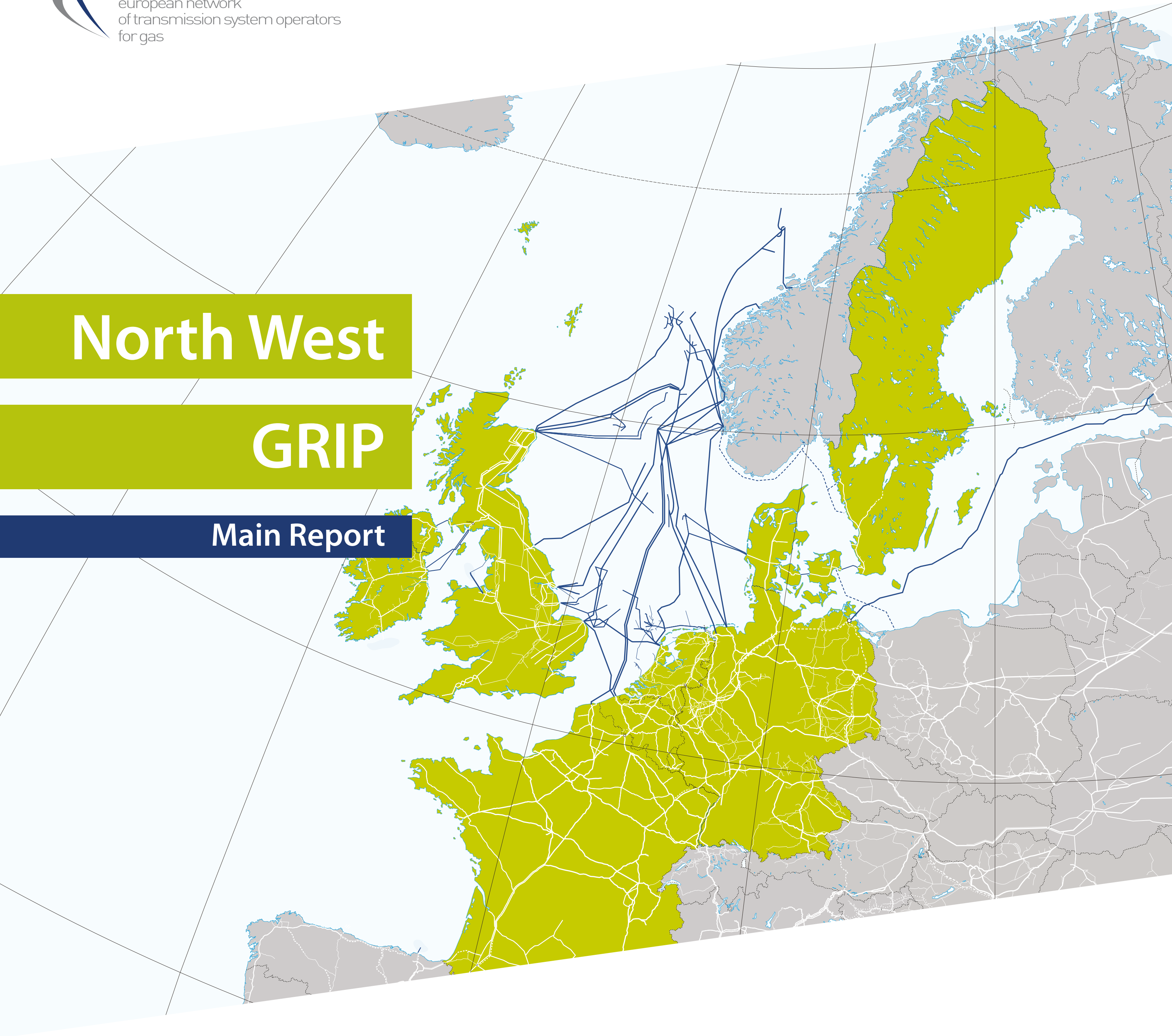
entsog
european network of transmission system operators for gas

Gas Regional Investment Plan
2013-2022



North West GRIP

Main Report

FLUXYS | TENP
FLUXYS | BE
FLUXYS | NEL
nationalgrid
Interconnector
TIGF
ENERGINET/DK
bayernets erdgas transport systeme
Thyssengas ERDGASLOGISTIK
gasunie transport services
gasunie crossing borders in energy
Wir transportieren Gas. nowega
swedegas
goal
ontras
Open Grid Europe The Gas Wheel
premier TRANSMISSION
gaslink Gas System Operator
GASCADE
NEL
GTG NORD
creos
GRTgaz Deutschland
GRTgaz

Table of Contents

LIST OF FIGURES & TABLES


Image courtesy of NW European TSOs

Foreword

It is my pleasure to welcome you to the second edition of the North West European Gas Regional Investment Plan (NW GRIP).

The 2013 edition of the NW GRIP builds on the previous edition of the NW GRIP and also complements the Ten Year Network Development Plan (TYNDP) 2013-2022 published by ENTSOG in February 2013. This GRIP is the result of close cooperation between the Transmission System Operators (TSOs) in the nine countries which are covered in the North West European region. This continued cooperation between the TSOs has spanned the past few decades and is evident in the day-to-day operations of the gas network in this region. The coordination of this document was facilitated by Gasunie Transport Services (GTS).

Stakeholders have been given an opportunity to engage in the development of this GRIP, through an official consultation and the responses received have further enhanced the quality of the document. The NW GRIP working group will also be launching a post publication consultation of the GRIP and welcomes further comments from stakeholders, which could improve future editions of the document.

Annie Krist
Entsog Board Member Coordinator of NW GRIP
Managing Director GTS

1.0 Introduction

This is the 2nd Gas Regional Investment Plan (GRIP) produced by the Transmission System Operators (TSOs) of North West Europe. This GRIP covers gas infrastructure projects and analysis from the following countries: Belgium, Denmark, France, Germany, Ireland, Luxembourg, The Netherlands, Sweden and the United Kingdom.

It 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. This GRIP will contribute to the fulfilment of tasks listed in the Gas Directive and Gas Regulation. Every effort has been made to ensure that this GRIP is consistent with the TYNDP 2013-2022 produced by the European Network of Transmission System Operators for Gas (ENTSOG), with existing National Plans and with the Gas Regional Investment Plans from other regions.

The underlying report focuses at regional level on:

- The specifics of the North West European region
- Supply and Demand evolution
- Additional regional analysis of the results identified in the TYNDP 2013-2022
- North West European Infrastructures which remedy the various issues in the region

The structure of the report covers these areas in detail. Furthermore, this report has taken into account the feedback received from stakeholders after the publication of the 1st GRIP in 2011. In addition to the feedback received after the first GRIP, stakeholders have had an opportunity to engage in the development of this GRIP through forums organised within the ENTSOG and Gas Regional Initiatives (GRI NW) platforms. The TSOs of the region also organised an official GRIP development consultation, as a means for stakeholders to engage in the development process. TSOs of the region would like to thank the stakeholders involved in this process and welcome continued engagement for future editions of the GRIP.

Based in part on the feedback received, the main enhancements of this edition are:

- A more harmonised approach between the different GRIPs, thanks to more coordination with the other GRIPs within the ENTSOG framework
- The interaction with stakeholders has been developed with presentations/exchanges at GRI NW meetings along with the open stakeholder consultation which was held in April 2013
- To provide more information on open seasons and other market based procedures which can trigger an investment and have recently occurred or are planned for the forth coming years
- Inclusion of projects from TSOs and non-TSOs
- Updates of gas demand forecasts in order to take into account the latest developments, in particular from the power generation sector
- In-depth analysis of the infrastructure needs identified for the region through inter alia National Plans, Open Seasons, Auctions, the TYNDP 2013-2022, and based on the analysis of Hubs price spread
- A detailed presentation of the remedies responding to the identified needs of the region

The TSOs of the region hope that this document will help the market to assess the need for gas infrastructure in the region and provide useful information to all stakeholders.

2.0 North West Specifics

2.1 INTRODUCTION

The North West Specifics chapter gives a unique insight into how the gas network of the North West region has evolved over the years and the challenges it faces in the years ahead. The chapter will utilise the synergies from the ENTSOG TYNDP 2013-2022 methodology by analysing how the implementation of the three pillars of European energy policy have and could further impact the North West network.

The capacity offered by gas infrastructure projects directly contributes to the development of the European internal energy market by enhancing all three aspects of the European energy pillars. With respect to competition, efficiently utilised infrastructure capacity is one of the key drivers to hub liquidity. For security of supply, sufficient cross border capacity allows the free movement of gas to the market where it is needed most. Finally, in a sustainable world, gas infrastructure capacity can play a significant role in supporting renewable energy sources when circumstances require a very reliable, clean and flexible source. This chapter will conclude with an overview of the Groningen and low calorific gas regions and an outlook of these markets up to 2022.

2.2 A HISTORY OF COOPERATION

The long and close collaboration between the TSOs in North West Europe is strongly related to the historical development of the gas grid in the region. The discovery of the giant Groningen gas field in The Netherlands in 1959 and the later discoveries of gas fields in the North Sea triggered the spread of gas across North West Europe. Since the early 1960s international cooperation has been part of the daily business of TSOs from ensuring sufficient cross-border capacity to preventing and overcoming incidents. This strong international partnership in North West Europe has also been crucial for the high level of market integration and security of supply in the region. This is supported by the results of the TYNDP 2013-2022 published in February 2013, which shows very few market integration issues for the region (detailed in chapter 4) and is further highlighted by the statements in the Commission's 2012 communication 'Making the Internal Market Work'[1].

The gas transportation grid in North West Europe was originally built to transport indigenous production from Dutch and UK gas fields to regional demand centres, as can clearly be seen in figure 1. Due to declining levels of indigenous production and increasing levels of national and regional demand, the requirement to source gas from further afield became a necessity. The North West region's thirst for natural gas resulted in significant infrastructure projects being undertaken to bring gas to the region from large suppliers like Norway and Russia. Figure 2 shows at a high level, how the European gas network has evolved, showing the development of the transmission system in Eastern Europe, which facilitates Russian flows to the North West region. There has also been considerable growth in the North Sea network enabling Norwegian gas to flow directly into Belgium, France, Germany, The Netherlands and the UK. In order to diversify supply sources even further, the North West region has seen an increase in the number of LNG supply terminals constructed, from which gas from all over the globe can be supplied.

[1] COM(2012)663, http://ec.europa.eu/energy/gas_electricity/internal_market_en.htm

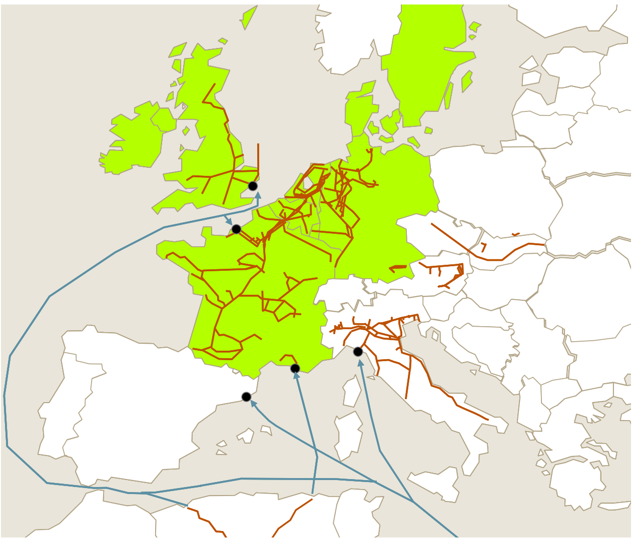


Figure 1
European Gas Grid in 1970

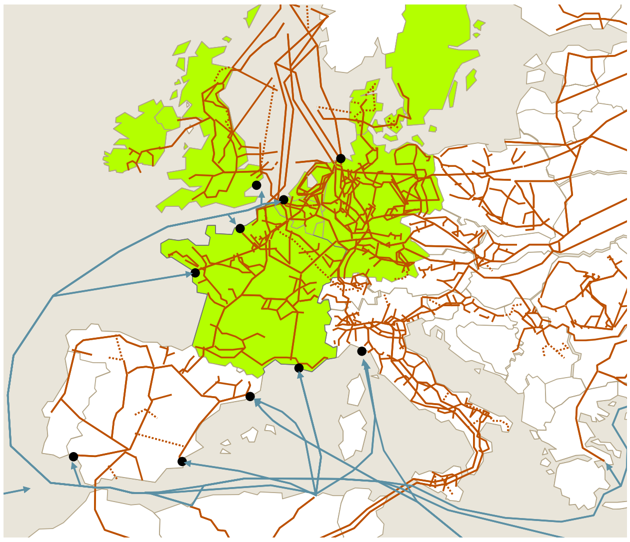


Figure 2[2]
European Gas Grid in 2000

2.2.1 TSO Cooperation

TSOs are challenged to run their networks as efficiently as possible either through incentives or other mechanisms, and as such solving constraints on cross-border points is part of the day-to-day operational business of TSOs. Neighbouring dispatching centres work closely together, where required, optimising gas flows and operation of the network in the region.

