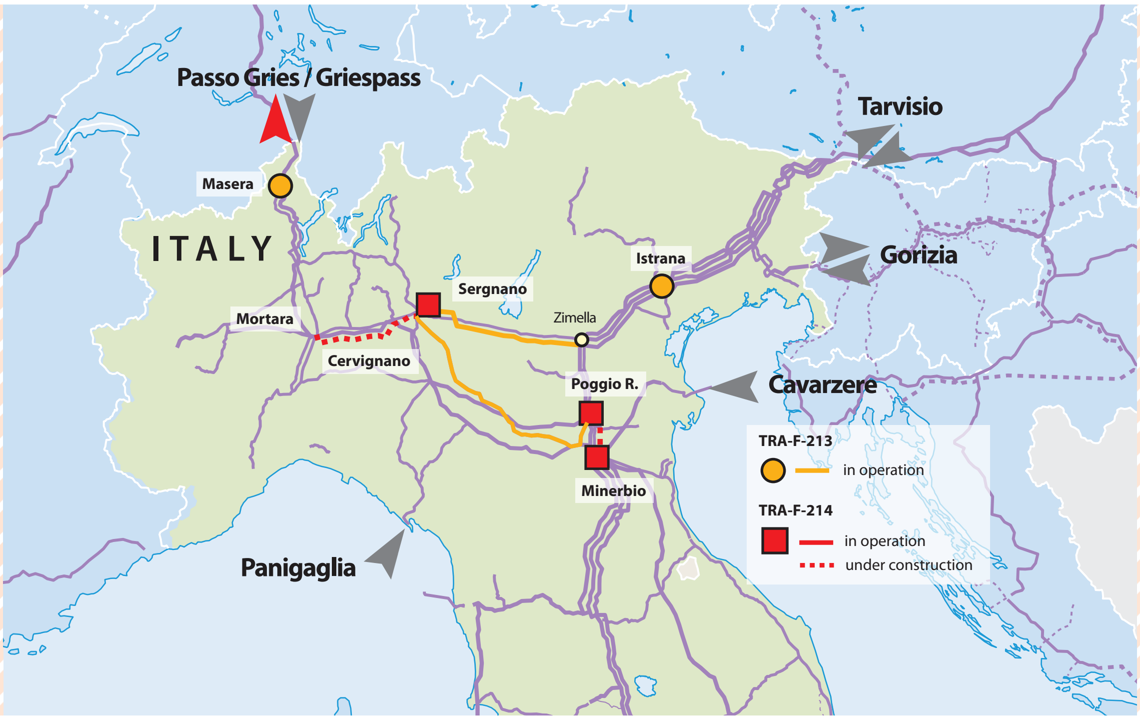

Figure 6.4: Support to the North-West market and bidirectional cross-border flows phase 1 (TRA-F-213) and phase 2 (TRA-F-214) (Source: ENTSOG TYNDP)

6.3.1.2 Support to the North-West market and bidirectional Cross-Border flows

The second phase is scheduled for commissioning in September 2018 and involves the construction of pipelines Cervignano–Mortara (62 km – DN 1400) and Minerbio–Poggio Renatico (19 km – DN 1200, already in operation since December 2015), as well as new compression plants in Minerbio (24 MW) and Sergnano (45 MW) and the expansion of the existing compression plant in Poggio Renatico (+25 MW).

The total length of new pipelines envisaged by this second project phase is 81 km, for an overall additional compression power of 94 MW. These investments will make available a new capacity of 35 MSm^3/d (around 375 GWh/d). Summed up to the capacity already created by the first investment phase, the total reverse flow capacity available at the commissioning date will reach the level of 40 MSm^3/d (around 429 GWh/d), 22 MSm^3/d (around 238 GWh/d) at Griespass exit IP and 18 MSm^3 (around 191 GWh/d) as competing capacity between Griespass exit and Tarvisio exit IPs.

The project "Support to the North-West market and bidirectional cross-border flows" is included in ENTSOG TYNDP 2017 with the identification code TRA-F-214.

6.3.2 IN SWITZERLAND: REVERSE FLOW TRANSITGAS SWITZERLAND

The Transitgas pipeline in Switzerland is currently dedicated to transport gas from Germany and France towards Italy and at the same time to satisfy the Swiss gas market needs. In order to implement the physical reverse flow, Transitgas has obtained the necessary permits to make the required modifications to its transmission system and is ready to start construction.

The Transitgas reverse flow project from Griespass to Wallbach and Oltingue envisages the modifications and expansion of the following system facilities in order to allow physical reverse flow:

- Ruswil compressor station: works will allow flows to be reversed and to compress gas from south to north. Additionally, as the new deodorisation plant in Germany will always allow to compress gas from France to Germany and vice versa, additional regulation capability and flow measurement will be installed in Ruswil.
- Lostorf interconnection station: works includes the exchange of regulation valves in order to be able to control gas flows in both directions.
- Wallbach metering station: works includes the installation of bi-directional US (Ultra-Sound) gas flow meters as well as the automation of several valves. Additionally, gas quality measurements will also be installed.
- Brislach station: installation of gas quality measurement (THT and sulfur) as a pre-warning for the odorisation plant built by GRTgaz in Oltingue for reverse flow.
- Däniken valve station: installation of gas quality measurement (THT and sulfur).
- Obergesteln valve station: works include the installation of a Pressure Control Valve in the bypasses of the existing valve station (foreseen in 2018).

Permits have already been received. Engineering, design phases and tender for EPC have been completed in 2016. The preparation of the works started early 2017 and the works have been initiated end of March 2017 in the Wallbach, Ruswil and Lostorf stations. Commissioning is planned for October 2017.


Image courtesy of FluxSwiss

6.3.3 IN GERMANY: REVERSE FLOW TENP GERMANY

In order to support the reverse flow project from Italy, trough Switzerland and up to Germany, Fluxys TENP and OGE have planned to invest via TENP KG[6)] in three major locations: the Hügelheim compressor station, a new deodorisation plant to be built and the Mittelbrunn compressor station.

Figure 6.5: Schematic overview of Reverse Flow on TENP in Germany

1. **Hügelheim compressor station works: Allowing a physical reverse flow on TENP as from end 2017.** The study and long lead item orders have been finalised in 2016 in order to be able to start the works early 2017. Currently, TENP KG is realising the civil & piping works. The current planning targets October 2017 as a technical commissioning date for this part of the project, where the commercial commissioning date is planned for end 2017/start 2018. Current project indicators show a timely completion.

>>>

6) TENP KG (Trans Europa Naturgas Pipeline GmbH & Co. KG) is the owner of the gas transmission system TENP (Trans-Europa-Naturgas-Pipeline). The TENP KG shareholders are Open Grid Europe GmbH (51 %) and Fluxys TENP GmbH (49 %).

2. **Deodorisation plant:** The plant will reduce the odorant in the gas (THT coming from France) to a maximum of 2 mg/m³, and ensure the gas delivered to Germany is compliant with the German Market rules.

   Following major developments have occurred in 2016:

   - A small-scale (pilot) deodorisation plant has been tested and allowed to confirm all key hypotheses and helped to fine-tune the envisaged operation modes.
   - In parallel, the tender for the FEED (front end engineering design) of the deodorisation plant has been prepared and the tender procedure has been launched in October 2016 allowing TENP KG to select the remaining bidders by early 2017.
   - Finally, the final plant location has been validated by TENP KG and already discussed with permitting authorities in order to ensure a good alignment with all actors.

   The focus for 2017 will be to ensure a timely completion of the FEED and prepare the EPC tender package while in parallel further supporting the permitting process for the envisaged plant location.

3. **Mittelbrunn Compressor Station:** The works will ensure more flexibility for gas transfer from the TENP to the MEGAL both in forward and reverse flow. The goal is to get the modifications implemented by 2020. Therefore, a feasibility study will be conducted in the first semester 2017 while the second semester will be used to further develop the basic design of the envisaged modifications.

Finally, Fluxys TENP has also been granted 9.9 million € EU-grants (1.2 million € for study and 8.7 million € for works) in order to support the project which is PCI labelled.

The deodorisation plant to be built in Germany will be the first in Europe able to handle large gas volumes in order to remove the THT content. This plant is a key innovation for the European industry since it leverages on extended research studies, on detailed engineering design as well as on the extended tests carried out by Fluxys TENP in 2015 and 2016 in a pilot plant installed in Krummhorn. This pilot plant is a smaller version of the industrial deodo plant which allowed to test all modes and expected behaviour of the plant. Besides that, it allowed to confirm the envisaged design and to fine-tune some envisaged operational modes.

6.3.4 IN FRANCE: REVERSE CAPACITY FROM SWITZERLAND TO FRANCE AT OLTINGUE

In France, an open season organised in 2012 confirmed that the market was interested in capacity, but no binding commitment was made in light of the costs required to create firm capacity, valued at the time at 258 million €. In 2014, GRTgaz reviewed the investments required and proposed the creation of 100 GWh/d in quasi-firm capacity for a budget valued at the time at 12 million €. After consulting the market and once the CRE had issued its approval on 17 December 2014, in 2015 GRTgaz decided to make the investments needed to create entry capacity of 100 GWh/d to which an additional 100 GWh/d of interruptible capacity may be offered. The utilisation of such capacity may be dependent on that of Taisnières and Obergailbach.

The project consists in adapting the Oltingue station, the interconnection point with Switzerland, and the Morelmaison station in order to reverse the direction of the gas flows. The cost of the project is estimated at 17 million €, once the initial studies have been completed.

Availability of the capacity is planned for 2018 when the exit capacity in Italy and the transmission capacity in Switzerland will be delivered.

By creating a new entry point in France, this project will give access to new sources of Libyan and Algerian gas by pipeline as well as Azeri gas. France will then benefit from a new source of gas transmitted from Azerbaijan via the Trans Adriatic Pipeline (TAP), which will provide 10 bcm of Azeri gas to Italy in 2020.

This project also connects the North PEG and PSV marketplaces in both directions, thereby providing new trading opportunities between these markets.

The project “Reverse capacity from CH to FR at Oltingue” is included in ENTSOG’s TYNDP with the identification code TRA-F-45.

Image courtesy of GRTgaz

6.4 PCI Status

Over the last years the importance of the projects related to the opening of the South-North Corridor has been underlined by the European Commission throughout the PCI (Projects of Common Interest) process.

The following table lists the reverse flow projects on the backbone of the South-North Corridor that have received the PCI label in the 2nd PCI selection round as adopted in November 2015.

SOUTH-NORTH CORRIDOR RELATED PCI PROJECTS

PCI	TYNDP Code	Name	Project Promoter
5.11	TRA-F-214	Reverse flow interconnection between Italy and Switzerland at Passo Gries interconnection point	Snam Rete Gas S.p.A.
5.10	TRA-F-208	Reverse flow interconnection on TENP pipeline in Germany	Fluxys TENP GmbH & Open Grid Europe GmbH

Table 6.1: South-North Corridor related PCI projects
(Sources: Annex to Commission Delegated Regulation (EU) 2016/89 and ENTSOG TYNDP)

These projects were also part of the very first PCI list in 2013, together with the project creating physical reverse flow from Switzerland to France.

The Trans-Adriatic Pipeline (TAP) project that will supply the South-North Corridor with Azeri gas has also been awarded the PCI label, again highlighting the importance Europe awards to a further increase in diversification of supplies to the EU market.

All projects currently holding the PCI label are part of the ENTSOG TYNDP 2017 and have endeavored to apply again for a prolongation of this priority status in the 3rd PCI call to be finalised by the end of 2017.

6.5 South-North Corridor Capacities: An Overall Picture

A set of key inputs for the ENTSOG NeMo modelling tooland for the analysis in the next Chapter 7 is represented by the pipeline firm technical capacities, storage withdrawal and injection rates and LNG plant regasification characteristics.

The main interconnection capacities throughout the Corridor, bridging the north and the south of the Region after completion of the reverse flow infrastructure projects described in the previous sections of this Chapter and used in the NeMo simulations, are schematically shown in Figure 6.6 (with values resulting from the lesser-of rule and expressed in GWh/d).

