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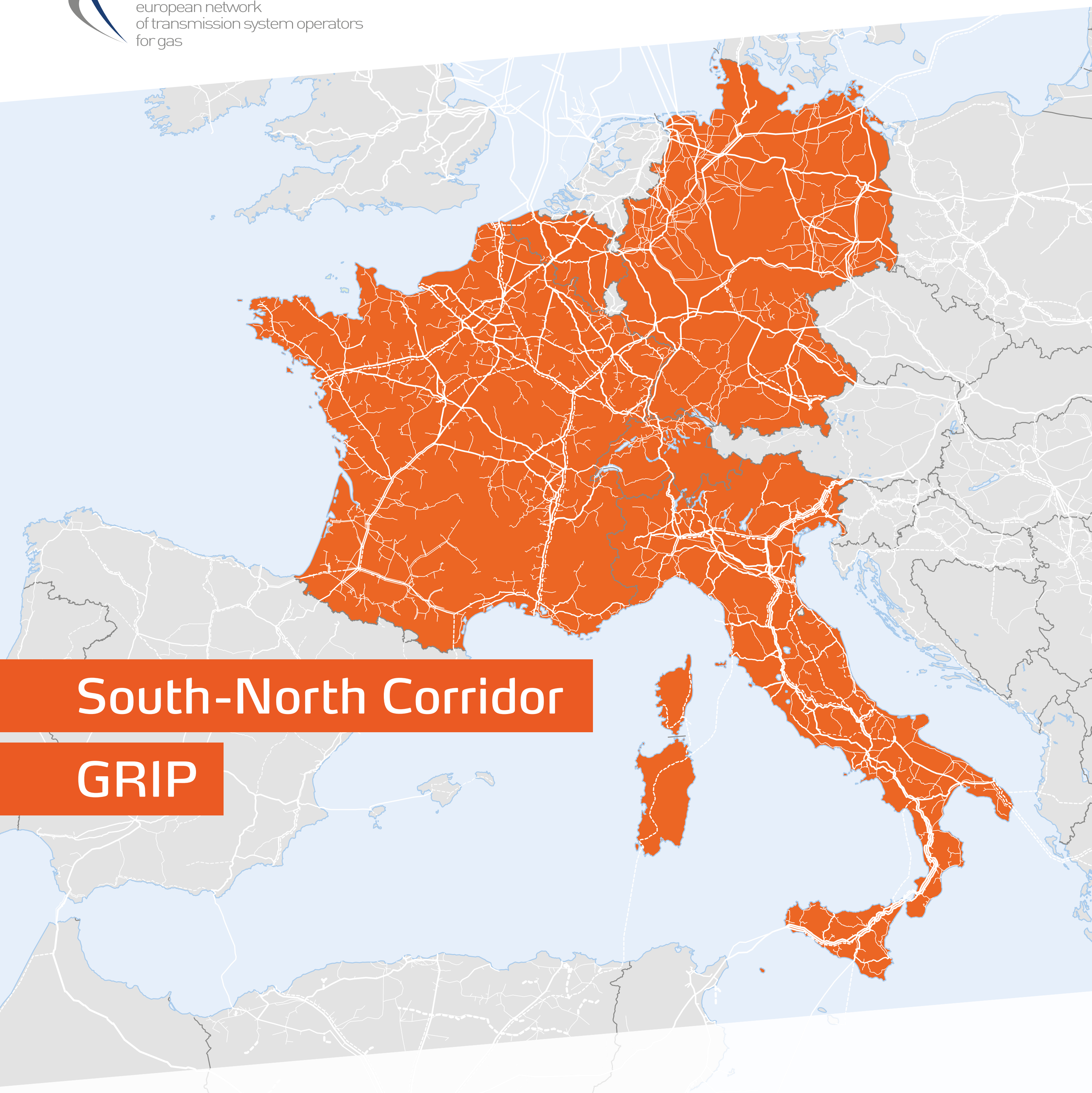
european network of transmission system operators for gas

GAS REGIONAL INVESTMENT PLAN 2014–2023



South-North Corridor GRIP

FLUXYS | BE

GRTgaz

FLUXYS | TENP

Open Grid Europe
The Gas Wheel

terranets bw

Infrastrutture Trasporto Gas

SNAM RETE GAS

FLUXSWISS

SWISSGAS

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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 (GRIP SNC) 2014 – 2023. This is the second edition, which builds further on the previous edition of the GRIP South-North Corridor released in June 2012, while also complementing the Ten Year Network Development Plan (TYNDP) 2013 – 2022 published by ENTSOG in February 2013.

This GRIP is the result of close cooperation between TSOs in the five countries of the European region made up of Belgium, France, Germany, Italy and Switzerland (the "Region"). The coordination of this document was facilitated by Fluxys Belgium and Snam Rete Gas (Regional co-ordinators).

This report takes into account the feedback received since the first GRIP edition, in particular the ACER opinion[1)], and stakeholder views expressed during the dedicated workshops presenting the first GRIP edition (November 2012) and introducing this second GRIP edition (November 2013).

TSOs of the Region would like to thank the stakeholders involved in this process and welcome further comments from them aiming at improving future editions of this report.

This South-North Corridor GRIP aims at giving stakeholders a deeper understanding of existing infrastructure and possible future market and projects developments within the Region.

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.

Paolo Mosa

CEO Snam Rete Gas S.p.A.

Walter Peeraer

CEO Fluxys Belgium

1) ACER Opinion of 25 March 2013 on Gas Regional Investment Plans 2011 (12) – 2020 (21) and related Annexes.

Executive Summary

This second edition of the South-North Corridor Gas Regional Investment Plan takes advantage from an enlargement of the Region, now spanning from Italy to Belgium and crossing the backbone of the European continent along Switzerland, Germany and France. The geographical expansion has been combined with a higher level of contents, measured as amount of information published and, more significantly, in terms of quality of the analyses presented.

The improvement of EU security of supply and market integration is linked to the expansion of infrastructure aimed at interconnecting markets, countries and gas corridors in flexible ways, commercially effective and physically reliable. In consideration of its position, at the heart of the European Union and at the crossroads of the major current and future gas import routes, the Region is vital for the creation of the internal gas market, as witnessed also by the Project of Common Interests affecting this area, among them the South-North Corridor projects.

The already considerable Regional infrastructure base, together with its expected developments and modernization, is destined to increase the role of the Region in bridging priority gas corridors and building a competitive and secure European internal gas market. The existing and expected assets in the Region are thoroughly assessed in the Report. It presents an exhaustive overview of the overall planned gas infrastructure, with a special focus on the South-North Corridor projects, being at the core of the Region and playing a key-role for the future evolution of European demand and supply patterns.

The rationales and the benefits of the South-North Corridor projects are further explored in the document and the possibility to follow the whole route evolution has been ensured adopting an Interconnection Point approach, as already done in the first edition of the Report.

Other initiatives with a Regional relevance, gathered according to the involved countries and relevant associated TSOs, have been reported following a project-based description of their main features.

Finally, a specific chapter has been destined in this South-North Corridor GRIP to the forward-looking perspectives for natural gas. This effort has been done on one side by highlighting the fundamental supply trends in the Region, with a particular focus to the depletion of Northern European reserves, and on the other hand by sustaining the evidences that natural gas is actually the best-placed fuel to back-up renewable energy sources, complementing their intermittent nature in the most sustainable way.

1 Introduction

Image courtesy of FluxSwiss

This report represents the 2nd Gas Regional Investment Plan (GRIP) produced by the Transmission System Operators (TSOs) currently composing the South-North Corridor Region: Belgium, France, Germany, Italy and Switzerland.

The document aims at providing a specific overview of the infrastructure (pipelines, storage facilities and LNG plants) of the Region together with an outlook of the developments of 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 and complements the transmission projects Regional overview presenting other projects of Regional relevance according to their geographical distribution.

The projects belong either to Regional TSOs or Third parties sponsors and the Report has been produced ensuring the highest degree of consistency possible with the Community-wide ENTSOG TYNDP 2013–2022, national TSO development plans and other Regions' GRIPs while updating the information presented where relevant. The status and all the data related to infrastructural projects in this Report reflect the best information available to the co-authors at the moment of drafting, hence not considering possible updates effective at the date of publication.

LEGAL BASIS

This publication is a legal obligation for TSOs, based on the European Directive 2009/73/EC Article 7 and further detailed by Regulation (EC) 715/2009 Article 12, to publish a Gas Regional Investment Plan every two years.

STRUCTURE OF THE REPORT

The report is structured according to the following sections:

- **Infrastructure and Supply:** a general overview of the gas sources available to the Region is provided together with a comprehensive analysis of the existing infrastructures capacities (pipelines, storages facilities, and LNG plants) and the main features of projects under development.
- **Demand Elements and Market Analysis:** historical and forecasted trends of the main demand features and an analysis of the last years markets developments is presented together with an overview of capacities and flows at the relevant Interconnection Points of the Region.
- **Gas-electricity links:** a section dedicated to the forecasted evolutions and main characteristics of the power generation industry in the Region, with a particular focus to renewable sources and their vital links with the gas sector.
- **The role of the Region:** the Regional weight with reference to the envisaged developments of European infrastructure and internal gas market is highlighted in terms of Security of Supply and Market Integration, linked in particular to supply-demand evolution in Western Europe.
- **South-North Corridor Projects:** according to an Interconnection Point approach, the section provides a description of the projects allowing physical reverse flow transmission capacity from Italy through Switzerland to France, Germany, and

Belgium. The initiatives are framed according to their PCI status, with an evaluation of the benefits generated in terms of criteria identified as relevant for projects of common interest by Regulation EC 347/2013.

- **Other TSO transmission projects:** further main transmission investments with Regional relevance are presented according to a project-based approach and gathered according to the involved countries and relevant associated TSOs.
- **Network Modelling:** developed in cooperation with ENTSOG, this new section aims at analyzing modelling results relevant in particular for the South-North Corridor. The use of the ENTSOG Network Modelling tool was combined with updated inputs compared to the Community-wide TYNDP 2013–2022 and an innovative set of scenarios.

ENHANCEMENTS OF THIS SECOND SNC GRIP EDITION

Special attention has been granted in this 2nd SNC GRIP to stakeholder's feedbacks and the way to accommodate their requests. In this view, several enhancements have been introduced, and in particular:

- A more detailed analysis of supply sources and infrastructural elements, now presented not only according to a status quo situation but including also a prospective, planning sub-section[1)].
- A deeper study of demand components, future trends, additional gas hubs information, including the increasing degree of price correlation among them, and finally an analysis of the relevant Interconnection Points in the Region.
- The inclusion of two completely new sections: a first one regarding power generation, highlighting in particular RES can grow only in a consolidated way with natural gas, and a second section related to simulations and network modelling studies, tailored on South-North Corridor evolutions.
- Finally, the core-sections related to transmission projects have been enriched with links to their PCI status and the benefits brought to European market integration.

1) The development of this section has been possible on the basis of a data collection process organized by ENTSOG in Q3 2013 and further integrated by co-authors on the basis of the latest available information, in particular national development plans.


Image courtesy of GRTgaz

TSOS CONTRIBUTING TO THE SNC GRIP

The following table shows the TSOs actively participating to the drafting of this publication ("co-authors").

COUNTRY	TSOs	
INVOLVED TSOs		
BELGIUM	Fluxys Belgium SA	FLUXYS | BE
FRANCE	GRTgaz	GRTgaz
GERMANY	Fluxys TENP GmbH	FLUXYS | TENP
	Open Grid Europe GmbH	Open Grid Europe The Gas Wheel
	terranets bw GmbH	terranets bw
ITALY	Infrastrutture Trasporto Gas S.p.A.	Infrastrutture Trasporto Gas
	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 2014–2023

The works on the second edition of the South-North Corridor Grip have been jointly coordinated by Fluxys Belgium S.A. and Snam Rete Gas S.p.A.

2 Supply and Infrastructure

Supply Sources

Infrastructural Elements

Image courtesy of Snam Rete Gas

Belgium, France, Germany, Italy and Switzerland (the "Region") are positioned together at the heart of the European Union, so that they naturally form a North-South / South-North spine along the continent.

The main advantage of this geographical location is that the Region is at the crossroads of the major gas routes and European priority corridors, therefore playing a strategic role under the perspective of both diversification of sources and security of supply.

The aggregate infrastructure basis already existing and under development, completes the picture, providing the playing field for the deployment of competitive dynamics at the basis of an effective market integration.

The following sections provide a representation of the gas sources available to the Region together with a detailed overview of the infrastructural features of the Region (pipelines, storages facilities, and LNG plants) and the projects under development.

2.1. Supply Sources

The main external supply sources for the Region are:

- Algeria
- LNG
- Libya
- Norway
- Russia
- The Netherlands.

An overview of the shares of these sources is given in Figure 2.1 (based on net aggregated 2012 yearly volumes).

Norway, Russia and the Netherlands each contributed about 25 % to 30 % to the yearly external supply. These three sources together provided about 80 % of the overall supply quantities to the Region in 2012.

The share of the sum of the supply quantities from Algeria and Libya was about 10 %, and a remaining equivalent share of about 10 % was supplied as LNG to Belgium, Italy and France.

The above-mentioned percentages are relevant to capture Regional supply dynamics, but should be interpreted as figures representing the picture of "a year", possibly destined to change within the limit of existing (and, in perspective, also planned) technical capacities. This might happen primarily according to market signals but it could be possibly driven by external events as well (e.g. disruptions due to political or technical reasons or the specific LNG market conditions after the Fukushima incident).

As about 1.5 % of the quantities entering the Region exited the Region towards Spain (being the only net exit for the region on a yearly basis in 2012) the quantities entering the Region add up to 101.5 %.

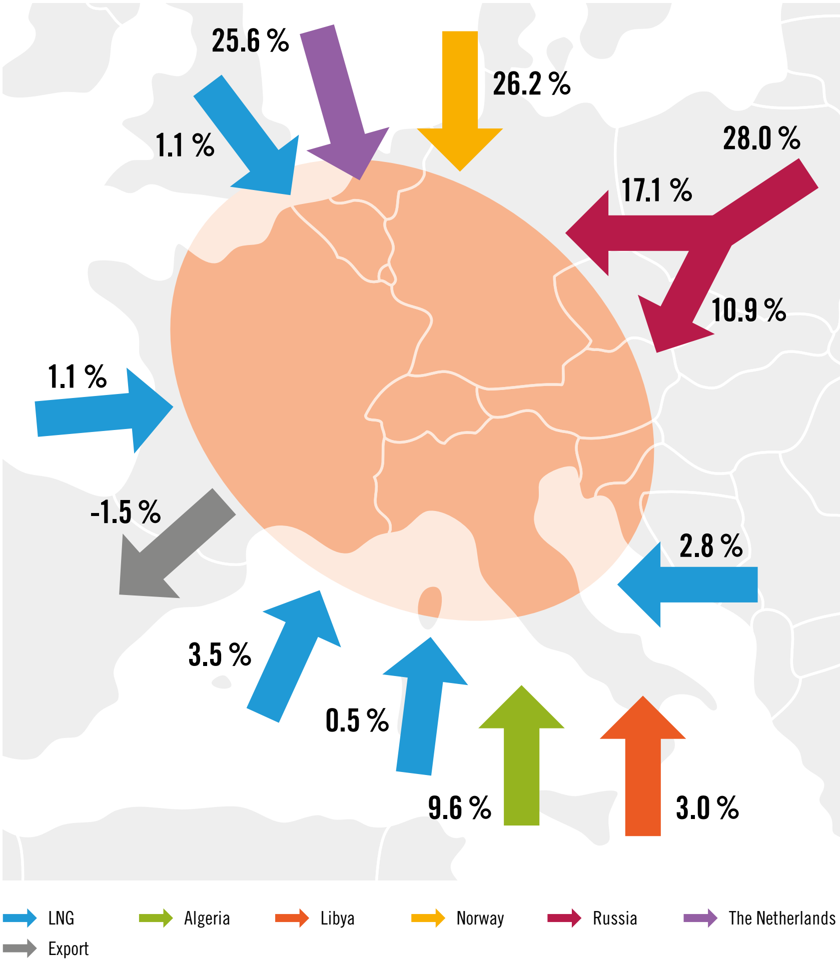


Figure 2.1: Geography and supply sources of the Region (indicative percentages based on net aggregated volumes in 2012, (Sources: participating TSOs and ENTSOG))

2.2. Infrastructural Elements

Infrastructures form the backbone for the development of competitive and integrated gas markets.

The services that infrastructure operators can provide to their users rely on the availability of adequate and well-developed transmission networks, complemented by the presence of equally advanced services offered by storage facilities and LNG operators.

The existing aggregated gas equipment of the Region represents a unique infrastructure base, coupling transmission assets with the flexibility provided by storage facilities and LNG plants and providing to users active in this area a wide range of market possibilities.

The same sound and balanced mix of infrastructure guarantees a substantial level of supply, along with diversification and security of supply for all Regional and EU customers.

Also adopting a forward-looking perspective, the number of projects included in this GRIP illustrates that the Region is willing to further develop the gas infrastructures, provided that favourable investment conditions sustain project promoters' efforts.

Taking into account the need to refurbish the existing infrastructure and the envisaged changes in demand and supply patterns, further investments in enhancing network, storage and LNG systems are essential to support market integration, security of supply and sustainability as pillars of the European energy policy.

The infrastructure analysis is organized in the following way:

- For the existing assets: the analysis focuses on the Regional weight for the different categories of infrastructure (pipelines, storage facilities and LNG plants) compared to the EU aggregate, with a specific breakdown for the countries composing the Region.
- For projected infrastructures: an overall evaluation has been conducted on the FID/non-FID situation for the various categories of assets. The chapter closes with a detailed list of projects, grouped in different tables according to the category of infrastructure, with the indication of the related project promoters, the FID/non-FID status and the foreseen commissioning year. More details on the respective projects can be found in annex A of ENTSOG TYNDP 2013–2022.

2.2.1 TRANSMISSION NETWORKS

The Regional aggregated high pressure gas network lengths add up to about 112,000 km, representing more than half of the total European transmission grid (around 208,000 km). As shown in Figure 2.2, the Region aggregates 54 % of the total transmission assets measured in terms of length, with three countries (France, Germany and Italy) contributing near equally to reach more than 50 % out of the total (more than 106,000 km)[1] and establishing a bulk infrastructure basis of the overall EU transmission network.

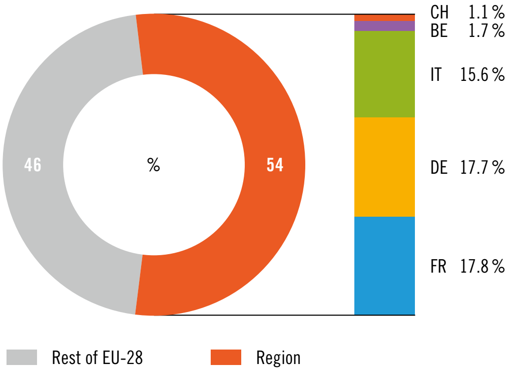


Figure 2.2: Regional transmission networks weight compared to overall EU

The development of transmission infrastructure in terms of length cannot be separated from an adequate enhancement of the compressor stations, representing the multiple hearts moving gas in the network according to market demand needs. Consistently with the previous figure, the Region offers near half (48 %, equal to 4,216 MW) of the total European power (8,841 MW)[2].

Figure 2.3 makes it possible to evaluate the contribution provided by the Region, broken down by its various member states, compared to the European aggregate compression power.

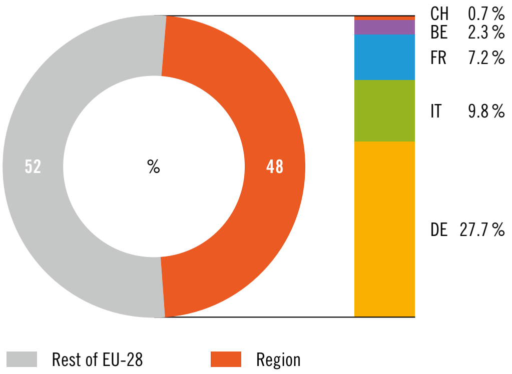


Figure 2.3: Regional compressor power weight compared to overall EU

It is interesting to note that transmission asset and total compressor power percentages throughout Europe match the Regional gas demand weight on the total, showing consistency between market needs and the infrastructure basis satisfying it.

1) Source: elaboration on data gathered from ENTSOG members [ENTSOG Annual Report 2013 – EU 28 reference]
2) Source: elaboration on data gathered from ENTSOG members [ENTSOG Annual Report 2013 – EU 28 reference]

2.2.2 STORAGE SITES

The Regional aggregated working gas volumes add up to around 551 TWh (52.1 billion cubic meters), representing 54 % out of 1,015.7 TWh (96.1 billion cubic meters) totalized by the aggregate of the overall European working gas volumes[1]. Figure 2.4 graphically shows the consistent weight of the Region in the field of gas storage. Considering the limited storage resource of Belgium, these data are aligned with those reported in the previous edition of "Gas Regional Investment Plan South-North Corridor 2012–2021".

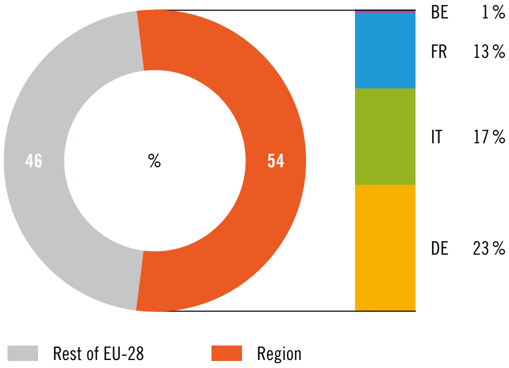


Figure 2.4: Regional storage site weight compared to overall EU

1) Source: data processed from "GSE Storage Map" (July 2013) and referred only to EU 28

2.2.3 LNG REGASIFICATION PLANTS

The LNG plants operating in the Region offer an aggregated regasification capacity of 529.9 TWh/y (47.5 billion cubic meters / year). This value has considerably increased compared to the previous "Gas Regional Investment Plan South-North Corridor 2012 – 2021" (+12.5 billion cubic meters / year) mainly thanks to the extension of the Regional border (which introduced the significant contribution of the Belgian Zeebrugge LNG terminal) and to a lesser extent to the commissioning of the OLT LNG Terminal in Italy during the last part of 2013. Figure 2.5 shows the growth of weight of LNG in the Region, since it now represents around a fourth (26 %) of total European regasification capacity (2,058.3 TWh/year equivalent to 184.4 billion cubic meters / year).[1)]

The contribution from Belgium and Italy is increasing the weight of the Region in total European regasification capacity, even though it stays relatively low when compared with gas transportation or storage assets. With interconnections with others areas and new regasification capacities, access to LNG will be reinforced, bringing a flexible and inherently diversified source of supply for the Region.

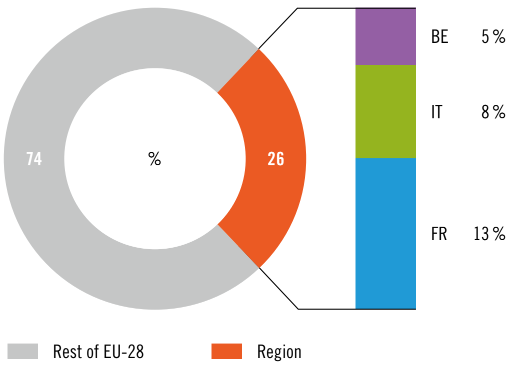


Figure 2.5: Regional LNG regasification plants weight compared to overall EU

1) Source: data processed from "GLE LNG Map" (July 2013) and referred only to EU 28

2.2.4 UPDATES ON INFRASTRUCTURE PROJECTS IN THE REGION

The Region appears very dynamic in terms of infrastructure developments as well, in particular in relation to transmission projects. On the basis of a data collection request organized by ENTSOG and completed in September 2013, the Region has 77 projects. For 25 of them, a final investment decision (FID) has been taken (32 % of the total, see Figure 2.6).

The detailed breakdown of the number of projects per country, project type and FID status is provided in the following table:

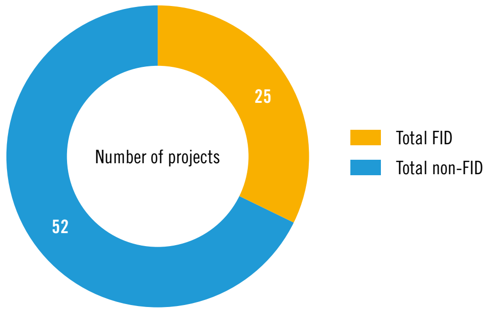


Figure 2.6: FID vs non-FID projects: the aggregate picture in the South-North Corridor Region

TYPES OF PROJECTS IN THE IN THE SOUTH-NORTH CORRIDOR REGION

COUNTRY	PIPE FID	%	PIPE NON-FID	%	STORAGE FID	%	STORAGE NON-FID	%	LNG FID	%	LNG NON-FID	%	TOTAL PROJECTS PER COUNTRY
Italy	3	4 %	5	6 %	3	4 %	4	5 %	1	1 %	5	6 %	21
Switzerland	0	0 %	1	1 %	0	0 %	0	0 %	0	0 %	0	0 %	1
France	8	10 %	15	19 %	2	3 %	3	4 %	1	1 %	4	5 %	33
Germany	5	6 %	11	14 %	1	1 %	3	4 %	0	0 %	0	0 %	20
Belgium	1	1 %	0	0 %	0	0 %	0	0 %	0	0 %	1	1 %	2
TOTAL REGION per project class	17	22 %	32	42 %	6	8 %	10	13 %	2	2 %	10	13 %	77

Table 2.1: Types of projects in the in the South-North Corridor Region;Data grouped in this table are sourced from the lists of projects (see Tables 2.2 to 2.4)

Figure 2.7 shows the situation in terms of the aggregate number of projects (FID + non-FID) for all countries composing the Region. The result indicates, as reasonably expected, that the three major systems together forms almost the total amount of projects (95 %), with France (at more the 40 % of the total) leading the Region in terms of envisaged initiatives. However, the total number should be read in connection with the specific list of projects (see following section), since different ways of representing them could have been adopted depending on the project promoters' choices. In other words, some TSOs adopt a more fragmented manner when identifying infrastructure enhancements, while other TSOs can decide to group together multiple initiatives into a single project, justified by the same objective. Moreover, this analysis is based on the number of projects, not providing indications about the "size" of projects themselves.

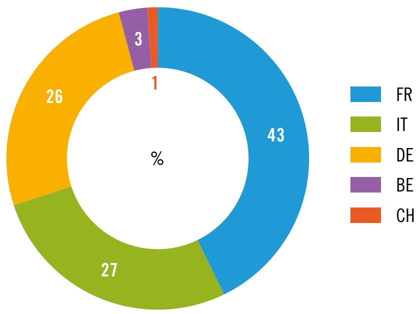


Figure 2.7: Country distribution of projects (FID + non-FID) in the South-North Corridor Region

While pipe initiatives add up to 49 projects (64 % of total project in the Region), storages projects can count on the highest expected realization rate, since six out of sixteen have already received an FID decision. This situation could be a sign of the positive economic perspective experienced in the past by storages. Anyway, considering the changed market climate currently characterizing storage sector, it's likely that these figures will change in the near future.

On the other hand, only two LNG projects have been granted with FID, with ten projects still waiting to proceed towards a more concrete development phase. This might be a consequence of the recent developments of LNG market dynamics and could also reflect the more competitive nature of this type of infrastructure compared to transmission and storage projects, more closely linked to demand and security of supply needs.