The dispatching centres of the region have various means to deal with such cross-border issues. For example:

- To swap gas (re-routing), not only bilaterally but also tri-laterally
- Operational Balancing Agreements (OBAs)
- Mutual assistance, for instance to reduce fuel gas
- Exchange of personnel knowledge and knowhow

The long established cooperation between the North West TSOs was formalised with the implementation of the 3rd Energy Package (Regulation (EC) No 715/2009) in March 2011. In most cases, the North West TSOs play a leading role when it comes to implementing the 3rd Energy Package. A few examples where the regional TSOs play an active part are:

- The significant involvement of North West TSOs in the drafting and implementing of the European Network Codes
- The very active participation of the North West TSOs in the development of ENTSOG documents like the TYNDP 2013-2022

Some very illustrative examples about the close cooperation of the North West TSOs are the recent UK Winter 2013 case, where the UK relied heavily on continental supplies and the way in which the North West region dealt with the 'Cold Snap' in February 2012, during which German North South transport was re-routed through The Netherlands and Belgium. Both examples are listed as case studies in the following section.

[2]Source: Fluxys Belgium

Case Study: UK Winter 2012/2013

Since 2000 the UK has significantly increased its import capacity, with the UK becoming a net importer of gas for the first time in 2004. The UK now has a diverse range of gas sources available, including domestic production, pipeline imports from continental Europe (IUK and BBL), pipeline supplies from Norway, LNG and storage.

Security of Supply in the UK is delivered through an effective gas market. Due to the liquidity of the UK wholesale market in the event of high demand days, it is expected that gas would become available due to the increase in gas prices.

The UK faced a unique range of circumstances during the 2012/2013 winter and especially in March 2013, which was the coldest in 50 years. The unseasonably cold weather combined with low levels of LNG, caused by a tight global LNG market, and little demand-side response from power generation led to storage stocks being rapidly depleted. Therefore in March 2013 the UK relied heavily on national production and pipeline supplies from Norway and from continental Europe. Whilst significant Norwegian supplies have been utilised in previous winters, it was the first time that continental supplies played such a key role in the UK supply mix. The combined flow of both IUK and BBL reached 114 mcm/d on 21st March 2013; the highest ever flow to the UK from continental Europe. In particular the Interconnector was used at full capacity for several days. This high water mark of continental flows to the UK was not a one-off, but rather a sustained flow pattern during March 2013, as can be seen in the table. Capacity that had never before been utilised was used when there was a significant financial incentive to flow gas into the UK market.

This period of high interconnector usage based on a high price differential shows how well the market arrangements between the UK and the interconnectors can work. Historical flows through IUK and BBL have been analysed by the Regulators (Ofgem, CREG & ACM) who are investigating instances where the flow of gas went against the price differential. There is a substantial body of work associated with this analysis which suggests ways to further optimise the flow of gas across the Interconnectors[3].

The table shows the top 15 highest ever flow days of gas from continental Europe to the UK (combined IUK and BBL flows)[4].

The next highest continental supply day came on 7th January 2010, which was due to serve climate conditions and is the now the 24th highest flow day from the continent to the UK.

RANK	DATE	CONTINENTAL IMPORTS (MCM/D)
1ST	21-Mar-13	114.10
2ND	24-Mar-13	111.19
3RD	23-Mar-13	110.40
4TH	20-Mar-13	104.43
5TH	25-Mar-13	101.83
6TH	05-Mar-13	97.07
7TH	07-Mar-13	94.24
8TH	08-Mar-13	94.09
9TH	26-Mar-13	93.66
10TH	22-Mar-13	92.76
11TH	31-Mar-13	92.27
12TH	13-Mar-13	90.02
13TH	30-Mar-13	88.11
14TH	14-Mar-13	85.87
15TH	27-Mar-13	84.19
24TH	07-Jan-10	80.14

Table 1

Highest flow days from Continental Europe to the UK (via BBL & IUK)

[3] https://www.ofgem.gov.uk/ofgem-publications/75776/interconnector-flows-further-analysis-next-steps-final.pdf
[4] Source: National Grid

Case Study: German Cold Snap in February 2012

During February 2012, there was a long cold snap in Russia and in central Europe, especially in the South of Germany, Italy and France. The Russian situation resulted in considerably reduced gas flows of up to -30% from Russia entering the Net Connect Germany (NCG) market area at Waidhaus.

In this period, exceptional temperatures of -20°C and below were recorded at weather stations in Southern Germany. These low temperatures led to high gas demand from end customers. As the cold snap continued over an unexpectedly long period and with exceptional low temperatures, some German distribution system operators (DSOs) registered historical peaks in capacity utilisation. In addition, transit flows increased compared to the average winter gas flows from Germany to France by 5 GWh/h (exit point Medelsheim) and from Germany via Switzerland to Italy by 6 GWh/h (exit point Wallbach)[5].

The German TSOs managed to fulfill the firm transmission contracts to the neighbouring TSO and DSO grids during this entire extraordinary phase, thereby ensuring the supply to German end consumers was maintained all the time. Nevertheless, a number of interruptible contracts had to be interrupted.

In addition to the actions of the German TSOs, it has to be stressed that the cold snap was supported by the good cooperation of European infrastructure operators. On request, neighbouring TSOs from The Netherlands and Belgium were taking gas flows from North to South to ensure grid stability. The Dutch TSO, GTS, and the Belgium TSO, Fluxys Belgium, assisted OGE by taking in additional gas and supplying this gas back into the German system via the Southern Dutch and Belgian border (Bocholtz - 's Gravenvoeren - Eynatten). This is an example of a swap between neighbouring network operators and enabled an additional 100 million m^3 to be transported in less than 14 days.

2.3 THE ROLE OF GAS IN THE REGIONAL ENERGY SUPPLY MIX

The share of gas in the gross energy consumption varies considerably per country, as is illustrated in table 2[6]. The table nevertheless highlights the important role gas plays within the North West region.

The role of gas in the electricity generation merit order in the North West region is changing (see figure 3) due to the combination of relatively low coal and carbon prices together with more renewable energy sources coming on line. Nevertheless, as figure 3 illustrates, even in 2011 with these external factors in play, gas still played a significant role in the regions electricity generation mix. Yet the figures also show there are differences in each country's electricity

2010 AND 2011 GAS SHARE IN GROSS ENERGY CONSUMPTION SOURCE TYNDP 2013-2022		
COUNTRY	**2010**	**2011**
Belgium	27,5%	25,7%
Denmark	20,0%	16,6%
France	16,1%	14,4%
Germany	21,9%	20,1%
Ireland	31,5%	29,3%
Luxembourg	26,3%	22,7%
The Netherlands	42,3%	42,2%
Sweden	2,9%	2,3%
United Kingdom	39,4%	34,4%

Table 2[6]
Gas Share in Gross Energy Consumption

[5]Source: Bundesnetzagentur: Bericht zum Zustand der leitungsgebundenen Energieversorgung im Winter 2011/12
[6]Please note that figures for 2012 were not available at the time of writing

generation mix. There are numerous potential reasons for these national differences, it could be because of political top down decisions or due to market based economics, or an increase in alternative generation sources.

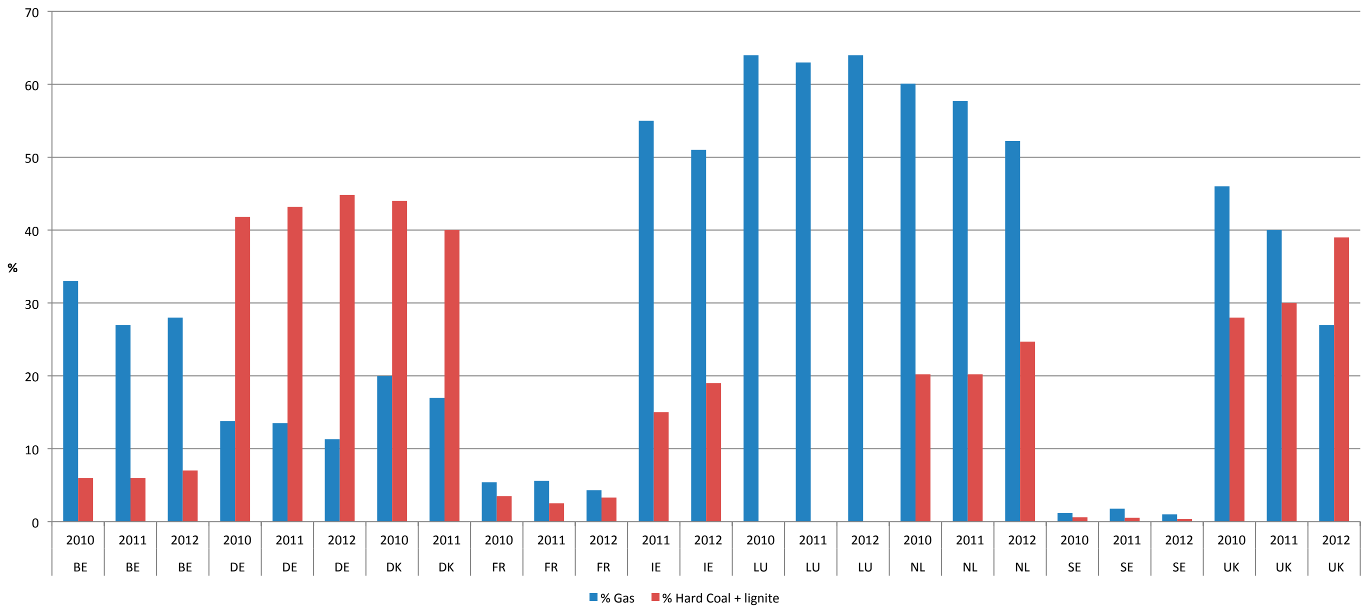


Figure 3
Share of Gas and Coal in Power Generation Fuel Mix

The annual gas demand compared with electricity demand for each Member State does show a different picture. In almost all NW European countries, the use of gas is significantly higher than the use of electricity. This is shown in figure 4. The exception is Sweden which has a relatively small gas market, and in France, where gas and electricity have an almost equal demand. When all NW European countries together gas and electricity demands are aggregated together and compared, the role of gas in the energy mix is some 60% higher than that of electricity.

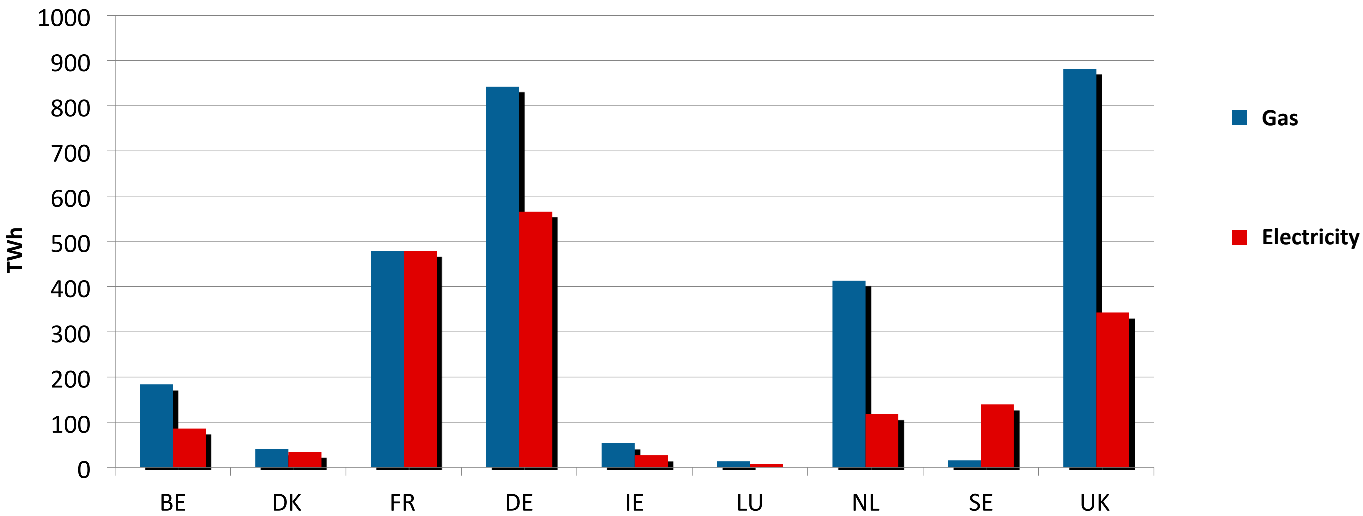


Figure 4
Annual Gas & Electricity Demand 2011[7]

[7]Source: Eurelectric and ENTSOG

A difference between gas and electricity may also be observed when looking at the location of production and consumption. Electricity production and consumption is more localised (consumed in the same country where it is generated), compared to gas which is much more internationally traded and transported. This is shown in figure 5 and 6. It may also be observed that long haul transport of gas is much cheaper than transport of electricity.