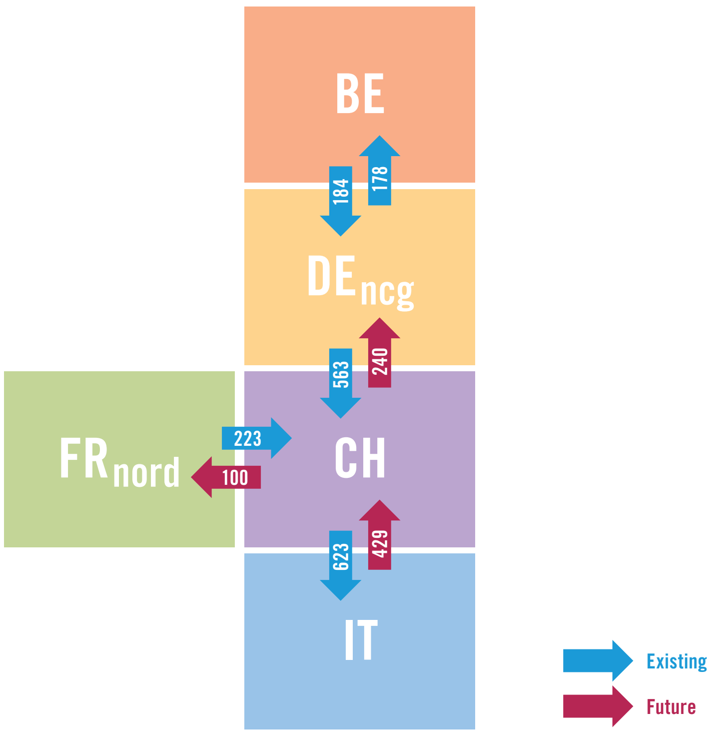

Figure 6.6: Schematic representation of the South-North Corridor and related existing and future capacities in GWh/d (Source: ENTSOG Capacity Map 2016 for existing capacities, TSO promoters for future reverse flow capacities)

It should be noted that capacities from Switzerland to France at Oltingue were not taken into account in the NeMo model for TYNDP 2017 simulations but they were considered in this report (cases c and d in the section 7.3 "Assessment results"). Considering on-going discussions with market participants and the French NRA about the commercial arrangements necessary to the merger of TRS and PEG Nord, GRTgaz did not have enough visibility to confirm the firm status of this capacity and therefore preferred not to declare the capacity as firm during the data collection process of TYNDP 2017. The envisaged investments will create quasi-firm entry capacity of 100 GWh/d (in competition with Taisnières and Obergailbach) to which an additional 100 GWh/d of interruptible capacity may be offered. The precise condition of use of this new capacity should be decided by end July 2017 and factored accordingly in future editions of GRIP and ENTSOG TYNDP.

7 Network Modelling

Image courtesy of Fluxys

7.1 Introduction

Also for this third version of the South-North Corridor GRIP a specific simulation exercise has been performed and numerous cases have been simulated using the ENTSOG Network Modelling tool (NeMo)[1].

A network modelling section has been introduced as from the second edition of the report following a specific ACER indication. The cases considered represent variations on scenarios considered in ENTSOG TYNDP 2017. Nevertheless, no additional or updated information with regard to demand and project data has been used as input to the NeMo tool, since the 3rd GRIP edition uses the same database as built for ENTSOG TYNDP 2017.

The network assessment using the NeMo tool is always performed at a European-wide scale but for demand variations, considered project clusters, disruption scenarios and selected output, closer attention is given to the South-North Corridor specificities.

7.2 Modelled Cases

In total, 240 cases have been processed through the NeMo tool for this specific 3rd South-North Corridor GRIP edition. The case specificities are a result of variations related to:

- the considered years to be simulated
- infrastructure clusters
- demand scenarios and profiles throughout Europe
- supply situations (including possible disruptions and different supply sources price configurations)

7.2.1 YEARS

For the purpose of this SNC GRIP, the years 2017, 2020 and 2030 were taken into account, with the latter two being the most relevant ones with regard to the foreseen commissioning dates of the main projects in the SNC Region (2017 has been kept for comparison purposes with the already existing infrastructure).

1) More details on the ENTSOG simulation tool and methodology can be found in the Methodology chapter of TYNDP 2017: http://www.entsog.eu/public/uploads/files/publications/TYNDP/2016/entsog_tyndp_2017_annex_F_method_web.pdf

7.2.2 INFRASTRUCTURE

Two infrastructure clusters have been considered as the most relevant for this analysis purposes:

- The "Low" infrastructure level, which complements the already existing infrastructure with projects that have already proceeded to FID.
- The "2nd PCI list" infrastructure level, which is adding to the "Low" infrastructure level all PCI projects resulting from the second PCI selection round.

To come to a manageable number of simulations and to get to a more focused analysis, both "Advanced" and "High" infrastructure levels, as defined in ENTSOG TYNDP 2017, have not been taken into account. This choice is also linked to the fact that the core projects bridging the South-North Corridor to the existing infrastructure will show their impacts in the "Low" infrastructure level as from year 2020 (the South-North Corridor reverse flow projects will be commissioned by the end of 2018 and TAP by the beginning of 2020), and the additional reinforcements of the Italian grid making available new potential gas sources for Europe will display their effects in 2030 at least for simulation purposes ("Adriatica Line" is a PCI project with commissioning scheduled for 2023).

7.2.3 DEMAND

As for the anticipated gas demand throughout Europe, the following cases were taken into account:

- winter peak demand (design case) situations of one-day duration
- average winter demand

Both demand cases are derived under the Blue Transition scenario storyline defined in ENTSOG TYNDP 2017. This scenario has been considered as representing the most challenging one in terms of infrastructure adequacy while, at the same time, representing a future evolution where gas is playing a key role in terms of meeting European energy needs at competitive and affordable costs, with respect to the environmental targets.

For the high daily demand the design case scenarios from TSOs constitute the reference scenario.

A first set of simulations has been performed taking into account a homogeneous demand situation across the whole of Europe (corresponding to cases a and b in the section 7.3 "Assessment Results").

A second set of simulations has been carried out adopting a reduced demand situation by releasing the constraint to maintain the whole continent under winter peak conditions. This represents a new climatic "macro-regional" approach introduced for the first time in the second edition of the SNC GRIP and, at this stage, not considered in TYNDP which takes a more general overall EU approach. Specifically, one macro-region has been considered under peak demand situations ("Northern Europe") while all other Member States ("Rest of Europe") are assumed to be under average winter demand conditions (corresponding to cases c and d in the section 7.3 "Assessment Results).

The detailed lists of the EU countries as grouped in consideration of the two macro-areas defined above are:

- Northern Europe: Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherlands, Poland, Sweden, Switzerland and United Kingdom
- Rest of Europe: all the other EU-28 Member States

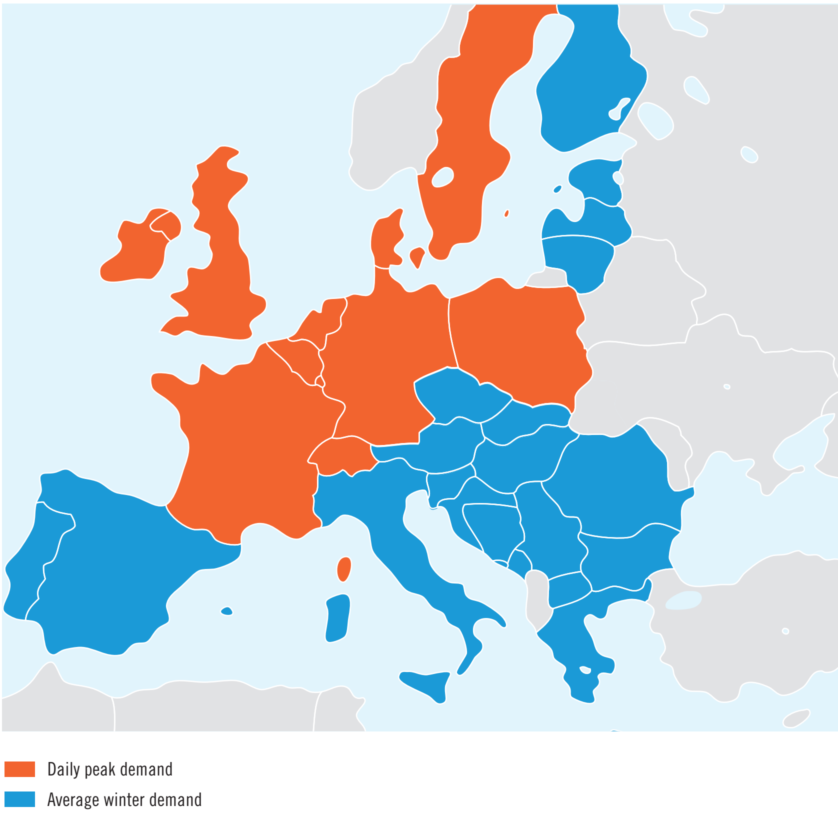

Figure 7.1: Representation of climatic macro-regions used for simulations purposes (daily peak demand in red, average winter demand in blue)

The underlying rationale justifying this macro-regional approach is to assess infrastructure utilisation should gas demand be different between the two macro-areas for climatic or other reasons (e.g. economic-related), as can be observed on a regular basis in real life.

7.2.4 SUPPLY AND PRICE CONFIGURATIONS

The same supply approach followed for TYNDP 2017 has been adopted in order to define the infrastructure utilisation rates (pipeline, storages and LNG plants) and different import source potentials.

With relation to disruption cases, particular relevance has been reserved to:

- Ukraine
- Belarus
- Norway
- Algeria

As for price configurations assumptions, the cases with cheaper North African (Algerian and Libyan) and Azeri gas have been investigated as well the cases where flows from Russia and/or Norway would represent the most expensive sources.

Finally, specific supply disruptions have been coupled with source price configurations, as shown in Figure 7.2 by the arrow linking the disruptions and the supply source prices columns.

The mix of the supply and price configurations considered in this network modelling analysis should not be interpreted as predictions for the future. Nevertheless, these cases have been designed for simulating situations triggering flows patterns, especially along the South-North Corridor route. In fact, due to its perfect market functioning assumption and other necessary simplifications, the NeMo model is not able to adequately represent market features reflecting hub prices differentials generated by various important demand drivers and/or infrastructure capacity restrictions (e.g. local energy demand spikes and/or specific facilities unavailability generating tensions on prices).

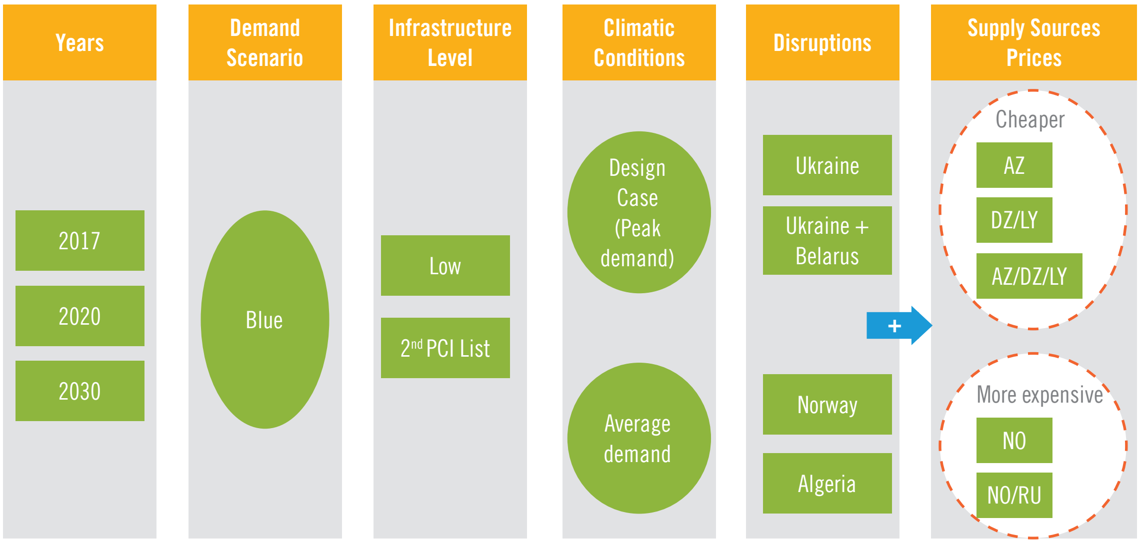

Figure 7.2: Schematic summary of the simulation cases for the 3rd SNC GRIP edition

7.3 Assessment Results

In accordance with the results obtained in TYNDP 2017, no major capacity issues were detected to face demand under perfect market conditions[2)] for the countries that constitute the South-North Corridor Region when the European supply is not facing any disruptions. However, additional projects can heavily improve security of supply and market integration under more market based conditions.

As for the considered disruption scenarios, the biggest impact in Europe occurs when considering a problem with Russian or Norwegian supplies.

For this 3rd edition of the SNC GRIP, the cases for which results are visualised below, are the following ones:

Russian disruptions:

- full interruption of flows through Ukraine and Belarus
- partial interruption of flows only via Ukraine

Norwegian disruption:

- assumed to be related to Norpipe outage.