The following graphs (Figure 2.8 and Figure 2.9) visualize the various classes of projects, introducing a temporal dimension.

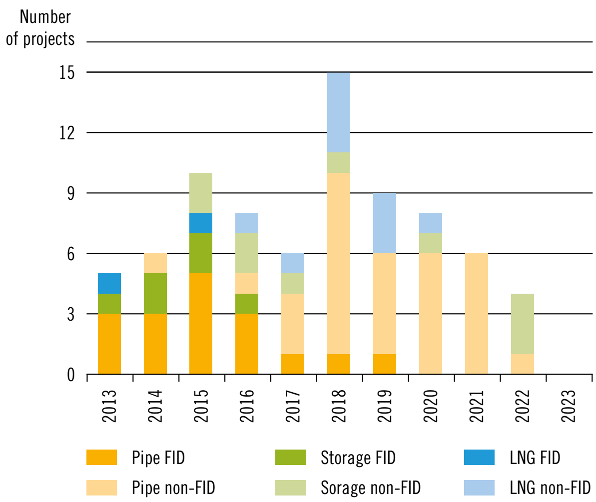


Figure 2.8: Total number of projects per type (LNG, Storage, Pipes) and status (FID, non-FID) in the South-North Corridor Region

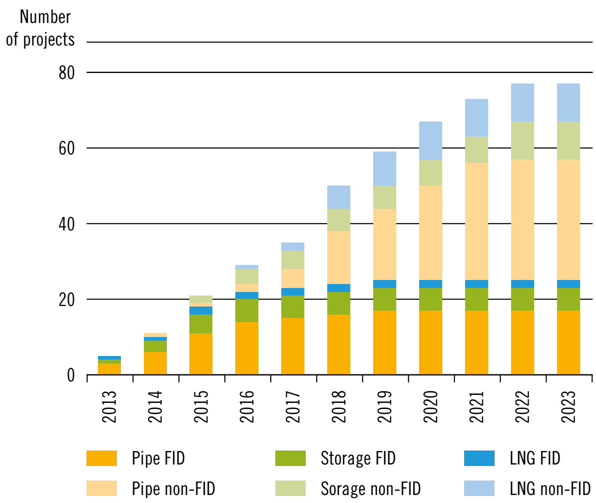


Figure 2.9: Cumulated distribution of Regional projects in the South-North Corridor Region

The first graph divides the projects according to the date of commissioning on a yearly basis: 2015 and 2018 are the years where a higher number of infrastructure projects are expected to enter into operation. The difference between these two deadlines is that 2015 is characterized by the highest number of FID-projects, while 2018 is the record year for non-FID infrastructure.

Figure 2.9 shows another interesting and intuitive feature of infrastructure planning: commissioning of FID initiatives is concentrated in the first half of the considered period, while for non-FID projects the operational phases are indicated for the final part of the decade under consideration. Non-FID projects are increasingly piling up from 2015 onwards, becoming the predominant item from the middle of the analyzed time horizon, while the FID number stabilizes between 2017 and 2019, as a possible indication of the average construction time for infrastructure.

Figure 2.10 represents an alternative graphical representation of the above-mentioned considerations, showing the relative weight of the various infrastructure classes and the related FID status. The pie graph makes evident that FID assets represent around a third of the overall projects, and that pipelines are the first category both for FID and non-FID infrastructure.

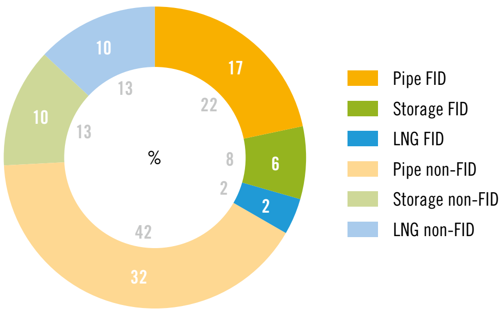


Figure 2.10: Relative weight of Infrastructure projects per class (LNG, storages, pipelines) and status (FID, non-FID) in the South-North Corridor Region

2.2.5 LIST OF PROJECTS

In the following tables all of the infrastructure projects (FID and non-FID) are presented in three detailed lists per type of infrastructure: transmission including compressor stations (Table 2.2), storage (Table 2.3) and LNG projects (Table 2.4).

All of the infrastructure projects represented refer to an open submission by project promoters, consistent with ENTSOG TYNDP 2013–2022 data gathering and updated through September 2013. Co-authors may have subsequently updated the project list based on the latest available information, in particular their national development plans.

Project Promoter	Name	TYNDP Code	FID Status	Commissioning
TRANSMISSION PROJECTS, INCLUDING COMPRESSOR STATIONS				
bayernets GmbH	MONACO section phase II (Finsing-Amerdingen)	TRA-N-240	Non-FID	2018
	MONACO section phase I (Burghausen-Finsing)	TRA-N-241	Non-FID	2017
Edison	GALSI Pipeline	TRA-N-012	Non-FID	2018
Fluxys	Reverse Flow Transitgas Switzerland	TRA-N-230	Non-FID	2018
	Bretella	TRA-N-207	Non-FID	2018
	Reverse Flow TENP Germany	TRA-N-208	Non-FID	2018
Fluxys Belgium	Alveringem-Maldegem	TRA-F-205	FID	2015
GASCADE Gastransport GmbH	Installation of Nord Stream onshore project	TRA-F-289	FID	2014
	Installing a reverse flow in Mallnow	TRA-F-292	FID	2014
	Extension of GASCADE grid in the context of the Nord Stream (on-shore) project	TRA-N-249	Non-FID	2014
	New net connection from Rehden to Drohne (new covenant from NEP2012)	TRA-N-291	Non-FID	2018
Gasunie Deutschland Transport Services GmbH	Extension of existing gas transmission capacity in the direction to Denmark – 1. Step	TRA-F-231	FID	2014
	Extension of existing gas transmission capacity in the direction to Denmark – 2. Step	TRA-N-232	FID	2015/2016
	Expansion of Nord Stream connection to markets in western Europe – Exit Bunde-Oude	TRA-N-316	Non-FID	2020
Gasunie Ostseeanbindungsleitung GmbH	Expansion of Nord Stream connection to markets in western Europe - Entry Greifswald	TRA-N-321	Non-FID	2020
GRTgaz	Arc de Dierrey	TRA-F-036	FID	2016
	Entry capacity increase from Belgium to France	TRA-F-037	FID	2013
	Transmission system developments for the Dunkerque LNG new terminal	TRA-F-038	FID	2015
	Iberian-French corridor: Western Axis (CS Chazelles)	TRA-F-039	FID	2013
	Reverse capacity from France to Belgium at Veurne	TRA-F-040	FID	2015
	Eridan	TRA-F-041	FID	2017
	New interconnection IT–FR to connect Corsica	TRA-N-042	Non-FID	2018

Project Promoter	Name	TYNDP Code	FID Status	Commissioning
GRTgaz (continued)	Val de Saône project	TRA-N-043	Non-FID	2018
	New interconnection to Luxembourg	TRA-N-044	Non-FID	2018
	Reverse capacity from CH to FR at Oltingue	TRA-N-045	Non-FID	2017
	Exit capacity increase to CH at Oltingue	TRA-N-046	Non-FID	2022
	Reverse capacity from France to Germany at Obergailbach	TRA-N-047	Non-FID	2020
	Transmission system developments for Montoir LNG terminal expansion at 12,5 bcm – 1	TRA-N-048	Non-FID	2018
	Arc Lyonnais pipeline	TRA-N-253	Non-FID	2019
	Connection of the Fos faster LNG new terminal	TRA-N-254	Non-FID	2019
	Fos Tonkin LNG expansion	TRA-N-255	Non-FID	2019
	Iberian-French corridor: Eastern Axis-Midcat Project (CS Montpellier and CS Saint Martin de Crau)	TRA-N-256	Non-FID	2021
	New line Between Chemery and Dierrey	TRA-N-257	Non-FID	2021
	Transmission system developments for Montoir LNG terminal expansion at 16,5 bcm – 2	TRA-N-258	Non-FID	2021
	Transmission system developments for Fosmax (Cavaou) LNG expansion	TRA-N-269	Non-FID	2020
IGI Poseidon S.A.	Poseidon Pipeline	TRA-N-010	Non-FID	2019
Open Grid Europe GmbH	System enhancements, including the connection of gas-fired power plants, storages and the integration of power to gas facilities	TRA-N-243	Non-FID	2020
	Stepwise change-over to physical H-gas operation of L-gas networks	TRA-N-244	Non-FID	2020
	Project study on the integration of Power to Gas (PtG) facilities into the gas transmission system	PRD-N-301	Non-FID	2016
Snam Rete Gas S.p.A.	Support for the North West market	TRA-F-213	FID	2016
	Support for the North West market and bidirectional cross-border flows	TRA-F-214	FID	2018
	Development for new imports from the South	TRA-N-007	Non-FID	2019
	Import developments from North-East	TRA-N-008	Non-FID	2021
	Additional Southern Developments	TRA-N-009	Non-FID	2021
terranets bw GmbH	Nordschwarzwaldleitung	TRA-F-228	FID	2015
TIGF	Girland - Artère de Guyenne Phase B	TRA-F-250	FID	2013
	Artère de l'Adour (former Euskadour) (FR – ES interconnection)	TRA-F-251	FID	2015
	Iberian – French corridor: Eastern Axis-Midcat Project	TRA-N-252	Non-FID	2021
Trans-Adriatic Pipeline AG	Trans Adriatic Pipeline	TRA-N-051	FID	2019

Table 2.2: Transmission projects, including compressor stations, detailed according to project promoter

Project Promoter	Name	TYNDP Code	FID Status	Commissioning
STORAGE FACILITIES				
Edison Stoccagio S.p.A.	San Potito e Cotignola	UGS-F-236	FID	2013
	Nuovi Sviluppi Edison Stoccaggio	UGS-N-235	Non-FID	2018
	Palazzo Moroni	UGS-N-237	Non-FID	2016
Geogastock	Grottole-Ferrandina Gas Storage	UGS-N-288	Non-FID	2016
ITAL Gas Storage S.r.l.	Cornegliano UGS	UGS-N-242	Non-FID	2015
STOGIT	Bordolano	UGS-F-259	FID	2015
	System Enhancements - Stogit - on-shore gas fields	UGS-F-260	FID	2016
Storengy	Hauterives Storage Project – Stage 1	UGS-F-004	FID	2014
	Etrez	UGS-N-003	FID	2015
	Hauterives – Stage 2	UGS-F-265	Non-FID	2015
	Alsace Sud	UGS-N-002	Non-FID	2022
	Etrez – Stage 2	UGS-N-264	Non-FID	2022
	Peckensen Gas Storage FID	UGS-F-317	FID	2014
	Harsefeld	UGS-N-001	Non-FID	2020
	Peckensen Gas Storage	UGS-N-005	Non-FID	2017
	Behringen Gas Storage	UGS-N-049	Non-FID	2022

Table 2.3: Storage facilities, detailed according to project promoter

Project Promoter	Name	TYNDP Code	FID Status	Commissioning
LNG TERMINALS				
API Nova Energia S.r.l.	api nòva energia S.r.l. – LNG off-shore regasification terminal of Falconara Marittima (Ancona, Italy)	LNG-N-085	Non-FID	2016
BG Group	Brindisi LNG	LNG-N-011	Non-FID	2017
EdF	Dunkerque LNG Terminal	LNG-F-210	FID	2015
Elengy	Montoir LNG Terminal Expansion	LNG-N-225	Non-FID	2019
	Fos Tonkin LNG Terminal Expansion	LNG-N-226	Non-FID	2019
	Fos Cavaou LNG Terminal Expansion	LNG-N-227	Non-FID	2020
Fluxys LNG	LNG Terminal Zeebrugge - Capacity Extension & 2nd Jetty	LNG-N-229	Non-FID	2018
Fos Faster LNG	Fos Faster LNG Terminal	LNG-N-223	Non-FID	2019
Gas Natural Rigassificazione Italia	Zaule - LNG Terminal in Trieste (Italy)	LNG-N-217	Non-FID	2018
Nuove Energie S.r.l.	Porto Empedocle LNG	LNG-N-198	Non-FID	2018
OLT Offshore LNG Toscana S.p.A	OLT Offshore LNG Toscana SpA	LNG-F-089	FID	2013
Sorgenia S.p.A.	LNG Medgas Terminal S.r.l.	LNG-N-088	Non-FID	2018

Table 2.4: LNG Terminals, detailed according to project promoter

Image courtesy of ITG S.p.A.

3 Demand Elements and Market Analysis

Historic Demand | Forecast Demand Trends
Market Development Indicators | Price Correlation
Interconnection Points in the South-North Corridor

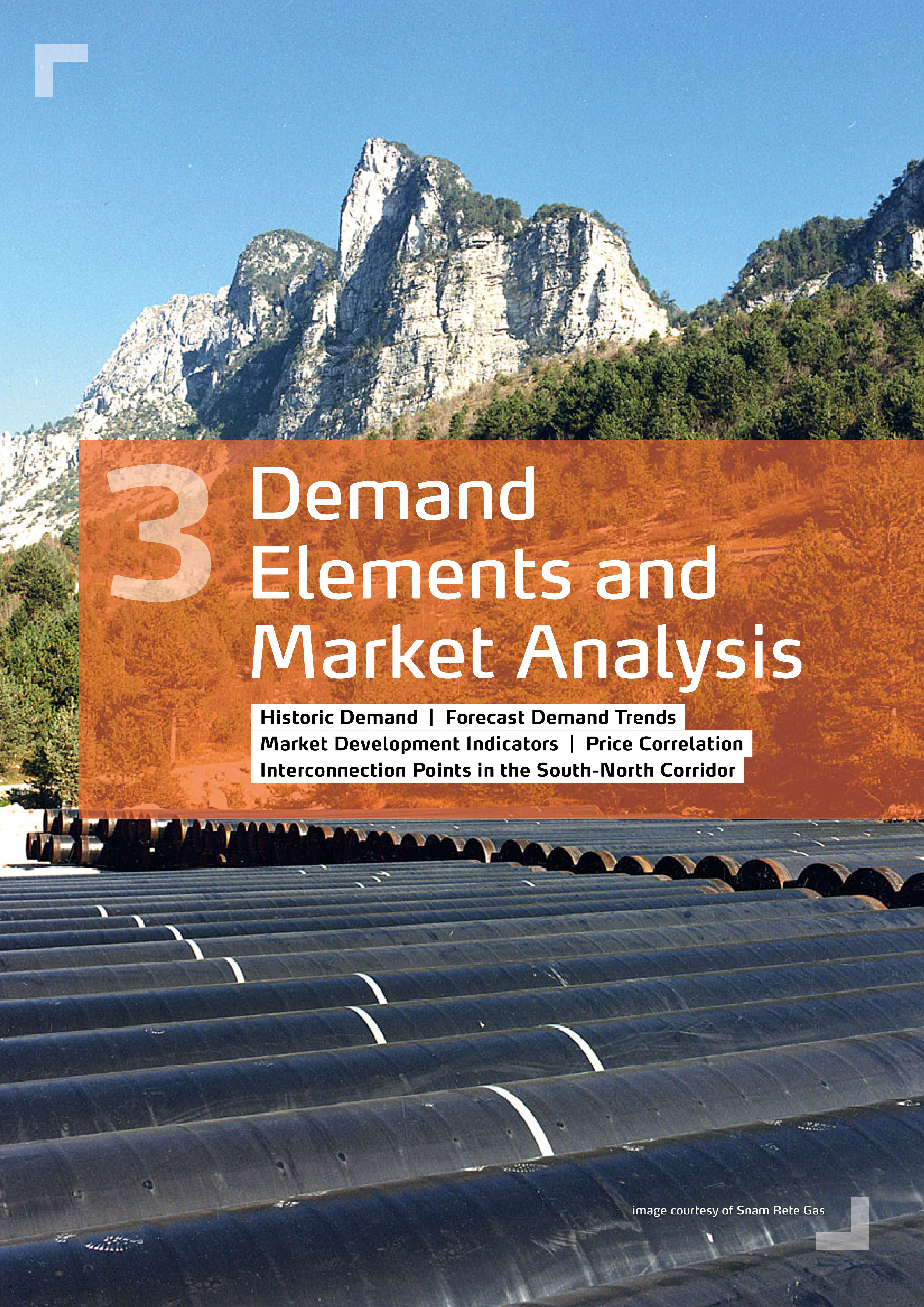


image courtesy of Snam Rete Gas

The infrastructure base described in the opening part of this Report is the fundamental prerequisite for a sound growth of the gas markets grouped in the Region. In fact, a well-developed transmission network provides the physical structure for linking the national market areas and, at the same time, it enables to share the flexibility potential provided by storage and LNG installations.

The Report provides hereby a brief assessment of some relevant market elements aimed at highlighting the relevance of the Region, both in terms of market size and of development of competitive dynamics.

The first part of the chapter provides a description of the main demand features, in terms of both historic and forecasted trends.

The second section of this chapter focuses on market indicators, following Regional hub developments (in terms of traded volumes and, if available, number of transactions) and closing with a price correlation analysis.

The third and last section of the Chapter introduces an analysis of the relevant Interconnection Points (IPs) of the Region, providing information on capacity booking and use.

3.1 Historic Demand[1)]

The Regional aggregated gas consumption in 2013 accounted for approximately half of the overall EU gas consumption. The near equivalent Italian and German figures add up to more than a third of the EU gas needs, while France and Belgium add another 14 % to the European requirements. The Swiss share is less than 1 %.

In absolute terms, the Regional annual demand amounted to about 2,412 TWh in 2013 (equal to around 228 billion cubic meters) compared to the total EU annual gas consumption of about 4,946 TWh (around 467 billion cubic meters).

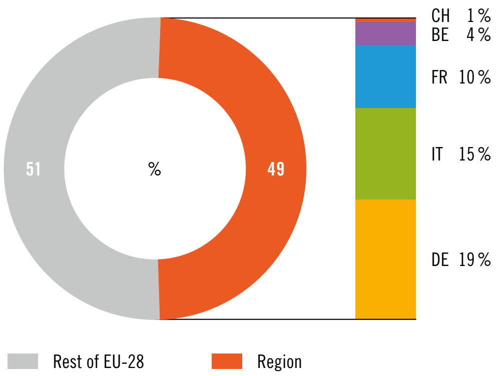


Figure 3.1: Relative Weight of Regional gas demand in 2013

1) ENTSOG (demands of Denmark and Ireland for year 2013 were not available at the date of writing this section; therefore, replacement data related to 2012 have been used)

The following table and bar chart show the consumption of most of the European countries in absolute terms (in GWh/year) and in relative terms (as a percentage of the total European consumption) in 2012 and 2013 (not normalized for temperature):

GAS DEMAND IN 2012 AND 2013, COUNTRY BY COUNTRY

COUNTRY	TOTAL GAS DEMAND IN 2012		TOTAL GAS DEMAND IN 2013	
	GWh/y	PERCENTAGE OF THE TOTAL EU DEMAND	GWh/y	PERCENTAGE OF THE TOTAL EU DEMAND
Slovenia	9,192	0.18 %	9,177	0.19 %
Sweden	12,974	0.26 %	12,393	0.25 %
Croatia	29,730	0.59 %	28,878	0.58 %
Lithuania	34,159	0.68 %	27,905	0.56 %
Switzerland	36,308	0.72 %	38,245	0.77 %
Denmark	38,611	0.77 %	38,611	0.78 %
Finland	38,832	0.77 %	36,937	0.75 %
Greece	47,087	0.94 %	41,452	0.84 %
Portugal	49,412	0.99 %	46,942	0.95 %
Ireland	51,814	1.03 %	51,814	1.05 %
Slovakia	56,970	1.14 %	55,061	1.11 %
Czech Republic	86,162	1.72 %	87,752	1.77 %
Austria	91,202	1.82 %	86,898	1.76 %
Hungary	105,653	2.11 %	97,166	1.96 %
Romania	132,557	2.64 %	119,247	2.41 %
Poland	155,734	3.11 %	162,601	3.29 %
Belgium	185,718	3.70 %	183,234	3.70 %
Spain	362,545	7.23 %	333,231	6.74 %
Netherlands	396,548	7.91 %	404,180	8.17 %
France	494,768	9.87 %	501,734	10.14 %
Italy	782,784	15.61 %	732,770	14.82 %
United Kingdom	841,502	16.78 %	830,271	16.79 %
Germany	909,100	18.13 %	955,900	19.33 %
Total	5.015.227		4,945,664	

Table 3.1: Gas demand in 2012 and 2013, Country by Country
(Source: ENTSOG data collection based on information from TSOs)

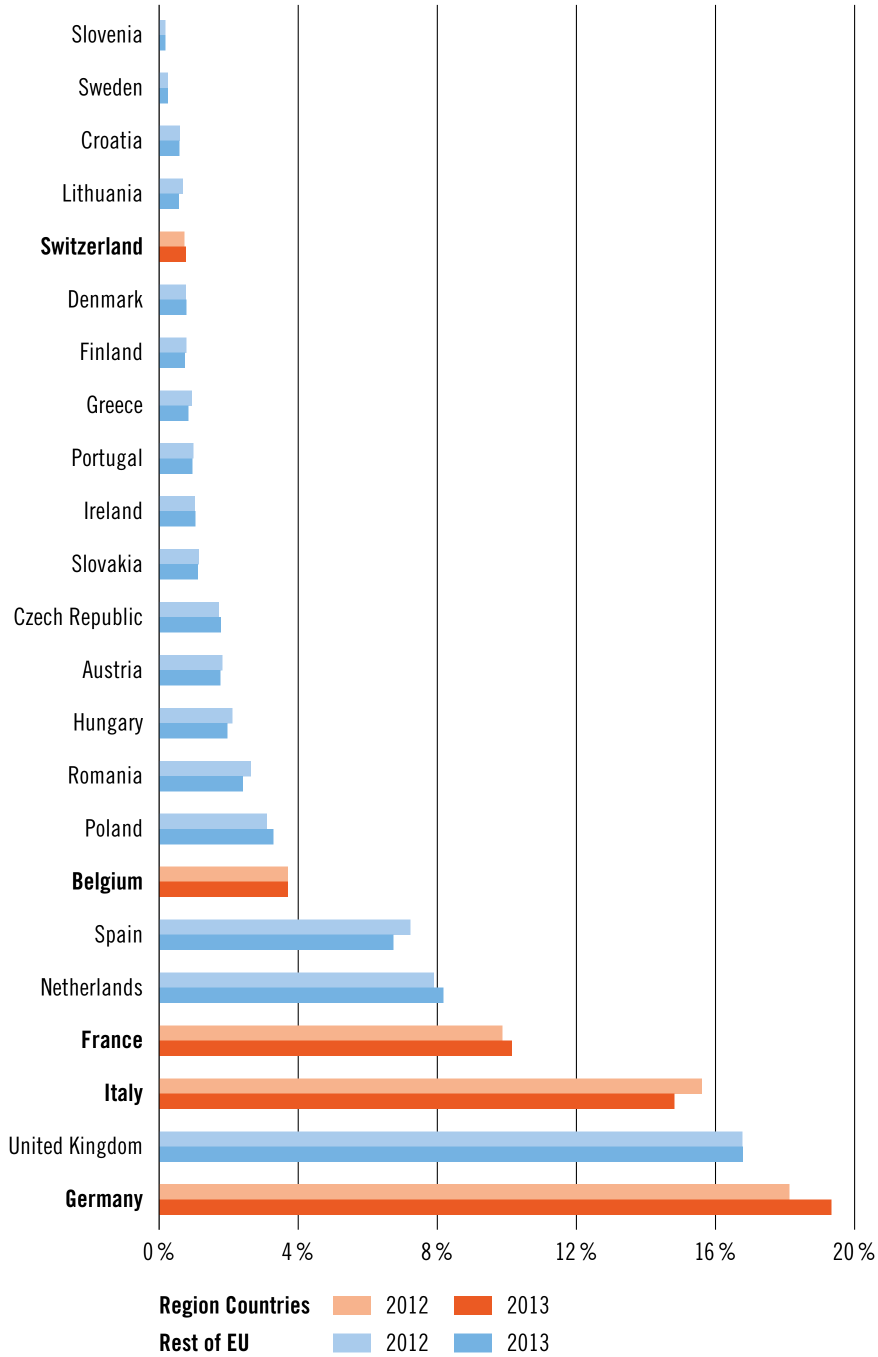


Figure 3.2: Gas Demand in 2012 and 2013 (Percentage of Total EU Demand)

3.2 Forecast Demand Trends[1)]

The Regional peak gas demand forecasts from 2014 to 2023 are pointed out in the following tables and charts.

It is worth highlighting that these "design case" figures are the result of TSO estimations as a response to a data collection organized by ENTSOG in summer 2013. The Regional demand in 2023 is estimated to be slightly lower than the demand expected for 2014.

DESIGN CASE GAS DEMAND FORECAST [GWh/d] IN THE SOUTH-NORTH CORRIDOR

Balancing Zone	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Belgium	1,435	1,383	1,417	1,448	1,444	1,455	1,464	1,475	1,486	1,498
France PEG N	3,144	3,156	3,152	3,130	3,138	3,128	3,119	3,100	3,068	3,036
France PEG S	944	947	946	939	942	939	936	930	921	911
France TIGF	331	333	333	367	370	370	376	376	376	376
France	4,419	4,437	4,431	4,436	4,450	4,437	4,431	4,406	4,365	4,323
Germay NCG	2,897	2,833	2,840	2,810	2,799	2,765	2,750	2,720	2,716	2,720
Germany GASPOOL	2,118	2,071	2,077	2,055	2,047	2,022	2,011	1,989	1,986	1,989
Germany	5,015	4,904	4,917	4,865	4,846	4,787	4,761	4,709	4,702	4,709
Italy	5,034	5,056	5,036	4,996	5,028	5,007	5,030	5,036	5,012	4,975
Switzerland	220	220	220	236	236	252	252	252	252	252
Total SN Corridor	***16,121***	***15,999***	***16,021***	***15,981***	***16,003***	***15,939***	***15,938***	***15,878***	***15,817***	***15,757***
Total Europe	**35,000**	**34,943**	**35,281**	**35,483**	**35,778**	**35,757**	**36,024**	**35,960**	**35,993**	**36,026**

Table 3.2: Design Case peak gas demand in the Region (2014 – 2023 projection)

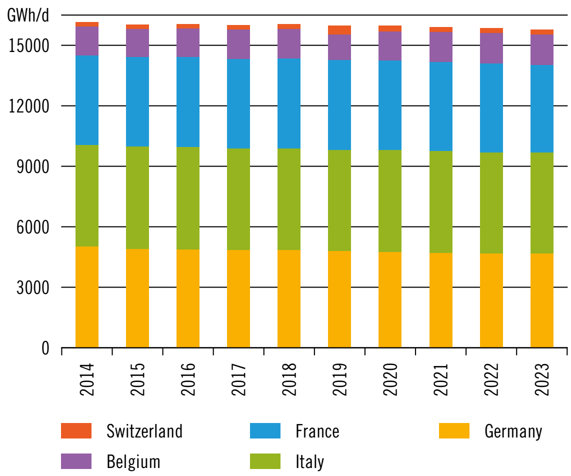


Figure 3.3: Design Case peak gas demand in the Region (2014 – 2023 projection)

1) Source: ENTSOG. Data used here refers to TSOs contributions sent to ENTSOG in August 2013 and their validity should be referred to that moment, while projections at the GRIP publication stage could actually differ.

The yearly gas demand in the South-North Corridor is estimated to slightly decrease in the next two years. It is anyway expected to increase again from 2015 on, possibly reaching a 3 % higher value in 2023.