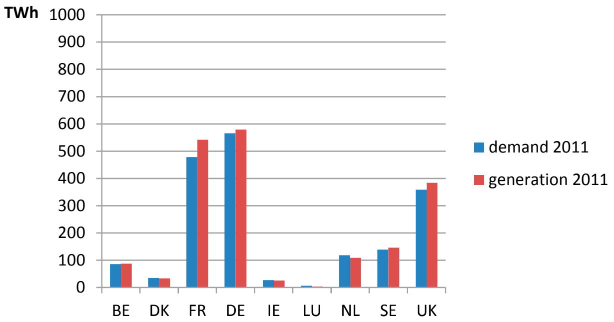


Figure 5

Electricity Production and Consumption

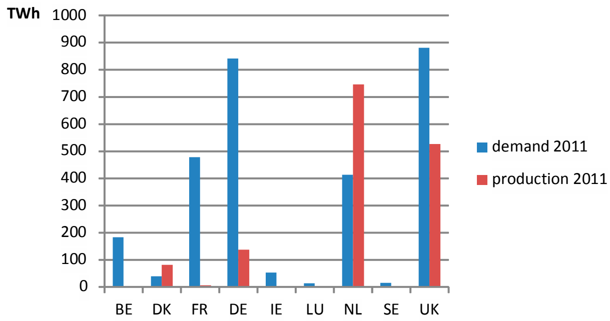


Figure 6

Gas Production and Consumption

This difference between location of consumption and location of production has a consequence for the cross-border interconnection capacity when gas is compared with electricity on a country by country basis. Figure 7 below shows the cross-border interconnection capacity within the North West European region for both gas and electricity on a country by country basis. The difference is in part explained by the difference in market size: the gas market is about 60% larger than the electricity market on an annual basis. A second explanation is the peak demand of gas and electricity which differs even more than 60%. A third explanation is the fact that most of the gas consumed is not produced in the same country. In all, gas interconnection capacities are more than ten times as high as electricity interconnections. The gas markets are therefore much more interdependent than the electricity markets. Although this data should be regarded as indicative, it can be seen that there is more gas interconnection capacity than electricity interconnection capacity.

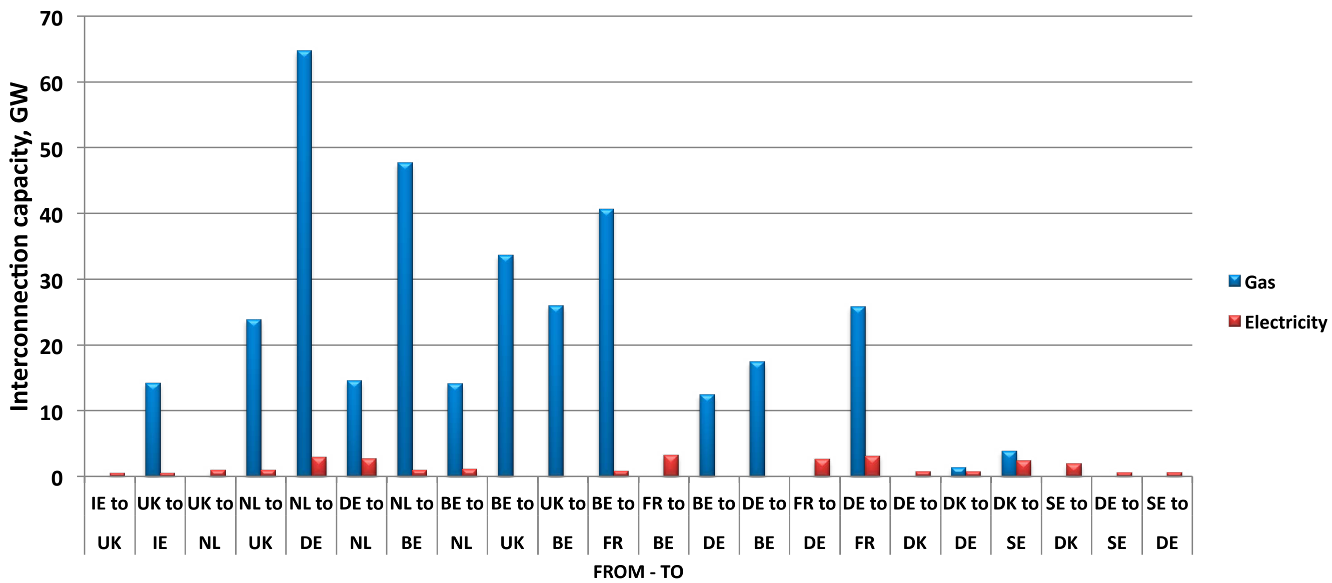


Figure 7

Cross Border Interconnection Capacity[8]

[8]Source: ENTSO-E, TenneT and ENTSOG, 2013 figures

2.4 THE L-GAS MARKET IN NORTH WEST EUROPE

Low calorific gas (L-gas) is produced in The Netherlands and in Germany. Dutch Groningen gas (G-gas), originating from the Groningen field is blended with High calorific gas (H-gas) to obtain L-gas which is exported to Germany, Belgium and France. Blending H-gas with nitrogen is also used to produce L-gas.

Reserves of L-gas are in decline, both in Germany and in The Netherlands as can be concluded from the two graphs below (more information about production in North West Europe can be found in chapter 3).

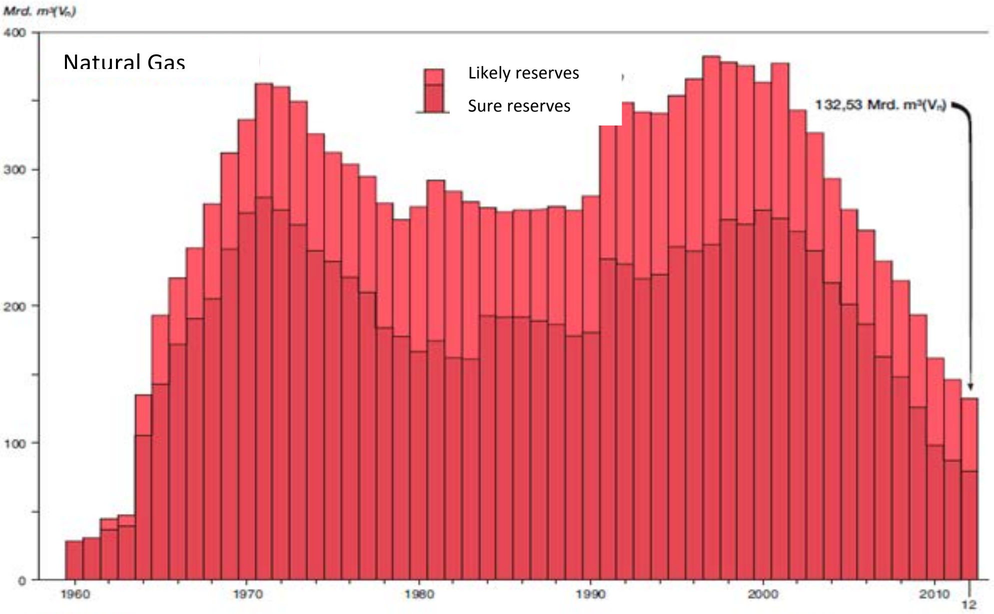


Figure 8
Reserves of L-gas in Germany[9]

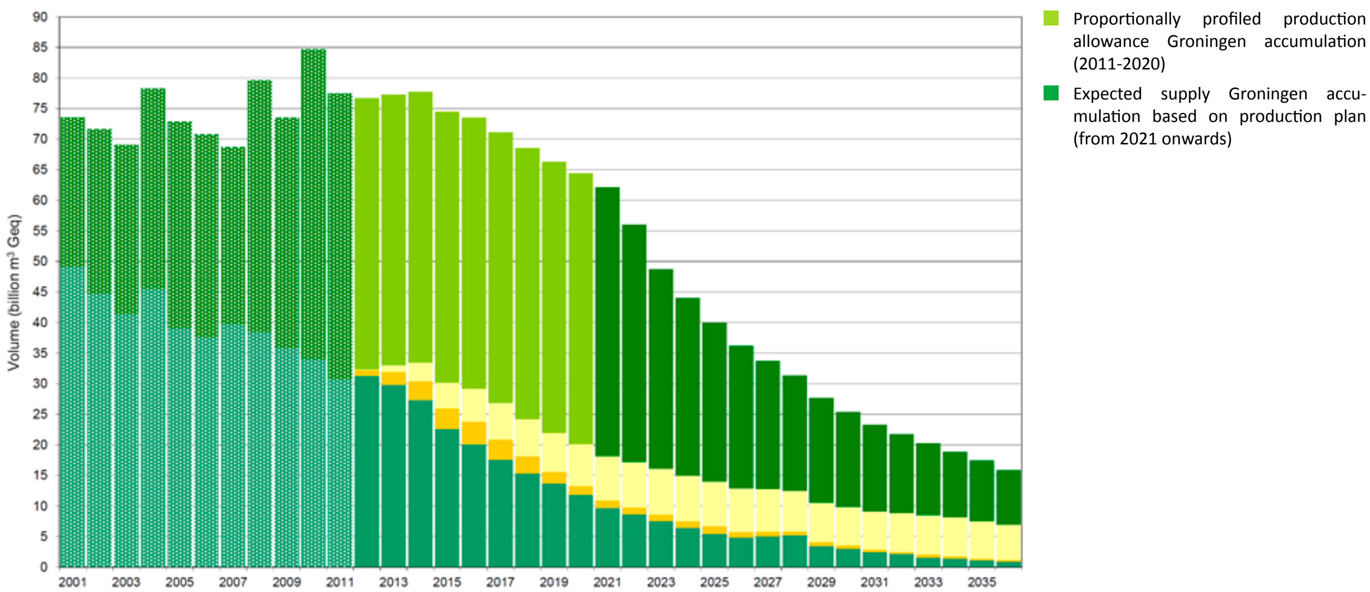


Figure 9
Production of L-gas in The Netherlands[10]

[9]Source: http://www.lbeg.niedersachsen.de/portal/live.php?navigation_id=657&article_id=865&_psmand=4
[10]Source: http://www.nlog.nl/en/oilGas/oilGas.html

The following figures illustrate the L-gas markets and provides a detailed overview of the different production, storage and blending stations available[11]. A fair share of the Belgian market is supplied with L-gas. The high pressure L-gas network is indicated with the blue lines in figure 10.