In these cases all demand in the CEE and/or NW Regions cannot be met and considerable impacts would be expected, especially under peak demand conditions. SNC capacities could help to transport some more gas from other sources to the impacted countries to relieve their conditions, potentially bringing less expensive energy resources being far from the problematic situations and therefore less influenced by the considered supply crisis.

Throughout the simulated scenarios a wide range of different flow patterns in Europe in general and along the South-North Corridor in specific is observed. This illustrates the flexibility in the potential usage of the Corridor infrastructure in the centre of Europe to connect the various markets from north to south or from south to north under diverging conditions and potential combinations of demand and supply.

Results showing a utilisation of the South-North Corridor backbone in the reverse direction have been in particular identified. In the following sub-sections, only the most significant examples of such market behaviour are highlighted with a focus on the circumstances leading to these kinds of flow patterns[3)].

The hypothesis underlying the represented flow patterns should not necessarily be interpreted as strictly realistic neither as a forecast of possible future situations. The case study assumptions have been designed to capture those market behaviours that the ENTSOG network modelling tool can currently not replicate, due to the basic routines and building blocks that each model must adopt as a simplification to reality.

2) The ENTSOG network modelling tool assumes a one-shipper behaviour without commercial restrictions taking into account only technical capacities.

3) It has to be noted that other flow combinations might also be possible to cope with the considered supply and demand profiles: this is an observation that should always be considered when looking at results from ENTSOG NeMo simulations.

Some recent actual examples which cannot be fully covered neither foreseen due to the necessary degree of simplification any model requires are:

- low LNG deliveries combined with other specific demand drivers, such for example multiple nuclear outages in France (December 2016) or Northern Europe
- more or less prolonged cold snap, associated with high demand for power generation (January 2017)
- restriction to storage or production capacities at key facilities (Rough in the United Kingdom, Bergermeer and/or Groningen in the Netherlands during 2016)

Nevertheless, some of these events almost brought "Transitgas [forward] flows close to zero" (Argus European Gas Report, 7 February 2017) with the price spread between PSV and Northern EU hubs reverting to a discount from the current usual premium conditions.

The gas infrastructure managed to support the high energy demand under all the specific circumstances mentioned above.

In the following sections, the results obtained from the NeMo model are reported identifying the prevailing flows under the considered cases. Since the specific figures produced by the model represent one of potentially many solutions, the exact numbers for flows are not reported. Flow directions and relative magnitudes are considered as the significant outcomes and represented respectively by arrows and corresponding thickness.

For Italy, the two nodes ITs and ITe, which represent respectively the total of capacities available in competition for import flows at southern Italian IPs (flows from North Africa, Southern Corridor, East Mediterranean, Middle East and possible future LNG regasification plants) and the total of capacities in competition for export flows towards Austria and Switzerland, are reported in addition to flows at the Italian national balancing point (IT) in order to be consistent with the NeMo network topology.

For all the following flow patterns representations, the darker blue arrows should be intended as results produced by the NeMo modelling tool taking into account the same assumption on capacities as in TYNDP 2017. The faded blue arrows refer to flows originating from simulations taking into account the capacity at Oltingue IP from Switzerland to France as fully firm. This additional sensitivity analysis, included in the "cases c and d," for consistency reasons has been adopted to reflect the particular nature of the capacity at Oltingue IP from Switzerland (CH) to France (FRn), currently declared as firm without additional constraints only at the Swiss side in the direction of CH towards FRn (at the French side its nature is still under definition).[4)]

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4) For a complete description of the capacities along the South-North Corridor and their use in the ENTSOG NeMo tool, please refer to the previous Chapter 6, in particular to the section "6.5 South-North Corridor Capacities: An Overall Picture".

7.3.1 CASE STUDY 1A/1B

CASE DESCRIPTION	
Year	2030
Climatic conditions	Peak Demand: Overall EU
Supply disruptions	Russian flows (UA+BY)
Infrastructure level	a) Low b) PCI
Supply prices	Southern sources cheaper (AZ+DZ+LY)

Table 7.1: Boundary conditions for case study 1a and 1b

Under the circumstance of a full onshore Russian disruption, Norwegian and LNG flows would be the first primary sources available for Northern Europe. This situation is likely to generate a price increase for these residual resources which would be traded at premium compared to relatively cheap sources from Southern and Southeastern Europe, being less affected by the critical situation. The flow patterns arising from this situation are triggering flows from Southern to Northern Europe, as represented in Figure 7.3 and Figure 7.4. The Italian network is exploiting its possibility to accommodate gas flows towards Northern and Central Europe activating a double reverse flow at IT-CH and IT-AT borders. Nevertheless, the maximum use of the reverse flow infrastructure is made possible under the 2nd PCI list infrastructure level, which includes the additional capacity from the South of Italy to the North, available from 2023 onwards by the commissioning of the PCI project "Adriatica Line" (264 GWh/d). In particular, with the commissioning of this project, higher volumes potentially coming from new sources (e.g. Azeri gas through TAP) are expected to flow at the Griespass interconnection point, jumping from a threshold which seems only locally relevant to two-third of the total reverse flow technical capacity from Italy towards Northern Europe, highlighting a more relevant impact on a continental scale.

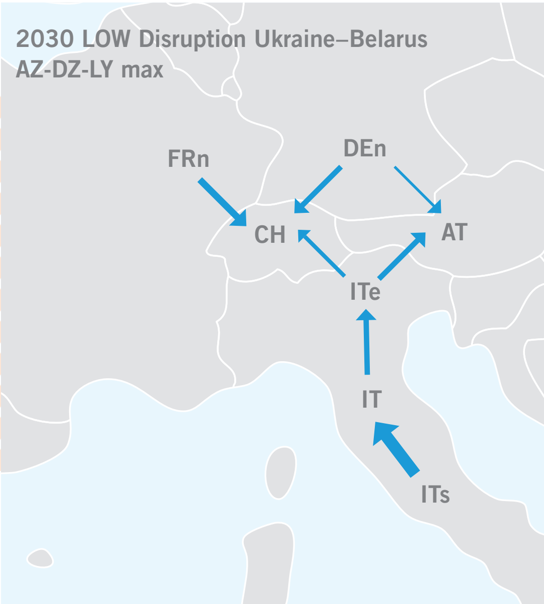


Figure 7.3: Case study 1a flow patterns

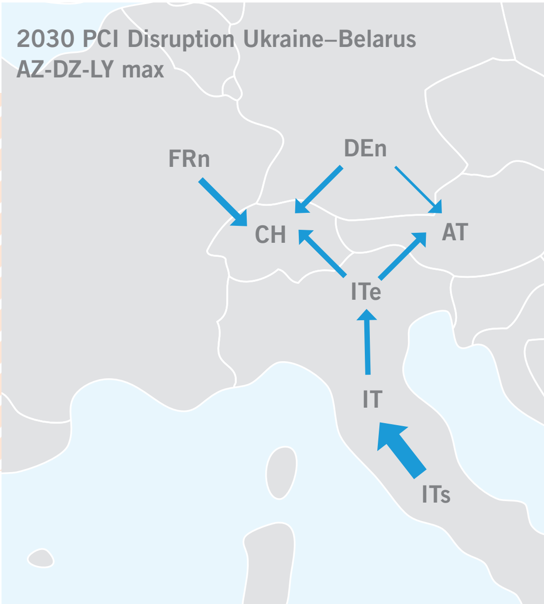


Figure 7.4: Case study 1b flow patterns

7.3.2 CASE STUDY 1C/1D

CASE DESCRIPTION	
Year	c) 2020 d) 2030
Climatic conditions	Peak Demand: Northern EU Average Winter: Rest of EU
Supply disruptions	Russian flows (UA+BY)
Infrastructure level	c) Low d) PCI
Supply prices	Southern sources cheaper (AZ+DZ+LY)
Capacity	CH>FRn bundled firm

Table 7.2: Boundary conditions for case study 1c and 1d

Compared to the previous cases 1a and 1b, the following cases adopt the hypothesis to have different climatic conditions across Europe, relaxing the assumption to have the overall continent under really tight peak demand conditions. Additionally, the capacity at Oltingue IP from Switzerland to France has been considered as fully (bundled) firm. The other boundary conditions stay the same and the flows patterns are reported respectively for 2020 under Low infrastructure level and for 2030 under PCI infrastructure level.

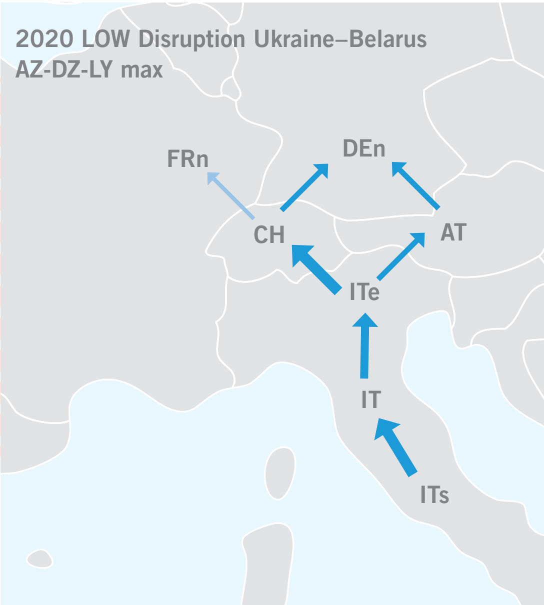


Figure 7.5: Case study 1c flow patterns

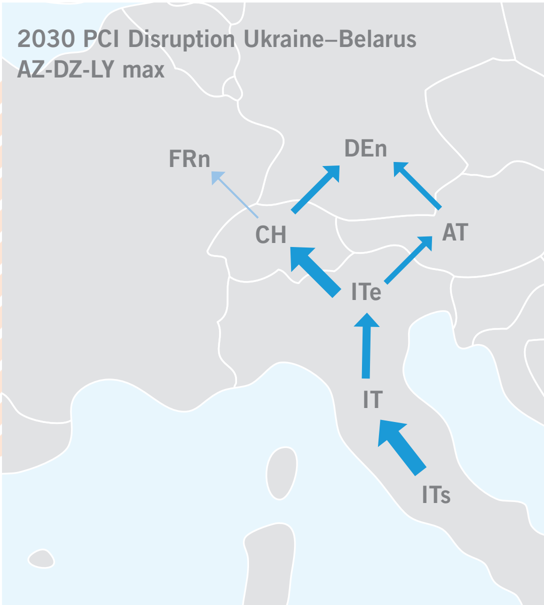


Figure 7.6: Case study 1d flow patterns

In these cases, the reverse flow towards Northern Europe appears complete already in 2020 – when the described SNC reverse flow projects are all commissioned – and provides even more relevant results in 2030, with the commissioning of the PCI project "Adriatica Line" (264 GWh/d), making higher volumes available for export potentially coming from new sources (e.g. Azeri gas through TAP and/or additional volumes from the East-Mediterranean basin/Middle East and North Africa).

7.3.3 CASE STUDY 2A/2B

CASE DESCRIPTION	
Year	2030
Climatic conditions	Peak Demand: Overall EU
Supply disruptions	Russian flows via UA
Infrastructure level	a) Low b) PCI
Supply prices	Norwegian most expensive

Table 7.3: Boundary conditions for case study 2a and 2b

A second analysed configuration is assuming only a partial disruption of Russian flows, related to the Ukrainian transit route (flows through Belarus are not interrupted). In addition, similarly to cases 1a and 1b, the main residual pipeline source available to Northern European countries (Norwegian gas) is set as trading at a premium, becoming relatively more expensive than all other potential supply sources.