YEARLY GAS DEMAND FORECAST [GWh/y] IN THE SOUTH-NORTH CORRIDOR

Balancing Zone	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Belgium	165,669	157,295	161,848	165,986	164,792	165,859	166,603	167,697	168,806	169,928
France PEG N	331,901	332,967	342,080	344,876	348,482	349,962	350,420	349,814	349,473	346,389
France PEG S	130,357	130,775	134,355	135,453	136,869	137,450	137,630	137,392	137,258	136,047
France TIGF	31,862	31,645	31,646	35,650	36,651	36,651	38,649	38,635	38,621	38,621
France	494,119	495,387	508,081	515,978	522,003	524,063	526,700	525,841	525,352	521,057
Germay NCG	463,000	455,000	455,000	450,000	447,000	444,000	440,000	436,000	435,000	435,000
Germany GASPOOL	391,000	381,000	383,000	379,000	379,000	373,000	371,000	367,000	366,000	367,000
Germany	854,000	836,000	838,000	829,000	826,000	817,000	811,000	803,000	801,000	802,000
Italy	817,620	827,200	837,606	844,833	849,329	862,651	878,475	893,841	900,397	903,585
Switzerland	30,000	30,000	30,000	32,500	32,500	35,000	35,000	35,000	35,000	35,000
Total SN Corridor	*2,361,408*	*2,345,882*	*2,375,534*	*2,388,298*	*2,394,623*	*2,404,574*	*2,417,778*	*2,425,379*	*2,430,554*	*2,431,571*
Total Europe	5,057,675	5,099,099	5,166,499	5,253,213	5,382,875	5,420,287	5,448,509	5,443,947	5,447,325	5,442,097

Table 3.3: Yearly gas demand in the Region (2014 – 2023 projection)

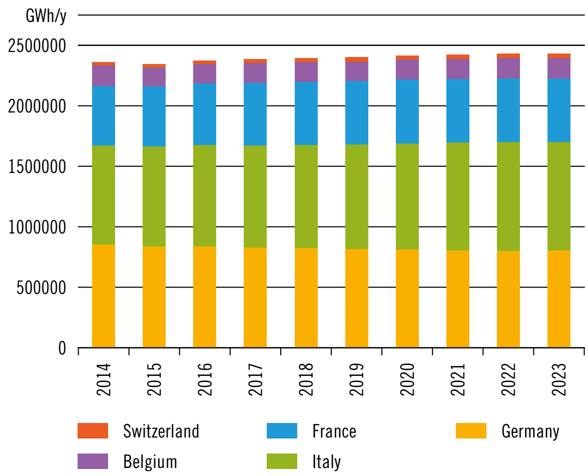


Figure 3.4: Yearly gas demand in the Region (2014 – 2023 projection)

Further elaborations on gas demand, including breakdown which might help to understand these trends, are reported in Chapter 4.

3.3 Market Development Indicators

The cross-border interconnections covered in this GRIP connect together the major trading points of the Region which are experiencing steady growth both in terms of traded volumes and of number of transactions.

The following graphs show the trends of the South-North Corridor gas hubs, which are:

Belgium

- Zeebrugge Beach: a physical entry point to the Fluxys transmission system, connected to Interconnector Zeebrugge Terminal ("IZT"), Zeepipe Terminal ("ZPT") and Zeebrugge LNG Terminal ("ZLNG"), and as from the end of 2015 the new IP Alveringem near Veurne linking to the Dunkirk LNG terminal under construction.
- ZTP (the virtual Zeebrugge Trading Point), benefiting from Zeebrugge Beach's stability and reputation, has recorded strong performance in traded volume since inception (October 2012).

France

- the PEG hubs are the three French trading points "Points d'Echange de Gaz": PEG Nord is the most traded market, followed by Peg Sud and TIGF in the southwest. One PEG will be created in April 2015 in the South, combining those two last markets (Peg Sud and TIGF in the southwest). French national regulator CRE has confirmed May 7th 2014 its guidance to create a single PEG in France in 2018.

Germany

- the GASPOOL hub and the NCG (Net Connect Germany) hub are the two German hubs

Italy

- the PSV (Punto di Scambio Virtuale) hub, the Italian national balancing point.

Highlights from the thermal year 2010/2011 to the thermal year[1] 2012/2013:

- Belgium: the Zeebrugge traded volumes increased by 8 %;
- Germany: the NCG traded volumes increased by 53 % and the GASPOOL traded volumes increased by 49 %;
- France: the sum of the PEGs traded volumes and the related number of transactions increased by 37 % and by 45 % respectively;
- Italy: the PSV traded volumes and the related number of transactions increased by 9 % and by 6 % respectively.

1) The "thermal year" or "gas year" is the period of time having a yearly duration and starting on October 1

Zeebrugge (BE)

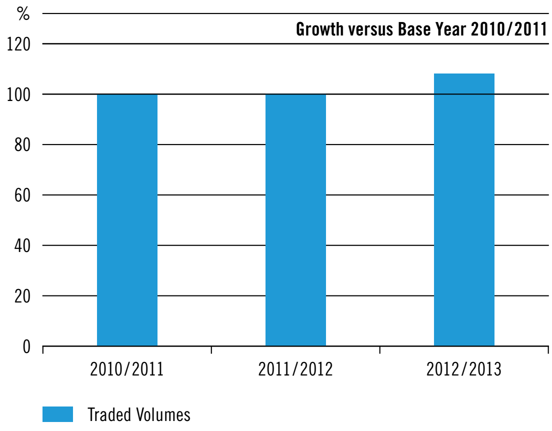


Figure 3.5: Zeebrugge traded volumes

NCG (DE)

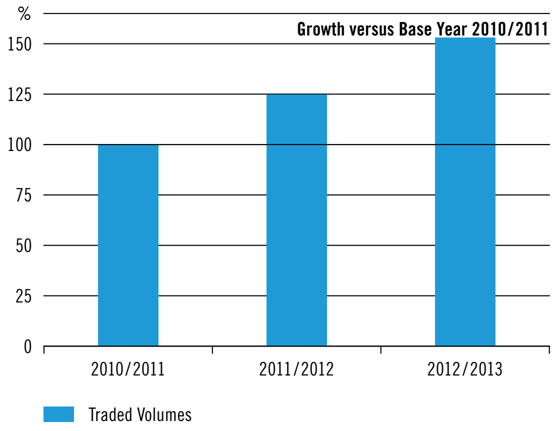


Figure 3.6: NCG traded volumes

GASPOOL (DE)

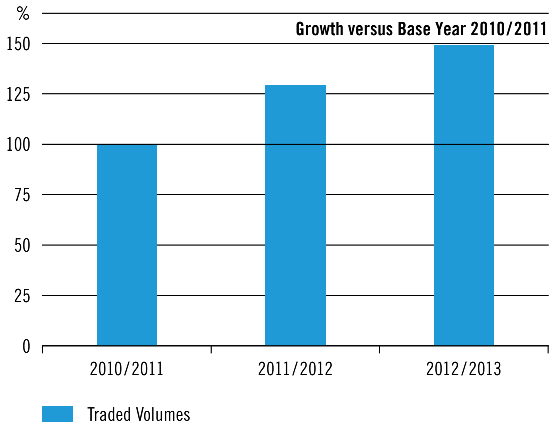


Figure 3.7: GASPOOL traded volumes

PEG NORD (FR)

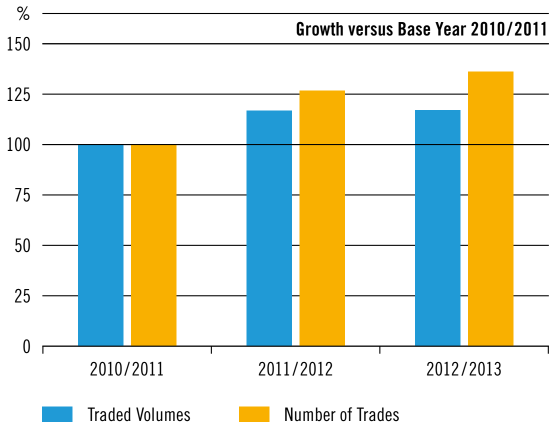


Figure 3.8: PEG Nord traded volumes and transactions

PEG SUD (FR)

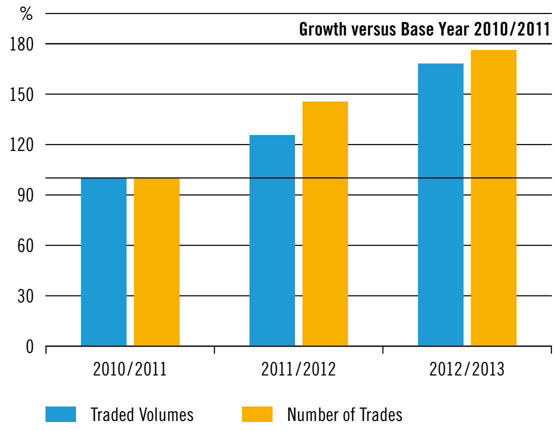


Figure 3.9: PEG Sud traded volumes and transactions

PEG TIGF (FR)

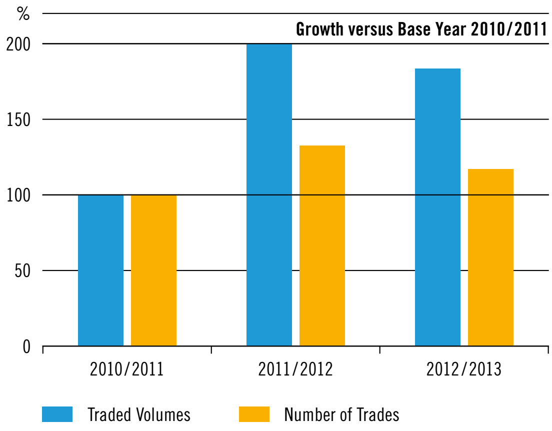


Figure 3.10: PEG TIGF traded volumes and transactions

PSV (IT)

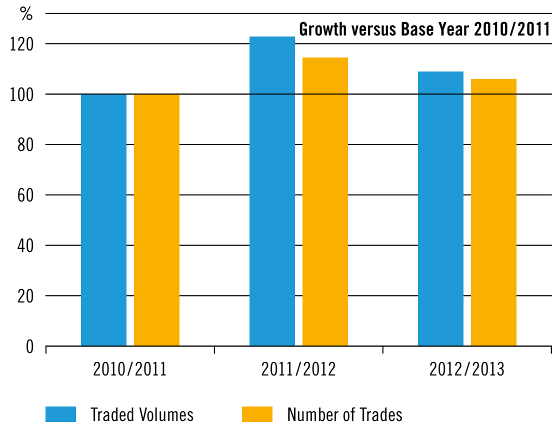


Figure 3.11: PSV traded volumes and transactions

In general, throughout continental Europe, the volume of gas being traded at the hubs (both in the "over-the-counter" markets and on exchanges) has been increasing over the past years.

The above developments are, among other things, the outcome of market and regulatory improvements, such as the early implementation of Capacity Allocation Mechanism Network Code (CAM NC[1)]) and the entry into force of Congestion Management Procedures (CMP[2)]).

The following figure shows that from the perspective of traded volumes, the European gas markets have been making notable changes in the last six to seven years: the traded volumes has gone from 5 bcm in 2000 to 550 bcm in the year 2011[3)]:

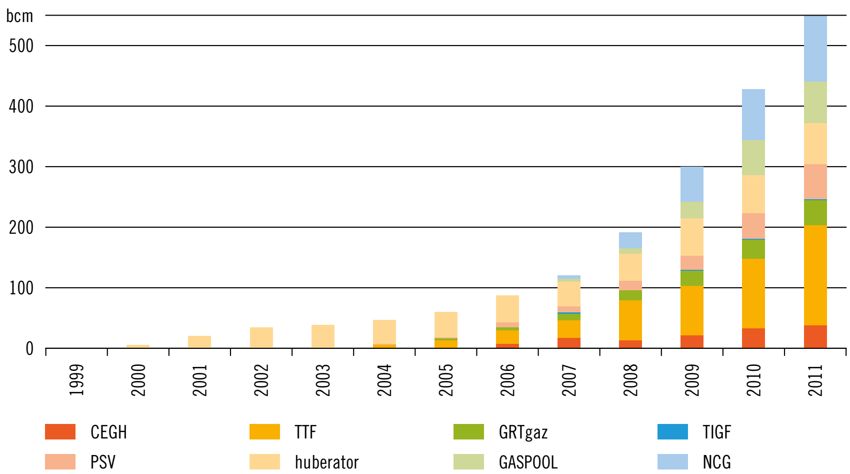


Figure 3.12: Traded volume of the European gas hubs and TSOs from 1999 to 2011 (Source: Oxford Institute for Energy Studies)

1) COMMISSION REGULATION (EU) No 984/2013 of 14 October 2013

2) COMMISSION DECISION of 24 August 2012

3) Source: "Continental European gas hubs: are they fit for purpose?", Oxford Institute for Energy Studies, Patrick Heather, NG63, June 2013

3.4 Price Correlation

Price correlation of the European gas hubs is an important factor because it may be an indication of the actual integration of the related gas markets. Furthermore, price correlation can be considered as one possible, even if not exhaustive, indicator of competitiveness and efficiency of hub gas trading.

In fact, the prices of gas on the hubs are expected to tend uniformly in the absence of physical and/or regulatory barriers distortions and in the absence of other factors thwarting arbitrage and competition activities. Therefore, closely parallel price movements at the hubs indicate that hubs form a single well-integrated market.

Substantially, price correlation may be used as one of the factors indicating whether the hubs may be capable of giving a correct and reliable signal for setting the price of gas sold under long term contracts.

Furthermore, efficiency and competitiveness in market pricing can take place only in the presence of hub price correlation.

Figure 3.13 (source: ENTSOG) shows the day-ahead price average trends on the South-North Corridor hubs and some other important European hubs.

The assessment of hub price correlation leads to think that the European gas hubs form an integrated market and that the correlation among their prices may be the basis for a reliable gas price reference in Europe. This also suggests that EU gas hubs may represent a benchmark for gas pricing in Europe.

In fact, even if the EU gas hubs show different levels of liquidity, price correlation is high and, moreover, is getting higher and higher.

Image courtesy of GRTgaz

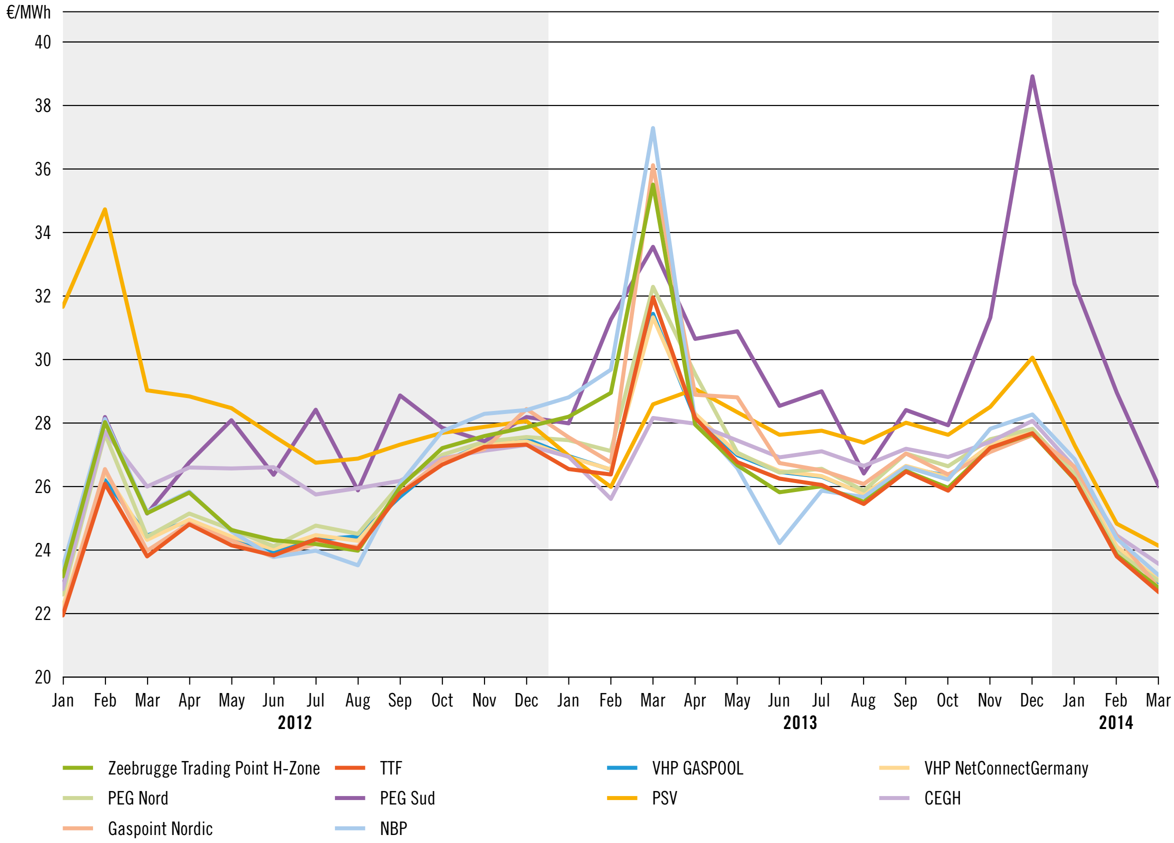


Figure 3.13: Price evolution at the major European gas hubs (2012 – 2013) (Source: ENTSOG)

It is worth highlighting that the correlation increases when the markets are physically connected through infrastructures. Examining the trend of the gas prices at the main European hubs in the light of this consideration, we may infer that:

- investments are needed to reduce the price spread between PEG Sud and other hubs. The merger of French hubs in 2015 and 2018 and potential increases of interconnections between France and other neighboring countries would result in a deeper integration of the French hub with the other hubs in the Corridor;
- as pointed out in the paper of "The Oxford Institute for Energy studies" the PSV correlation to the other hubs has been increasing thanks to the implementing of open access transportation measures (CAM Network Code early implementation and CMP measures);
- the reverse flow projects in the South-North Corridor can play a substantial role to support further alignment between European gas prices through increased market integration between the main European hubs.

3.5 Interconnection Points in the South-North Corridor

The South-North Corridor is historically oriented from north to south, with gas from Russia, Norway and the Netherlands flowing through Germany and Belgium towards Switzerland, France and Italy. Additional supplies from Algeria, Lybia and LNG terminals complete local demand in Italy and France, but cannot yet reach Belgium and Germany.

The table below shows the internal Interconnection Points (IPs) in the Region along with capacity values taken from the ENTSOG capacity map (which are the result of the lesser-rule application on TSO input data).

Name	From	To	Technical firm capacity (GWh/d)
INTERCONNECTIONS BETWEEN COUNTRIES			
Eynatten/Lichtenbush/Raeren	Germany (GASPOOL)	Belgium	94
	Germany (NCG)	Belgium	342
	Belgium	Germany (GASPOOL)	137
	Belgium	Germany (NCG)	163
Medelsheim/Obergailbach	Germany (NCG)	France (PEG Nord)	567
Wallbach	Germany (NCG)	Switzerland	583
Oltingue/Rodersdorf	France (PEG Nord)	Switzerland	223
Griespass/Passo Gries	Switzerland	Italy	627
Blaregnies/Taisnières	Belgium	France (PEG Nord)	870
INTERCONNECTIONS WITHIN COUNTRIES			
Liaison GASPOOL NCG	Germany (GASPOOL)	Germany (NCG)	312
	Germany (NCG)	Germany (GASPOOL)	37
Liaison Nord Sud	France (PEG Nord)	France (PEG Sud)	270
	France (PEG Sud)	France (PEG Nord)	230
PIR Midi	France (PEG Sud)	France (TIGF)	395
	France (TIGF)	France (PEG Sud)	255

Table 3.4: Internal Interconnection Points (IPs) in the Region along with capacity values (source ENTSOG Capacity Map 2014)

The section below tries to illustrate market behaviour for the relevant interconnection points within the region as observed for the period 2012–2013. An aggregated view per IP is given by combining measured flows, booking data, technical capacities and interhub price spreads on a monthly basis. Special attention should be paid to the evaluation of the presented results as for instance technical, contractual and flow data are always the result of a dual input from both sides of the border, where in case of differences a lesser rule is applied. An important aspect concerns the technical capacity on an interconnection point, as it is not straightforward to determine such a value in a uniform way in an integrated entry-exit system where the considered capacity on one IP has a direct impact on all other IPs of the market area. These firm technical capacities are calculated in advance based on a worst case combination of flow patterns on the concerned grid, where in reality flows on a specific IP could be higher because of favourable flow conditions on other IPs freeing up space in the network. This implies that on a short-term basis more capacity can become available than was originally calculated on a firm basis from a long term planning perspective. Flows can be even higher when considering the possible activation of interruptible capacity and operational swaps between adjacent operators.

It should be noted that the technical capacities are the result of yearly numbers on both sides of the flange on which the lesser-rule is applied, so not taking into account possible short-term additional capacities made available on the concerned interconnection points to accommodate requested nominations.

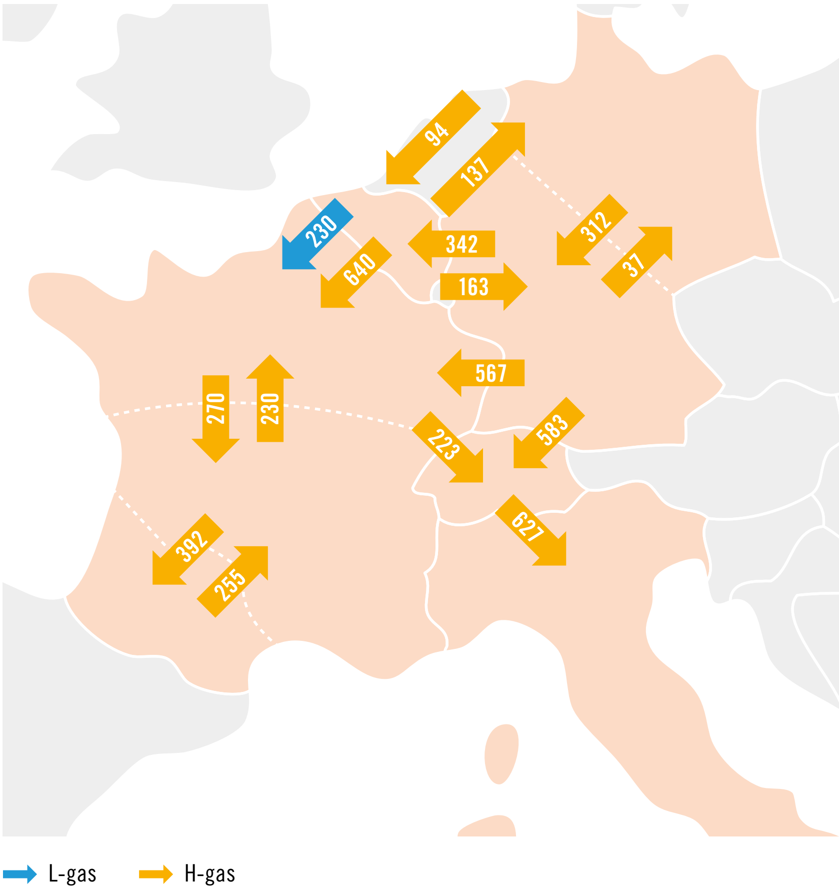


Figure 3.14: IPs and related technical firm capacities in the South-North Corridor (Source: ENTSOG Capacity Map 2014)

A. EYNATTEN (BE/DE)

The Eynatten IP (consisting of two separate physical stations) connects Belgium with the two German market areas, NCG and GASPOOL in a bidirectional way. It plays an important role in the integration of these three markets, functioning in either direction according to the needs of the market, mostly from Belgium to Germany in 2012 and from Germany to Belgium in 2013 as shown below. The two IPs showed very high usage towards Belgium in March 2013, to send exceptional gas flows to the UK through Interconnector when cold weather hit England, while British storage facilities were announced to be low and Norwegian deliveries to UK were reduced. Spreads between Zeebrugge and German hubs then reached 5 €/MWh.

The Eynatten IP shows enough flexibility in both direction so that shippers may adapt to price spreads between German and Belgium markets.

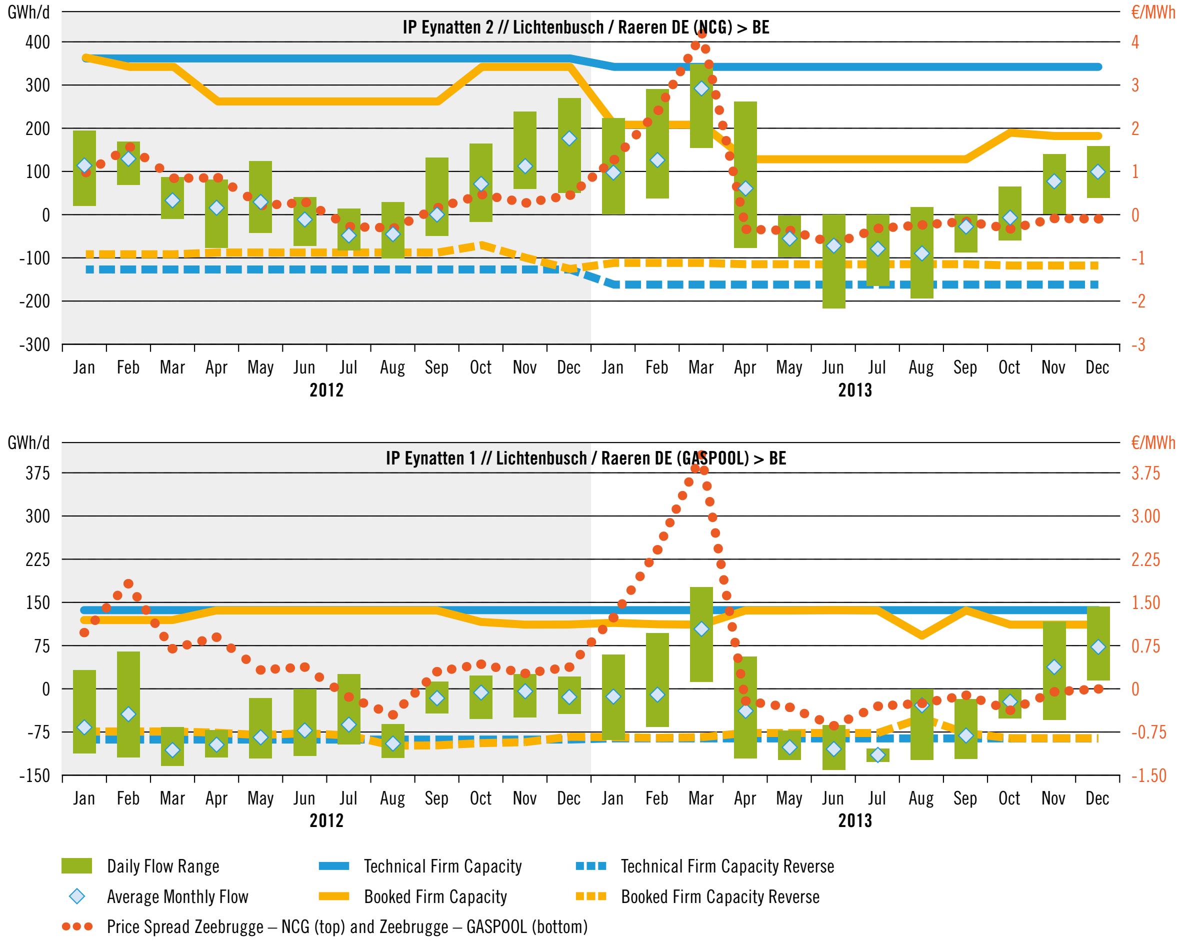


Figure 3.15: Technical capacities (ENTSOG capacity map 2014), gas flows and booked capacities (Fluxys Belgium, OGE, Gascade, Thyssengas, Fluxys TENP); price spreads at Eynatten IP (DE/BE)

B. BLAREGNIES / TAISNIÈRE (BE/FR)

This IP connects Belgium and France with L and H gas. It was used at its highest point in February 2012, when demand reached record levels in France caused by a cold snap, and in December 2013, when the commercial capacity was raised from 570 GWh/d to 640 GWh/d. The Blaregnies IP shows available capacities for H-gas and well-connected markets with low price spreads (March 2013 excepted).