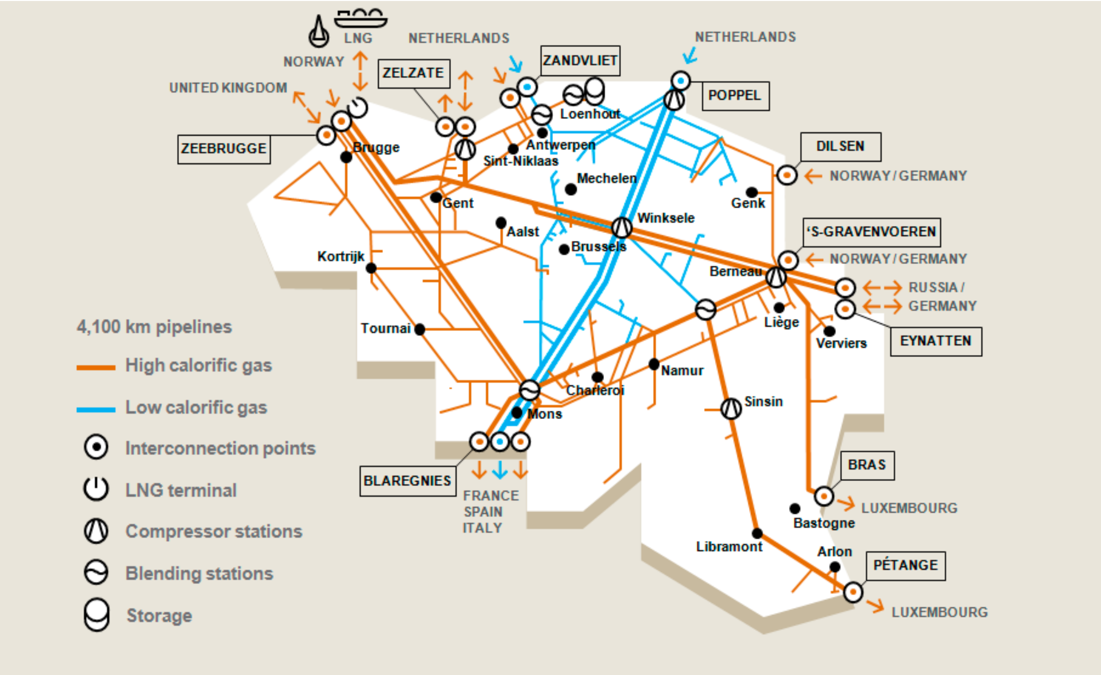


Figure 10

L-gas and H-gas High Pressure Network in Belgium

In France, part of the Northern market is supplied with L-gas. The high pressure L-gas pipelines in France are indicated in yellow (figure 11).

L-gas

H-gas

Figure 11

L-gas and H-gas High Pressure Network in France

[11]The Dutch market is mainly supplied with G-gas. This market area will not be further detailed in this chapter

The German L-gas market is indicated by the yellow dots in North, West and Central part of the country. The number included in the yellow dots refers to the L-gas conversion areas, which are ranked according to the German Network Development Plan Gas 2013 (‘Netzentwicklungplan, NEP 2013’).

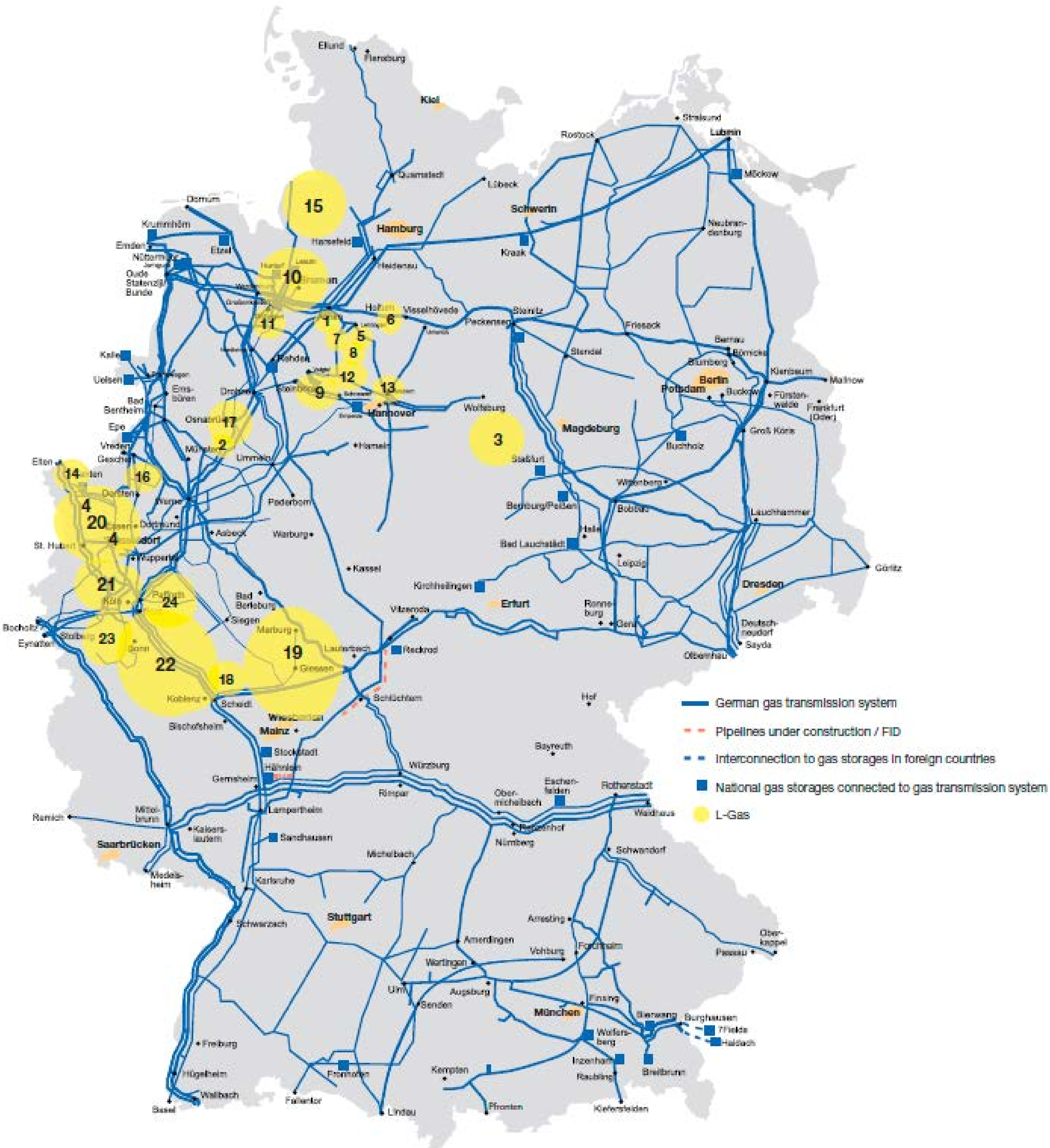


Figure 12
German L-gas market conversion areas

The current market demand for all L-gas countries (including the Dutch G-gas market) is shown in the overview below. It indicates the different sizes of the markets, the countries producing L-gas, G/L-gas storage and the quality conversion facilities.

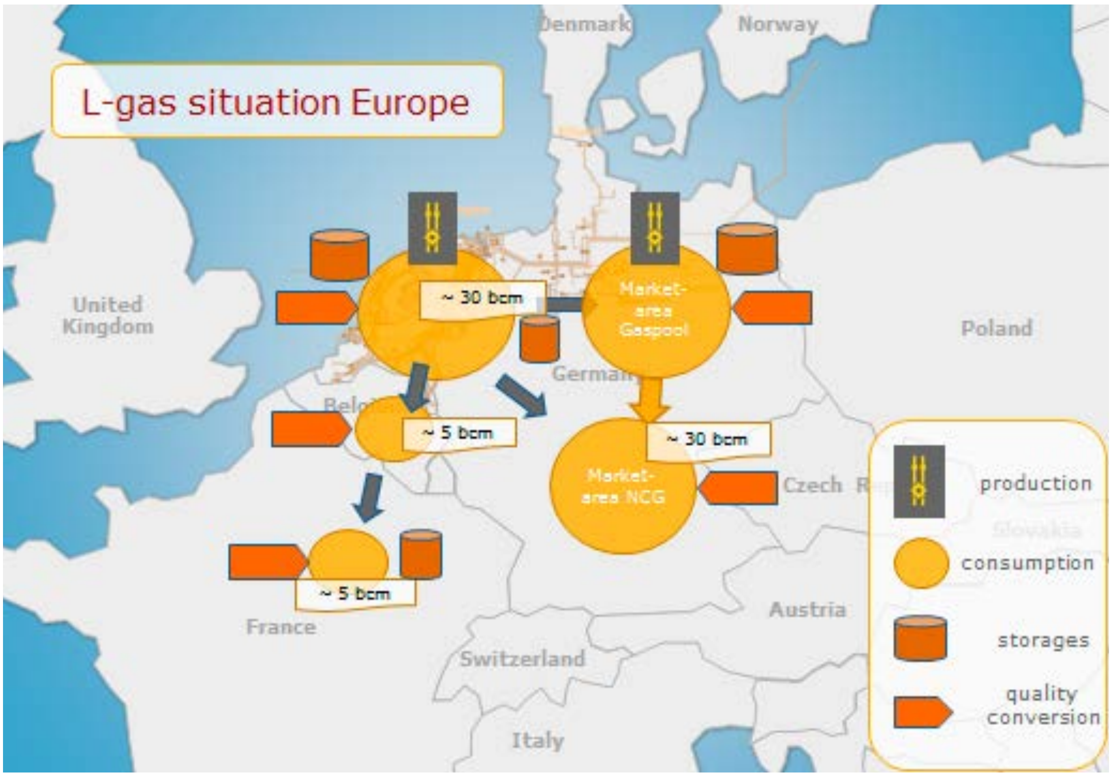


Figure 13
Overview of G-gas and L-gas market

It has become clear that the current L-gas market demand cannot be sustained. Other sources of gas will, in due course, replace the L-gas sources. This topic is being discussed on the Gas Platform with representatives of the involved Member States. For L-gas coming from The Netherlands, a gradual conversion of the markets in Germany is foreseen around 2020 to be followed later on in Belgium and France (circa 2025). The conversion of the domestic market in The Netherlands is not likely to start before 2030, because the current appliances are not suitable to be switched to different gas qualities. Conversion of the markets will take several years seeing as all appliances will have to be checked and adapted to a different gas quality range and adaptation of infrastructure is also required. As part of the requirement for future market conversion, the German NEP 2013, takes into account a reduction of L-gas import capacities from The Netherlands of about 10% per year starting from 2020. To prepare Germany for the L-gas decline and the reduction of indigenous production the conversion of some L-gas areas will start around 2016.

The TYNDP 2013-2022 has not modelled the conversion of L-gas markets separately because the future need for L-gas substitution is neither a matter of resilience of the system nor can L-gas be imported from somewhere else, which is the core focus of the TYNDP 2013-2022. The conversion of this market into H-gas markets will be the result of on-going intensive interaction between governments, TSOs and suppliers. Currently, evaluations are carried out regarding the possibilities for the substitution of L-gas; the exact impact this may have on infrastructures has not yet been fully determined.

Because the GRIP covers a ten-year-period, only conversion of the German L-gas market up to 2022 is dealt within this GRIP. The other L-gas markets in Belgium, France and the G-gas market in The Netherlands will be converted at a later stage.

To prepare Germany for L-gas conversion the German L-gas TSOs established a working group in 2011 to analyse the future development of L-gas. The results of the working group have been included in the recent modelling draft for the German NEP 2013. The Plan includes some of the consequences of this conversion which have already been investigated. The selection of areas must be done carefully, cost efficiently and in compliance with SoS targets.

General criteria for finding conversion areas in Germany are:

- Usage of existing interfaces of H- and L-gas-networks
- Integration of existing L-gas transmission infrastructure for H-gas transports after the conversion
- Definition of network areas, where quality conversion at the time of conversion is controlled securely (number of facilities, available experts, etc.)
- Secure need of exit capacity within the L-gas market for production units for full usage
- Connection of H-gas pipelines within close proximity to high transport capacities
- Secure source of storages within the L-gas system to facilitate the demand-supply-balance
- Consideration of the impacts of the separation of adjacent networks for a partial conversion to H-gas
- Maintain the security of supply for the L-gas-system
- Additional H-gas capacities have to be taken into account

Identification of H-gas sources for the German market has also been analysed in the previous NEP and is also subject to further studies in the new NEP. An extract is shown from the scenario development of this NEP in the schematic diagram below[12].