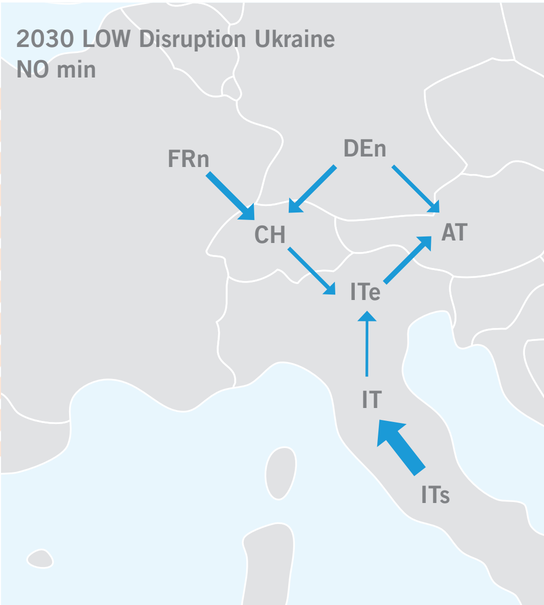


Figure 7.7: Case study 2a flow patterns

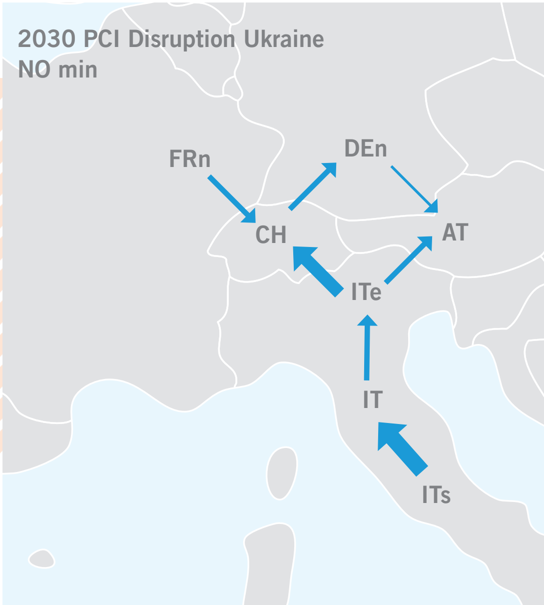


Figure 7.8: Case study 2b flow patterns

Similarly to the previous case studies 1a and 1b, also here 2nd PCI list projects are making additional resources available from Italy towards Northern Europe. In particular, the effect of the "Adriatica Line" commissioning creates additional capacity in the South of Italy (ITs) and makes enough volumes available to the Italian system able to support a complete reverse flow layout (Figure 7.8), which is not detected in case Italian network reinforcements are not implemented (Figure 7.7).

7.3.4 CASE STUDY 2C/2D

CASE DESCRIPTION	
Year	c) 2020 d) 2030
Climatic conditions	Peak Demand: Northern EU Average Winter: Rest of EU
Supply disruptions	Russian flows via UA
Infrastructure level	c) Low d) PCI
Supply prices	Norwegian most expensive
Capacity	CH>FRn bundled firm

Table 7.4: Boundary conditions for case study 2c and 2d

As for section 7.3.2, the exercise to adopt different climatic conditions across Europe and fully (bundled) firm capacity at Oltingue IP from Switzerland to France has been repeated with other variables constant except the exploration of the year 2020 in addition to 2030.

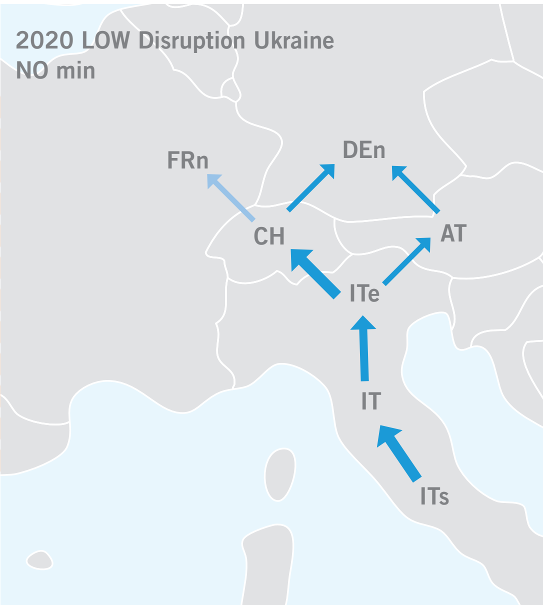


Figure 7.9: Case study 2c flow patterns

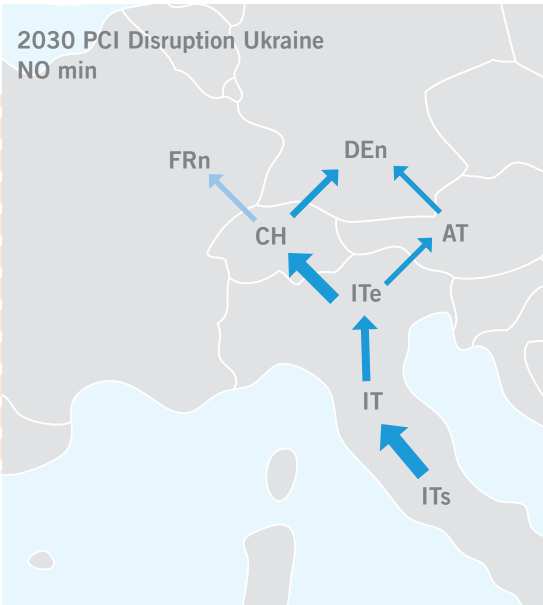


Figure 7.10: Case study 2d flow patterns

The results obtained in cases c and d generally reflect the trend of a full reverse flow configuration towards Northern Europe already detected in the analogous cases 1c and d. A complete reverse flow appears already in 2020 – with all SNC reverse flow projects commissioned – providing even more relevant results in 2030, with the commissioning of the other projects in Italy which can maximise the SNC potential.

7.3.5 CASE STUDY 3A/3B

CASE DESCRIPTION	
Year	2030
Climatic conditions	Peak Demand: Northern EU
Supply disruptions	Norwegian flows (Norpipe to DE)
Infrastructure level	a) Low b) PCI
Supply prices	Norwegian most expensive

Table 7.5: Boundary conditions for case study 3a and 3b

A third interesting case assumes the interruption of Norwegian flows towards Germany at the Emden interconnection point, as it is one of the main access points for this source to Europe. At the same time, the residual flows from Norway are assumed to become relatively more expensive, since the availability of this supply is becoming more limited.

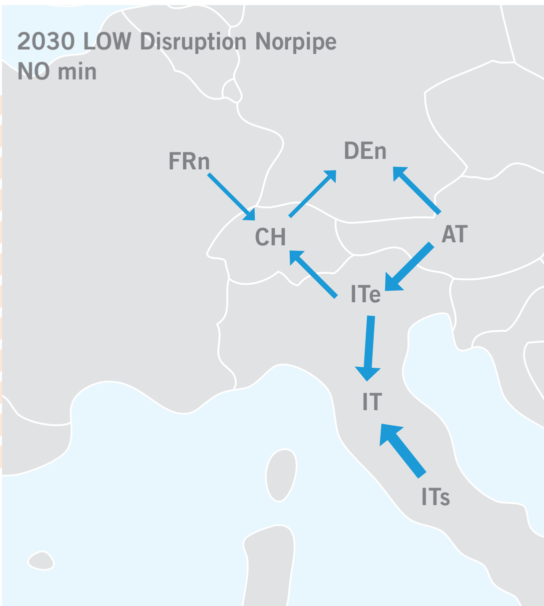


Figure 7.11: Case study 3a flow patterns

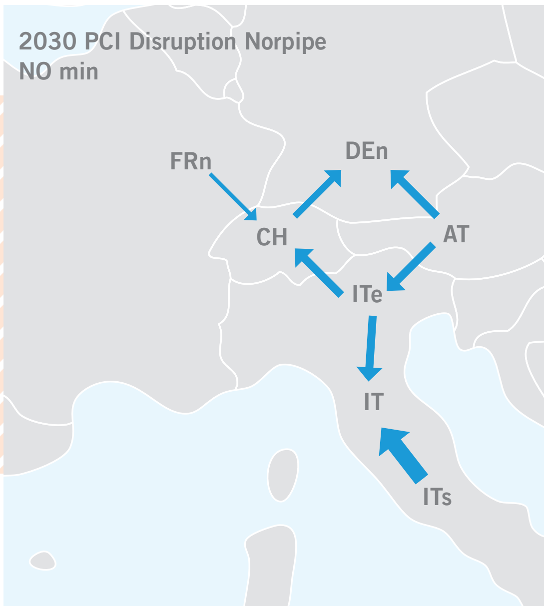


Figure 7.12: Case study 3b flow patterns

The outcomes of this configuration differ from the previous ones due to the wide availability of Russian flows, neither disrupted nor restricted by price constraints. In this situation, reverse flows are activated only from Italy towards Switzerland and Germany, while the IP between Italy and Austria is used to convey part of the Russian resources towards Europe. Again, in the PCI infrastructure level more gas is made available to the Italian system (Figure 7.12) and indirectly for the overall of Europe compared to the “Low” infrastructure level situation (Figure 7.11).

7.3.6 CASE STUDY 3C/3D

CASE DESCRIPTION	
Year	c) 2020 d) 2030
Climatic conditions	Peak Demand: Northern EU Average Winter: Rest of EU
Supply disruptions	Norwegian flows (Norpipe to DE)
Infrastructure level	c) Low d) PCI
Supply prices	Norwegian most expensive
Capacity	CH>FRn bundled firm

Table 7.6: Boundary conditions for case study 3c and 3d

To ease the comparability of results, also for this last case study the same approach has been followed adopting different climatic conditions across Europe and fully (bundled) firm capacity at Oltingue IP from Switzerland to France, while keeping constant the other variables and exploring both years 2020 and 2030.

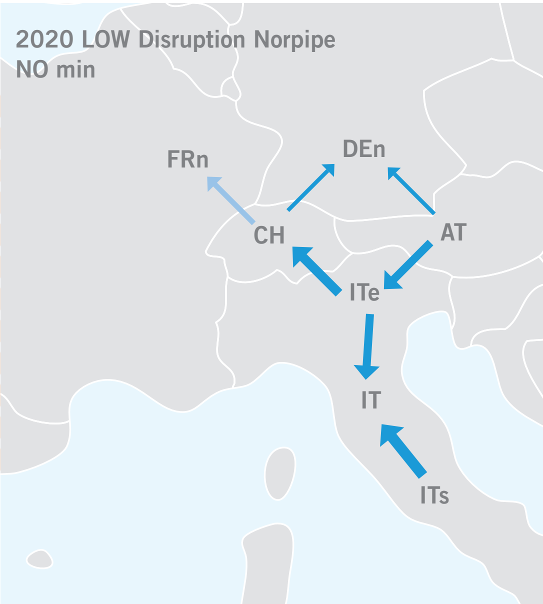


Figure 7.13: Case study 3c flow patterns

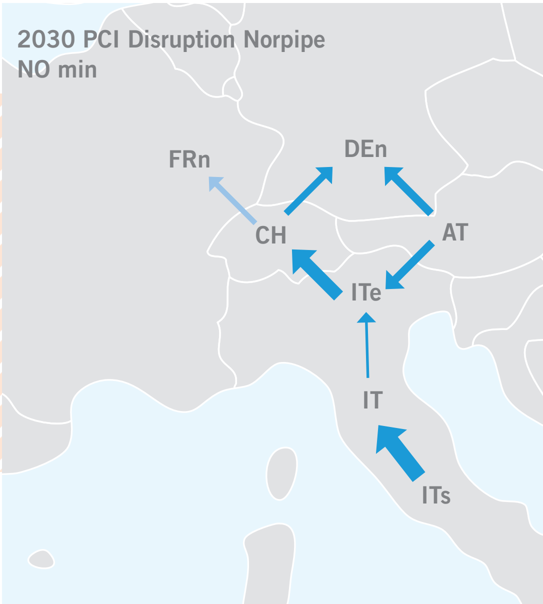


Figure 7.14: Case study 3d flow patterns

Compared to the previous case studies 1 and 2 (variants c and d), all related to more or less intense Russian disruptions, in cases 3c and 3d the possibility to get to a full reverse flow configuration is not displayed by the model results. The disruption of Norpipe and the simultaneous availability of Russian flows activate a partial reverse flow configuration, this time directed from Italy - which can benefit from gas from Austria coming likely from Ukraine – towards Switzerland and then to Germany and France. To be noted that the flows towards Northern Europe via Switzerland result more relevant compared to the ones obtained in the cases of a complete reverse flow configuration to reflect the competing nature of reverse-flow capacities at the ITe node.

Finally, the comparison of results between the years 2020 and 2030 gives additional hints towards the importance of a reinforcement of the Italian network ("Adriatica Line" and "TAP interconnection"), if relevant volumes from North Africa and the Southern Corridor have to be made available at the benefits of overall European diversification and security of supply.


Image courtesy of Snam Rete Gas

8 Other TSO Transmission Projects in the Region

Image courtesy of Fluxys

8.1 Investments in Belgium and Luxembourg (Northern Area of the Region)

8.1.1 BELGIUM

8.1.1.1 Market and Network Overview

Natural gas will remain a core component of the energy mix in tomorrow's low-carbon economy. As a natural gas infrastructure company, Fluxys aims to build bridges between markets so that suppliers can transport natural gas flexibly to their customers or between European gas trading places.