As from the end of 2015, physical firm capacity becomes available from France to Belgium when the Dunkirk LNG terminal under construction will be connected to the Belgian grid. This will be achieved by the creation of a new interconnection point at Alveringem / Veurne.

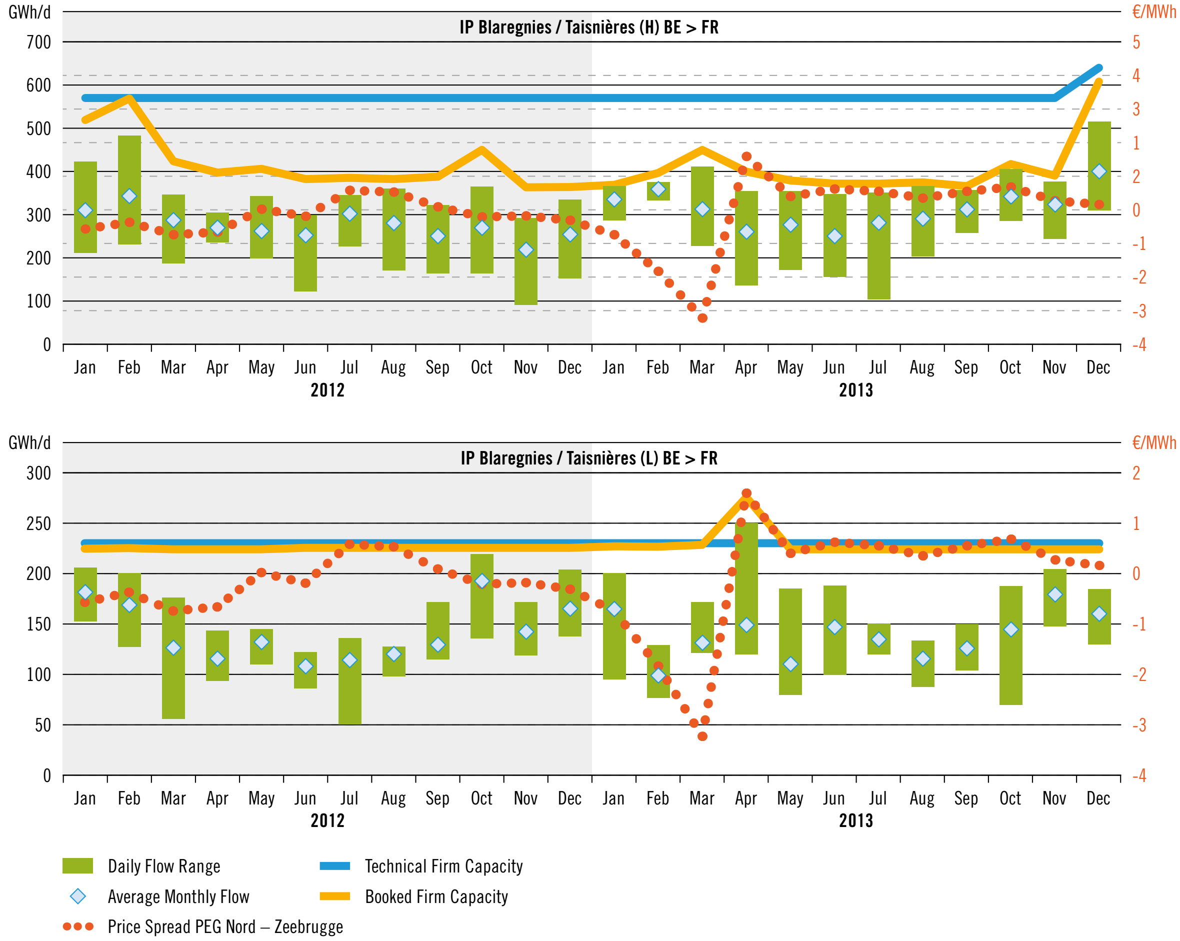


Figure 3.16: Technical capacities (ENTSOG capacity map 2014), gas flows and booked capacities (GRTgaz and Fluxys Belgium); price spreads at Blaregnies/Taisnières IP (BE/FR)

C. MEDELSHEIM / OBERGAILBACH (DE/FR)

This IP connects the German NCG with the French PEG Nord. It was used at its maximum technical capacity on March 2013, when German hubs were the most attractive markets of the Region, showing a dynamic similar to the one detected at Eynatten.

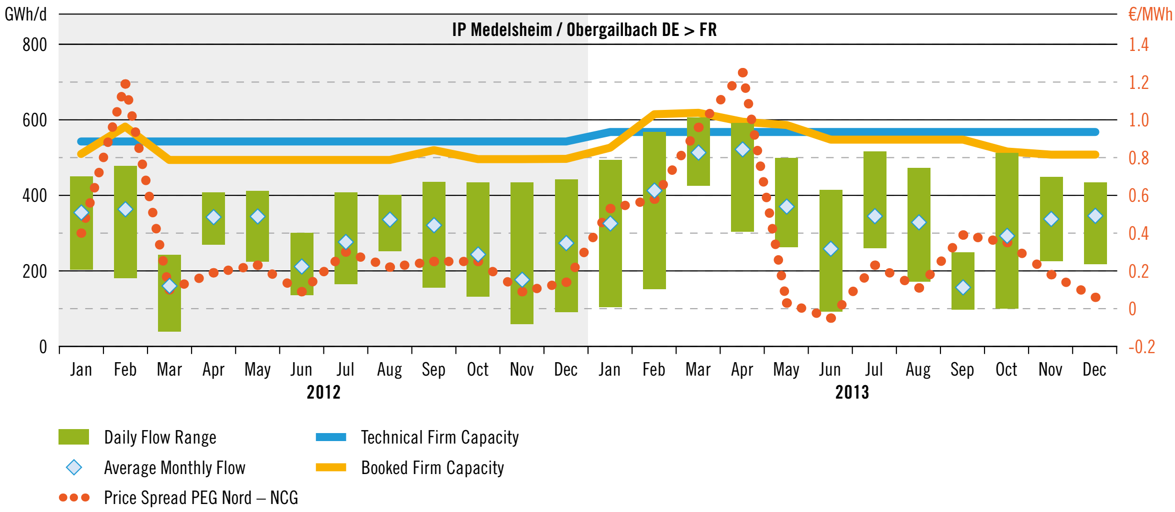


Figure 3.17: Technical capacities, booked capacities, gas flows and price spreads at Medelsheim/Obergailbach IP (DE/FR) (Source: ENTSOG Capacity Map 2014, GRTgaz, OGE and GRTgaz Deutschland)

D. OLTINGUE / RODERSDORF (FR/CH)

The gas flow between France and Italy through Switzerland has fallen in 2012 as prices on PSV got closer to the common levels in neighboring gas hubs. The IP was used at its maximum capacity during the cold snap in February 2012 and in late 2013 when Greenstream (Libyan supply to Italy) was shut down for eight days. The IP is fully booked.

Between November 2012 and April 2013, prices on PSV were often lower than at PEG Nord. Gas flows could not be reversed to answer market needs, but they regularly reached minimum levels, confirming that the reverse ability could be useful for the market.

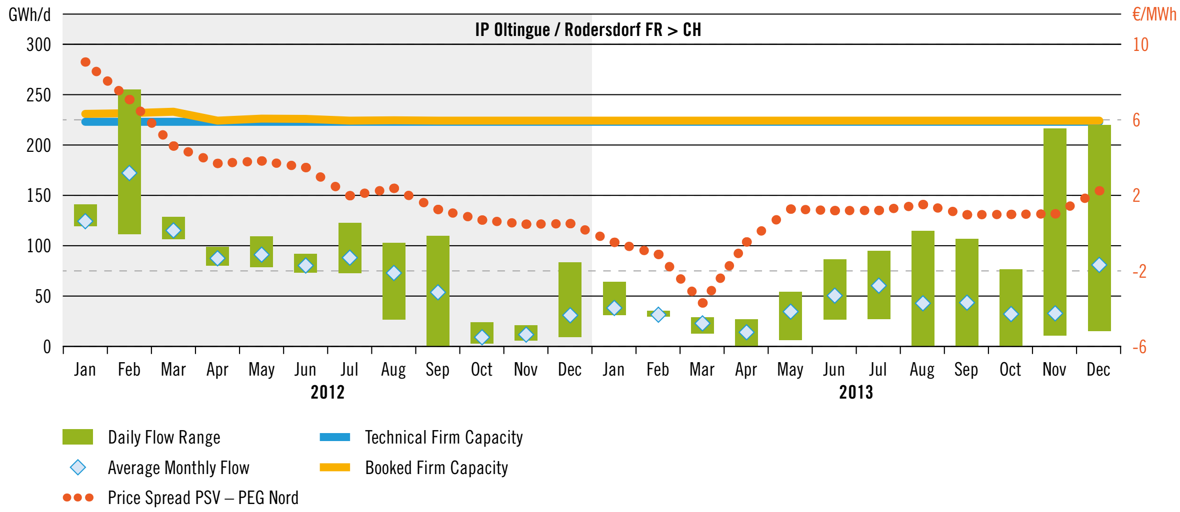


Figure 3.18: Technical capacities, booked capacities, gas flows and price spreads at Oltingue/Rodersdorf IP (FR/CH) (Source: ENTSOG Capacity Map 2014, GRTgaz, FluxSwiss and Swissgas)

E. WALLBACH (DE/CH)

Similar to the French/Switzerland IP, the interconnection between Germany and Switzerland reached its highest levels in February 2012, in relation to the cold snap, and its maximum in coincidence with additional import needs for Italy (possibly linked to temporary interruptions from North-Africa supplies, such as Libyan gas). Like Oltingue IP, technical capacities are nearly fully booked, with maximum use in case of supply shortages downstream.

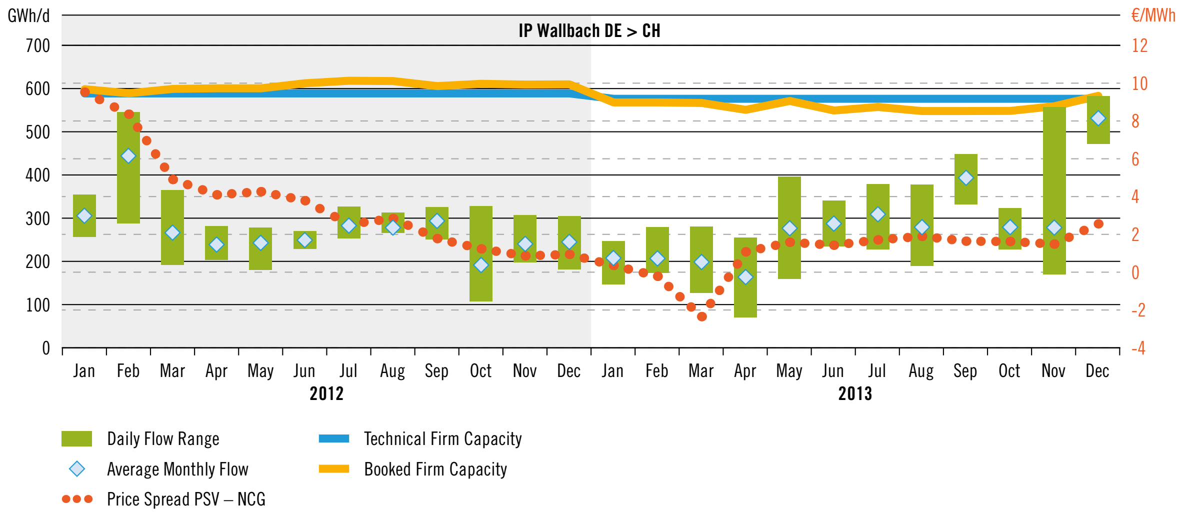


Figure 3.19: Technical capacities, booked capacities, gas flows and price spreads at Wallbach IP (DE/CH) (Source: ENTSOG Capacity Map 2014, Fluxys TENP, OGE, FluxSwiss and Swissgas)

F. PASSO GRIES (CH/IT)

At Passo Gries, interconnecting Switzerland and Italy, gas can flow to Italy coming from both Germany (through Wallbach) and from France (through Oltingue/Rodersdorf).

Gas flows towards Italy reached a peak corresponding with February 2012 cold snap. From that point onwards, flows in north-south direction tended to progressively decrease, confirming the evolution of the IP towards reverse flow conditions (south-north direction, from Italy towards Northern Europe).

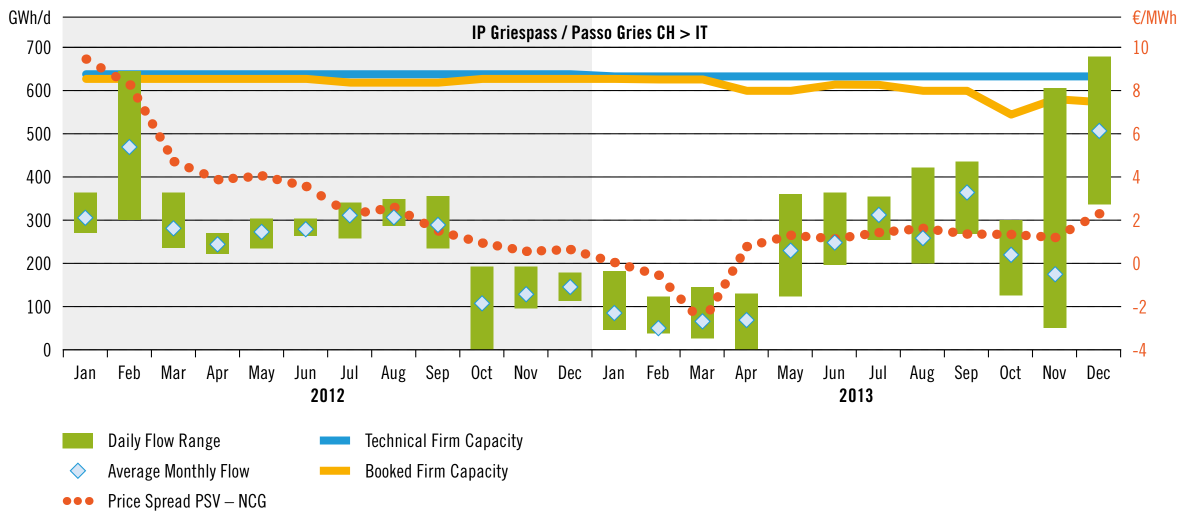
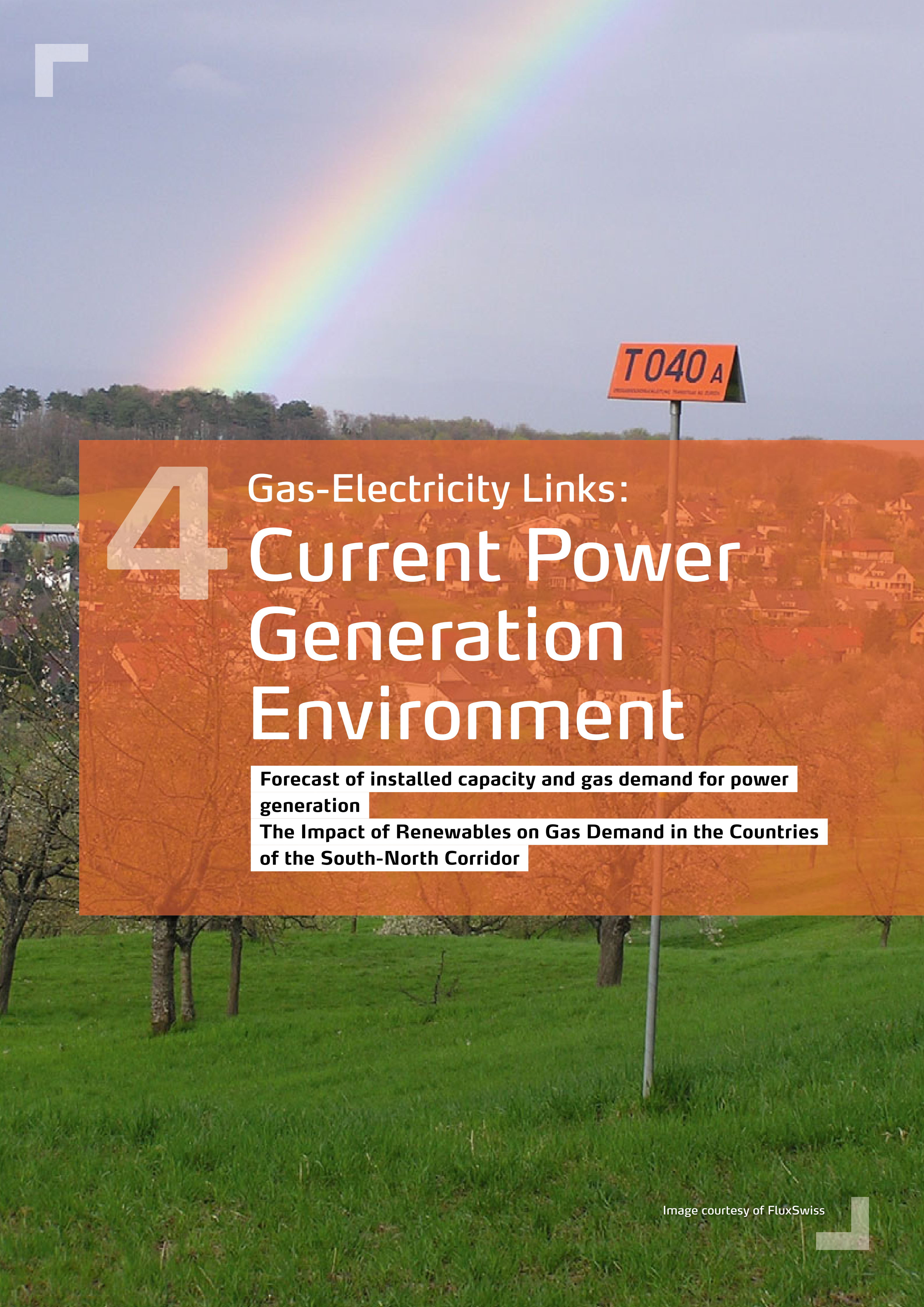


Figure 3.20: Technical capacities, booked capacities, gas flows and price spreads at Passo Gries IP (IT/CH) (Source: ENTSOG Capacity Map 2014, FluxSwiss, Swissgas and Snam Rete Gas)

The bidirectional nature of the pipeline, as resulting when the flow projects are commissioned, will guarantee an efficient link between markets useful in both directions to mitigate demand fluctuations and align gas prices across the EU. The flexible infrastructure behavior can be already noticed in the last part of 2013, when prices in Italy temporarily increased compared to the rest of Northern European hubs and gas flows oscillated significantly till reaching again top levels and implying the use of interruptible capacities (available at the IP all year).

CONSIDERATIONS ON THE SECTION

- Interconnections between the countries of the South-North Corridor are functioning well, allowing flexibility between sources for shippers.
- Thanks to the Projects of Common Interests (PCIs), improvements are expected in order to strengthen the integration of hubs, especially by developing further flexibility and reverse flow capacities at interconnection points in the Region.



4 Gas-Electricity Links: Current Power Generation Environment

Forecast of installed capacity and gas demand for power generation

The Impact of Renewables on Gas Demand in the Countries of the South-North Corridor

Image courtesy of FluxSwiss

4.1 Forecast of Installed Capacity and Gas Demand for Power Generation

The development of the installed capacities of gas power plants in the countries of the Region is shown in Fig. 4.1 based on the ENTSOG data collection from summer 2013 with input from the European gas TSOs. The electrical capacity could grow from 90,500 MWe in 2013 to 110,000 MWe in 2023. Over this period, the share of the installed capacity in the Region compared to the installed capacity in all of Europe is expected to stay at about 43 %.

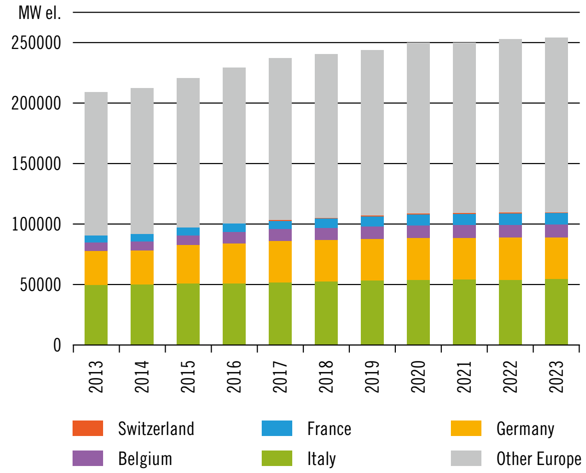


Figure 4.1: Forecasted evolution of European installed capacity for gas-fired power generation (Source: TSOs/ENTSOG collected data)

The possible evolution of the yearly gas demand for power plants in the countries of the Region is shown in Fig. 4.2. The demand is expected to grow from 550,000 GWh/y in 2013 to 710,000 GWh/y in 2023. Over this period, the share of the yearly demand compared to the EU aggregate lies between 40 % and 50 %.

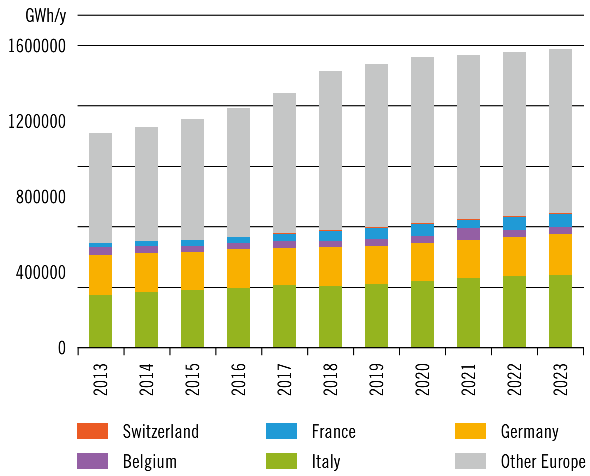


Figure 4.2: Forecasted evolution of yearly gas demand for power generation (Source: TSOs/ENTSOG collected data)

As witnessed by the comparison of power generation landscapes in the countries of the Region (following sections from 3.1.1 to 3.1.5), the current levels of gas prices compared to other sources (especially coal), combined with incentives granted to RES, make it very hard for gas power plants to stay competitive. The number of functioning hours has progressively reduced in the last few years and this has negatively affected the gas demand for power generation.

This negative trend, also worsened by the economic crisis effects, should be hopefully inverted in the next years thanks to the implementation of positive elements such as:

- a more effective EU Emissions Trading Scheme, destined to correctly pricing negative coal environmental impacts;
- a rescaling of subsidies for RES technologies in accordance with their maturity, possibly complemented by the use of freed-up resources for capacity remuneration measures, targeted to those gas-fired plants needed to back up renewables sources.

The above mentioned initiatives could help to explain the only apparent discrepancy between historically observed decreasing figures and the positive forecasts included in this section.

While the demand for power generation is expected to grow from 550,000 GWh/y in 2013 to 710,000 GWh/y in 2023, other types of gas demand are expected to shrink from about 1,800,000 GWh/y in 2013 to about 1,700,000 GWh/y in 2023. This leads to a growth of the share of gas used for power generation from 23 % to 30 %, showing an expected leading role for gas in this domain. The rationales behind this expectation are further elaborated in the following sections of this Chapter.

Image courtesy of Snam Rete Gas

4.2 The impact of renewables on gas demand in the countries of the South-North Corridor

According to Directive 2009/28/EC, the renewable sources are destined to cover 20 % of total final gross energy consumption in the whole EU by 2020. Each Member State must achieve at least an agreed rate of energy production from renewable sources, as shown in table 4.1 (target set by the Directive compared to situation related to 2005).

SOUTH-NORTH CORRIDOR COUNTRY TARGETS FOR THE SHARE OF ENERGY FROM RENEWABLE SOURCES

Country	Share of energy from renewable sources in gross final consumption of energy, 2005 (S_{2005})	Target for share of energy from renewable sources in gross final consumption of energy, 2020 (S_{2020})
Belgium	2.20 %	13 %
France	10.30 %	23 %
Germany	5.80 %	18 %
Italy	5.20 %	17 %

Table 4.1: South-North Corridor country targets for the share of energy from renewable sources in gross final consumption of energy in 2020 (source: Directive 2009/28/EC)

A reasonable assumption is that most of the renewable technologies will appear in the power generation sector: if this might reduce the growth of gas demand for power generation in terms of possible impacts on the overall gas demand, the same is not true for peak gas demand requirements, due to the inherent intermittent nature of RES. This conclusion is confirmed by Figure 4.3 where expected peak gas demand for power generation is foreseen to stay stable and then again increase along the considered time horizon.

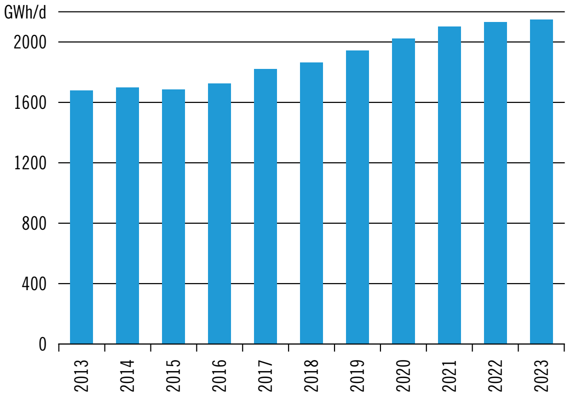


Figure 4.3: Forecasted evolution of peak gas demand for Power Generation in the Region (Source: TSOs/ENTSOG collected data)

Indeed, sustainable and reliable growth of green electricity sources is heavily dependent on the back-up solutions put in place to substitute the renewable electricity streams when the wind is not blowing, the sun is not shining, while the possible contribution of other RES is by nature limited.

It seems therefore very likely that the intermittency of renewable sources will create in future a requirement for alternative flexible electricity generation. From an operational perspective, natural gas is best-placed to deliver this, also taking into account the environmental credentials of gas compared to coal.

As natural gas is the fossil fuel having the least impact in terms of CO_2 emission, gas power plants represent the most appropriate solution to fulfil the necessary RES back-up function without running the double risk of wasting the environmental gain provided by green energy sources and, at the same time, to disperse the substantial amount of resources deployed incentivising them via subsidies.

Increasingly intermittent nature of gas demand, driven especially by renewable generation paths and climatic conditions, is confirmed by various forward-looking research projects. Extracts from a Pöyry study[1)] related to the major market of the Region, i.e. Germany, are included below.