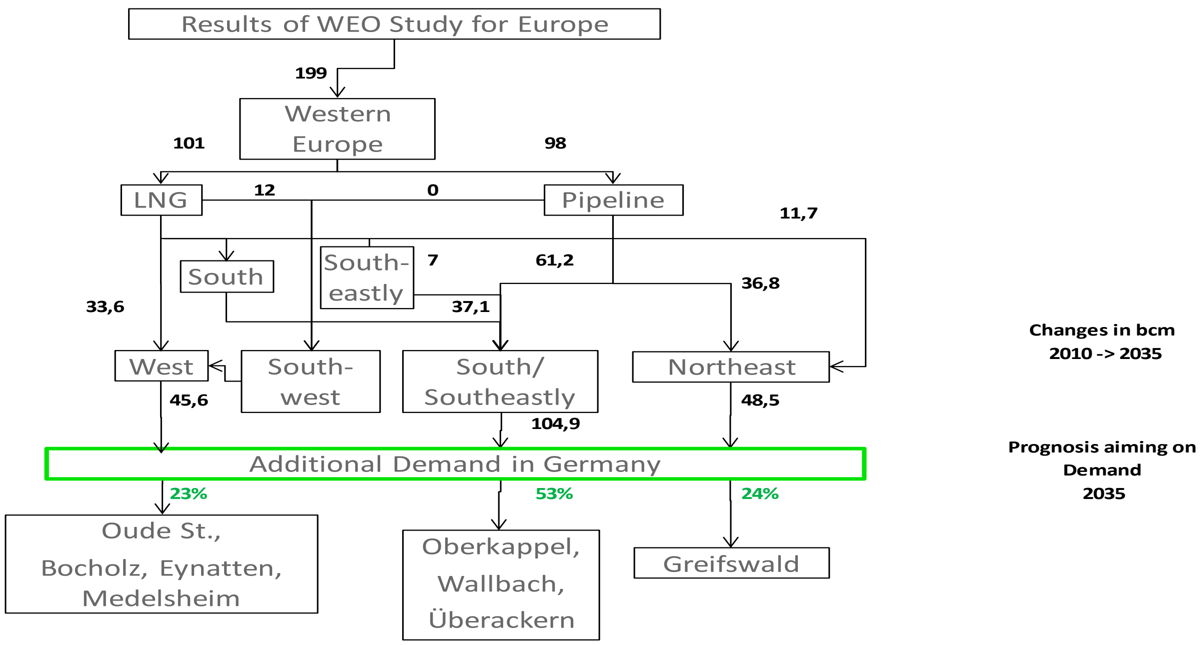


Figure 14

Distribution of future H-gas sources for Germany

[12]http://www.fnb-gas.de/files/nep_gas_2014_szenariorahmen_konsultationsdokument_2013-07-22.pdf

2.5 ODOURISATION IN THE NORTH WEST EUROPEAN TRANSMISSION SYSTEMS

Natural gas is odour-free, but in order to identify any leaks on the distribution network and on internal facilities, odourised gas is distributed. The distribution of odourised gas is compulsory in all European countries. In most European countries, the odourisation takes place just upstream of the distribution networks. But in some countries, the odourisation process is centralised by transmission systems operators upon entry onto the system; this is the case in France, Ireland, Sweden and Spain. In the NW Region, this difference in gas odourisation practices is an obstacle, except in the case of force majeure, to flows from France to Germany and Belgium[13].

This topic is the subject of a particular point in the network code on interoperability. This code being drafted by ENTSOG was given to ACER in September 2013. Then the process of formal validation by ACER, the EC, the Member-States, the Council and the Parliament will be followed. It will rely on the guidelines issued by ACER on 26th July 2012 which provide for the case where differences in odourisation practices present barriers to trade cross-border gas, operators will seek an agreement within six months.

2.6 THE THREE EUROPEAN ENERGY POLICY OBJECTIVES AND THE NORTH WEST REGION

As illustrated by the findings of National Plans and the TYNDP 2013-2022 the North West gas market is very mature. The networks are strongly interconnected and operational cooperation is part of the day-to-day business of TSOs. However, the North West region still faces challenges in the years ahead, challenges which may result in the need for additional investment. These challenges are best viewed through the prism of the three European energy pillars, competitiveness, security of supply and sustainability.

2.6.1 Competitiveness

Ensuring a level playing field for market participants is a key tenet to achieving a complete internal energy market for gas. The North West region has pioneered liberalised gas markets as it has:

- The largest and most liquid hubs in Europe
- Functioning wholesale markets
- Increasing price convergence between national wholesale markets
- Hundreds of market players
- The most interconnected markets in Europe
- Relatively few cross border congestion issues outlined in the TYNDP 2013-2022 (which will be covered in chapter 4)
- Relatively diversified access to sources of supply outlined in the TYNDP 2013-2022 (which will also be covered in chapter 4)

A key task for any TSO is to ensure that there is enough capacity available efficiently for market participants. By ensuring enough capacity TSOs allow the flow of gas to where it is most valued based on price signals. However, to ensure there is enough capacity available to meet market demand, TSOs require a market signal to build new capacity and a regulatory regime which allows for revenues to be recoverable through a stable and clear tariff regime.

[13]An improvement of this situation will occur in 2015 with the creation of firm capacity from France to Belgium allowed by the installation of a new pipeline and an interconnection for non-odourised gas to be transmitted between Dunkirk and Belgium. It has to be noted that no French customers will be connected to these works, directly or indirectly

In the following paragraphs the investment climate and the gas hubs in the North West region are described.

2.6.1.1 Investment Climate

The North West region is still seen with a positive outlook for investors; however continued success in this regard is far from guaranteed and is becoming more and more of a challenge. Existing and future infrastructure projects will only come on stream if there is:

- A stable investment climate, ensuring that system owners are incentivised to invest in infrastructure projects and that investors can trust that they have a sufficient return on their investments
- A supportive regulatory framework (in the project's definition, execution and operation phase)

The degree of market development and the structure of natural gas transmission systems vary considerably within Europe. Therefore, regulatory regimes should put in place measures tailored to the specific investment needs, which different systems have utilised throughout their development. The TYNDP 2013-2022 listed five groups of 'barriers to investment', being the National Regulatory Framework, Permit Granting, Market, Financing and Political. This report focuses on three areas of particular interest to the NW region.

- **National Regulatory Framework**
  A supportive regulatory framework (in the project's definition, execution and operation phase) facilitates a stable investment climate, ensuring that system owners are incentivised to invest in infrastructure projects and that investors can rely on a sufficient return on their investments.

- **Market**
  The move towards short-term capacity products at extremely low or even zero reserve prices means there is a risk of under-recovery of revenues for the TSOs. This may lead to an unstable tariff regime and potentially results in parties booking long-term capacity picking up additional costs due to those who 'wait and see' and benefit from discounted short-term products. The North West region has already seen the consequences of such a move on the commodity price in the UK. The ratio between UK entry capacity charges and commodity charges has changed from 90:10 to 70:30 in recent years[14]. There is also the long-term impacts, if market participants choose to use only short-term capacity, it will distort investment signals and could eventually lead to congested interconnection points across the North West region.

- **Political**
  Policy makers' decisions have an impact on market confidence, especially in regard to reaching long-term environmental targets. It is therefore vital that policy makers offer consistent and predictable messages. Investment in gas infrastructure is a long-term financial commitment. Inconsistent or partially contradictory political messages can have a direct effect on whether the market feels confident to invest or not. Investors in gas infrastructure traditionally look for long-term low risk investments, where regulatory certainty allows them to recoup their investment over a long period of time. Negative messages regarding the future role of gas in the generation mix could deter investment in gas generation, which could lead to supply issues in the short and medium term.

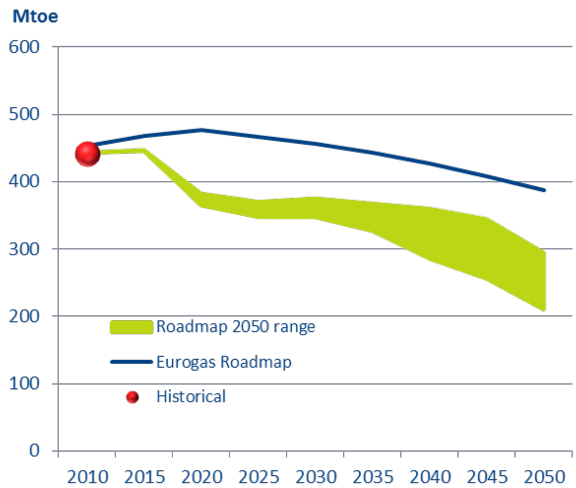
[14]For further information please see: https://www.ofgem.gov.uk/ofgem-publications/59255/ngg-response-call-evidence-use-gas-interconnectors-gbs-borders.pdf

2.6.1.2 Current Gas Generation Environment

The present global market conditions combined with the EU Emissions Trading Scheme (ETS) has led to an increase in the use of coal for power generation over gas. The impact of this on the North West region in the generation merit order has been the moth-balling and closure of gas-fired power plants across the region[15]. Due to changes in the merit order, for example, one of the most efficient gas power plants, Irsching 5, located in South Germany, has run into economical losses. As reduced operating hours do not cover its costs, the closure of the power plant was up for discussion. The closure was only avoided as Irsching 5 has a high relevancy for the electricity system in the Southern German region and a compromise between the plant operator E.ON, the German power TSO Tennet and the German regulator Bundesnetzagentur (BNetzA) was achieved. A compensation payment from the power TSO Tennet to the operator E.ON was agreed for keeping the plant running. This compensation payment then gets passed on to end customers. In the Netherlands some 3 GW of gas-fired power generation will be moth-balled until 2020, and also in the UK[16] and Belgium[17] mothballing occurs due to the reasons mentioned.

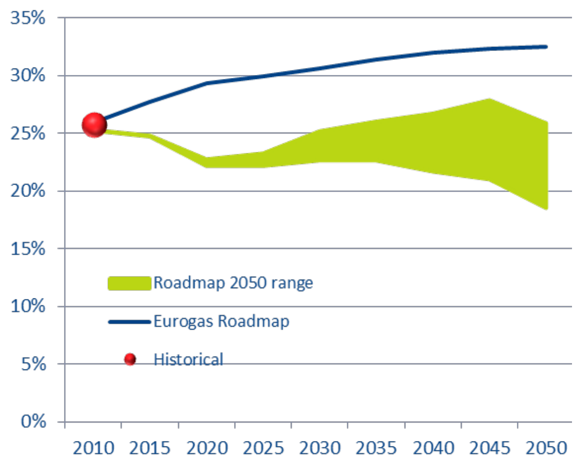
There is considerable uncertainty surrounding the political ambitions to achieve the ambitious European long-term environmental targets. This is illustrated by the strongly diverging annual gas demand projections, as is expressed in figure 15 which is taken from the TYNDP 2013-2022, and summarises the long-term perspective for gas consumption as outlined by the Communication 'Energy Roadmap 2050'.

It should be noted that the 5 alternative decarbonisation scenarios in the Roadmap represent 5 divergent options for the achievement of the same target by 2050 (a reduction of CO2 emissions up to 80-95% from 1990 levels). In a similar exercise, Eurogas Roadmap depicts an alternative energy scenario, where the 2050 reduction targets are achieved with an important contribution from gas. The energy consumption scenario outlined by the Eurogas Roadmap contemplates a substantial improvement in the sustainable use of natural gas in the long-term. This may be achieved with the development of Carbon Capture and Storage and the increase in the use of natural gas as a transportation fuel.



Natural gas in primary energy consumption

Source:TYNDP 2013-2022



Share of gas in primary energy

Source:TYNDP 2013-2022

Figure 15

Gas Demand up to 2050

[15]See for example: http://www.statkraft.com/presscentre/press-releases/statkraft-puts-another-gas-fired-power-plant-into-cold-reserve.aspx
[16]https://www.ofgem.gov.uk/ofgem-publications/75232/electricity-capacity-assessment-report-2013.pdf
[17]http://wathelet.belgium.be/wp-content/uploads/2012/07/Plan-Wathelet-pour-lélectricité.pdf

2.6.1.3 North West European Gas Hubs

The North West region hosts the most liquid and largest hubs in terms of size or traded volume in Europe. The figure below shows the liquidity is increasing. Herens Tradability Index[18] measures different types of factors describing the degree of how liquid the hub is.