Fluxys Belgium is the independent operator of both the natural gas transmission grid and storage infrastructure in Belgium. The company also operates the Zeebrugge LNG terminal. Fluxys Belgium is active in the transmission, storage and LNG businesses and intends to play a pioneering role in developing the gas infrastructure required to diversify Europe's natural gas supply sources and in developing the solutions needed to connect and integrate European gas markets.

The Belgian natural gas grid is one of the best interconnected infrastructures in Northwestern Europe. The 18 interconnection points on the Belgian grid are opening the network to natural gas flows from the United Kingdom, Norway, the Netherlands, Russia and all LNG producing countries. The Belgian grid also serves as the crossroads for transmission flows of natural gas to the Netherlands, Germany, Luxembourg, France, the United Kingdom and Southern Europe (Figure 8.1).

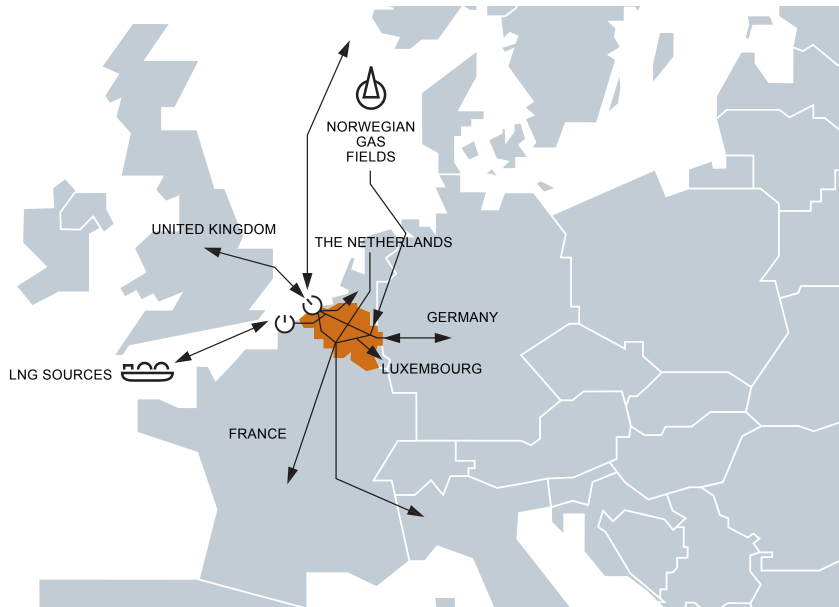


Figure 8.1: Fluxys Belgium network in NW Europe (Source: Fluxys)

8.1.1.2 Milestones

BeLux market integration, a first in Europe

On 1st October 2015, Fluxys Belgium and Creos Luxembourg successfully launched the first ever gas market integration between two European Union Member States, namely Luxembourg and Belgium. This market integration is fully in line with the European Union's blueprint that aims at building an internal gas market without borders, where gas can flow freely from one country to another. The successful merging of the Luxembourg and Belgian gas markets is the result of around two years of close collaboration between Creos Luxembourg, Fluxys Belgium and their respective regulators, the Luxembourg Regulatory Authority (ILR) and Belgium's Regulatory Commission for Electricity and Gas (CREG).

The merging of the markets opens up more opportunities for competition for the two countries and boosts security of supply for Luxembourg. The integrated market is beneficial for suppliers too, as there is now only one balancing zone for the two countries and liquidity on the ZTP gas trading point is boosted. With the removal of the Bras/Pétange interconnection point from the commercial offer, grid users no longer have to reserve capacity at that point to transmit gas between Belgium and Luxembourg.

Alveringem-Maldegem, the Dunkirk–Zeebrugge link

In parallel with the construction of the LNG terminal at Dunkirk, a pipeline has been laid to link this new installation to the Zeebrugge area. The pipeline connects three infrastructures: the Dunkirk LNG terminal as a new gas entry point for Europe, the grid of French system operator GRTgaz and the Fluxys grid in Belgium. GRTgaz has laid a 26-km long pipeline from the compressor station in Pitgam to the French-Belgian border. Fluxys Belgium has built a new interconnection point in Alveringem near Veurne, and a 72-km long pipeline between Alveringem and Maldegem.

The new installations of the two system operators were commissioned in late 2015. This combination allows the transport of up to an additional 8 bcm of natural gas to Belgium and elsewhere in Europe from the Dunkirk LNG terminal, strengthening security of supply, market integration and diversification of sources while offering a wider basis for natural gas trading in the North-West Region. The project gives system users maximum flexibility in choosing the destination for their natural gas flows, as by using the Belgian system they can move their gas flows to a wide range of destinations. Besides, it renders the Belgian grid completely bidirectional.

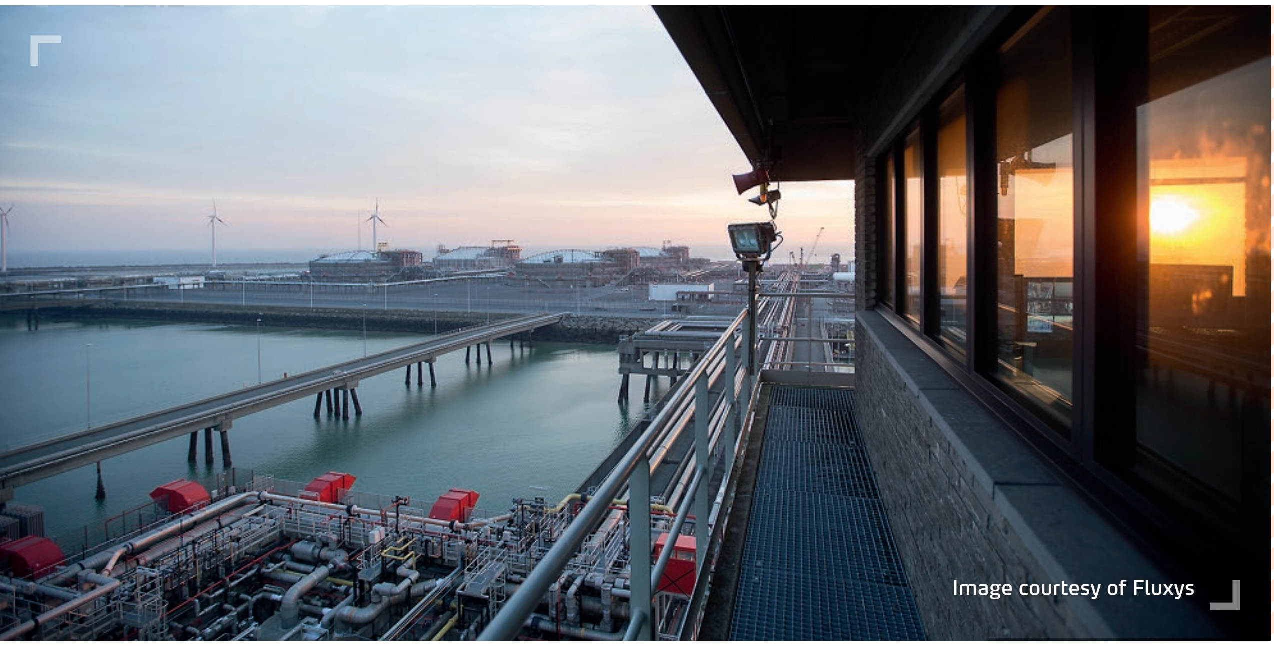


Image courtesy of Fluxys

8.1.1.3 Investment Plan Fluxys Belgium: The Program in a Nutshell

Every year, Fluxys Belgium updates its ten-year indicative investment program for its three core activities, namely natural gas transmission and storage, and LNG terminalling. The four main pillars of the program are constituted by:

- investments triggered by commercial initiatives and external cooperation
- investments required to cover anticipated trends in peak demand in Belgium
- investments aiming to guarantee the integrity of the natural gas transmission infrastructure and ensure that said infrastructure is in good condition
- investments in equipment, ICT applications and buildings

The indicative investment plan for the period 2017–2026 shows that beyond the significant ongoing and future development of the LNG infrastructure in the Zeebrugge area, the transmission capacity of the Fluxys Belgium network is considered sufficient to meet market demand with regard to domestic and border-to-border activities. Major investments sanctioned over the past four years made it possible to develop a Belgian network of an adequate size with considerable entry capacities, bidirectional flows without congestion and optimum connections with other gas networks in North-West Europe. The drop in future investments is therefore a logical development.

While investments are still anticipated in the short term to support the development of certain public distribution networks and to make the modifications needed to convert L-gas networks, a significant part of the indicative investment plan 2017–2026 is therefore devoted to the maintenance, modification and modernisation of the network.

8.1.1.4 Zeebrugge LNG Terminal: The LNG Gateway into Northwestern Europe

The Zeebrugge LNG terminal serves as a gateway to supply LNG into Northwestern Europe. Any LNG unloaded at the terminal can be redelivered for consumption on the Belgian market, or traded on the Zeebrugge Hub for onward transmission to supply other end consumer markets in any direction such as, the United Kingdom, the Netherlands, Germany, Luxembourg, France and Southern Europe. Almost 40 % of investments planned in Belgium over the next decade are linked to the two projects aiming to further develop the Zeebrugge LNG terminal, that is the construction of a fifth storage tank and a third jetty.

Yamal LNG (LNG-F-229)

In March 2015 Fluxys LNG concluded a 20-year contract with Yamal Trade for the transshipment of up to 8 million tonnes of LNG per year (approx. 11 bcm of natural gas). The transshipment services will form a key link in the logistics chain from Russia's Yamal peninsula to supply Asian markets, among others, year-round. This agreement will promote LNG activity in Zeebrugge in the long term and will also significantly bolster traffic at the port.

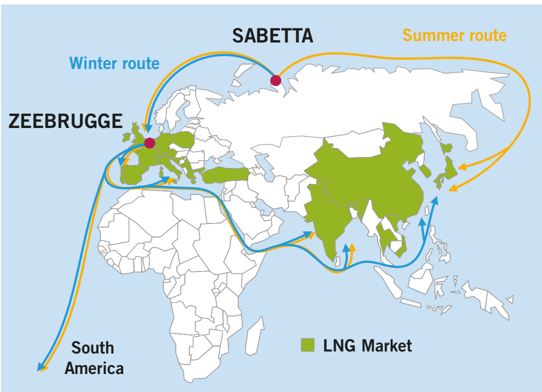


Figure 8.2: Yamal LNG project in Zeebrugge (Source: Fluxys)

In order to facilitate these transshipment services, Fluxys LNG is building a fifth storage tank capable of holding some 180,000 cubic metres. Additional compression capacity is being developed too. The new storage tank will primarily be used during winter for the transshipment of LNG from LNG icebreaker vessels from the Yamal production site to traditional LNG carriers. Preparatory works began in mid-2015 and the new storage tank is set to be commissioned early 2019, according to the current schedule.

Small scale development

A second jetty for the loading and unloading of LNG carriers has recently been commissioned at the Zeebrugge LNG terminal. It will be the site of the loading and unloading of vessels both large and small carrying between 2,000 cubic metres and 217,000 cubic metres of LNG. Small bunker vessels will thus be able to load LNG to then resupply other vessels powered by LNG or small bunker terminals. With the construction of the second jetty and the new capacities which have already been reserved, the Zeebrugge LNG terminal is continuing to evolve into a hub for the small-scale use of LNG, i.e. as a fuel for shipping and long-distance haulage trucks.

In 2015, Fluxys LNG conducted a market survey for the LNG terminal to ascertain interest in small-scale LNG services, such as the loading of small bunkering and supply vessels, or even services loading LNG trucks. The survey recorded sufficient interest to warrant the launch of a preliminary study to identify which infrastructure extensions would be needed.

In October 2015, Fluxys signed an agreement with ENGIE, Mitsubishi and NYK Line to acquire 25 % in a vessel that will offer LNG bunkering services from its home port of Zeebrugge, Belgium. This LNG bunkering vessel, with a capacity of 5,100 cubic metres LNG and recently commissioned in South Korea, has arrived in Zeebrugge and is now operational. Becoming a partner in the ownership of this LNG bunkering vessel fits Fluxys' strategy to support the development of the small-scale LNG market.

In March 2016, Gazprom and Fluxys signed a Framework Agreement on small-scale LNG cooperation in the European market. The agreement reflects the intention of the parties to collaborate on joint projects in the construction and operation of LNG receiving terminals, LNG filling stations and LNG bunkering infrastructure in Europe.