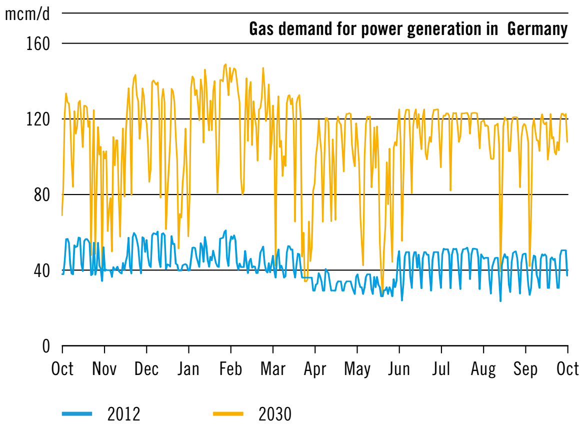


Figure 4.4: Gas demand for power generation in Germany (Source: Pöyry Management Consulting: "How will intermittency change Europe's gas markets?" (October 2012))

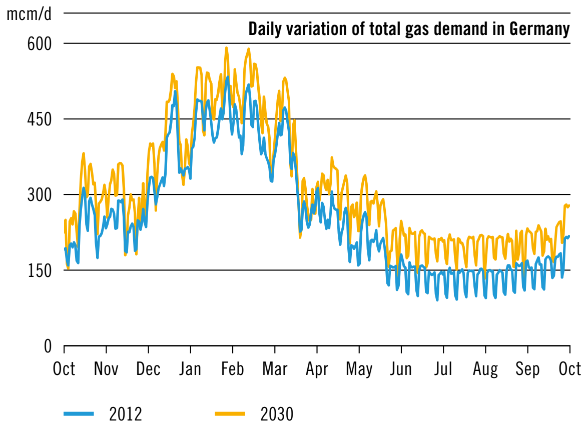


Figure 4.5: Daily variation of total gas demand in Germany (Source: Pöyry Management Consulting: "How will intermittency change Europe's gas markets?" (October 2012))

The graphs show how the of power generation linked to gas demand between 2012 and 2030 is destined to substantially increase in the next 20 years. This, added to the demand expressed by other relevant sectors such as residential and industry, leads to forecast general growth expectations in the levels of overall daily demand.

The following section illustrate in greater detail the link between electricity production and utilized sources for all the countries composing the South-North Corridor Region, with particular emphasis on RES roles and to the possible developments in natural gas uses.

1) "How will intermittency change Europe's gas markets?" (October 2012)

4.2.1 POWER PRODUCTION IN BELGIUM

As shown in Figure 4.6, the total gross electricity production in Belgium has seen a slight but progressive decrease from 2010 to 2012, where at the same time a comparable increase in electricity import was marked. The same trend has been followed by near all energy sources, although natural gas (around a third of the total production) and nuclear (more than half of the total production) still retain key and leading roles in the power generation mix.

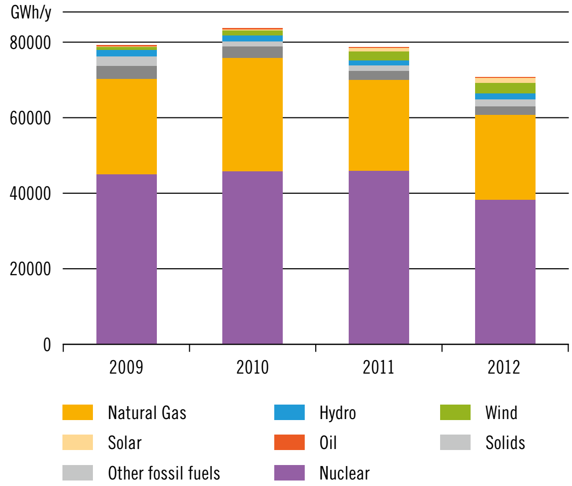


Figure 4.6: Power Generation in Belgium by source 2009 – 2012 (ENTSOG elaborations on ENTSO-E data)

Among renewable sources, while for natural geological reasons hydroelectric production is retaining a limited role (around 2 %), wind and solar have been increasing at impressive rates from 2009 to 2012 moving respectively from 1.2 to 3.9 % and from 0.2 to 2.3 %.

The future evolution of the power generation breakdown will remain a strategic decision, based on the planned nuclear phase-out, electricity import developments, and capacity payment mechanisms for power plants.

Image courtesy of Fluxys Belgium

4.2.2 POWER PRODUCTION IN GERMANY

The Figure 4.7 shows the German breakdown of power generation for the period 2009–2012. The main sources are represented by fossil fuels[1)], covering around two thirds of the total electricity production mix in a slightly incresing trend. Nuclear energy has decreased from near a fourth of the total till around 17 % and the currently experienced trend is expected to further decrease following the decision to phase-out all national nuclear plants.

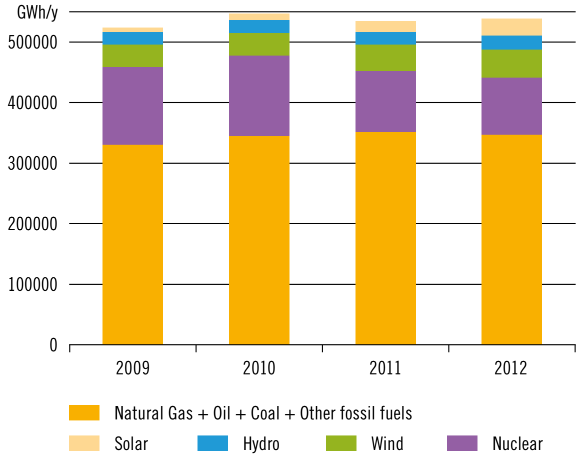


Figure 4.7: Power Generation in Germany by source 2009–2012 (ENTSOG elaborations on ENTSO-E data)

In the renewable field, wind and solar are the most promising RES in term of relative growth rates, since hydroelectric production seems to have reached a stable and contained contribution at around 4 %. In particular, significant growth must be noticed for solar energy, increasing more than four times in the period till reaching around 5 % of the total energy mix. Wind is marked by less remarkable growth, but remains the most significant renewable source for power production (8.5 %).

1) Natural gas and coal disaggregated data are not available, so the graph shows in a qualitative and undetermined way the aggregated value of the two electricity sources (oil is not representing a significant part of this figure).

4.2.3 POWER PRODUCTION IN FRANCE

Power production in France is mostly dominated by nuclear production, with nuclear power plants providing around 75 % of total production. Hydroelectric production represents the second source of electricity, with a share reaching 12 % of total production.

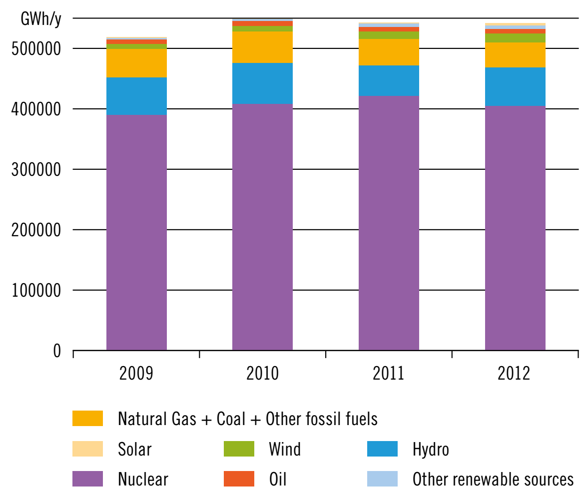


Figure 4.8: Power Generation in France by source 2009 – 2012 (ENTSOG elaborations on ENTSO-E data)

Gas covers over half of the fossils fuels used for power production. The use of fossil fuels remains a valuable source for flexibility, but has been slightly decreasing between 2009 and 2012, contributing to around 9 % of total production.

In the meantime, production from renewable sources has doubled under the fast development of solar and wind energy, reaching nearly 5 % of the total production in 2012.

4.2.4 POWER PRODUCTION IN ITALY

Figure 4.9 shows the evolution of electricity production in Italy for the period 2009–2012, showing stable aggregated levels in the four years under consideration.

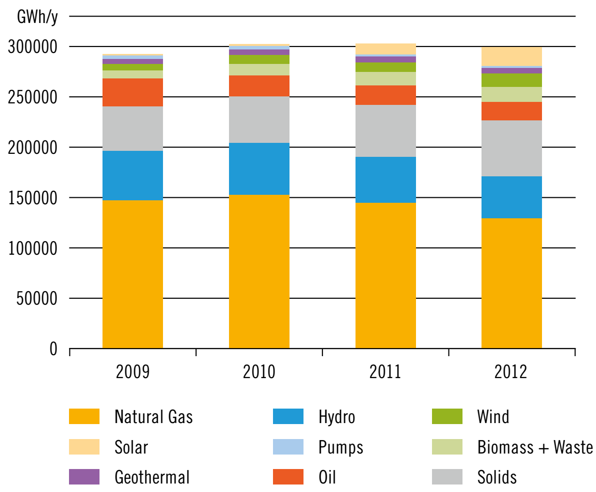


Figure 4.9: Power Generation in Italy by source 2009–2012 (ENTSOG elaborations on ENTSO-E data)

The use of fossil fuels has shown a small decrease from the 2009 data, although they still remain the main source for power generation (around two thirds). Among them, natural gas plays a leading role, covering a share which, depending on the specific year under consideration, comprises between 43% and 50% of the total gross electricity. Italy's CCGT plants are mostly newly built units, characterised by high efficiency levels. In any case, as already mentioned as conditions generally common at EU level, the current level of gas prices compared to other sources (coal) combined with the dispatching merit and incentives grant to RES make it hard for gas power plants to stay competitive, and the number of functioning hours has progressively reduced in the last few years.

Renewable sources in Italy are experiencing steady growth, reaching near a third of the total power production in 2012. Hydroelectric production, a historic factor in the Italian electricity generation mix, covers about half of the RES share at the end of the considered period. The most promising renewable sources are wind (near doubling from 2009 to 2012 till around 4% of the total) and especially solar, which is moving from a mere 0.2% of total production in 2009 till reaching a staggering 6.3% in 2012 to become the second source of RES generation after hydro.

4.2.5 POWER PRODUCTION IN SWITZERLAND

As shown in Figure 4.10, Swiss power generation experienced a small decrease from 2009 to 2011, followed by a recovery in 2012 near to pre-crisis level. It is interesting to note that power generation is currently driven by two major sources: renewable sources, especially hydroelectric production (slightly more than half of the total) and nuclear (around 40 %). Fossil fuels slightly decreased their already limited share, with natural gas playing a leading role (94 % of fossil fuels contribution).

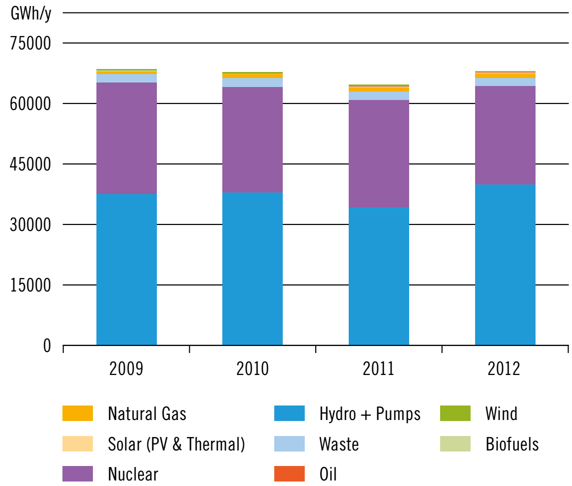


Figure 4.10: Power Generation in Switzerland by source 2009 – 2012 (IEA source for 2009 – 2011 data and elaborations on Swiss Federal Office of Energy data for 2012)

After the Fukushima incident, the Swiss government decided to phase-out nuclear power production (the first nuclear power plant will be shut down in 2019). Hydroelectric resources are already well-exploited, and there is virtually no more potential, so it is highly likely that gas-fired power plants will fill the gap. However, at current gas prices the realization of relevant CCGT installed capacity depends on an adequate coverage of fixed costs (capacity payments). Another solution could consist in electricity import, considering the overcapacity potential for power production in the rest of Europe. In any case, a large part of this excess import potential is dependent on non-controllable power injections (e.g. wind) and further electricity network grid expansions are required.

Notwithstanding the low volumes currently destined for electricity energy production, 2012 marked a historic record for natural and biogas overall consumption in Switzerland, with a growth of +5.4 % compared to the previous year (biogas performance was even outstanding – with +12 % on year-to-year basis – but volumes are still very limited in absolute terms compared to the total).[1)]

1) The Swiss gas market reached the size of near 4 GWh in 2013 (39.96 billion kWh, source: ASIG Swiss Association of Gas Industry), of which 97 million kWh came from biogas. The main use is for residential consumption and CNG for vehicles. Main import sources are EU and Norway (about two-thirds of the total) and Russia (covering nearly a quarter of the demand).

5 The Role of the Region

in the Development of EU Gas Infrastructure and Internal Market

Image courtesy of Fluxys Belgium

The Region plays a significant role in bridging the most relevant European gas markets and is going to increase its relevance in developing the gas infrastructure, which forms the physical interconnection between the main gas hubs.

The Region is destined to cover a key function in terms both of:

- **Security of Supply,** with relation to the evolutions of the internal European supply and demand patterns.
- **Market integration,** providing a flexible gas route interconnecting the major gas market places.

This two-fold role has been recognized by the European Commission in the adoption of Regulation 347/2013. Four priority corridors for the gas infrastructure have been identified by the Regulation, and the Region is placed at the cross-roads of three of them: South-North gas interconnections (South Western Europe), South-North gas interconnections (Central Eastern and South Eastern Europe) and Southern Gas Corridor (Caspian Region).

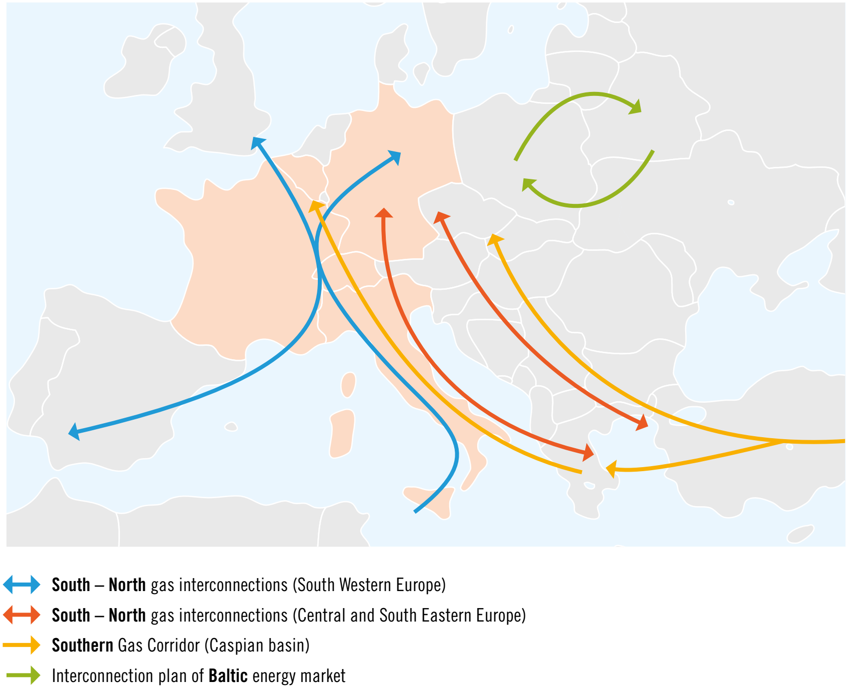


Figure 5.1: European priority corridors for natural gas infrastructures and the role of the Region (Source: Elaboration on European Commission publication)

With reference to priority corridors, the implementing acts to Regulation 347/2013, issued on October 2013[1], have adopted the first Union list of Projects of Common Interests (PCIs). These infrastructure projects 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.

The pipelines identified as Projects of Common Interests and included in the South-North Corridor Region represent a veritable backbone for future European gas infrastructure developments, as is also clearly visible in the following picture.

1) Commission Delegated Regulation 1391/2013

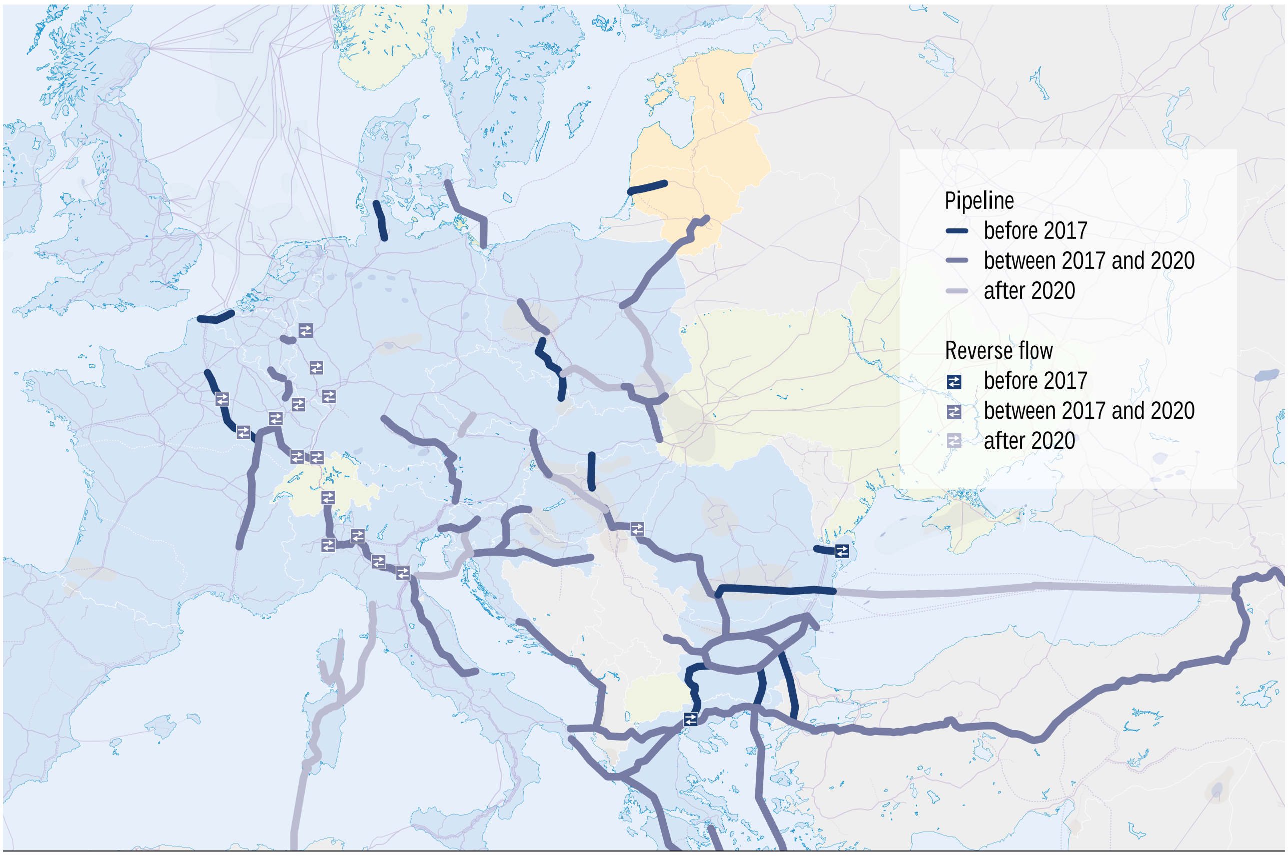


Figure 5.2: Graphical representation of pipeline PCIs, with indication of reverse flow projects; (Source: Elaboration on European Commission publication, Energy DG Interactive Map (http://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/))

The impact of the commissioning of PCIs infrastructure in bridging gas market hubs is particularly relevant considering the fact that the Region stretches along a corridor that, due to the historical evolution of national market and related gas sources, is not yet deployed to its full potential.

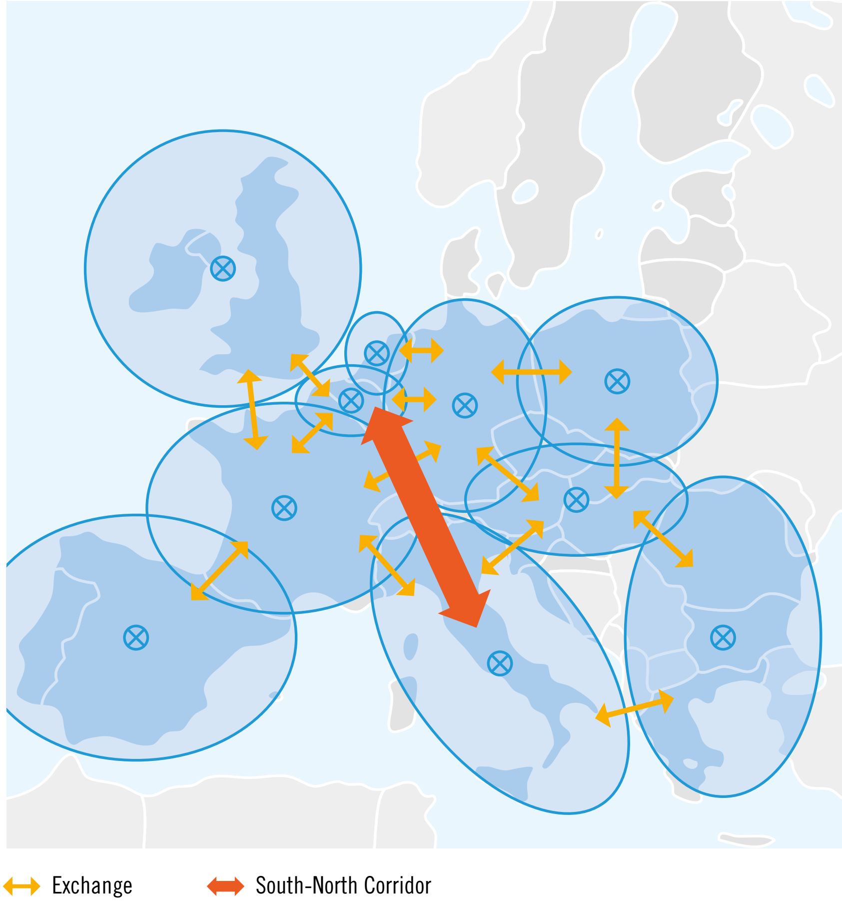


Figure 5.3: Gas Hubs in Europe according to ACER draft Gas Target Model 2 ("Bridge 2025") with superposed the possible South-North Corridor Region interconnecting role; (Source: Elaboration on ACER presentation (3rd ACER GTM workshop – Brussels, 15 May 2014))

Stretching along the core of Europe, the completion of the South-North Corridor represents the possibility to integrate the most liquid and mature hubs in Northern Europe with the rest of the continent, spreading their positive effects in terms of competition, but also ensuring a higher degree of security of supply to all direct and indirect linked gas systems.

The following chapter illustrates in greater detail the projects constituting the South-North Corridor, together with its link to other infrastructure bridging the Region to other corridors and hubs.

6 South-North Corridor

Introduction | Project Rationales
Projects Description | PCI Status
Odorisation

Image courtesy of Snam Rete Gas

6.1 Introduction

Today, the main 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 and Italy.

This section illustrates the projects in the Region for the opening of the "South-North Corridor" creating physical transmission capacity from Italy through Switzerland to France, Germany, and Belgium enabling physical reverse flows and enhancing the interconnectivity of the European gas network, with the goal to connect the main European gas markets: Germany, UK, Italy and France.

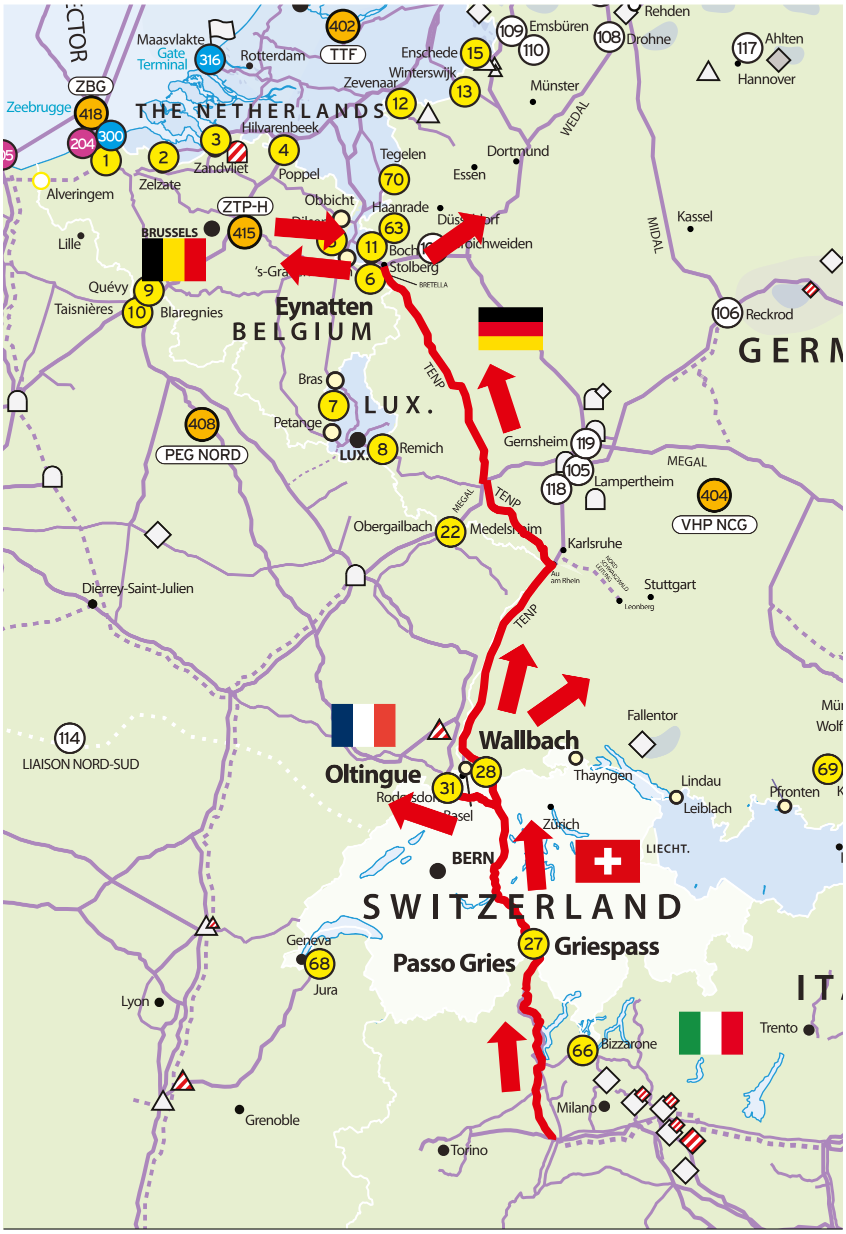


Figure 6.1: The South-North Corridor

6.2 Project Rationales

Traditionally there has been a substantial southward oriented flow from gas producers in the North Sea and Netherlands across Switzerland to Italy. In the medium to long term there is now a potential to build up the capacity for a new pattern of flows, from the South to the North of Europe.

This new pattern of Northwards flows from Italy would clearly improve Europe's **security of supply** and **competition** by connecting the main European gas markets.

Future European gas flows will not only be determined by demand but also production. 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 and the related infrastructure will have to be put in place to connect these new sources of gas.