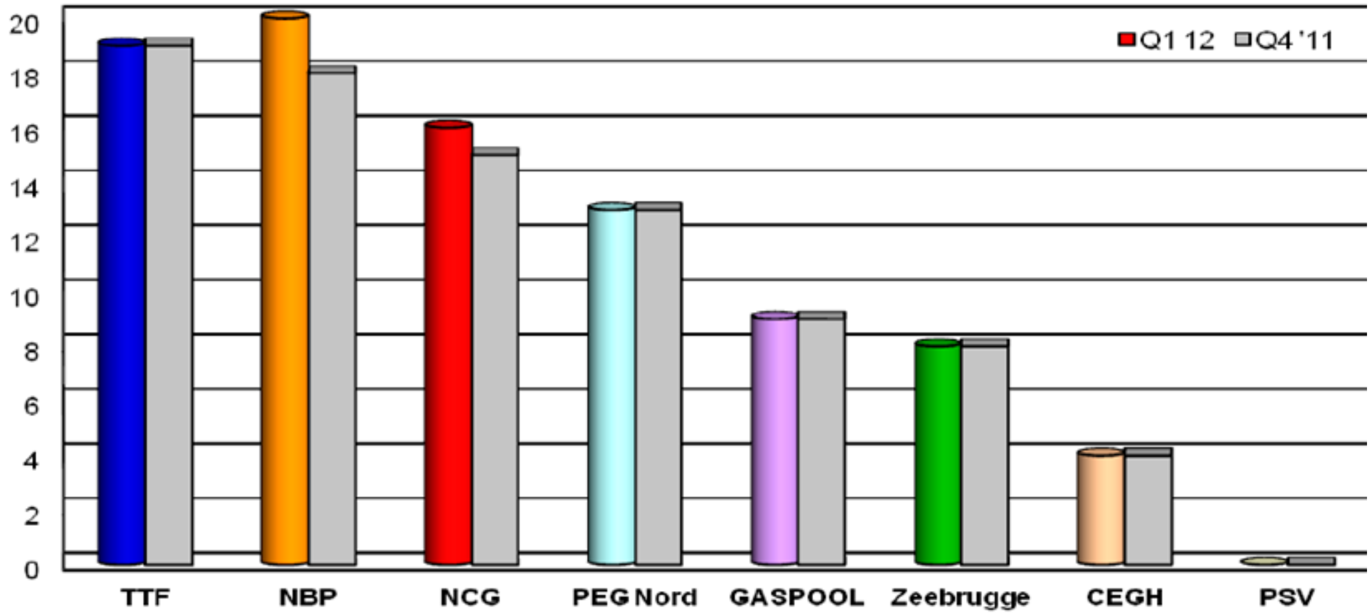


Figure 16
ICIS - Herens Tradability Index Q1 2012

Two[19] virtual hubs, NBP in the UK and TTF in The Netherlands, are the most mature hubs in Europe and they are used for financial risk management of gas portfolios. In addition, they have an open and easy access to trade with a wide range of participants, are transparent and have proven to be reliable in the market.

The virtual hubs NetConnect Germany (NCG) and GASPOOL in Germany together with PEGs in France are less mature than NBP and TTF, yet the traded volumes on these hubs are increasing year on year.

The physical hub of Zeebrugge Beach in Belgium is also in the upper range with respect to liquidity. Zeebrugge Beach is the market for trading physical gas either made available in the Zeebrugge area (from Norway, UK and LNG) or coming from the Belgian market. In October 2012 the new virtual hub ZTP (Zeebrugge Trading Point) was launched together with the new Entry-Exit model in Belgium. After more than ten years, Zeebrugge Beach is one of the most active hubs in continental Europe and is used as a reference in a number of contracts.

Gaspoint Nordic in Denmark is still very small, but the volume is steadily increasing from very low levels.

The liquidity of the North West European region's hubs continues to increase. To measure liquidity, churn ratios (traded volume divided by physical volume) are often used as well as the number of active participants, the HHI of the traded quantities, the variety of contracts the hub offers, and the price spread between bid and offer. Unfortunately, it is not always easy to get access to these factors.

[18]https://www.icis.com/compliance/documents/european-gas-hub-report-methodology-september-2012/
[19]Some parts of the following text have been based on Patrik Heather: 'Continental European Gas Hubs: Are they fit for purpose?', June 2012

The following table shows the total traded volumes on NBP, Zeebrugge, TTF, PEG, GASPOOL, NCG and NPG, and as it is seen, the traded volume continues to increase year on year[20].

YEAR	TWH
2010	9,609
2011	25,000
2012	25,480

Table 3
Total traded volumes on NBP, Zeebrugge, TTF, PEG, GASPOOL, NCG and NPS

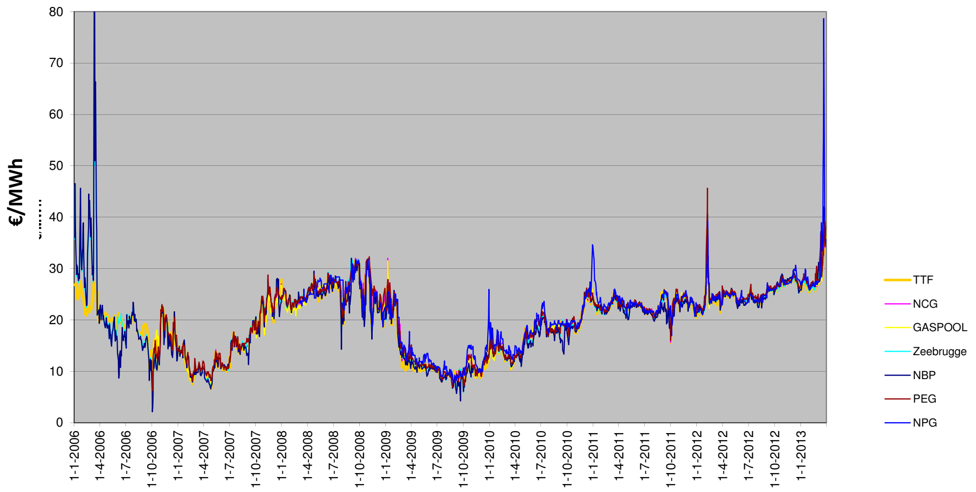


Figure 17
Price development on different European hubs

More evidence to show that hubs have gained more importance, can be seen by looking at the close price correlations between the hubs, and how the price volatility continues to decrease as interconnection capacity is increasingly used to capture spreads between markets. In addition, the volume physically delivered on hubs compared to the total consumption of gas also continues to increase. In 2012, this proportion went beyond 80% looking at the numbers from UK, NL, BE, DE, FR, AT and IT[21]. Also, due to renegotiations of the long-term oil-indexed contracts, the hub gas prices have begun to decouple from the oil indexed price since 2009.

Nevertheless, there are still situations where bottlenecks occur and price-spreads exist between the different hubs despite investments in cross-border capacities and improved service provided. Therefore, even in this already well-supplied region, new investments in gas infrastructure and the improvement of services could help decrease price spreads and volatility. By improving the competition between supply sources, this will support further market integration in the region. An example of where there is still diverging prices is PEG Sud. Figure 18 illustrates the convergence in the monthly average day-ahead gas prices of the North West European hubs. The graph shows for summer 2012 the close price correlations between the North West European hubs compared to some other European hubs. In general, the movements in the day-ahead prices are closely related, but PEG Sud shows a divergent pattern to the other North West European hubs because of the dependency on LNG of this region. Remedies to this situation are presented in chapter 4 section 4.2.1.

[20]Sources: ICIS Heren, ICE, APX-Endex, EEX, Nord Pool Gas and Powernext
[21]Source: Quarterly Report on European Gas Markets, Market Observatory for Energy, DG Energy, Volume 6, Issue 1, First quarter 2013

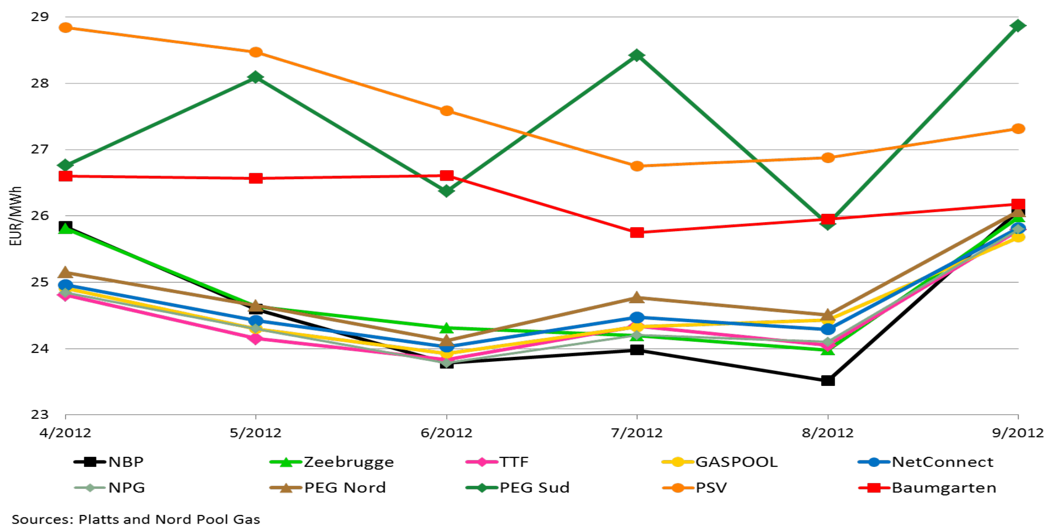


Figure 18
Day-Ahead Gas Prices in NW European Hubs

Another example of existing bottlenecks in the region is the German/Danish case. When gas supplies from the North Sea are not deliverable to the Danish market, Denmark and Sweden rely solely on supply from Germany. In spring 2013, two situations arose where the day-ahead prices on Gaspoint Nordic had increased substantially above the price level in Germany, as figure 19 shows. The figure also shows that exit capacity to Denmark was close to full utilisation during the two spikes. The reason for this spike is the missing expansion of the infrastructure around the Danish-German border. However, once the planned projects are successfully implemented, the price spreads are expected to disappear.

There could be occasions where the use of capacity is not correlated with the price spreads on the regions hubs. As previously stated, analysis has already been undertaken on the UK and continental price spreads. This analysis also features thirteen responses from stakeholders who provide their detailed answer as to why flow against the price differential could occur.

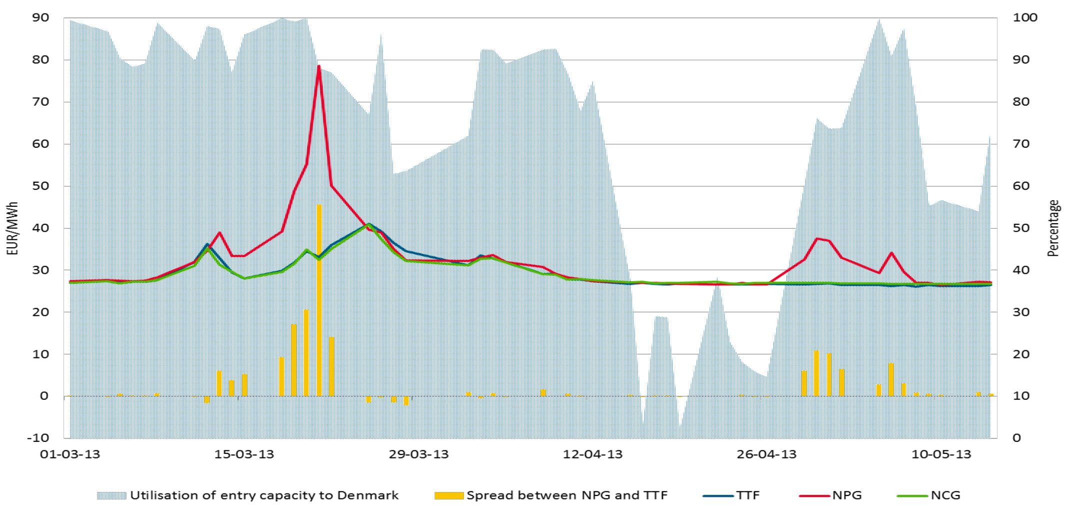


Figure 19
Gas Prices and Capacity Utilisation (Spring 2013)

2.6.2 Security of Supply

Security of Supply is imperative for a well-functioning internal market. The TSOs of the North West region have, over the years, supported developments at national and European level for improving Security of Supply. Due to significant investment in gas infrastructure in recent years, the North West region has some of the most diversified supply sources anywhere in Europe.

As a result of the January 2009 Russia/Ukraine crisis, Security of Supply rose to the top of the European energy agenda resulting in the publication of Regulation (EU) No 994/2010 in October 2010. This Regulation predominantly places obligations on national competent authorities, which are supported by TSOs of the North West region when required. This GRIP in no way intends to duplicate the work completed by competent authorities at a national level in the framework of the implementation of the Security of Supply Regulation.