Third Jetty (PCI candidate) (LNG-N-742)

Another project through which Fluxys LNG wishes to actively contribute to the development of LNG is the construction of a third jetty at the Zeebrugge LNG terminal. This jetty will be used by small LNG vessels (capacity of approximately 2,000 cubic metres to 30,000 cubic metres), which should encourage the development of smaller scale LNG activities, such as the bunkering of commercial vessels. The project still needs to undergo a market consultation, but feasibility studies are currently being conducted for a range of technical solutions.

8.1.1.5 L/H Conversion

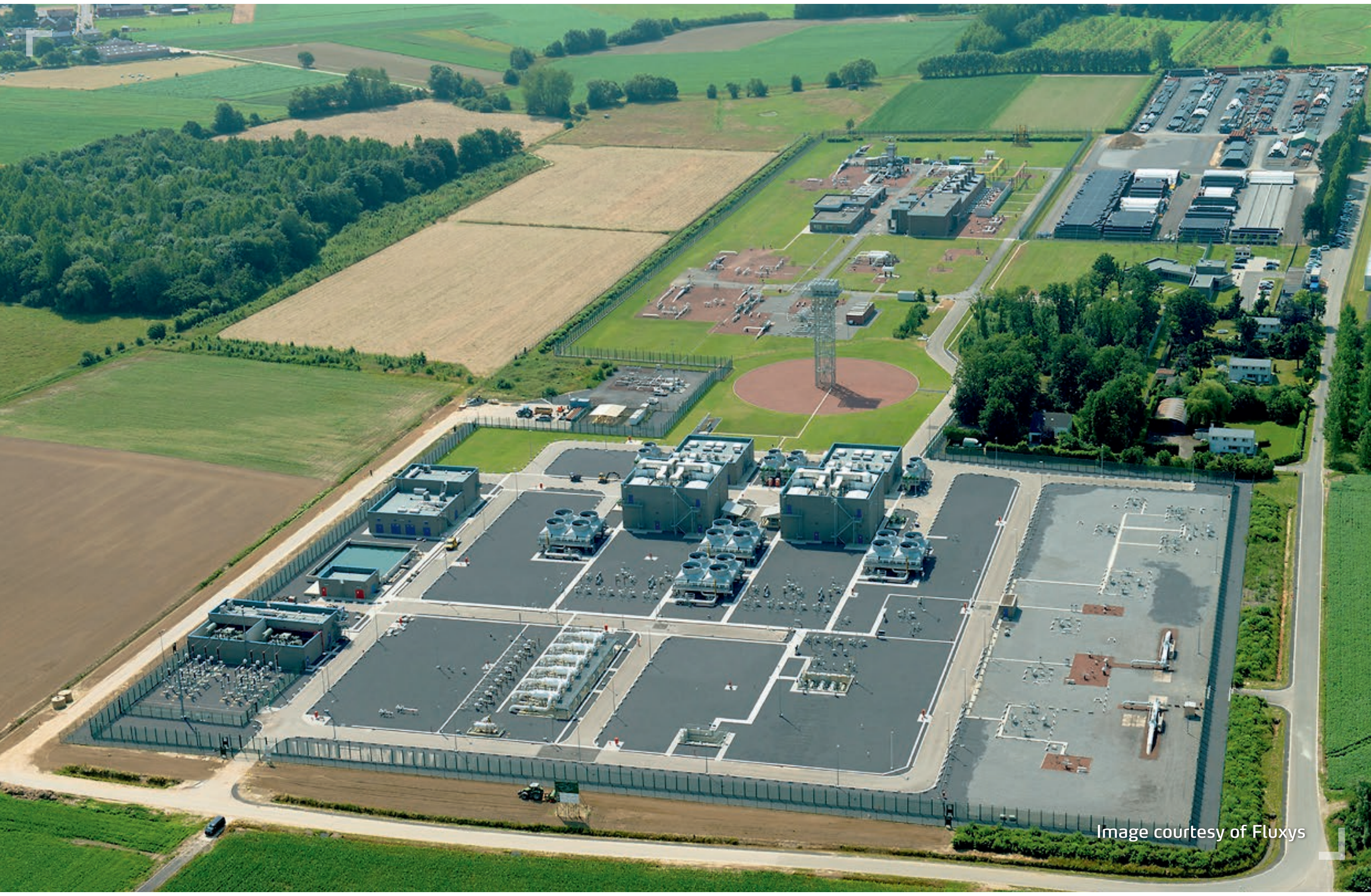
The gradual depletion of the Groningen natural gas field (which produces low calorific natural gas, or L-gas) has prompted the Dutch government to completely phase out L-gas exports to Belgium and France between 2024 and 2030 and to Germany between 2020 and 2030. Moreover, extracting natural gas from the dwindling field triggers earthquakes, so production capacity has been limited since 2014.

L/H conversion in Belgium (PCI candidate) (TRA-N-500)

The investments expected to cover modifications to the Fluxys Belgium network in connection with the L/H conversion are mainly for:

- Interconnections between the West-East H-gas backbone and the North-South L-gas backbone (at Winksele) mainly planned for 2018–2019 so as to start converting the zone to the south of Winksele in 2020
- shoring up certain pressure-reducing stations to secure the optimum operation of the H-gas market following the conversion
- additional temporary separators between the parts of the network with different gas qualities during the various phases of the conversion, or different pressures during or after conversion

These modifications are still being studied. The scope and schedule, especially for the second and third bullet points above, still need to be set out. This does not take into account inspections of gas appliances at customer sites or changes to public distribution networks.



Transmission to Germany

Germany also needs to convert from L-gas to H-gas (approximately 30 bcm/y). This change in import needs is analysed extensively in the national Network Development Plan drawn up by the German TSOs (NDP 2016). This plan comprises two supply scenarios:

- Q.1: extra supply from the south/southeast
- Q.2: extra supply from the northeast (linked to the expansion of the Nord Stream)

Both scenarios also include increased supplies from the west/southwest (LNG from Belgium, the Netherlands, the United Kingdom and France).

Fluxys Belgium supports the vision of the German development plan and supports the principle of capacity development at the Eynatten interconnection point on the Belgian-German border as part of the "ZEELINK" project, which intends to lay a new dual pipe in Germany on the border between Belgium and North Rhine-Westphalia. The direct link with the Zeebrugge zone, which is itself directly connected to the new Dunkirk terminal by the new Alveringem-Maldegem pipeline and with the Dutch network via the Zelzate border station, can provide the German market with the required capacity and flexibility as well as access to diversified supply sources.

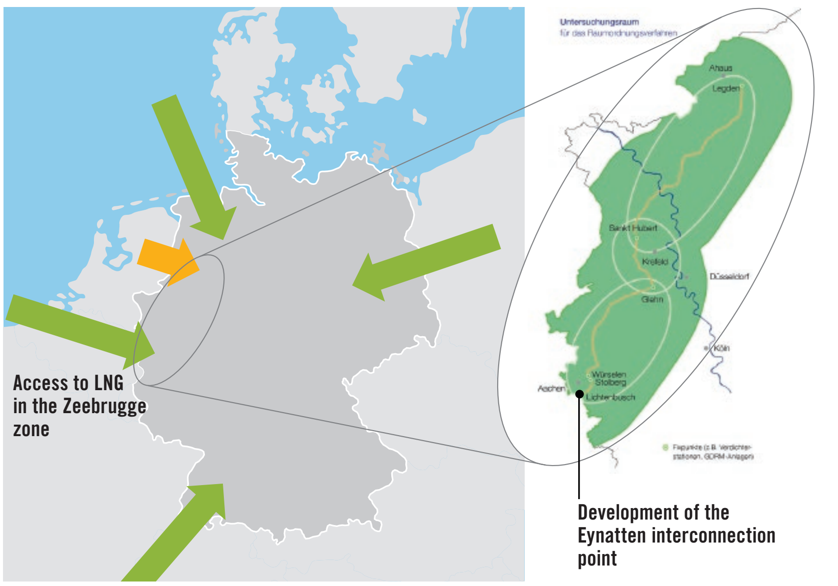


Figure 8.3: Development of the Eynatten IP in the context of L/H conversion in Germany (Source: Fluxys)

8.1.2 LUXEMBOURG

On 1 October 2015, the Luxembourg gas TSO, Creos Luxembourg and the Belgian gas TSO, Fluxys Belgium launched the very first integrated gas market involving two EU Member States. This merger, which received broad media coverage is the result of extensive cooperation dating back to 2013 between Creos Luxembourg, Fluxys Belgium and their respective regulators, the Institut Luxembourgeois de Régulation (ILR) and Belgium's Commission de Régulation de l'Electricité et du Gaz (CREG). It is very much in line with the main objectives of the Gas Target Model updated on 16 January 2015, that is, to improve liquidity and accessibility as key features for an efficient gas market design, and the EU's goal to create an internal, borderless gas market where gas supplies can circulate freely between all Member States. Combining the two markets enhances market competitiveness for both countries, and also strengthens Luxembourg's security of supply.

In common with other European gas markets, the Belgian and Luxembourg markets make use of national entry/exit systems, with access fees applying between the two countries. In other words, to be able to transmit gas from Belgium to Luxembourg, in the past suppliers had to pay an exit fee for gas to leave Belgium and an entry fee to enter Luxembourg. With the creation of the integrated BeLux market, these entry-exit access fees between Belgium and Luxembourg were removed and the Zeebrugge Trading Point (ZTP) became the gas trading point for the integrated market.

The merger has created a single balancing market in the two countries, offering further opportunities for suppliers and shippers to be active in both countries. In order to manage the rules and mechanisms for commercial balancing in the new integrated market area, Creos Luxembourg and Fluxys Belgium have established a new jointly owned (50/50) company called Balansys.

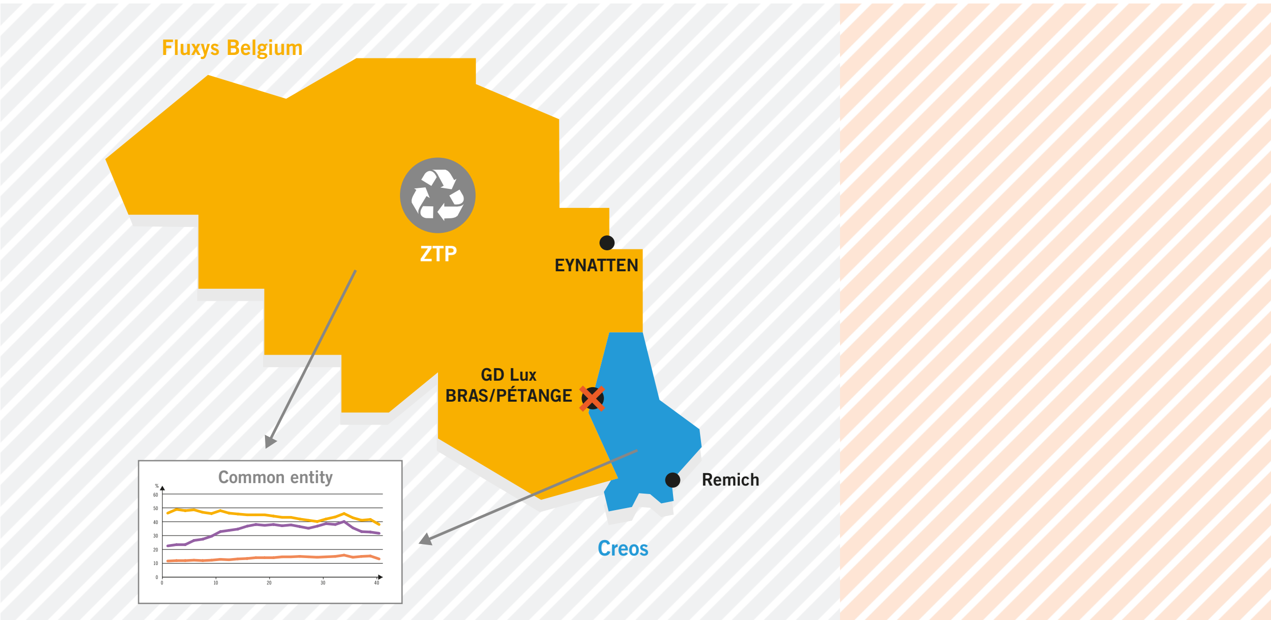


Figure 8.4: A single integrated gas market for Belgium and Luxembourg
(Source: Fluxys Belgium & Creos Luxembourg)

8.2 Investments in France (Western Area of the Region)

The projects included in TYNDP 2017 are shown in the map below. They are consistent with GRTgaz's Development Plan for the 2015–2024 period, published in November 2015. It has been updated with the publication in November 2016 of the Development Plan for the 2016–2025 period.