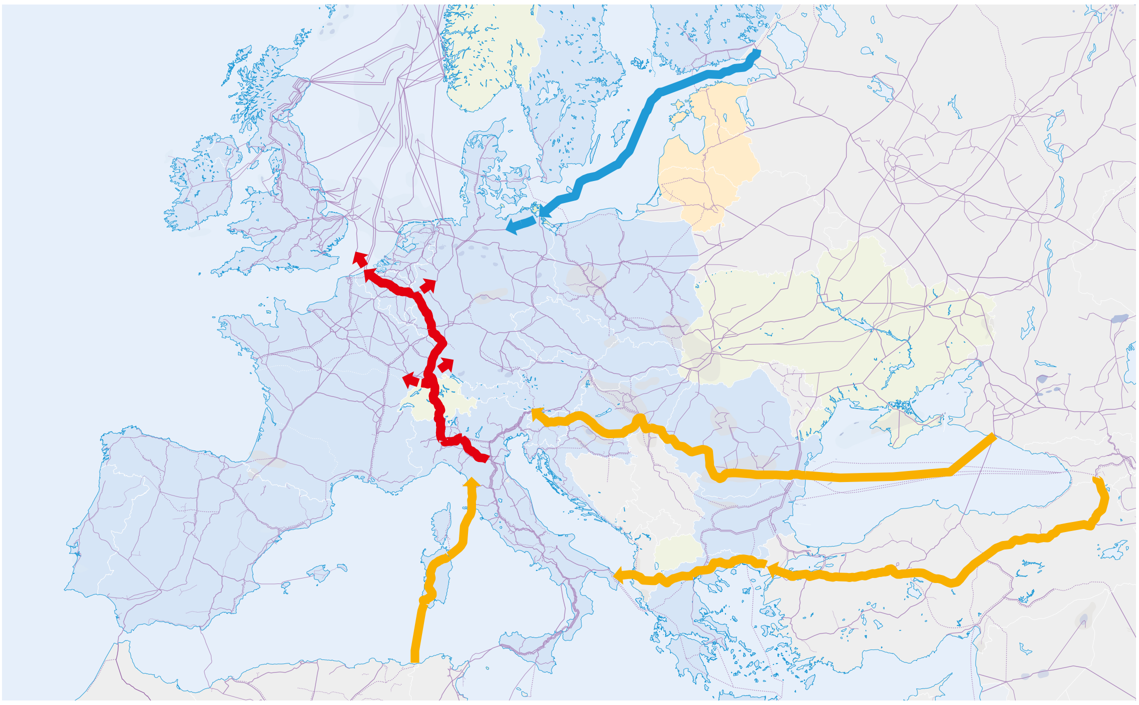
One of the most obvious and least-costly options for diversifying supply sources is to create reverse flows. This is a core EU goal, which enjoys widespread support by the European Commission and in legislation, as demonstrated by the recent publication of the 'Projects of Common Interest' list (PCIs).

With supply diversification expected to be one of the main rationales for reverse flows, recent events in Crimea and Ukraine could push for a reduced dependency on Russian gas, further favoring such a diversification policy.

Image courtesy of OGE

Gas flows dynamics are expected to become increasingly unpredictable and multi-directional: flow reversals and shifts in flow patterns will be likely in the future, following price spreads signals, to which a truly interconnected European gas grid will be able to promptly react.

Current trends in Europe show decreasing internal gas production and Regional oversupplies, particularly relevant in those areas profiting from a high degree of flexibility in terms of import, LNG and storage capacities, that can help to fill demand gaps. Italy in particular, with a further increase of import diversification expected when Azeri gas reaches the country via TAP, will see materialized additional demand-supply margins. The level of flexibility resources then available represents the pre-condition to play the role of the Southern European balance hub, flowing gas towards Northern gas markets when needed.



Reverse Flow Project | Under construction | Planned or announced

Figure 6.2: South-North Corridor project in the context of other major planned or under construction transmission infrastructure

This trend can already be detected looking at the spread in gas prices between Italy and Northern Europe, strongly reduced over the last few years, down to a level of transport and transaction costs. The full completion of 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 bidirectional way from Northern and Southern Europe and vice versa.

Currently, along the gas transmission route between the UK and Italy, only the UK Interconnector pipeline and the network in Belgium can flow gas in both directions. The TENP and Transitgas systems in Germany and Switzerland can move physical flows from north to south only, and also the Italian network to date can offer small amounts of commercial capacity (backhaul) in an exit direction along the Corridor. To exploit the full "South-North Corridor" potential of and 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 8 "Network Modelling".

6.3 Projects Description

We are starting projects description from the current situation, including some steps already undertaken in the last few years.

Snam Rete Gas has already begun investments in the Italian network to enable physical flows from east to west in Northern Italy and, consequently, south to north flows from the Italian-Swiss border toward Europe.

For the TENP and Transitgas systems, investments to make the infrastructure bi-directional are in an advanced planning stage and could create not only physical south to north capacity, but also additional capacity from Germany to Belgium.

In December 2012, Fluxys TENP and FluxSwiss in association with Fluxys Belgium and Snam Rete Gas launched a coordinated market process for interested shippers to book long-term gas transmission capacity from the Italian trading point PSV through Switzerland to the NCG and GASPOOL trading points and/or the ZTP trading point in Belgium, with regard to the new capacity some of the TSOs are building or will build in their respective transmission systems.

The joint approach of the four TSOs resulted in the Memorandum of Understanding agreed between parent companies Snam and Fluxys in August 2012 for developing and marketing reverse flow capacities from south to north between Italy and the UK.

On the same year, in June 2012, Fluxswiss and GRTgaz, in close cooperation with Snam, launched a joint consultation to interconnect PSV and PEG Nord with a reverse flow at Oltingue.

Shippers showed strong interest in south to north capacity, expressing however the need to postpone binding commitments to a later stage, considering also the current uncertainty about gas demand evolution in Europe and the need to solve a

Image courtesy of GRTgaz

few remaining outstanding issues (e.g. odorisation). As a result, the coordinated market process was discontinued in April 2013 and postponed.

Fluxys TENP, FluxSwiss, Fluxys Belgium and Snam Rete Gas closely work together to solve any remaining open issues involved, and the marketing of reverse flow capacities will be relaunched as soon as possible.

GRTgaz and FluxSwiss are discussing with prospective customers and involved regulators the performance of a market test.

In the current project planning, capacity along the entire route from Italy to Belgium will be made available as from October 2018.

Snam Rete Gas, FluxSwiss and Fluxys TENP have put in place a project coordination to ensure technical alignment of the execution of the projects under the responsibility of the respective TSOs.

As the permitting processes and the nature of the technical measures are significantly different along the route and for each concerned TSO, the projects coordination will aim at achieving an aligned approach with regards to the timing of the commissioning and hence the availability of the capacities along the routes.

The following sections provide a description of the various projects composing the South-North Corridor, building upon the appreciated Interconnection Point approach already adopted in the first GRIP edition.

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

The Snam Rete Gas project to support flows to the North West Italian market and to create exit flow towards Passo Gries Interconnection Point can be divided into two phases:

- The three-year period 2014–2016 is expected to see the finalization of the first phase of the project to support to the North West market and bidirectional cross-border flows, which will also allow the creation of an initial availability of flows for export from January 2016. The completion of this phase will ensure exports of 5 MSm³/d (around 54 GWh/d) at Passo Gries 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, 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 Passo Gries 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 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, Poggio Renatico–Cremona, and Zimella–Cervignano as well as a new node in Sergnano. It also includes upgrades to the compressors at Istrana and Masera, as well as work on the measurement equipment at Masera which enables management of the exit flows at Passo Gries and Tarvisio.

Some of the work included in the project has already been completed. The Cremona–Sergnano pipeline and the upgrading of the compression plant in Istrana have been in operation since the end of 2011. The work 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 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 urbanized area of Emilia, Veneto and Lombardy.

The construction of the Cremona–Sergnano pipeline will also connect the new storage field of Bordolano, with projected 1.2 bcm of working gas, to the national network.

The completion of the first project phase will ensure the possibility to export up to 5 MSm³/d (equivalent to around 54 GWh/d) at Passo Gries toward Switzerland.

Figure 6.3: Support for the North West market

6.3.1.2 Support for the North West market and bidirectional cross-border flows

The second phase is scheduled for commissioning at the beginning of 2018, and it involves the construction of pipelines between Cervignano – Mortara and Minerbio – Poggio Renatico as well as new compression plants in Minerbio and Sergnano and the expansion of the existing compression plant in Poggio Renatico.

This second part of the project will permit increased capacity in reverse flow at the exit point of Passo Gries to up to 40 MSm³/day (equivalent to around 429 GWh/d).

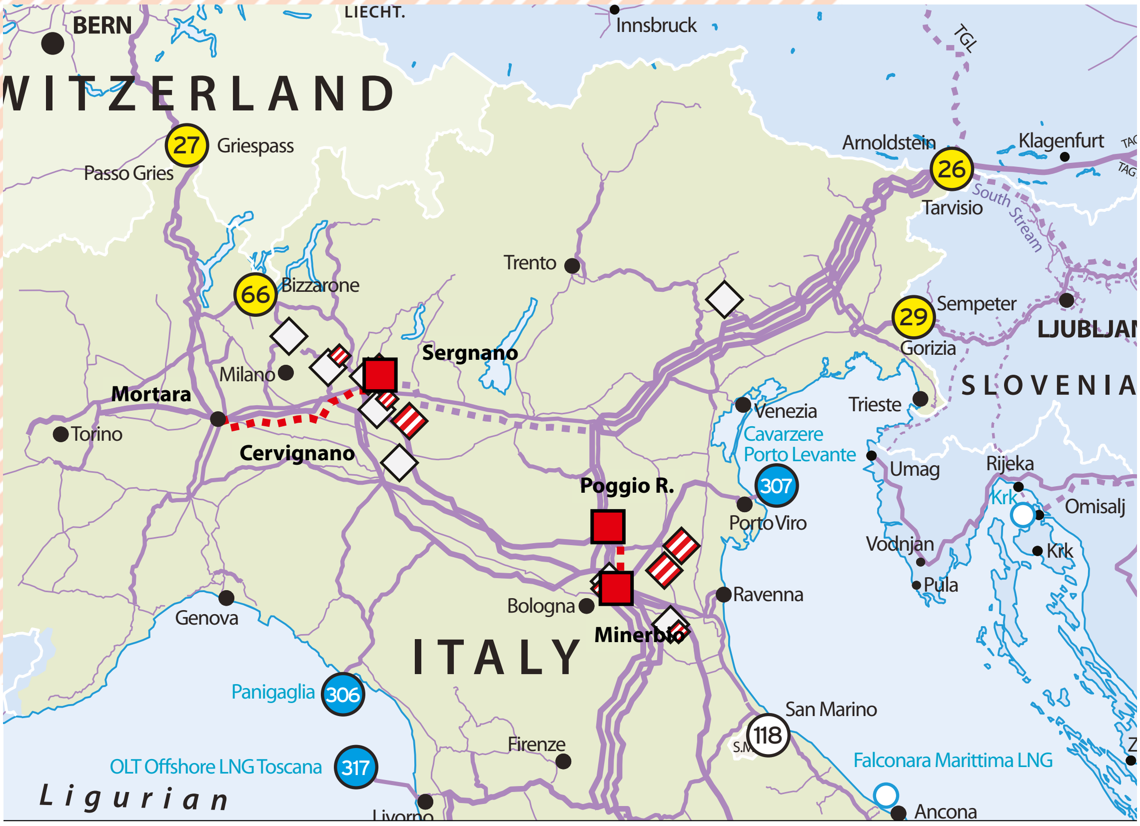


Figure 6.4: Support for the North West market and bidirectional cross-border flows

6.3.2 IN SWITZERLAND: TRANSITGAS REVERSE FLOW (FROM THE PASSO GRIES INTERCONNECTION POINT TO THE WALLBACH AND OLTINGUE INTERCONNECTION POINTS)

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 Passo Gries to Wallbach envisages the modifications and expansion of three main system facilities in order to allow physical reverse flow:

- Ruswil compressor station;
- Lostorf interconnection station;
- Wallbach metering station.

Permits have already been received, and engineering, design phases and tender are the next steps to start.

Figure 6.5: Positioning of Ruswil, Lostorf and Wallbach, where modifications of Transitgas are foreseen

6.3.3 FRENCH SECTION: OLTINGUE INTERCONNECTION POINT

The main exit point from the GRTgaz system to Switzerland (and Italy) is at the Oltingue Interconnection Point. Flow levels at this point are currently directed from France to Switzerland. This point is almost fully booked and shows a wide range of use, from 0 to the maximum available capacity. Until now, no entry capacity for physical flow to France is offered at the Oltingue IP.

The following picture provides the positioning of Oltingue IP with relation to the German, Swiss and Italian networks, as well as locations for foreseen investments at Morelmaison:

Figure 6.6: Oltingue IP positioning and locations foreseen for investments at Morelmaison

The investments, foreseen in order to develop 100 GWh/day (or 9 Mcm/day) entry capacity to France (PCI 5.9, TRA-N-045), are now identified, assuming that the "Arc de Dierrey" project is completed:

- Investment located at Oltingue in order to change the way gas flows.
- Adapting the interconnections at Morelmaison.

The currently estimated time to build this new infrastructure is around three years.

6.3.3.1 Increase in the Forward Flow

Furthermore, GRTgaz has received requests from shippers for additional firm capacity from France to Italy via Oltingue. A scenario currently under consideration is foreseeing to increase the capacity of about 60 GWh/d (around 5 Mcm/d).

The investments that are necessary on the French network for such a development are a compression station near Champey and core network reinforcements with an expected time for building this infrastructure estimated at about five years.

Next steps on this north-south flow project are linked to on-going studies on the Swiss side.

6.3.4 IN GERMANY: TENP REVERSE FLOW AND CONNECTION WITH GASPOOL/NCG MARKET AREAS AND BELGIUM

As a result of the South-North Corridor Project, gas entering from Switzerland could be made available in the German market and connected markets. As such, the project is to improve TENP integration in the national and European natural gas transmission system and to increase liquidity in the German market.

To enable bidirectional flow in the TENP-system, Fluxys TENP is planning to create new transmission capacities at the Wallbach cross-border interconnection point (GÜP Wallbach) on the German-Swiss border as well as at the Eynatten cross-border interconnection point (GÜP Eynatten) on the German-Belgian border.

Dependent on market interest, it is planned to connect the NCG and GASPOOL market areas by connecting the TENP-system to the pipeline system of GASCADE Gastransport GmbH (GASCADE) at the Stolberg compressor station (Fluxys TENP), which would result in a new market area interconnection point in Stolberg.

Figure 6.7: TENP-system flow reversal project and new bidirectional interconnection pipeline initiative (Bretella), in combination with NOS and Zeelink projects

The investment and capacity measures envisaged by Fluxys TENP could include modifications at the compressor stations of Stolberg, Hügelheim and Mittelbrunn and the installation of additional compressors in Stolberg with a view to increasing the pressure up to 84 bar, allowing Fluxys TENP to offer exit services into the GASCADE system as well as into the direction of Eynatten.

Another investment under consideration consists of a new bidirectional interconnection pipeline (Bretella) and a station in Nordschwaben between the compressor station in Stolberg and the cross-border interconnection point at Eynatten (Belgium), which would create additional capacities between Germany and Belgium. These additional capacities also require additional compression power in Stolberg.

Should the market demand not be high enough Fluxys TENP is also considering a reduced investment case allowing for capacities from Wallbach to NCG without additional capacities to Belgium and GASPOOL. This reduced investment case does not request the installation of the additional compressors in Stolberg.

The investments are planned to be ready as of October 2018.

The planned flow reversal is integrated in the German network development plan of German TSOs (details see *www.netzentwicklungsplan.de* and in next chapter of the report, section: "The investments in the eastern area of the Region") and also supports investment projects of other TSOs, at this stage not being core to the Reverse Flow Project, in particular the NOS-project sponsored by terranets bw and the ZEELINK project planned by OGE and (for ZEELINK 1) Thyssengas.

The terranets bw project "Nordschwarzwaldleitung" (NOS-project) is the realization of a pipeline of ca. 70 km (DN 600 / DP 80) in the south-western area of Germany (federal state of Baden-Württemberg). The ongoing construction establishes another connection between the terranets bw network in Baden-Württemberg and the European gas transmission network.

Through this, the onward demand of transport capacities for natural gas in Baden-Württemberg will be covered and an essential contribution for the security of supply will be made. The reversion of TENP will generate additional gas capacities, which would secure the demand in south-western Germany. The construction of NOS will be finalized at the end of 2015.

The ZEELINK project is composed of three sub-projects. The sub-project "ZEELINK 1", planned by OGE and Thyssengas, is a new pipeline of about 112 km (DN 1000/ DP 100) from Eynatten at the German/Belgian border to St. Hubert in the federal state North-Rhine Westphalia. The sub-project "ZEELINK 2", planned by OGE, is a new pipeline of about 115 km (DN 1000/DP 100) from St. Hubert to Legden in the German federal state North-Rhine Westphalia. The sub-project "VDS Rheinland", planned by OGE, is the development of a new compressor station with two 25 MW units in the area of Aachen in the German federal state North-Rhine Westphalia. Implementation of the ZEELINK project is foreseen between 2020 and 2024. The main purpose of the ZEELINK project is to support the conversion of markets currently supplied by low-calorific gas (L-gas) to high-calorific gas (H-gas) (see also section 7.2.3).

6.3.5 IN BELGIUM: EYNATTEN INTERCONNECTION POINT

The Fluxys Belgium network can already accept reverse flow gas coming from Germany. The existing pipeline system at the Eynatten interconnection point is already bidirectional and gives full access to the entire Belgian H-gas network and hence to the ZTP trading point.

Since the UK Interconnector between Belgium and the UK is already a bidirectional pipeline, gas can flow directly from the Belgian system to the Great Britain market, allowing for the full completion of the South-North Corridor.

6.4 PCI Status

In 2013 several projects that allow for the opening of the South-North Corridor have attained PCI status, confirming their importance for the cross-border security of supply and supply diversification of Europe.

The table below lists these projects on the backbone of the South-North Corridor.

SOUTH-NORTH CORRIDOR PROJECTS WITH PCI STATUS	
5.9	PCI Reverse flow interconnection between Switzerland and France
5.10	PCI Reverse flow interconnection on TENP Pipeline in Germany
5.11	PCI Reverse flow interconnection between Italy and Switzerland at Passo Gries interconnection point
5.12	PCI Reverse flow interconnection on TENP Pipeline to Eynatten interconnection point (Germany)

Table 6.1: South-North Corridor projects with PCI Status; Source: Section "Bi-directional flows between Italy, Switzerland, Germany and Belgium/France" of Chapter 5 "Priority corridor North-South gas interconnections in Western Europe ('NSI West Gas')" Annex B of Commission Delegated Regulation 1391/2013

The South-North Corridor projects are particularly important for the European Internal Gas Market completion, also because they all share the key-feature of reverse flow infrastructure. This infrastructure bidirectionality has been recognised as bringing peculiar benefits according to Regulation EC 347/2013, so that having a reverse flow nature is a criterion directly fulfilling the admissibility rule for entering in the PCI selection list.

Reverse flow projects provide additional benefits to the ones generated by mono-directional pipelines replicating their functions, with relation to the all four criteria considered essential by the Regulation to evaluate gas projects:

- **Market integration and competition.** Bi-directional pipelines allow for greater price convergence compared to mono-directional pipelines having the same function in connecting markets.

  In fact, if the choice is between a new pipeline and the reverse flow of an existing infrastructure, this second solution permits to better follow spot price dynamics between hubs, permitting a deeper market integration and making possible the functioning of a competitive European internal gas market. This is highly likely unless comparatively low load factors are accepted for those mono-directional pipes replicating the reverse flow function.

- **Interoperability and flexibility of the system.** The same operator normally manages reverse flow infrastructure in both directions. This situation is far less granted in case of multiple mono-directional pipes replicating reverse flow functions. In fact, the underlying physical and geographical separation of the pipelines not only increases their costs but also the probability that the number of subjects operating the assets will increase.

  First of all, from a physical point of view, a single operator optimises dispatching avoiding that gas flows in opposite directions (sub-optimal effect in case of meshed and evolved entry-exit systems are connected). Secondly, from a commercial perspective, having the same counterparts when marketing, using and managing capacity rights represents a clear advantage both for shippers and TSOs.

  In conclusion, reverse flow benefits materialise both in physical and in commercial terms, increasing interoperability, flexibility and the overall efficiency of the system.

- **Security of Supply.** Regulation 994/2010 (SoS Regulation) clearly recognises the importance of reverse flow in enhancing European SoS, prescribing bidirectional pipelines for each cross-border interconnection between member states as a general rule. Reverse flow infrastructure increases the flexibility of the European grid, permitting quick physical responses to cover energy needs arising from stressed or emergency situations. Additionally, reverse flow projects perform this task in the most effective way because – "time-wise speaking" – they become available earlier to face possible emergency conditions, since faster permitting and usually shorter realisation phases can ensure earlier commissioning.
- **Sustainability.** Avoiding the laying of additional pipes is bringing several "green" positive externalities: in terms of avoided CO_2 emissions linked to pipeline production and laying (e.g. steel production and transportation, construction and following O&M activities etc.) as well as more general environmental impacts in terms of landing preservation benefits, since the track used for reverse flow purposes is the same already exploited for the prevailing flows.

All the above mentioned benefits have been recognised in granting South-North Corridor projects the PCI status and demonstrate that this infrastructure is a necessary and cost-effective missing link for the completion of the internal gas market.

6.5 Odorisation

As a consequence of the planned bidirectionality on the Transitgas system, new flow patterns can occur in the future, additional to the ones possible today.

The conceivable combination of a flow from France to Switzerland at the Oltingue IP and a reversed flow from Switzerland to Germany at Wallbach might be one of them. This could be a problem as in France the odorisation process is centralised upon entry into the system while in Germany no odorised gas is accepted at the entries.

As there is currently no formal plan in France to avoid odorised gas flowing from France into the Transitgas system, the installation of a de-odorisation plant would be required in order to avoid odorised gas flowing into Germany.

Gas in Switzerland and gas entering into Italy is a mix of gas, coming from Germany (non-odorised) and coming from France (odorised), which has never created problems until now in terms of interoperability of the interconnected systems (France – Switzerland and Italy).

Two solutions are under study to prevent possible THT-odorant quantities entering into Germany thereby not respecting current German specifications. On the one hand the construction of a de-odorisation plant by Fluxys TENP with a final investment decision expected in 2015. Studies are on-going to evaluate which THT removal technology provides the best results from a technical and economical perspective, with the next stage being pilot plant level testing.

On the other hand, on a wider time horizon, GRTgaz has launched studies to evaluate the impact of a change of odorisation practices on its network, from centralised to de-centralised odorisation. The first exchanges with the national stakeholders showed the need for a wide-ranging consultation in order to weigh up the impacts of the harmonisation process. To this effect, GRTgaz will launch the construction of pilot facilities with the assistance of a distribution network operator.

7 Other TSO Transmission Projects in the Region

- Investments in the Western area of the Region
- Investments in the Northern area of the Region
- Investments in the Eastern area of the Region
- Investments in the Southern area of the Region
- Other Investments Relevant for the Region

Image courtesy of Snam Rete Gas

This chapter groups together other transmission projects of importance in the Region, mainly following a country-based approach:

- **"Investments in the Western area of the Region"** (section 7.1), describing the main GRTgaz system enhancements;
- **"Investments in the Northern area of the Region"** (section 7.2), depicting system development in Belgium;
- **"Investments in the Eastern area of the Region"** (section 7.3), presenting the draft National Development Plan 2014 of Germany's gas transmission system operators (TSOs);
- **"Investments in the Southern area of the Region"** (section 7.4), illustrating other key projects for Snam Rete Gas transmission network enhancement additional to "Support for the North West market and bidirectional cross-border flows" projects;
- A final section dedicated to other projects possibly relevant for the Region and interesting more than one country (section 7.5).

In this section, the country maps presenting the overall TSO, SSO and LSO infrastructure projects use the same codes the projects had in the TYNDP 2013–2022, as reported also in the tables composing the section 2.2.5 of Chapter 2. In the same maps the infrastructural projects are indicated by the following colours:

FID projects | non-FID but PCI projects | non-FID and non-PCI projects

7.1 Investments in the Western area of the Region

In line with the aforementioned South-North Corridor, major investments including PCI projects are foreseen to better integrate North West Europe (Belgium, Germany, northern France) with the South Region (Portugal, Spain, southern France) through the North-South corridor in Western Europe.

The first projects are aimed to reinforce the core network in the northern area and better interconnect France with Belgium, Germany and Luxembourg.

Arc de Dierrey (PCI 5.14, TRA-F-036): This 300-km long pipeline with a diameter of 1,200 mm is a key piece of infrastructure to strengthen the core-network in France and enable to connect the **new Dunkerque LNG** regasification plant (LNG-F-210). This LNG terminal will be commissioned in 2015, along with the northern section of Arc de Dierrey between Cuvilly and Dierrey (180 km), while the southern section between Dierrey and Voisines being commissioned one year later (2016).

New interconnection between France and Belgium (PCI 5.13, TRA-F-040): the **new Dunkerque LNG** terminal will provide large quantities of non-odourised gas near the French/Belgium border enabling the creation of a new interconnection point from France to Belgium with a 270 GWh/d capacity in 2015. Preliminary works for the new pipeline (25 km) began in March 2014.

In the same area, an **interconnection between France and Luxembourg** (PCI 5.17, TRA-N-044) is under consideration to strengthen the security of supply of Luxembourg (2018). This project is currently on hold, since the binding phase of an Open Season procedure in 2013 failed to meet interest from shippers.

Creation of firm capacity to Germany at Obergailbach (PCI 5.6, TRA-N-047): preliminary studies have been launched on this reverse capacity, which is crucial for market integration. This study is conducted in connection with assessment over changes in the odourization process. Their impact will be assessed with the help of pilot facilities in coordination with a distribution network operator.

After those reinforcements in the north, the following projects cover a major piece of the North South axis connecting the South Region (Portugal, Spain, southern France) with North West Europe. These Projects of Common Interests will enable LNG supplies to reach northern markets, contribute to remove the current bottleneck at the North South Liaison and bring liquidity and converging prices to southern hubs (see GRIP South 2013 for further details) :

- **Strenghtening the north-south pipelines Val de Saône between Voisines and Etrez in the Lyon area** (PCI 5.7, TRA-N-043): this looping of the Bourgogne pipeline (200 km pipeline with a diameter of 1,200 mm) is a key element to connect France with Germany, Switzerland and Spain. CRE has confirmed Val de Saône and Gascogne Midi as the most suitable investments to reach a single market place in France, at the earliest in 2018. A final investment decision is expected to be made by the end of 2014.
- **Arc Lyonnais** (PCI 5.8, TRA-N-253) consists in the looping of the East Lyonnais pipeline between Saint Avit and Etrez on 170 km.
- **Midcat** (PCI 5.5, TRA-N-256) aims to create a new IP between France and Spain

Figure 7.1: France – Location of projects, identified by their ENTSOG TYNDP code

7.2 Investments in the Northern area of the Region

Fluxys Belgium updates annually its ten-year indicative investment programme to factor in new market signals for its three core activities: transmission and storage of natural gas and terminalling of liquefied natural gas (LNG). For these updates, due account is taken of the changing needs for natural gas supply, requests for additional connections, new needs of grid users as identified through international market consultations and diversification of sources contributing to security of supply and effective market functioning, among other things.

As part of its indicative investment program for Belgium, Fluxys plans to lay new pipelines, including one between Alveringem and Maldegem linking the future LNG terminal at Dunkirk with the Zeebrugge area and further towards the German markets. Other main topics include the further development of the Zeebrugge LNG terminal as a gateway to Europe and to bolster the potential of natural gas as a transport fuel.