The North West region has been relatively unscathed by recent gas supply crises which predominately impacted Eastern Europe. As was detailed in the case study about the 2012 Cold Snap (see section 2.2.1), this was not only a challenge for infrastructure but also a supply problem. The North West region has a substantially diversified range of gas supplies, and now has direct access to the following different types of supply:

- National Production
- Russian Gas
- Norwegian Gas
- LNG
- Storage

The North West region does however face Security of Supply challenges ahead, especially relating to the continued decrease in national production. Transmission networks will need to become more flexible to ensure that supplies can be accessed from non-traditional routes and sources. The annual supply analysis in chapter 3 section 3.3 clearly highlights that the North West region will become more reliant on imported gas, from 56% (1,700 TWh) in 2013 to 69% (2,061 TWh) in 2020. As North West Europe TSOs will need to facilitate the increase in imported gas coming into the region, this is likely to require further investment in the North West gas network.

2.6.3 Sustainability

The third and final pillar of the European energy policy is sustainability. The EU has led the world in developing binding climate change targets for 2020. The increase in renewable electricity generation sources will revolutionise the European energy mix. As the National Energy Renewable Action Plans for the countries of the North West region show in table 2, solar and wind generation on a yearly basis should increase significantly in the coming years.

Gas is abundant, affordable and available and it is the cleanest of the fossil fuels, thus placing it in the ideal position to support the development of variable renewable energy sources. The change in the generation mix of the North West region will impact the gas network of the region. The key aspect of this change in the North West network will be the requirement for more flexibility, allowing gas to quickly become available when renewable energy sources are not generating electricity[22]. The North West gas network will need to be reinforced and modified accordingly.

Due to the intermittent character of wind and solar energy these sources are not always available where and when required by the market. Gas-fired power plants supported by the gas system can provide back-up capacity, and even when capacity is under utilised, gas-fired power plants will still be vital in the generation mix, due to the intermittent nature of renewable generation. Besides its back-up role, gas infrastructure offers other advantages in a renewable energy supply. Gas

[22]According to the 2009 study Trade Wind, 'Integrating Wind Developing Europe's power market for the large-scale integration of wind power,' 200 MW of installed Wind Power in Europe in 2020 will result in a capacity credit of 14%, which means that only 14% of 200 MW is available under all conditions. For report, see: http://www.trade-wind.eu/

ELECTRICITY PRODUCTION (GWh/y)	GAS-FIRED	WIND ON AND OFF SHORE	WIND ON AND OFF SHORE	SOLAR ELECTRIC PV&CSP	SOLAR ELECTRIC PV&CSP	HYDRO POWER	HYDRO POWER
COUNTRY	**2011**	**2010 NRAP**	**2020 NRAP**	**2010 NRAP**	**2020 NRAP**	**2010 NRAP**	**2020 NRAP**
Belgium	22.866	991	10.474	304	1.139	362	440
Denmark	7.772	8.606	11.713	2	4	31	31
France	29.761	11.638	57.900	613	6.885	69.024	71.703
Germany	81.400	44.668	104.435	9.499	41.389	18.000	20.000
Ireland	14.435	4.817	11.970	0	0	701	701
Luxembourg	2.318	60	239	20	84	107	124
The Netherlands	71.200	4.470	32.408	73	570	127	184
Sweden	2.613	4.793	12.500	1	4	68.210	68.000
United Kingdom	126.835	14.150	78.270	40	2.240	5.100	6.360
TOTAL	**359.200**	**94.193**	**319.909**	**10.552**	**52.315**	**160.961**	**167.543**

Sources: Entsog TYNDP 2012-2022 and ECN Renewable Energy Projections as Published in the National Renewable Energy Action Plans of the European Member Stats 28112011

Table 4
Renewable Energy Projections Europe

from renewable energy sources may be an important element of the future energy system because gas can be produced flexibly from biomass and waste and from a surplus of electricity (power to gas). Promising technologies like Power-to-Gas gain growing attention as they offer a huge potential to balance deviations in power injection from renewable energy systems. Therefore it is worth taking a closer look at this technology as it contributes to a higher degree in energy efficiency and to a sustainable environment. The integration of Power-to-Gas facilities brings benefits in different ways. On the one hand, this technology captures the flexibility of gas infrastructures by converting unused power flows into gas. Those gas flows can be transported through gas transmission systems and stored for later use during peak times. On the other hand, additional capacities coming from Power-to-Gas conversion lead to a declining dependency of gas imports. Power-to-Gas leads to a higher flexibility for renewable power systems and a shrinking dependency on gas imports, it also offers a meaningful potential to reduce greenhouse gas emissions for the fulfilment of the climate change targets.

As demands on gas infrastructures are increasing, the integration of Power-to-Gas facilities into existing cross-border infrastructures is getting more important. Nevertheless, for the avoidance of financial risk, profound analysis and suitable locations have to be identified before large-scale investments decisions can be made. As the opportunities for the production of gas from renewable energy develop in the decades ahead, the gas system will have to handle this additional gas. Likewise, how will the gas systems of the region be effected if gas use (LNG/CNG) in the transportation sector becomes commercially successful?

3.0 Supply & Demand

3.1 INTRODUCTION

As shown in the North West Specifics chapter, the countries of North West Europe have a long history of gas utilisation and some of the most mature and liberalised gas markets in Europe. The following chapter shows the historical and potential development of demand and supply in the region. All figures used have been sourced from the Transmission System Operators (TSOs) of the region in 2013, unless otherwise stated.

3.2 DEMAND

3.2.1 Annual Demand

The importance of the North West region to the total EU gas demand should not be underestimated. Figure 20 shows the annual gas demand of the North West region compared to the rest of the European Union. It shows that historically the 9 countries of the North West region made up more than 58% of the total EU demand.

Whilst the total EU gas demand is expected to rise over the next ten years, the North West regions annual demand is forecasted to decline slightly, over the same period. So even with some of the most mature gas markets in Europe, with unparalleled levels of domestic penetration and with the increased development of renewable electricity generation, the countries of the North West region are still expected to make up over half of the total EU gas demand over the next 10 years.

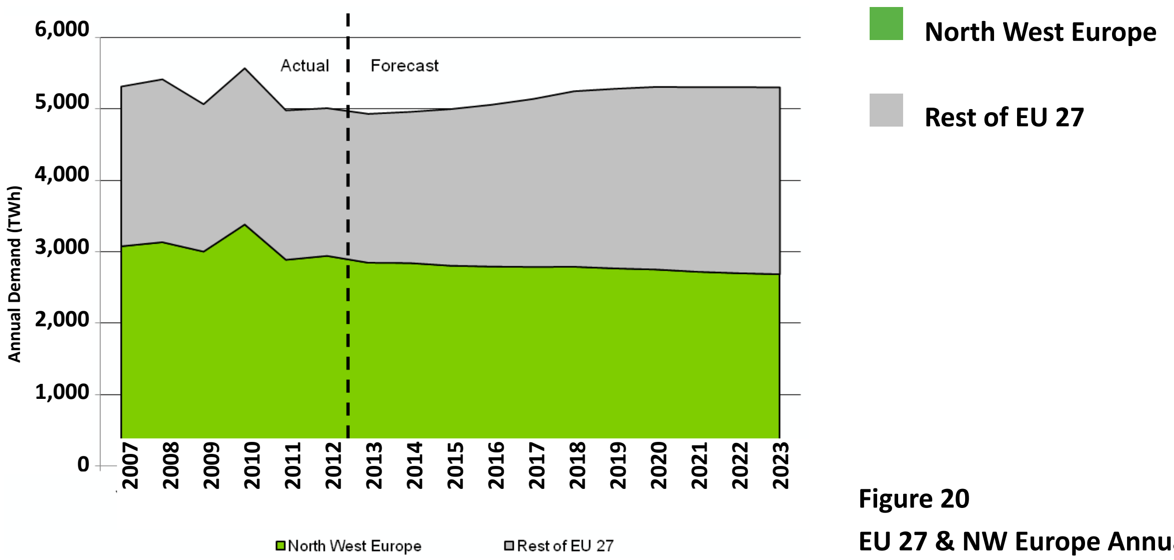
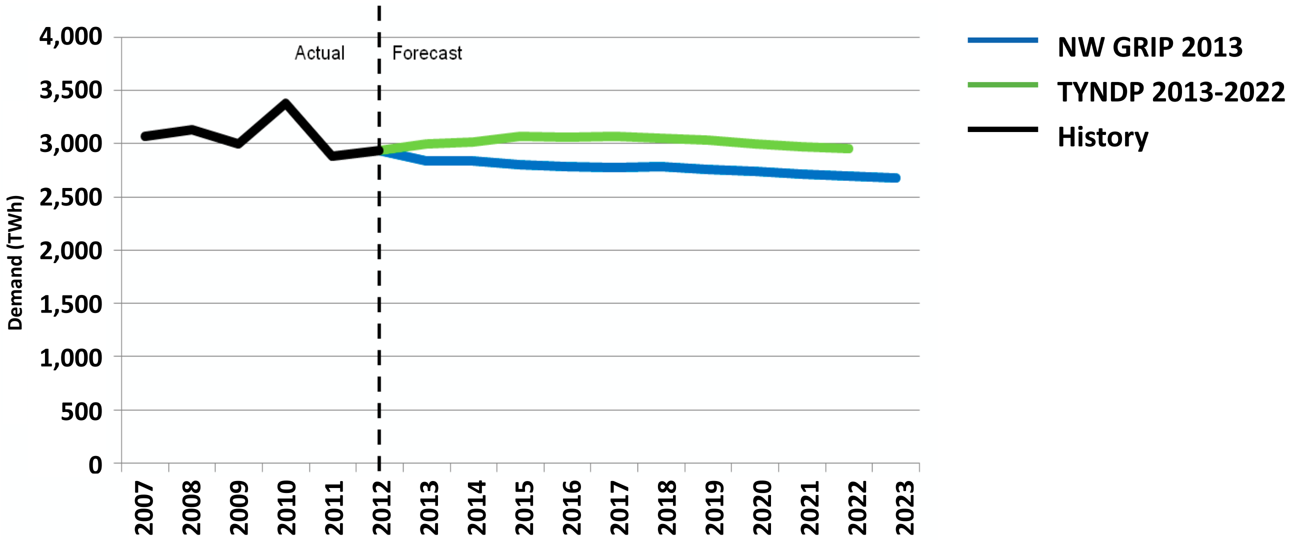


Figure 20
EU 27 & NW Europe Annual Gas Demand

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NW Europe	58%	58%	59%	61%	58%	59%	58%	57%	56%	55%	54%	53%	52%	52%	51%	51%	51%

Figure 21 shows a comparison between the TYNDP 2013-2022 figures and the figures provided by the TSOs for this GRIP. The chart shows the North West regions annual demand projection. Both set of figures were supplied by the TSOs of the region, with the TYNDP 2013-2022 figures being produced in 2012, and the NW GRIP figures produced in 2013.

Whilst the data provided to the TYNDP 2013-2022 in 2012 showed a slight increase in demand across the period, the 2013 projection shows a very small decrease in annual demand. The average difference between the two sets of data is 8% per year over the period, considering these figures come just a year apart it shows a fairly significant deviation. It should be observed that TSOs developed their expertise mainly on daily capacities (since these determine network capacities) rather than annual volumes.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	AVERAGE
Difference (TWh)	-152	-178	-261	-266	-281	-265	-265	-253	-257	-259	-224
Difference (%)	-5%	-6%	-9%	-9%	-9%	-9%	-9%	-8%	-9%	-9%	-8%

Figure 21
NW Annual Demand Comparison between the TYNDP 2013-2022 & NW GRIP 2013

The North West region of Europe, with its long history of cooperation in the gas industry, is still not one homogenous region. Uncertainty with regards to how annual demand will develop is shown by the diverging demand evolution at a national level. National specifics also play a part in understanding how the utilisation of gas will develop over the next 10 year period. The map below shows how local factors combined with industry wide uncertainty, impact the evolution of gas usage nationally. There are significant national differences on how much gas will be used on an annual basis during the next 10 years. TSOs of the region have different annual demand scenarios which are covered in their own national plans.

For example, two countries with significantly diverging expectations are Ireland and Denmark:

- Ireland: +20% Annual Demand Increase. The economic recovery, combined with favourable gas pricing and the expansion in the dairy industry is expected to drive growth in gas demand in Ireland. Historically Ireland has relied heavily on oil for its energy, with 56%[23] of Ireland's total primary energy supplied by oil. With favourable gas pricing, gas fired power generation could also steer gas demand up.
- Denmark: -20% Annual Demand Decrease. As part of the Danish governments pledge to be fossil fuel free by 2050[24], Denmark leads Europe in the development of renewable electricity generation. Therefore there is the expectation that annual gas usage will decline over the next 10 years in Denmark due to a strong increase in renewable energy sources.