In 2016, GRTgaz has completed a major work program with a total budget of 1,085 million €, to connect the new Dunkirk LNG terminal to its transmission network. It included a 17-km non-odorised pipeline, the 123-km pipeline "Hauts de France II" and the 300-km pipeline "Arc de Dierrey", all commissioned between 2015 and 2016.

Alongside, a new interconnection point has been created in 2015 in Alveringem to provide non-odorised gas from the new Dunkirk LNG Terminal to the Belgian border up to 270 GWh/d.

8.2.1 CREATING A SINGLE MARKETPLACE IN FRANCE IN 2018

The simplification of the gas market has been a constant priority for CRE (French NRA). The NRA has set a target in 2012 to finalise the integration of market in France and create a single market place by 2018. To this end, GRTgaz and TIGF have decided in 2014 and 2015 to invest 880 million €. The PCI projects "Val de Saône" (5.7.1) and "Gascogne Midi" (5.7.2) from the second list of PCI will enable the merger of balancing zones by creating additional flows from north to south thus removing the current bottleneck between north and south and reducing the LNG dependency in the South of France. These projects have been approved by CRE and supported by stakeholders after a cost-benefit analysis in 2013 and a cross-border cost allocation between France and Spain in 2014.

The "Val de Saône" project consists in the looping of the Burgundy pipeline for 189 km, a third compressor adding 9 MW to the compressor station in Etrez, and adjusting the interconnections at Palleau, Etrez and Voisines. The permitting phase is completed and works will begin in 2017 to reach a commissioning in 2018. This project is identified in the TYNDP 2017 as TRA-F-43.

The "Gascogne Midi" project aims to create a physical flow from TIGF to GRTgaz through the Midi pipeline. It consists in the looping of the Gascogne pipeline for 60 km, and consolidation of the Barbaira compressor station and the adaptation of interconnections in Cruzy and Saint-Martin-de-Crau. Permitting is ongoing. Commissioning is also expected in 2018. This project is identified in the TYNDP 2017 as TRA-F-331.

Figure 8.5: TYNDP 2017 project map for France (Source: ENTSOG TYNDP 2017)

8.2.2 CREATING A REVERSE CAPACITY FROM FRANCE TO GERMANY AT OBERGAILBACH

Beyond commercial backhaul capacity already existing from France to Germany, GRTgaz is considering physical reverse flow from France to Germany. The PCI creating a reverse flow from France to Germany would improve access to LNG for the German market and contribute to respond the need for additional supplies in western Germany as a replacement for L-gas. The creation of this reverse flow (100 GWh/d) will result in reinforcing the network on the North-East pipeline between Morelmaison and Voisines, additional compressor stations and a few adaptation of interconnections to enable a reverse flow.

It would also require solutions to harmonise odorisation practises in France and Germany, since gas is odorised upon entry on the transmission system in France and Spain, whereas it is done upon entry on the distribution system in Germany. GRTgaz is currently conducting feasibility studies on two types of solutions. The first solution consists in adopting non-centralised odorisation practices. It is currently being assessed technically and economically on two small scale units. An alternative solution is also being considered, with a deodorisation plant, more suitable for intermittent flows. The results of these two feasibility studies are expected in 2017.

This project is identified in the TYNDP 2017 as TRA-N-047.

8.2.3 REINFORCING INTERCONNECTIONS BETWEEN FRANCE AND SPAIN

Interconnection capacities with Spain have been reinforced in 2013 and in 2015 in both directions. 195 GWh/d have been added from Spain to France and 65 GWh/d from France to Spain.

The PCI 5.5 "Midcat" aims to reinforce the interconnections with Spain by creating a new interconnection point, east of the Pyrenees, in order to mitigate the dependence of the Iberian Peninsula on LNG and enhance market integration. Enagás, GRTgaz and TIGF have performed together a joint technical study to identify the investments required to create firm capacities. To add 230 GWh/d firm capacity from Spain to France and 160 GWh/d from France to Spain, several developments of French and Spanish networks have been identified amounting to roughly 3 billion €. To enable these capacities and remove congestions that would result from south to north flows, the project would require, in addition to new compressor power, the following items:

- the looping of the Rhône pipeline for 220 km (PCI project 5.8.2, "Eridan")
- the looping of the East Lyonnais pipeline for 150 km (PCI project 5.8.1, "East Lyonnais")
- the looping of the Midi pipeline for 240 km
- the looping of the Beauce pipeline for 63 km
- the connection to the border for 120 km

A smaller set of investments, the "STEP" project (South Transit East Pyrénées), is also being considered. It is limited to investments on Enagás and TIGF network and would create interruptible capacities, up to 80 GWh/d from France to Spain and 120 GWh/d in the other direction.

On the French side, the "Midcat" project is identified in the TYNDP 2017 as TRA-N-256, and the "STEP" project as TRA-N-252.

8.2.4 EXPANDING LNG TERMINALS IN MONTOIR AND FOS-SUR-MER

The expansion of the LNG terminals in Montoir and Fos is being considered.

The LNG terminal in Montoir could be expanded from 10 to 12.5 bcm by 2020–2022, requiring notably the reinforcement of the Maine pipeline and the reinforcement of compressor stations.

The project is identified in the TYNDP 2017 as LNG-N-225 and TRA-N-258.

The expansion of the LNG terminal Fos Cavaou from 8 to 16 bcm would involve the reinforcement of the Rhône pipeline from south to north, including "Eridan" for 220 km, "Arc Lyonnais" for 200 km, the Beauce pipeline for 63 km and additional compressor power.

The project is identified in the TYNDP 2017 as LNG-N-227 and TRA-N-269.

8.2.5 ENSURING THE L-GAS CONVERSION PROCESS

The decrease of L-gas supply by 2029 will require converting the L-gas consumers in France. In 2016, French infrastructure operators (Storengy, GRDF and GRTgaz) have submitted to Ministries a plan to convert the L-gas customers to H-gas in the North of France. GRTgaz will start works to prepare the transmission network to enable the first conversions of L-gas customers in selected cities as a testing phase between 2016 and 2020. The conversion will then be extended and performed from 2021 to 2029.

This project is identified in the TYNDP 2017 as TRA-N-429.


Image courtesy of GRTgaz

8.3 Investments in Germany (Eastern Area of the Region)

On 1 April 2016 the German TSOs submitted the *Draft German Network Development Plan 2016)* to the German national regulatory authority Bundesnetzagentur (BNetzA). In the *Draft German Network Development Plan 2016* the German TSOs propose investments into the German gas transmission system of 4.4 billion € by 2026. These investments include 802 km of new pipelines and 551 MW of additional compressor power.

The major drivers for the investments are the requirements to adapt the German gas transmission system for the entry of additional H-gas replacing the declining indigenous L-gas production and the L-gas imports from the Netherlands (see Chapter 5.3).

The *Draft German Network Development Plan 2016* is based on a scenario framework which was consulted on in mid-2015 and formally acknowledged by BNetzA on 11 December 2015. In December 2016 BNetzA revised the scenario framework. Based on the revised scenario framework, the German TSOs are developing and consulting on a revised *Draft German Network Development Plan 2016* in Q1 2017.

The scenario framework for the *German Network Development Plan 2016* describes two supply scenarios for additional H-gas quantities required due to the declining Dutch and German L-gas production under consideration of – among others – projects described in the ENTSOG TYNDP 2015. Based on the shares defined in the scenario framework for the two supply scenarios, the following peak flow assumptions were applied in the modelling of the *Draft German Network Development Plan 2016* (see Table 8.1).

ASSUMPTIONS ON ADDITIONAL ENTRY PEAK FLOW (GWh/h)		
Supply scenario	**Q.1**	**Q.2**
NORTH EAST	2.7	17.9
WEST/SOUTH WEST	13.1	13.6
SOUTH/SOUTH EAST	22.7	11.1

Table 8.1: Peak flow assumptions for the two supply scenarios Q.1 and Q.2 of the Draft German Network Development Plan 2016

The supply scenario Q.2 was derived by taking a limited share of additional capacities from Nord Stream 2 into account, while the supply scenario Q.1 did not include this assumed additional capacity.

8.3.1 MARKET CONVERSION PROJECTS L- TO H-GAS

in the GASPOOL Market Area

The complete conversion of the German gas transmission system from L-gas to H-gas is planned for 2030 as set out in the draft German NDP 2016. For this reason Gasunie Deutschland developed a project called 'GUD: Complete conversion to H-gas (TRA-N-955)' to show in several steps the implementation of the GUD L-gas transmission system in H-gas until 2030. The project is linked to the GTS project 'H-Gas conversion of L-Gas export border point (TRA-N-882)'. On the German side no investments are required, the pre-existing infrastructure will be used. The project is only a capacity modification, which does not require actual investment or construction works.

The project 'Embedding CS Folmhusen in H-Gas (TRA-N-951)', which is also related to the conversion of the German gas transmission system from L-gas to H-gas, ensures the operability of the Compressor Station Folmhusen in the H-gas system (so far this can only accommodate L-gas).

8.3.2 MARKET CONVERSION PROJECTS L- TO H-GAS

in the NCG Market Area Including the ZEELINK Project

In order to handle the declining L-gas production of the Groningen field, the German TSOs Open Grid Europe and Thyssengas are planning the development of several new metering and regulating stations connecting H-gas transmission system with the current L-gas transmission systems in line with the draft German NDP 2016.

In addition, Open Grid Europe and Thyssengas are currently developing the 227 km ZEELINK project from the Belgian-German cross-border interconnection point Lichtenbusch via Sankt Hubert to Legden (North Rhine-Westphalia). The ZEELINK project includes a new 39 MW compressor station near Aachen.

The ZEELINK project represents the largest single project in the German Network Development Plan 2016. It connects new H-gas sources to the German gas transmission system (e.g. the LNG-terminal Zeebrugge in Belgium), reinforces the North-South transmission capacity in the NCG market area and thereby contributes to the security of supply in the NCG market area including the regions affected by the L-gas production decline.

8.3.3 NCG MARKET AREA TSO PROJECTS –

Technical Capacities from/to Gas Storages and to DSO Systems

The following system enhancement projects aimed at increasing the technical capacities between the TSO and DSO systems as well as between the TSO systems and gas storages in the NCG market area are included in the draft German NDP 2016 and the TYNDP 2017.

- New 33 MW Wertingen compressor station by bayernets and Open Grid Europe (TRA-N-340)
- New 39 MW Rimpar compressor station project by GRTgaz Deutschland and Open Grid Europe (TRA-N-755)
- New 45 MW Rothenstadt compressor station by GRTgaz Deutschland and Open Grid Europe (TRA-F-337)
- New 39 MW Herbstein compressor station by Open Grid Europe (TRA-F-344)
- 49 MW upgrade of the Werne compressor station by Open Grid Europe (TRA-F-345)
- Schwandorf to Finsing pipeline (141 km) project by Open Grid Europe (TRA-F-343)

These system enhancement projects are aimed at increasing the technical capacities between the TSO systems and gas storages in the NCG market area as well as capacities from the TSO to the DSO systems in the NCG market area.

8.3.4 PROJECTS TO ENABLE PHYSICAL CAPACITY TO TRANSPORT GAS IN BOTH DIRECTIONS BETWEEN MEMBER STATES

The following project is included in the *Draft German Network Development Plan 2016* and the TYNDP 2017:

- West to East operation of the Waidhaus interconnection point by GRTgaz Deutschland and Open Grid Europe (TRA-F-753)

8.3.5 TENP REVERSE FLOW PROJECT

The Reverse Flow project on TENP[1] consists in the reversal of the compressor station in Hügelheim, improving the flow patterns in the compressor station of Mittelbrunn and building a new deodorisation plant near the German-Swiss border. The works in the compressor stations in Hügelheim and Mittelbrunn are necessary to allow the transportation of gas quantities from Italy to Germany in the south/south-west Region at the cross-border point Wallbach. The construction of the deodorisation plant is necessary to remove THT from the gas coming from France via Switzerland for it to be compliant with the German market (see Chapter 6.3.3 for a more detailed description of the project in the context of South-North Corridor).

8.3.6 "MONACO" (PHASE I)

German TSO bayernets will build a new pipeline called '"MONACO" (phase I) from Haiming/Burghausen to Finsing (near Munich). Because of the resulting increase in cross-border-capacity for gas exchange, the importance of the project was identified at European level and was therefore awarded PCI-status (October 2013). The construction permit was granted in early 2016 and initial preparation measures towards construction took place in autumn 2016.

"MONACO" (phase II) was planned to connect "MONACO" (phase I) further westwards from Finsing to Amerdingen. However, the D*raft German Network Development Plan 2016* did not confirm the necessity for additional transport capacity. Therefore the current position is that this project will not be pursued.