7.2.1 INTERCONNECTION FROM THE DUNKIRK LNG TERMINAL TO THE FRENCH AND BELGIAN NETWORKS: THE DUNKIRK-ZEEBRUGGE LINK

Fluxys is a 25 % partner in the LNG terminal being built at Dunkirk, alongside EDF (65 %) and Total (10 %). Fluxys also has a 49 % stake in Gaz-Opale, a joint venture which will operate the future facility. The terminal is due to be operational by end 2015 and will have a capacity of 13 billion m^3 of natural gas per year, which will contribute significantly to strengthening security of supply and to the effective functioning of the market in North-West Europe.

Alongside construction of the LNG terminal in Dunkirk, a pipeline will be laid to connect three infrastructures: the Dunkirk LNG terminal as a new gas entry point for Europe, the network of French transmission system operator GRTgaz and Fluxys' network in Belgium. This combination will allow up to an additional 8 billion m^3 of natural gas to be transmitted to Belgium and elsewhere in Europe from the Dunkirk LNG terminal, thereby strengthening security and diversity of supply. The Dunkirk-Zeebrugge pipeline project is a first in Europe. To begin with, it is the result of close cooperation between the national regulators and the system operators concerned. Secondly, it will create cross-border capacity from the Dunkirk LNG terminal in France (also connected to PEG Nord) to the ZTP and Zeebrugge Beach gas trading places in Belgium.

To link up the Dunkirk and Zeebrugge areas, French transmission system operator GRTgaz will lay a pipeline between the Dunkirk LNG terminal and the French-Belgian border. Fluxys Belgium, in turn, will build a new interconnection point in Alveringem and lay a new pipeline between Alveringem and Maldegem that will run for a distance of around 74 km. Based on the current schedule, work on laying the pipeline will start early 2015, with the pipeline itself to come into operation that autumn.

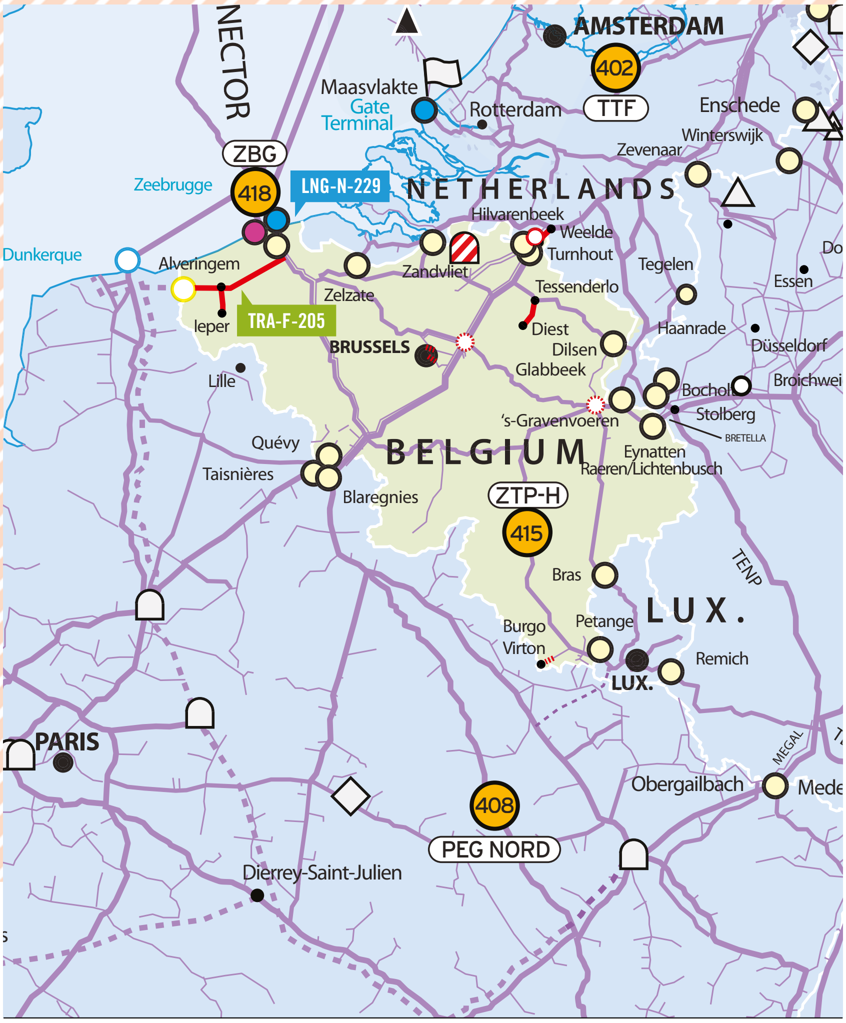


Figure 7.2: Belgium – Location of projects, identified by their ENTSOG TYNDP code

7.2.2 ZEEBRUGGE LNG TERMINAL: LNG GATEWAY TO EUROPE

Fluxys' Zeebrugge LNG terminal offers its users maximum flexibility. It is one of the few terminals in the world that can accommodate all LNG ships in circulation, while offering users of the Zeebrugge LNG a whole range of destinations for their natural gas. They can either trade it at the Belgian trading points or move it via Fluxys' Belgian grid to supply the Belgian market or other end-user markets in Europe.

A second jetty for loading and unloading LNG carriers is currently under construction at the LNG terminal and will enter into service in 2015. The jetty will be able to accommodate loading and unloading of both small and large LNG carriers, with capacities of between 2,000 m³ and 217,000 m³ of LNG. Preliminary studies for the project were co-financed by the European Union (Trans-European Networks – TEN).

With the construction of the second jetty and new loading capacity booked for small LNG carriers, the Zeebrugge LNG terminal continues to evolve into a hub for the supply of LNG as a fuel for ships and long-distance haulage trucks. This market niche is still in its infancy, but it has a great deal of potential due to the low emission values of natural gas. Accordingly, Fluxys is involved in a number of studies examining the possibilities of establishing basic infrastructure for LNG refuelling of ships and trucks.

7.2.3 GERMAN L/H CONVERSION

Due to declining indigenous production in Europe, there will be a definite increase in the demand for H-gas imports in Western Europe over the next few years. The decline in L gas imports from the Netherlands and the decline seen so far in Germany's own production will lead to greater H-import demand in Germany. In the German network development plan (NEP), it is assumed that new gas volumes will be brought to Europe by means of LNG and pipeline projects.

According to the position statement of Fluxys Belgium submitted during the consultation process for NEP 2013, after expansion measures which have not yet been realised, up to 26 GWh/h could be transported in the Belgian gas network across the border transfer point Eynatten to Germany as of 2018. After the provision of this additional capacity, volumes of gas from the LNG facilities in Zeebrugge and Dunkirk could be provided for the German market. The development of the capacity at the Eynatten interconnection point can contribute to the supply requirements of Germany and more in particular support the optimization of the conversion from L gas to H gas, given the geographical proximity to the current L gas consumption zones in Germany and the potential complementarity with the ZEELINK project planned by OGE and (for ZEELINK 1) Thyssengas as described in section 6.3.4 (figure 6.7) as well as a number of other projects presented in the NEP 2014.

Image courtesy of Fluxys TENP

7.3 Investments in the Eastern area of the Region

On 1 April 2014 the German TSOs submitted the draft German Network Development Plan 2014 (Draft NDP 2014) to the German regulator BNetzA[1]. In this draft NDP 2014, Germany's gas transmission system operators (TSOs) present the results of their latest network modelling complete with findings from public consultation and a determination of long-term capacity needs, in order to meet the requirements of the German Energy Law (Energiewirtschaftsgesetz, EnWG) and the German Network Access Code (Gasnetzzugangsverordnung).

This third issue is based on the scenario framework which after public consultation was confirmed by the German national regulatory agency Bundesnetzagentur (BNetzA) on 16 October 2013.

As proposed by TSOs, network development will require investments of approximately € 1.8 bn by 2019 and a total of € 3.1 bn by 2024.

In general, the current plan confirms the findings published in the previous NDP 2013. For the period ending 2024 the new NDP has identified the need for additional network upgrades mainly resulting from:

- **More specific information on L/H gas market conversion needs**
  Under the confirmed scenario framework these needs will much exceed the last NDP, the changes resulting from an extension of the period under review and current findings regarding detailed market conversion schedules.
- **A rise in demand for H gas supplies**
  Additional volumes of H gas to substitute L gas require further improvements of the gas infrastructure to carry these quantities to Regions in need.
- **Greater capacity required for gas storages**
  The significant increase in capacities to be considered and modifications to temperatures curves have added to the need for upgrades.

Security of supply considerations in the NDP 2014 have focused on L/H gas market conversion and resulted in a detailed proposal for the gradual conversion of areas now supplied with L gas to H gas. In addition, the availability of L gas until 2030 has been investigated.

For the period ending 2024 the NDP 2014 has made allowance for the additional H gas volumes needed and allocated them to specific H gas supply sources as specified in the scenario framework. Providing an infrastructure in Germany that can take these volumes to the conversion zones is part of the proposed NDP project list.

In both the gas and power sectors, gas-fired power stations are vital to maintaining today's high supply security. From a macroeconomic perspective, the dynamic capacity product specially designed for these plants by German TSOs in the NDP 2013 has the potential to meet the needs of this difficult to predict market.

1) Reference: Draft of the German TSOs for the German NDP 2014:
http://www.fnb-gas.de/files/nep_gas_2014_entwurf_2014-04-01.pdf

Maintaining security of supply at a high level calls for infrastructure upgrades to be preceded by complex and interdependent planning and permission procedures which are crucial for keeping project deadlines. An intense dialogue with all stakeholders is essential to prevent unnecessary delays which may hamper security of supplies.

The immense outlay for transmission system development as provided by the TSOs will be recovered by charging transport tariffs. All parties involved in the NDP process should therefore ensure that in the long run network projects are viable from the viewpoint of macro-economics. A stable and sustainable regulatory regime offering return rates which appropriately reflect project risks is needed to make sure that projects are economically reasonable for investors at a time when transport customers are committing themselves for ever shorter periods.

As network modelling requirements for the years up to 2019 have become more similar in this and previous NDPs, the system development needs identified and the projects derived therefrom have gained stability. The process of drawing up NDPs could, however, be further optimized if NDPs were due only every other year, thus offering more time for consultation and network simulation. Biennial NDPs would also be better in line with other planning intervals such as that of the EU-wide NDP (ENTSOG TYNDP).

Figure 7.3: Germany – Location of projects, identified by their ENTSOG TYNDP code

7.4 Investments in the Southern area of the Region

This paragraph covers further infrastructure enhancements in the southern area of the Region, additional to Snam Rete Gas transmission network developments ("Support to the North West market and bidirectional cross-border flows" projects) already described in the previous chapter 6.

Other key projects for Snam Rete Gas transmission network enhancement additional to "Support for the North West market and bidirectional cross-border flows" projects and having a Regional relevance, also in terms of potential interlinks between South-North Corridor and other Regions are the following initiatives:

- Development for new imports from the South
- Import developments from North-East
- Additional Southern developments

These three new projects are currently planned with commissioning date between 2019 and 2021 and will involve the development of around 1,400 km of new pipelines and the installation of around 300 MW of new compression capacity.

- **"Development for new imports from the South"** (TRA-N-007; included in PCI list with code 6.18): Snam Rete Gas, in line with the findings of SEN (National Energy Strategy), considers the development of new imports from the south, a strategic element to enable greater diversification of energy sources, so as to increase the competitiveness of the gas market and provide greater security 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.

  The project includes the construction of an approximately 430 km-long new pipeline and a compression plant of approximately 33 MW (Sulmona compressor station[1)]), along the south-north line, known as the "Adriatic Line". The Adriatic Line is functional to transport quantities of gas from any new sourcing initiatives from Sicily and from the middle Adriatic. The Adriatic Line can be seen as a development that has the character of generality and allows the system of gas supply to new Italian imports to be set up, such as the projects of TAP and ITGI and a new LNG plant in Sicily (Porto Empedocle).

  The Adriatic Line is included in the list of Projects of Common Interest and in the Snam Rete Gas ten-year plan.

  The upgrade work required for the transport of new quantities of gas is currently under feasibility study and the commissioning of the entire project is scheduled for 2019.

- **"Import developments from North-East"** (TRA-N-008): the project involves the realization of new pipelines to increase the transmission capacity from the northeast, and the connection of a regasification terminal in the northern Adriatic Region. The construction of an LNG terminal in the northern Adriatic area is included in the PCI list, and the connection to the national network is included in the Snam Rete Gas ten-year plan.

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1) The construction of Sulmona CS has been approved 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.

Figure 7.4: Italy – Location of projects, identified by their ENTSOG TYNDP code

- A final investment decision has not yet been made and the availability of the new capacity (350 GWh/d) is expected in 2021.
- **"Additional Southern developments"** (TRA-N-009): this project includes a series of pipelines and related plants. It would create additional transmission capacity (up to 264 GWh/d) to facilitate gas from a possible second new entry point in southern Italy.

Figure 7.5: Other Snam Rete Gas development projects (Development for new imports from the South – Import developments from North-East – Additional Southern development)

7.5 Other Investments Relevant for the Region

This section introduces four additional projects that stretch across more than one country and can have a potential impact on the Region itself in terms of new interconnections and/or additional available sources of gas.

7.5.1 TRANS ADRIATIC PIPELINE (TAP)

At the end of 2013, a final investment decision (FID) has been taken by the Shah-Deniz-II Consortium on extracting gas from the Shah Deniz II gas field in Azerbaijan, and this decision was key for TAP next steps toward commissioning. With this long-awaited decision, it is confirmed that Europe will get 10 billion cubic metres (bcm) per year starting from the end of 2019.

This direct access to the Caspian basin will have a significant impact on energy security and diversification of supplies for Europe. Through its further enlargement, the corridor will have the potential to meet up to 20 % of the EU's gas needs in the long term.

The choice of TAP to bring gas from Azerbaijan to Europe creates an additional input for the South-North Corridor intended to bring gas from Italy through Switzerland towards North West Europe. As shown in the Figure 7.6 below, the potential of TAP and the so-called Southern Corridor is particularly relevant for European diversification and security of supply , especially if linked to the broad accessibility also to Middle East in addition to Caspian reserves.

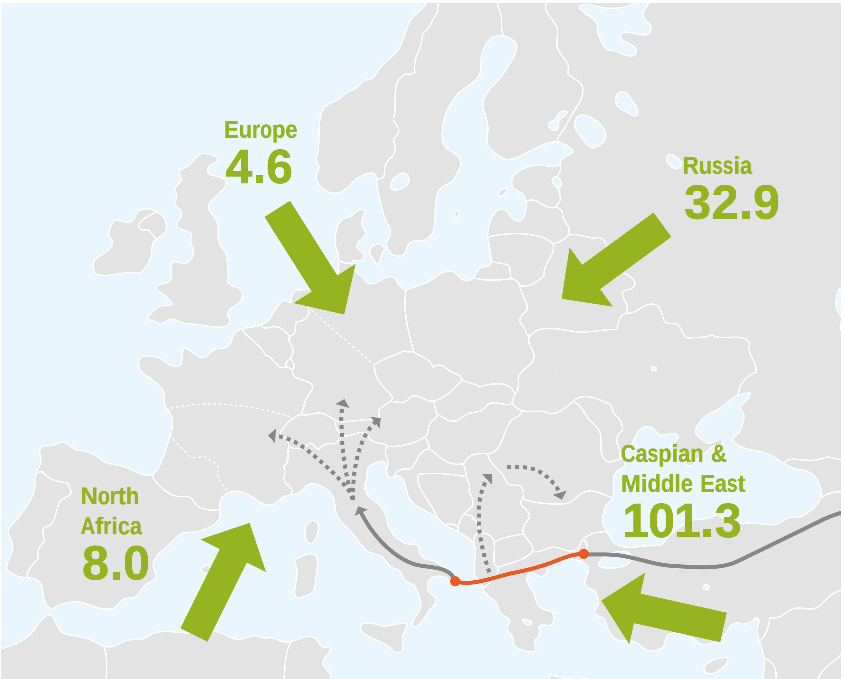

Figure 7.6: Traditional and potential sources of gas to Europe (10^3 bcm)
(Source: Elaboration on BP world energy statistical review (2012))

In June 2013, the Shah-Deniz-II Consortium had already chosen the Trans Adriatic Pipeline (TAP) to bring gas from the Turkish border via Greece and Albania to Italy. It had also been decided earlier that the gas will be shipped via the upgraded "South Caucasus Pipeline" through Georgia and via TANAP, a completely new 2,000 km-long pipeline, through Turkey to its western borders.

The picture below shows the complete route between Shah-Deniz-II and Italy.

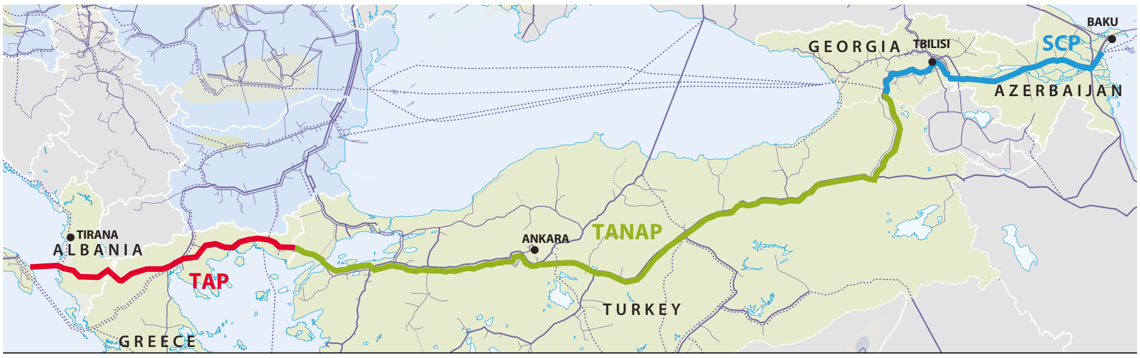

Figure 7.7: Azeri gas trip from Shah-Deniz to Italy (Source: TAP website)

More specifically, the TAP will start in Greece, cross Albania and the Adriatic Sea and come ashore in Southern Italy. The TAP route will be approximately 870 kilometres in length and will initially have a capacity of 10 bcm/year, but is designed be easily expanded to 20 bcm/year.

Figure 7.8: Zoom on TAP schematic representation (Source: TAP website)

The shareholder structure of TAP is currently structured as follows: SOCAR (20 %), BP (20 %), Statoil (20 %), Fluxys (16 %), Total (10 %), E.ON (9 %), Axpo (5 %).

7.5.2 GALSI AND CYRENEE PROJECTS

The projects hereby described aim at making accessible natural gas to Sardinia (GALSI) and Corsica (CYRENEE) and are presented as non-FID projects respectively in Snam Rete Gas and GRTgaz Ten-year development plans.

7.5.2.1 GALSI Project

The GALSI project includes the installation of new onshore pipelines with a total length of 350 km, an offshore pipeline of 275 km and the construction of a compressor plant in Olbia. The project ensures new transmission capacity at the entry point of Porto Botte in Sardinia of 24 MSm³/d.

The construction of a new gas pipeline connecting Algeria to Italy is shown in the PCI list, but at the moment there is no information about the development of the project by the sponsoring companies.

7.5.2.2 CYRENEE Project

Cyrénée is the project for the pipeline connecting Galsi to Corsica with 220km offshore and 230km onshore between Bastia and Ajaccio. A public consultation took place in 2010. The feasibility studies have sketched out a draft route. They have been put on hold in relation with the uncertainties around the Galsi project.

7.5.3 AN ACCESS TO THE ITALIAN AND EUROPEAN GAS NETWORK FOR SARDINIA, CORSE AND ELBA ISLANDS

Infrastrutture Trasporto Gas (ITG) evaluated various alternatives to be applied in case the Galsi project should have a undefined postponement, whilst considering the Cyrénée and GALSI routes and minimising technical complexities (such as high depth sea and long off-shore routes) and costs, in line with cost-effectiveness and efficiency principles.

The best option identified by ITG for the above scenario consists in two pipelines connecting Piombino (in the Tuscany region, center of Italy) to the islands of Elba and Corse (at Bastia); this project would create the presuppositions for the realization of the other infrastructures necessary to provide the islands with gas (that are the transmission and distribution systems onshore these islands and an off-shore connection between Sardinia and Corse).

TECHNICAL FEATURES

	batch 1 Piombino – Elba	batch 2 Piombino – Bastia
length	30km	120km
diameter	4"	18"
op. pressure	50bar	125bar
max capacity	20 MSm³/year	2.5 BMSm³/year
Batch 3: based on the Cyrénée route and the GALSI on shore route. A partial capacity resizing would be necessary		

A compression station should be installed at the entry site in Piombino.

The whole project, including batch 3, has some regulatory, permitting and financial complexities and will require the involvement of other TSOs and the coordination between European regulatory authorities, such as the French and Italian NRAs.

Identified complexities, however, do not affect the project's attractiveness, given the reciprocal benefits that its implementation could bring to the involved countries; such benefits are expected to encourage these countries to cooperate for a shared network realization.

The realization of the above projects of section 7.5.2 and 7.5.3 and other needed infrastructures in Corse and in Sardinia will make natural gas available for the local populations and industries.

This will bring the following benefits:

- improvement of the energy mix (using natural gas instead of oil, LPG and diesel fuels brings a relevant cost reduction);
- reduction of CO_2 emissions.

Figure 7.9: GALSI Project

Figure 7.10: ITG Project

8 Network Modelling

Introduction | Modelled cases
South-North Corridor capacities
Assessment results

Image courtesy of GRTgaz

8.1 Introduction

For this second version of the GRIP South-North Corridor numerous cases have been simulated using the ENTSOG Network Modelling tool (NeMo)[1], which tries to satisfy demand throughout Europe with the considered supply sources taking into account technical interconnection capacities between different market zones.

This represents an evolution compared to the previous report of this Region where no modelling was taken into account. The cases considered represent variations on scenarios considered in TYNDP 2013–2022, with updated information with regard to demand and project data. It is to be noted that network assessment is always performed at a European-wide scale but for demand variations, considered project clusters, disruption scenarios and output, closer attention is given to the Corridor specificities.

8.2 Modelled Cases

In total, 156 cases have been processed through the NeMo tool for this specific GRIP. The case specificities are a result of variations on behalf of the considered year, demand profiles throughout Europe, infrastructure clusters, and supply situations including possible disruptions.

8.2.1 YEARS

For the purpose of this GRIP, the years 2014, 2018 and 2023 were taken into account, with the latter two being the most relevant ones with regard to the foreseen commissioning date of the main projects in the Region.

8.2.2 INFRASTRUCTURE

As in TYNDP two different infrastructure clusters were considered as a combination of existing infrastructure and future projects depending on their FID status. Two specific additional clusters have been taken into account. One by adding all PCI projects (as a result of the first PCI selection round) and another one by adding only the core projects bridging the South-North corridor to the existing infrastructure plus projects that already proceeded to FID status. This last infrastructure cluster focuses on the flow reversal at the interconnection points Passo Gries, Oltingue and Wallbach, in this way making possible to transport gas from Italy towards the North West European markets. Projects in Italy, Switzerland and Germany related to this cluster are taken into account as from the simulated year of 2018. The project TAP offers a new possible entry of gas for Italy and a new potential gas source for Europe as a whole in terms of supply diversification and is taken into account for the 2023 simulation year.

1) More details on the ENTSOG simulation tool and methodology can be found in the Methodology chapter of TYNDP 2013–2022.

8.2.3 DEMAND

As for demand throughout Europe, winter situations of one day and 14-day duration were taken into account. For the high daily demand the sum of demand from design case scenarios from TSOs constitutes the reference scenario. For the 14-day high demand scenarios, a similar approach is applied as for the one day peak situation, but starting from the so-called 14-day uniform risk[1] as defined in TYNDP 2013–2022.

In addition to high demand also cases marked with an average daily demand are considered mainly to assess the level of market integration under different supply patterns.

Variants on the reference scenario for daily peak demand are created by considering peak demand in one Region and average winter demand in all other Regions (with Regions for this specific purpose defined as North West, CEE, and Mediterranean). This is a new "Regional" element introduced in GRIPs simulations, at this stage not considered in TYNDP, which takes a more general overall approach. The underlying rationale justifying this Regional approach is to assess infrastructure utilization should gas demand be highly differentiated across different European macro-areas for climatic or other (for example, economical linked) reasons.

The table below lists the EU countries as they are grouped in the three macro-areas:

NORTH WEST	MEDITERRANEAN	CENTRAL EASTERN EUROPE
Belgium	Greece	Austria
France	Italy	Bulgaria
Germany	Portugal	Croatia
Ireland	Spain	Czech Republic
Luxembourg		Fyrom
Netherlands		Hungary
Switzerland		Poland
United Kingdom		Romania
		Serbia
		Slovakia
		Slovenia

Table 8.1: Country composition of the 3 macro-areas

1) This refers to the sum of the average daily demand during a 14-day period of high gas consumption in each zone, based on a common definition of climatic conditions

The following schematic maps visualize the three alternative demand situations using in the modeled cases, in a geographical representation:

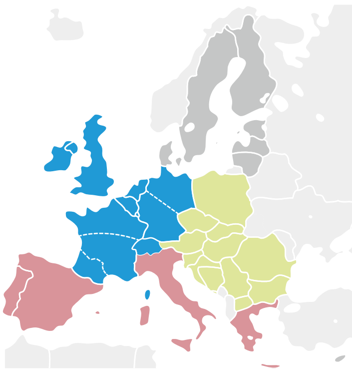

Figure 8.1:
North West Region under peak demand and rest of Europe under average demand conditions

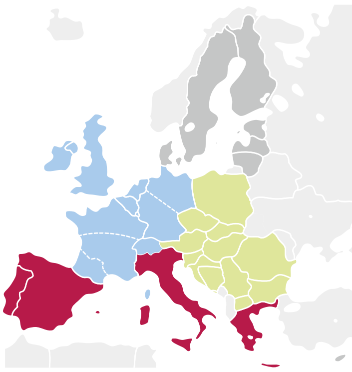

Figure 8.2:
Mediterranean Region under peak demand and rest of Europe under average demand conditions

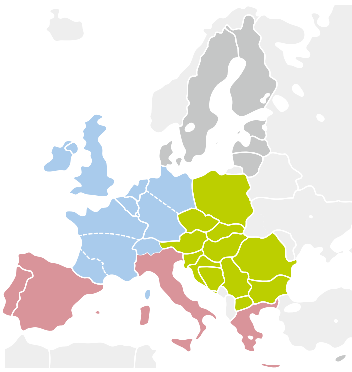

Figure 8.3:
Central Eastern Europe Region under peak demand and rest of Europe under average demand conditions

An attempt has been made to find some numerical evidences[1)] about this intuitive, possible correlation between gas demand and geography. Below the preliminary results are reported by considering the months with both the minimum and maximum demand day per country composing each macro-area. The findings described should be considered as indicative signals, to be confirmed by future and/or statistically extended analysis. Minimum demand cases have been reported together with historical peaks since anyway relevant to shows a possible demand-geography correlation, although the modeled cases are closer to maximum demand situations.

Starting with the geographical area corresponding to NW countries, we can detect a strong concentration (84 % of the cases) in August and July as months with the lowest demand and a relevant indication in December and February (71 % of the cases) as coldest months.

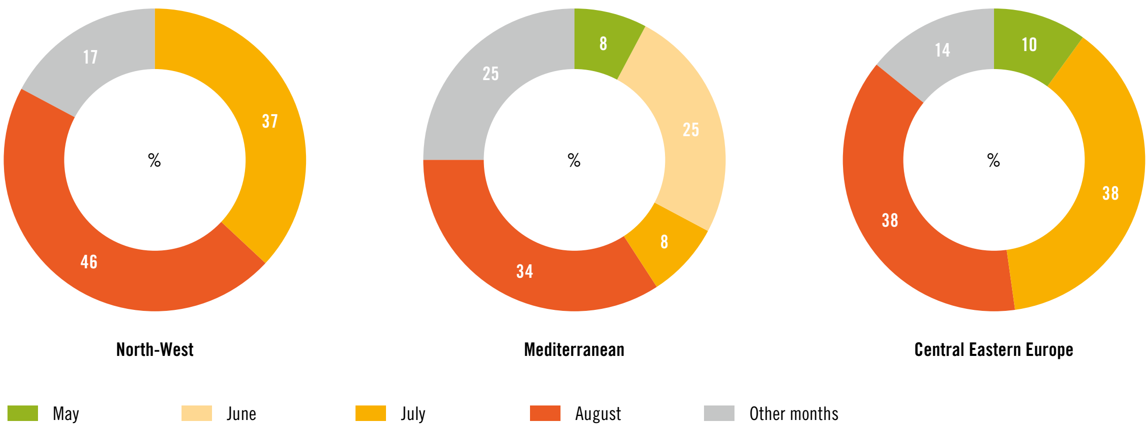

Figure 8.4: Comparison of the statistical historical (period 2010 – 2012) distribution of minimum demand days per month in the three macro-areas

1) Data are sourced from ENTSOG "System Development maps" 2010 – 2011 – 2012 editions

Mediterranean countries shows a wider temporal spread both with relation to peaks and to lowest demand records with comparison to both NW and CEE macro-areas. Should this finding be confirmed by additional analysis, this might provide a flexibility reserve from this Region to cover other parts of Europe (at least, in terms of storage and LNG resources and to extend the current and future available imports sources to the overall Europe).

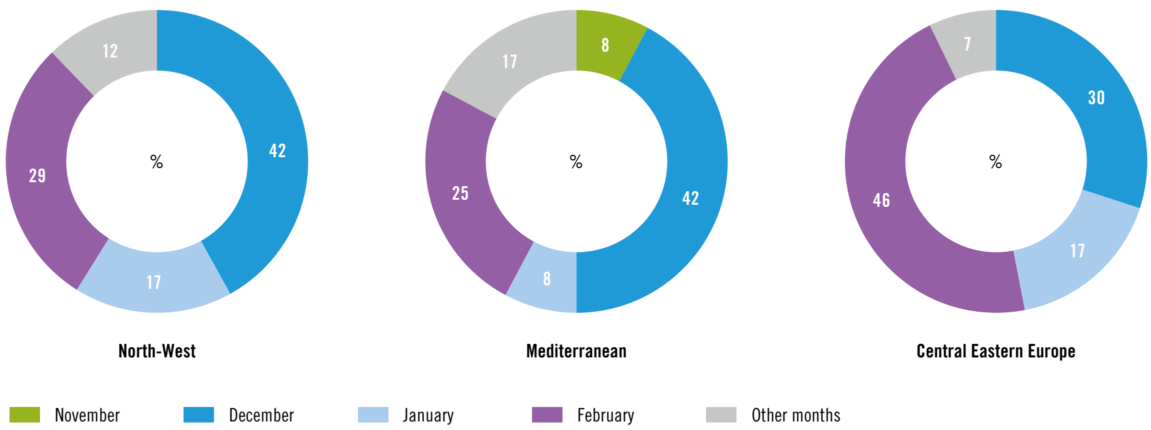

Figure 8.5: Comparison of the statistical historical (period 2010 – 2012) distribution of maximum demand days per month in the three macro-areas

Finally, Central-East European macro-area shows trends closer to NW patterns, although coldest day are concentrated in February and December (totaling 77 % of the cases, with the months inverted as the coldest ones) while for summer season is more equilibrated between July and August and less concentrated in terms of lowest demand records.

Finally, the following graph provides indications about the magnitude of the maximum demand values actually registered in the three macro-areas[1].

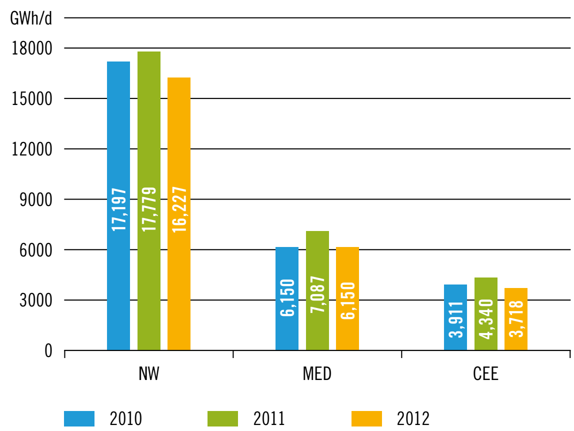

Figure 8.6: Historical aggregated maximum gas demand for the three different macro-areas

1) These values are the actual registered values in the countries composing the various macro-areas assumed to be demand-homogeneous. They should be interpreted only as broad indications of the average or peak demand values used in the simulations, useful to approximate with historical figures the size of different areas in terms of demand scale.

8.2.4 SUPPLY

The same supply approach was followed as for TYNDP 2013–2022 with a historical maximum for pipeline imports (last three years), the use of UGS as a last resort supply, and LNG as a combination of the former two (import component based on historical send-out plus last resort storage function).

The following table summarizes the simulation cases developed specifically for GRIPs purposes:

SITUATIONS	PIPE IMPORTS	LNG	UGS
SUPPLY SOURCES			
1-DAY DESIGN-CASE OR 1-DAY UNIFORM RISK	The maximum reached on one day during the last 3 years	Import component is equal to the Average Winter Supply. The remaining send-out is used as last resort	Last resort supply
14-DAY UNIFORM RISK	The highest average of 14 consecutive days during the last 3 years	Import component is equal to the Average Winter Supply. Additional send-out based on the maximum use of stored LNG	Last resort supply
1-DAY AVERAGE	Average shares by source of the different supply import sources in the European yearly balance of last 3 years, applied to the required imports. When the supply coming from one source is limited by the intermediate potential supply scenario, the corresponding missing volume is divided between the remaining sources proportionally to their ability to increase their level i.e. how far they are from reaching their own intermediate supply potential scenario.		Not used
1-DAY AVERAGE SUMMER	Based on the 1-day average – decreased by source to represent the seasonal swing. The seasonal swing in gas supply has been estimated as the average seasonal swing of the last 3 years for each source.		The total injected volume for Europe has been defined as 80% of the WGV (based on the average use of the last 3 years), and divided by balancing zone proportionally to the injection capacity.
1-DAY AVERAGE WINTER	Based on the 1-day average – increased by source to represent the seasonal swing. The seasonal swing in gas supply has been estimated as the average seasonal swing of the last 3 years for each source.		Average withdrawal equals average injection (country by country) of the average summer.
1-DAY – MIXED CASES	Minimum: Supply by source and route as resulting of the 1-day Average Maximum: As the 1-day Design Case		Min: value in average winter Max: withdraw availability (linked to stock level)
2-WEEK – MIXED CASES	Minimum: Supply by source and route as resulting of the 1-day Average Maximum: As the 14-day Uniform risk		Min: value in average winter Max: withdraw availability (linked to stock level)

Table 8.2: Simulation cases developed specifically for GRIPs purposes

These reference case scenarios will be complemented with some specific disruption scenarios for peak demand situations, namely individual interruptions of specific sources (Algeria or Azerbaijan) or routes (Russian supply through Ukraine or Norwegian supply through Franpipe or Langeled). Supply minimizations and maximizations were also examined through simulations for average demand scenarios.

8.3 South-North Corridor Capacities

The main interconnection capacities throughout the Corridor bridging the north and the south of the Region after completion of the considered infrastructure projects that are used in the NeMo simulations are shown below schematically (values as a result of lesser rule and expressed in GWh/d).

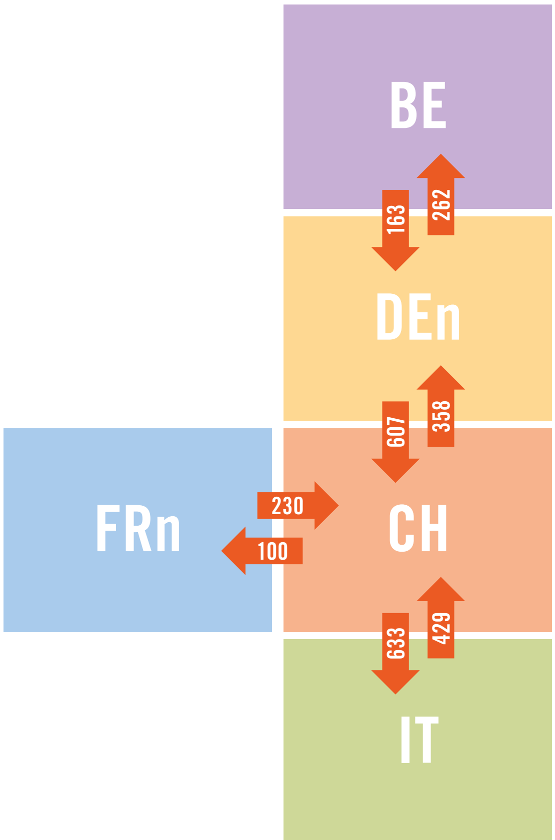

Figure 8.7: Schematic representation of the South-North Corridor and related technical capacities

8.4 Assessment Results

In accordance with results obtained in TYNDP 2013 – 2022, no major capacity issues were detected to face demand under perfect market conditions[1] for the countries that constitute the South-North Corridor Region when European supply is not facing any disruptions. Additional projects can however heavily improve security of supply and market integration under normal market conditions.

As for the considered disruption scenarios, the biggest impact in Europe occurs when considering a problem with Russian supplies. In this case the maximum winter demand in the CEE Region cannot be met, while SNC capacities could help to bring some more gas from other sources to the impacted countries to relieve the situation.

Throughout the simulated scenarios a wide range of different flow patterns throughout Europe in general and through the South-North Corridor in specific are observed. This illustrates the flexible possibilities in the 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 possible combinations of demand and supply cases.

Results showing a high utilization rate of the South-North Corridor backbone have been identified. Below, only the most significant examples of such market behaviour are highlighted with a focus on the circumstances leading to these kinds of flow patterns[2], although it has to be noted that other flow combinations might also be possible to cope with the considered supply and demand profiles, which is always to be considered when looking at results from NeMo simulations.

8.4.1 CASE STUDY 1: NORTH-SOUTH FLOW

When climatic conditions cause peak winter demand in the south of Europe more gas is needed in Italy when compared to an average winter day. This can be offset through an increased use of storage in a first step. However, when at the same time faced with an Algerian disruption, more gas will need to be imported from the north, implying an increased utilization rate of the north to south capacities of the corridor, the latter with increased flows from France and Germany to Switzerland.

CASE DESCRIPTION	
Year	2018
Demand	Max Winter 14-Day Mediterranean Average Winter 14-Day rest of Europe
Supply	Disruption Algeria
Infrastructure	FID + non-FID

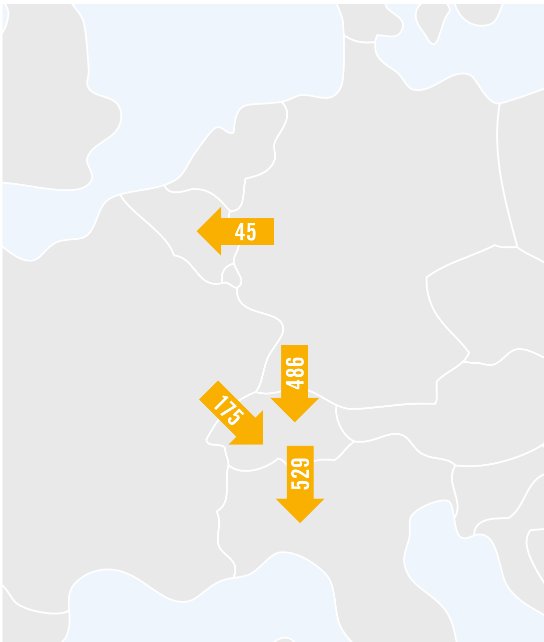

Figure 8.8: Case study 1: North-South Flow

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

2) It has to be noted that other flow combinations might also be possible to cope with the considered supply and demand profiles: this is a condition that should always to be considered when looking at results from ENTSOG Network Modelling simulations.

8.4.2 CASE STUDY 2: SOUTH-NORTH FLOW (RUSSIAN MINIMIZATION)

When Russian supplies are minimized under average demand situations more gas is needed from other sources. When the SNC projects aimed at creating reverse flow capacity in the corridor would be commissioned, additional gas can be delivered from the South towards North and East Europe, adding up to increased flows from the west, and help to compensate for the reduced imports from Russia.

CASE DESCRIPTION	
Year	2023
Demand	Average Day Europe
Supply	Minimization Russia
Infrastructure	FID + non-FID

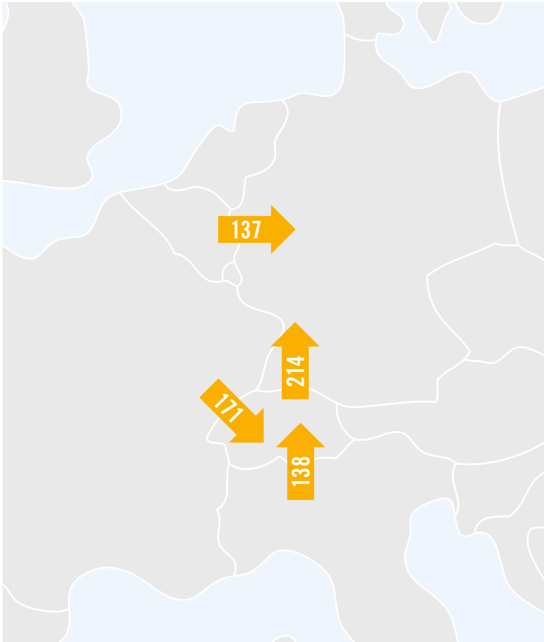

Figure 8.9: Case study 2: South-North Flow (Russian minimization)

8.4.3 CASE STUDY 3: SOUTH-NORTH FLOW (LNG MINIMIZATION)

When LNG deliveries to Europe fall to a minimum and at the same time North West Europe is facing heavy winter conditions, one of the main concerned countries could be France due to its high LNG dependence. To cover peak demand more gas could be sourced from Italy through Switzerland, on top of an increased inflow from Russian gas through Germany and Belgium

CASE DESCRIPTION	
Year	2018
Demand	Max Winter Day North West Europe Average Winter Day rest of Europe
Supply	Minimization LNG
Infrastructure	FID + non-FID

Figure 8.10: Case study 3: South-North Flow (LNG minimization)

8.4.4 ADDITIONAL CONSIDERATIONS

Although no explicit results have been produced as outputs from the ENTSOG Network Modelling tool, a more intense utilization of SNC infrastructures in reverse flow, in terms of exploitation of both its branches in the South to North directions, can be considered as a concrete possibility in the medium-term, as from 2018 onward.

These results could emerge from likely revisions of model inputs since an update of the underlying dataset and/or to the hypothesis used in the simulations seems reasonable to reflect:

- a higher export potential for Italy, determined by decreasing or stable internal yearly consumption requirements, accompanied with an increase of imports (TAP and LNGs plants) and storage capacities of the country;
- increased import needs for Northern Europe, linked to a progressive decline of North Sea and Dutch indigenous productions.[1)]

The progressive reduction of North Sea production, particularly the ones linked to L gas fields, will have particularly relevant effects on the future imports needs of Germany.

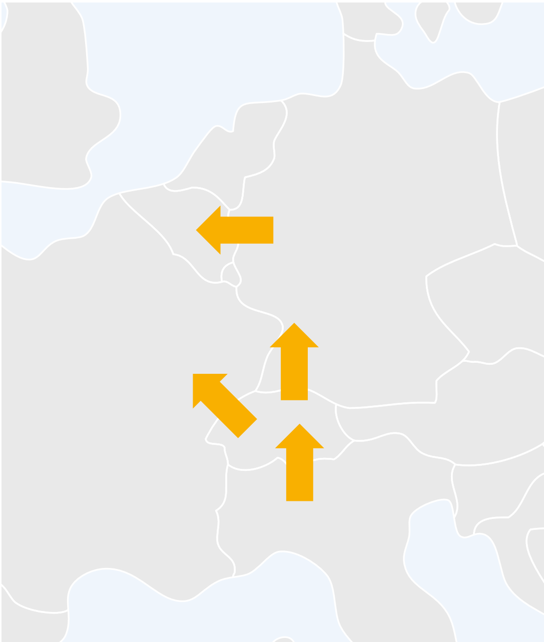

Figure 8.11: Additional Considerations

1) With particular reference to the decline of North Sea indigenous productions and the effects on supply of Northern European countries, we refer to:
- OECD/IEA publication "Energy Policies of IEA Countries – The Netherlands – 2014 Review" which concludes that the pace of decline of L gas production could be faster than expected in case of further production reductions in the Groningen area and that "as a result, the Netherlands is expected to shift from a net exporter to a net importer of gas around 2025".
- North-West GRIP 2013 – 2022, section 2.4 "The L-Gas Market in North West Europe", clearly showing a steep decline of L gas reserves in Germany and production in the Netherlands.

The identification of new H gas sources for the German market has also been analyzed in the last two German national development plans (2013 NEP, already released, and 2014 NEP, currently handed over by the association of German TSO Fnb Gas to BNetzA).

As highlighted in the Figure 8.12 below, the additional supply which, according to IEA/WEO 2012 study, integrated into the NEP scenario framework 2014, is necessary to Western Europe and Germany in particular will be mainly covered (53 %) by import from the southern border of the Region (interconnection points of Wallbach, Oberkappel and Überackern) with relevant contribution also by north and north-east points (such as Eynatten, Bocholtz, Greifswald and Medelsheim), which all together provide for the remaining 47 % of the foreseen demand gap.

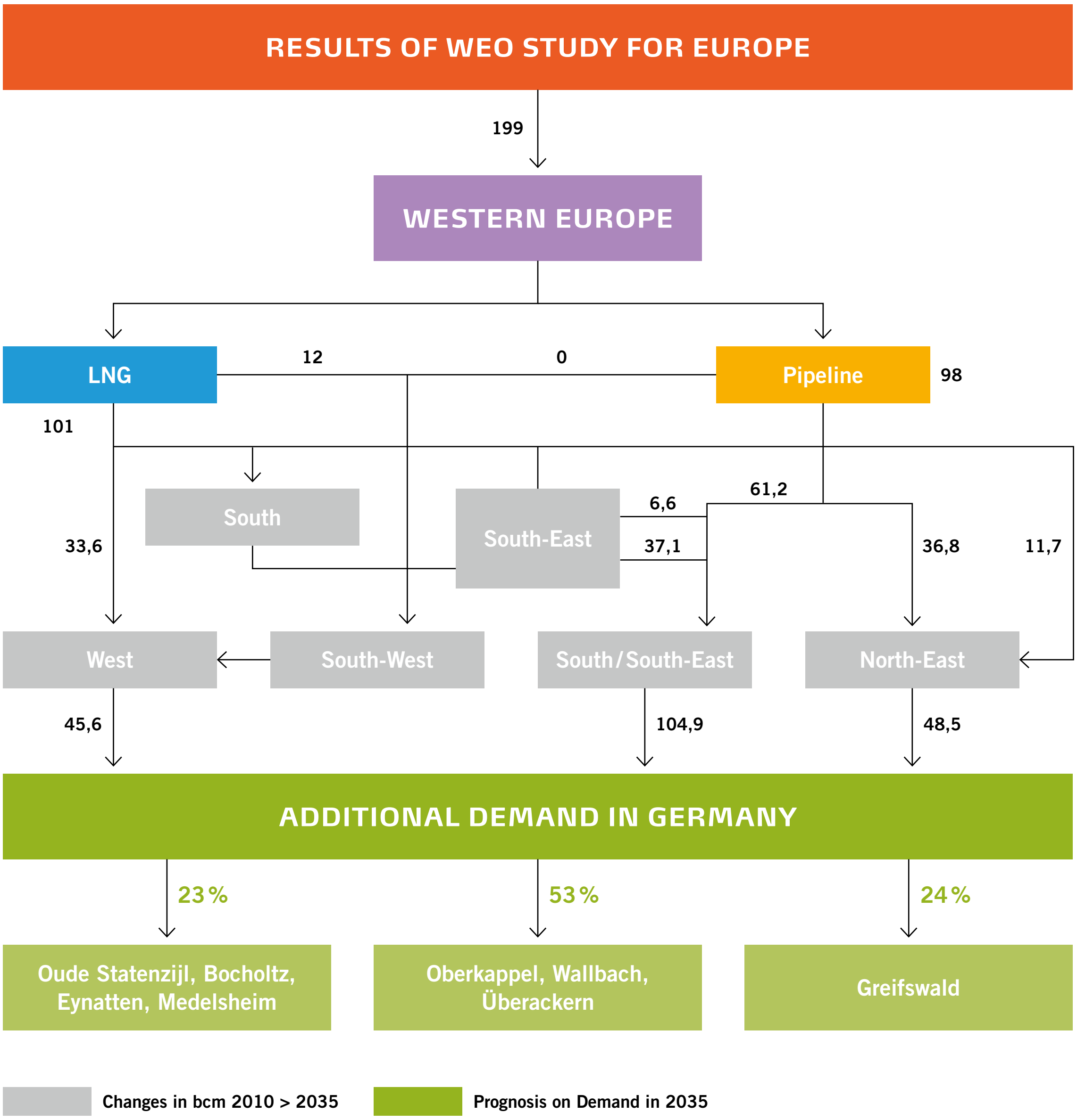

Figure 8.12: Modelled determination of supply sources of gas for Germany (graphical re-elaboration from: Draft Network development plan 1st April 2014 "2014 NEP"); (Source: http://www.fnb-gas.de/files/nep_gas_2014_entwurf_2014-04-01.pdf)

The forecasted needs of Germany highlight again the importance of South-North Corridor for the future Regional security of supply and market needs, constituting a clear signal of the key-role this infrastructure is going to play in flowing gas both South to North and North to South directions.

Way Forward – Stakeholders Feedback Form

Interactions with stakeholders are welcomed and TSOs of the Region, with ENTSOG support, have organized different events, allowing to any external parties to provide inputs to GRIPs structure and elaboration. In particular:

- Following its publication on June 2012, SNC GRIP first edition has been presented and discussed on November 2012 (6th TYNDP Workshop at ENTSOG Offices);
- SNC GRIP second edition structure and main contents has been anticipated on November 2013 at the Gas Regional Investment Plan (GRIP) Workshop on Brussels;
- More recently, during 9th TYNDP/CBA Workshop, held in Vienna on June 2014, the main subjects and findings of the finalized version of the GRIP have been introduced by Region's coordinators.

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

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

We will be happy to receive reader's feedback and we will take them into consideration for future 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 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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Legal Disclaimer

The South-North Corridor GRIP was prepared in a professional and workmanlike manner by the TSOs of the five 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 the stakeholders via public consultation for the preparation of the TYNDP 2013–2022. The South-North Corridor GRIP contains TSOs' own assumptions and analysis based upon this information.

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Definitions

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

Supply Dependence A notion related to Supply Diversification in terms of dependence of a Zone on a particular external supply source; it is measured through an indicator which is set at 20 % and 60 % share of an external supply source in covering the total annual demand forecast of a Zone.

Supply Stress A supply situation which is marked by an exceptional supply pattern due to a supply disruption.

Technical capacity The maximum firm capacity that the Transmission System Operator can offer to the network users, taking account of system integrity and the operational requirements of the transmission network (Art. 2(1)(18), REG-715)

Transmission The transport of natural gas through a network, which mainly contains high-pressure pipelines, other than an upstream pipeline network and other than the part of high-pressure pipelines primarily used in the context of local distribution of natural gas, with a view to its delivery to customers, but not including supply (Art. 2(1)(1), REG-715)

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

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

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

Abbreviations

ACER	Agency for the Cooperation of Energy Regulators
ASIG	Associazione svizzera dell'industria del gas / Swiss Association of Gas In dustry
BCM	Billion Cubic Meter
BE	Belgium
BLN	Billion
BNetzA	Bundesnetzagentur / German National Regulatory Agency
BP	British Petroleum
CAM NC	Capacity Allocation Mechanisms Network Code
CCGT	Combined Cycle Gas Turbine
CEE	Central Eastern Europe
CEGH	Central European Gas Hub
CH	Switzerland
CMP	Congestion Management Procedures
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
Co-authors	Fluxys Belgium; GRTgaz; Fluxys TENP; terranets bw; Open Grid Europe; Infrastrutture Trasporto Gas; Snam Rete Gas; Swissgas; FluxSwiss
CRE	Commission De Regulation de L'Energie / French National Regulator Agency
CS	Compressor Station
DE	Germany
DG	Directorate-General
DN	Diameter Nominal
DP	Dynamic pressure
EC	European Commission
ENTSO-E	European Network of Transmission System Operator for Electricity
ENTSOG	European Network of Transmission System Operator for Gas
EU	European Union
FID	Final Investment Decision
Fnb Gas	Vereinigung der Fernleitungsnetzbetreiber Gas e. V.
FR	France
GLE	Gas LNG Europe
GRIP	Gas Regional Investment Plan
GSE	Gas Storage Europe
GTM	Gas Target Model
GUP	Grenzüberschreitender Punkt / Cross-Border Interconnection Point
GWh	Giga Watt hour
GWh/d	Giga Watt hour/day
GWh/y	Giga Watt hour/year
H-Gas	High-calorific natural gas
ICT	Information & Communications Technology
IEA	International Energy Agency
IP	Interconnection Point
IT	Italy
IZT	Interconnector Zeebrugge Terminal
Km	Kilo meter
KWh	Kilo Watt hour
L-Gas	Low-calorific natural gas
LNG	Liquified Natural Gas
Mcm	Million cubic meter
Mcm/d	Million cubic meter/day
Med	Mediterranean
MSm^3	Mega Standard cubic meter
MSm^3/d	Mega Standard cubic meter/day
MW	Mega Watt
MWh	Mega Watt hour
NBP	National Balancing Point
NCG	Net Connect Germany
NDP	Network Development Plan
NEP	Netzentwicklungsplan (German Network Development Plan)
NeMo	Network Modelling
NOS	Nordschwarzwaldleitung – Northern Black Forest Pipeline
NRA	National Regulatory Authority
NSI	North South Interconnection
NW	North West
O&M	Operation & Maintenance
OECD	Organisation for Economic Co-operation and Development
OLT	Offshore LNG Toscana
PCI	Project of Common Interest
PEG	Points d'Echange de Gaz
PSV	Punto di Scambio Virtuale

RES	Renewable Energy Source
SCP	South Caucasus Pipeline
SEN	Strategia energetica nazionale / National Energy Strategy
SN	South North
SNC	South-North Corridor
SOCAR	State Oil Company of Azerbaijan Republic
SoS	Security of Supply
TANAP	Trans Anatolian Pipeline
TAP	Trans Adriatic Pipeline
TEN	Trans-European Networks
TENP	Trans Europa Naturgas Pipeline
THT	Tetrahydrothiophene
TSO	Transmission System Operator
TTF	Title Transfer Facility
TWh	Tera Watt hour
TWh/y	Tera Watt hour/year
TYNDP	Ten Year Network Development Plan
UGS	Underground Storage
USD	US Dollar
VHP	Virtueller Handelspunkt/ Virtual trading point
WEO	World Economic Outlook of IEA
WGV	Working Gas Volume
ZLNG	Zeebrugge LNG Terminal
ZPT	Zeepipe Terminal
ZTP	Zeebrugge Trading Point

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