8.3.7 "MORE CAPACITY"

The German TSOs GASCADE, NEL, Gasunie Deutschland, ONTRAS and Fluxys Deutschland have launched a non-binding market survey in 2015 to determine the future need for additional transport capacities at the borders of the H-Gas market area GASPOOL.

The non-binding enquiries submitted for the purposes of the survey are used to determine whether there is sufficient cross-border demand for the further planning of new development projects (demand analysis).

The survey identified further needs of new gas infrastructure related to higher cross-border capacity demand. The respective TSOs are therefore developing infrastructure projects which depend on a binding capacity auction to be held in 2017.

1) Source: www.fluxys.com/tenp/en/TenpSystemInfo/SouthNorthProject/ReverseFlow

The outcome relates to the market area transmission of gas volumes from Russia to GASPOOL and further from GASPOOL to the Netherlands. The enquired capacities at the border from Russia to GASPOOL and from GASPOOL to the Netherlands are higher than the current available technical capacities. The TSOs agreed to carry out a technical study to identify further developments on the borders of the corresponding market areas.[2)]

The following projects are partly considered in the "More Capacity" market survey.

8.3.7.1 "EUGAL" Project

Additional capacity needs were identified as a result of the market survey. To ensure the transport of the requested new gas volumes and to further improve the security of supply for the market areas of Poland, the Czech Republic, GASPOOL and NCG, the "EUGAL" (European Gas Pipeline Link) project (TRA-N-763) has been developed by GASCADE Gastransport GmbH.[3)]

8.3.7.2 "Expansion NEL" Project

Based on the supply scenario Q.2 of the *Draft German Network Development Plan 2016* a new compressor station in the south of Hamburg for the import of gas volumes from Russia via Nord Stream to Germany (GASPOOL) is required. The project "Expansion NEL" (TRA-N-807), developed by Gasunie Deutschland, NEL Gastransport and Fluxys Deutschland is a prerequisite for the transport of new capacities into the market area to cover the growing German demand for high calorific gas, caused among others by the necessity of the conversion from L-gas to H-gas. The project is part of "More Capacity", which includes e.g. the extension of the receiving terminal Greifswald.

8.3.7.3 Transport of Gas Volumes to the Netherlands

The project "Transport of gas volumes to the Netherlands" (TRA-N-808) was developed by Gasunie Deutschland to cover the demand at the German-Dutch border as the result of the non-binding market survey "More Capacity". The project is including the evacuation of gas volumes from Russia via Nord Stream and Germany to the Netherlands.

8.3.7.4 Upgrade IP Deutschneudorf and Lasów

Linked to the "More Capacity" project, the German TSO ONTRAS intends to increase its cross-border capacities at the Deutschneudorf and Lasów interconnection points. These two capacity extension projects aim to support the exchange of gas between the Czech Republic and Germany as well as Poland and Germany. A final investment decision has not been taken yet.

2) Further information can be found on www.more-capacity.eu

3) Further information can be found on www.eugal.de

8.3.8 PROJECT OVERVIEW

The projects of the draft *German Network Development Plan 2016* included in the TYNDP 2017 are shown in Figure 8.6.

Figure 8.6: TYNDP 2017 project map for Germany (Source: ENTSOG TYNDP 2017)

8.4 Investments in Italy (Southern Area of the Region)

In the following sections a short description of the initiatives promoted by Snam Rete Gas is provided other than the projects already described in Chapter 6 (shown in Figure 8.7). Moreover this section takes into account updated information on Snam Rete Gas projects compared to the TYNDP list reported in Chapter 2 Table 2.1.

8.4.1 DEVELOPMENT FOR NEW IMPORTS FROM THE SOUTH

Snam Rete Gas, in line with the findings of SEN (National Energy Strategy, see paragraph 4.2.4), considers the development of new imports from Southern Italy as a strategic element to enable a greater diversification of energy sources, so as to increase the competitiveness of the gas market and provide greater security of supply to the entire national transmission system.

Snam Rete Gas has therefore planned the construction of a project that will create new transmission capacity of approximately 24 MSm³/d (equivalent to around 264 GWh/d) to facilitate gas from future entry points in the south of the country.

The project includes the construction of an approximately 430-km new pipeline (48"– DN1200) and a compression plant of approximately 33 MW (Sulmona compressor station [4)]), along the South-North line, known as the Adriatica Line. The Adriatica Line will serve to transport quantities of gas from any new sourcing initiative from Sicily and from the middle Adriatic. The project can be considered as a backbone development that has the character of generality, allowing to set up the system of gas supply to new Italian imports from the south.

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

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

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

8.4.2 INTERCONNECTION WITH SLOVENIA

In line with the expected increase in gas consumption in the area of Koper (Slovenia), taking into account the objectives of the European Directive No. 2009/73/EC and existing local infrastructure, the Italian MiSE and the Slovenian Ministry of Infrastructure agreed to build a new interconnection pipeline between the networks of Snam Rete Gas and Plinovodi in the area of San Dorligo della Valle-Osp and to support the participation of both companies in the development of a coordinated interconnection project.

Snam Rete Gas and Plinovodi have defined a technical agreement that establishes the main technical elements of the project, such as the transmission capacity, taking into account the sizing of the pipeline, the minimum contractual pressure at the interconnection point and the maximum operating pressure. Under the agreement, the project foresees new capacity at the new exit point of the national network of San Dorligo della Valle amounting to about 0.3 MSm^3/d.

This project is still awaiting a final investment decision and commissioning is currently planned for 2023.

8.4.3 ADDITIONAL SOUTHERN DEVELOPMENTS

Snam Rete Gas ten-year development plan also contains a non-FID project aimed at the expansion of the South-North transmission route, which includes a series of pipelines and related plants. The project would create additional transmission capacity to facilitate gas from a possible second new entry point in Southern Italy.

8.4.4 IMPORT DEVELOPMENTS FROM NORTHEAST

The project involves the construction of new pipelines to increase the transmission capacity from northeast and the connection of a regasification terminal in the northern Adriatic area (which might possibly be the "Onshore LNG terminal in the Northern Adriatic", included in ENTSOG TYNDP 2017 map as LNG-N-217). A final investment decision has not been taken yet.

8.4.5 SARDINIA METHANISATION

The project includes the realisation of the natural gas transport network of Sardinia island interconnected with the new entry points from LNG plants. In accordance with the "Energy and Environmental Plan of Sardinia Region 2015–2030" the gas supply of the island network is guaranteed by LNG plants whose number and localisation are under consideration. Nevertheless, the project is designed to reach security of supply and flexibility also with a single supply entry point.

The project includes a backbone National Network of about 380 km with diameter DN 650/DN 400 and regional network pipelines of about 190 km with diameter DN 400/DN 150 to supply the main consumption areas of the Region.

The project is planned in three phases: the beginning will be in 2017 and 2018 and the completion between 2020 and 2022.

Figure 8.7: Project map for Italy (Source: Snam Rete Gas)

9 Way Forward

Image courtesy of Snam Rete Gas

Way Forward – Stakeholders Feedback Form

In order to provide continuity to stakeholders involvement, we we propose for interested readers to complete the fields below and send them via mail to the Region's coordinators:

- **Snam Rete Gas**: Marco.Gazzola@snam.it
- **Fluxys:** Geert.Smits@fluxys.com

We will be happy to receive reader's feedback and we will take them into consideration for future SNC GRIP editions.

Organisation and Contact Details

Company/Organisation Name

Organisation type (TSO, LNG terminal operator, UGS operator, Trader, Shipper, Consultant …)

Contact person

E-mail

Did you find the contents and analysis of the South-North Corridor GRIP interesting?
What additional information/analysis would you like to see included in the future edition of the GRIP?

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The South-North Corridor GRIP was prepared in a professional and workmanlike manner by the TSOs of the six countries forming the South-North 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 stakeholders via public consultation for the preparation of the TYNDP 2017. The South-North Corridor GRIP contains TSOs' own assumptions and analysis based upon this information.

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Abbreviations

ACER	Agency for the Cooperation of Energy Regulators
AZ	Azerbaijan
bcm	Billion Cubic Meter
bcm/y	Billion Cubic Meter per Year
BE	Belgium
BeLux	Belgium and Luxembourg
BImSchG	Bundes-Immissionsschutzgesetz/Federal Immission Control Act (Germany)
BImSchV	Bundes-Immissionsschutzverordnungen/Federal Immission Control Regulation (Germany)
BNetzA	Bundesnetzagentur/German National Regulatory Agency
BY	Belarus
CCGT	Combined Cycle Gas Turbine
CCS	Carbon capture and storage
CEE	Central Eastern Europe
CEER	Council of European Energy Regulators
CEF	Connecting Europe Facility
CH	Switzerland
CHP	Combined Heat and Power
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
Co-authors	Creos, Fluxys Belgium, Fluxys Deutschland, FluxSwiss, Fluxys TENP, GRTgaz, Open Grid Europe, Snam Rete Gas, Swissgas and terranets bw
CRE	Commission de régulation de l'énergie/French National Regulatory Authority
CREG	Commissie voor de Regulering van de Elektriciteit en het Gas/Commission de Régulation de l'Électricité et du Gaz/Belgian National Regulatory Authority
CS	Compressor Station
DE	Germany
DEn	Net Connect Germany Area (for NeMo purposes)
DG	Directorate-General
DN	Diameter Nominal
DSO	Distribution System Operator
DZ	Algeria
EC	European Commission
EEG	Erneuerbare Energien Gesetz/Renewable Energy Sources Act (Germany)
EnergieStG	Energiesteuergesetz/Energy Tax Act (Germany)
ENTSOG	European Network of Transmission System Operator for Gas
EPC	Engineering, procurement and construction
EU	European Union
FEED	Front End Engineering Design
FID	Final Investment Decision
Fnb Gas	Vereinigung der Fernleitungsnetzbetreiber Gas e.V.
FR	France
GasNZV	Gasnetzzugangsverordnung/gas network access regulation (Germany)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRIP	Gas Regional Investment Plan
GTM	Gas Target Model
GTS	Gasunie Transport Services B.V.
GUD	Gasunie Deutschland GmbH & Co. KG
GWh	Gigawatt-hour
GWh/d	Gigawatt-hour per day
GWh/h	Gigawatt-hour per hour
H-gas	High calorific natural gas
ICT	Information & Communications Technology
IEA	International Energy Agency
ILR	Institut Luxembourgeois de Régulation/Luxembourg National Regulatory Authority
IP	Interconnection Point
IT	Italy
ITe	Node for export flows from Italy towards Austria and Switzerland (for NeMo purposes)
ITGI	Interconnector Turkey-Greece-Italy
ITs	Node for import flows at the southern Italian IPs (for NeMo purposes)
km	Kilometer
KWKG	Kraft-Wärme-Kopplungs-Gesetz/Combined Heat and Power Act (Germany)
kWh	Kilowatt-hour

L-gas	Low calorific natural gas
LNG	Liquefied Natural Gas
LU	Luxembourg
LY	Libya
mg/m³	Milligrams per cubic meter
MiSE	Ministero dello Sviluppo Economico/ Ministry of Economic Development (Italy)
MSm³	Mega Standard cubic meter
MSm³/d	Mega Standard cubic meter per day
MW	Megawatt
MWh	Megawatt-hour
NBP	National Balancing Point
NCG	Net Connect Germany
NDP	Network Development Plan
NEP	Netzentwicklungsplan (German Network Development Plan)
NeMo	Network Modelling
NO	Norway
NRA	National Regulatory Authority
NSI	North-South Interconnection
NW	North West
OJ	Official Journal of the European Union
PCI	Project of Common Interest
PEG	Point d'Echange de Gaz
PSV	Punto di Scambio Virtuale
REMIT	Regulation (EU) No 1227/2011 on wholesale energy market integrity and transparency
RES	Renewable Energy Source
RU	Russia
SEN	Strategia energetica nazionale/ National Energy Strategy
SN	South North
SNC	South-North Corridor
SOCAR	State Oil Company of Azerbaijan Republic
TAP	Trans Adriatic Pipeline
tcm	Trillion cubic meter
TEN	Trans-European Networks
TENP	Trans Europa Naturgas Pipeline
THT	Tetrahydrothiophene
TRS	Trading Region South
TSO	Transmission System Operator
TTF	Title Transfer Facility
TWh	Terawatt-hour
TWh/y	Terawatt-hour per year
TYNDP	Ten-Year Network Development Plan
UA	Ukraine
UGS	Underground Storage
UK	United Kingdom
UN	United Nations
USD	US Dollar
WEO	World Economic Outlook of IEA
ZTP	Zeebrugge Trading Point

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