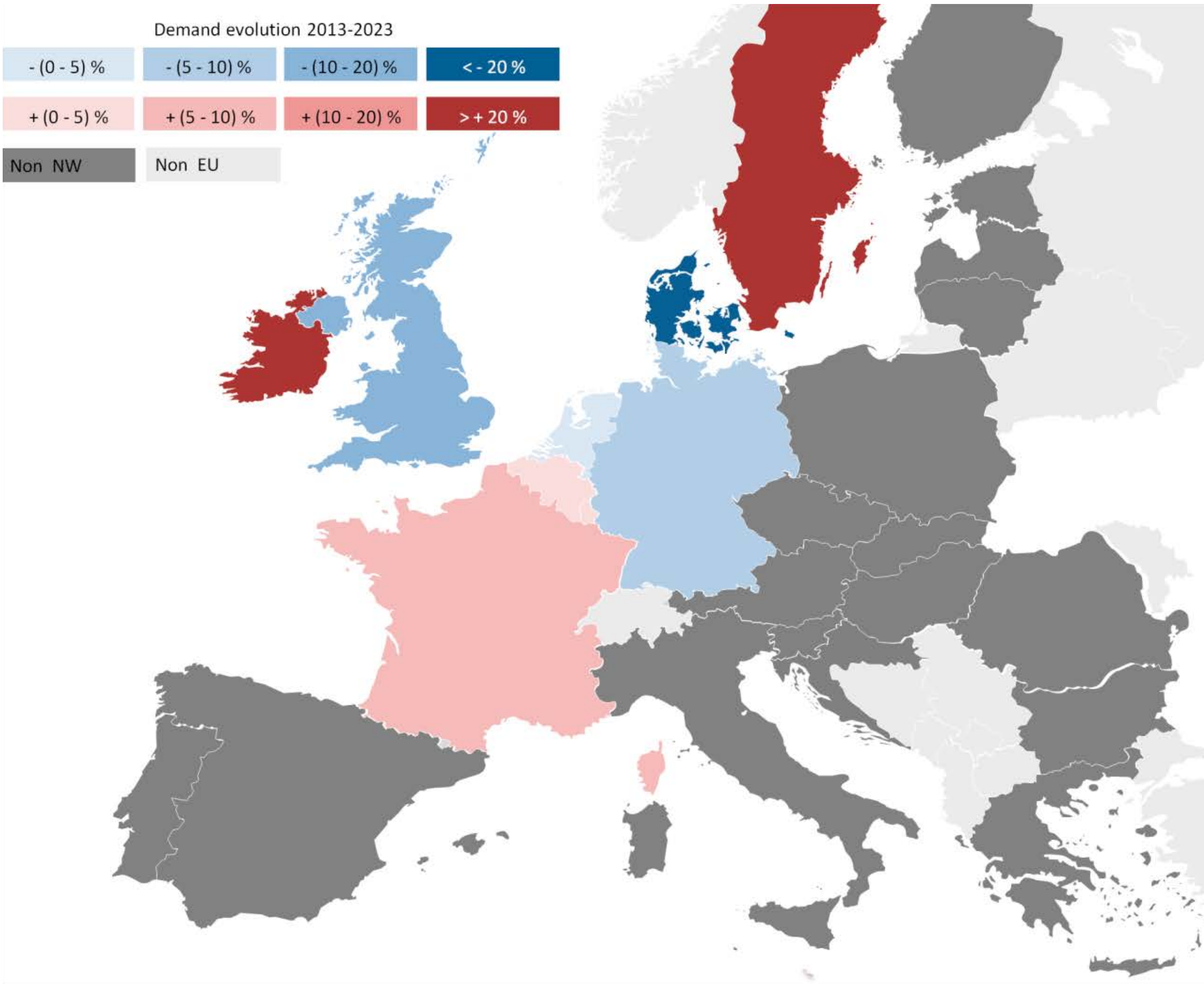


Figure 22
NW Europe Annual Demand Evolution

[23]Figure taken from Bord Gais website http://www.bordgais.ie/corporate/index.jsp?p=354&n=364
[24]Taken from Energinet http://www.energinet.dk/EN/GAS/Udfordringer-for-gassen-i-fremtiden/Gasforbrug-og-leverancer-2013-2050/Sider/default.aspx

3.2.2 Renewables Impact on NW Region

There is considerable uncertainty regarding how annual gas demand will develop over the next decade in the North West region and across Europe. The growth in renewable power generation technologies is however more certain. The impact of a large increase in renewable power generation will also increase gas demand volatility, and increase operational challenges for TSOs. For the networks to be able to respond and act in ways they were not originally intended, further investment in the networks will be required to provide the necessary flexibility.

The example in figure 23 is taken from the July 2011 Transporting Britain's Energy (TBE) process and highlights a possible, extreme event in 2020/21 (based on extrapolated 2007 data) with total wind generation at 30 GW. Over a period of 15 hours, the wind load factor decreased from 84% to 15%. If we assume all the reduction in generation from wind is met by an upturn of CCGT generation, then this equates to an increase in within-day gas demand of roughly 90mcm/day.

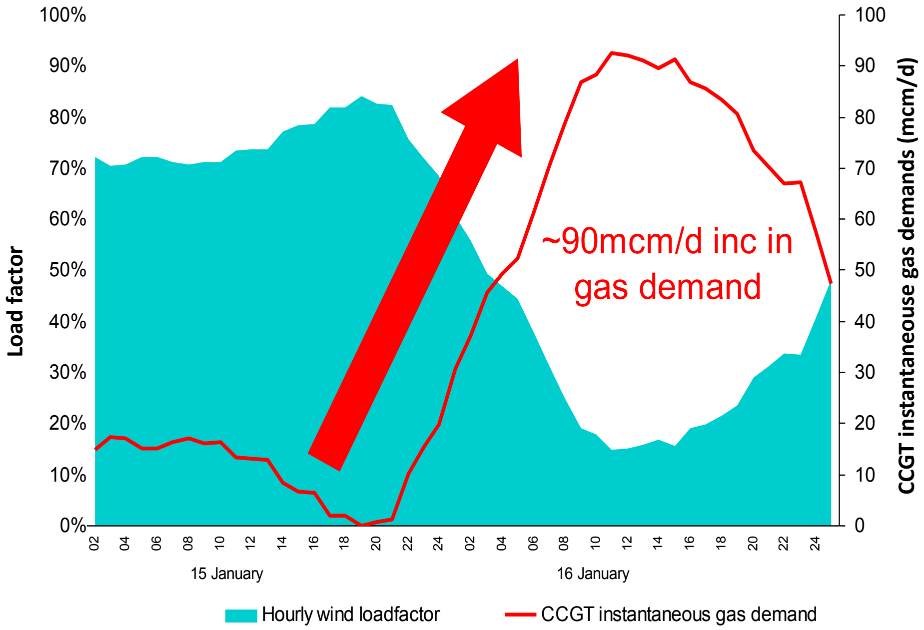


Figure 23
Wind vs. Gas Intermittency

Whilst this theoretical example is an extreme event, it highlights how gas networks in North West Europe may have to deal with increasingly variable and unpredictable demand from CCGTs used as back-up for variable renewable energy sources. The example also shows the requirement for fast-acting capacity to support intermittent renewable generation.

If a network does not have sufficient flexibility due to the lack of investment, there is a risk that this could lead to constraints, which could end up impacting unduly on the end-consumer. There is a considerable amount of variable renewable energy sources coming on-line across the whole of North West Europe, especially with respect to the binding European climate change targets, the so called '20-20-20' targets. The table below highlights the German example of this, and the impact this already has on German generation flexibility requirements.

	Wind + PV (MW)	Installed Wind & PV Capacity	All Installed Generation Capacity
Total installed (Wind & PV) capacity	54,065	100%	32%
Maximum generation	26,479	49%	16%
Minimum generation	402	1%	0%
Average generation	7,374	14%	4%
Maximum increase within 1 hour	4,348	8%	3%
Maximum increase within 5 hours	13,907	26%	8%
Maximum decrease within 1 hour	-4,723	-9%	-3%
Maximum decrease within 5 hours	-14,966	-28%	-9%

Table 5
Variable RES Indicators in Germany (for 2011)

Due to the intermittent nature of some renewable energy sources, other more consistent fuels must be available for the generation mix. In 2011 German Wind and PV renewable generation was on average running at 14% of total installed renewable capacity on a daily basis. This highlights the requirement for conventional generation sources to help meet demand in the short to medium term.

If gas is to act as an enabler fuel for renewable energy sources across the region, then gas infrastructure has to become more flexible. The German example in 2011 shows that over a quarter of all wind and solar PV generation capacities came on-line and off-line in five hour periods. This means the generation supply chain must be extremely flexible to provide back-up generation capacity at very short notice. The renewable generation peaks and troughs will only get larger as more and more variable renewable energy sources comes on-line, again further increasing the requirement for a highly flexible and well meshed gas infrastructure network across North West Europe.

3.2.3 Annual Demand Breakdown

Figure 24 shows the annual demand breakdown of the North West region for the next ten year period. The chart is broken down into Domestic, Commercial and Industrial (DCI) demand compared to Power Generation demand for the region. It shows a projected plateauing in Power Generation demand in the region over the next ten years. It is important to stress the considerable amount of uncertainty around the Power Generation figures. Power Generation is market based and is heavily influenced by fuel price. Cheap coal combined with low carbon prices from the EU Emission Trading Scheme (ETS) have made it attractive to burn coal instead of gas. This has lead to a reduction of gas demand in the power sector over the last few years. With the introduction of auctioning as the default method for allocation of carbon allowances on the ETS, combined with the decommissioning of old oil and coal fired power plants, this could result in a change to the power generation merit order, and could mean an increase in gas demand in the generation sector in the coming years.

From the historical data in figure 24 illustrates, that annual temperatures also heavily influence gas demand. This is due to the high percentage of households that rely on gas for heating, as demand increases when outdoor temperatures go down. This demand increases when outdoor temperatures go down. As weather conditions cannot be forecasted on this time scale, such extremes are not included in annual demand forecasts. This should be borne in mind when comparing actual data and demand forecasts.

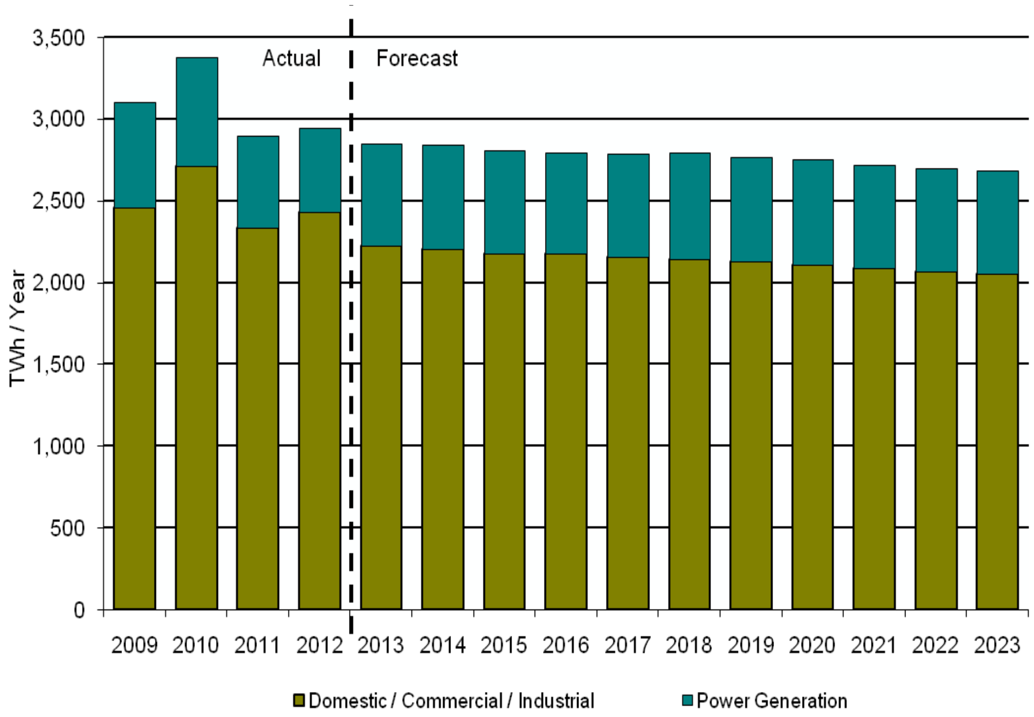
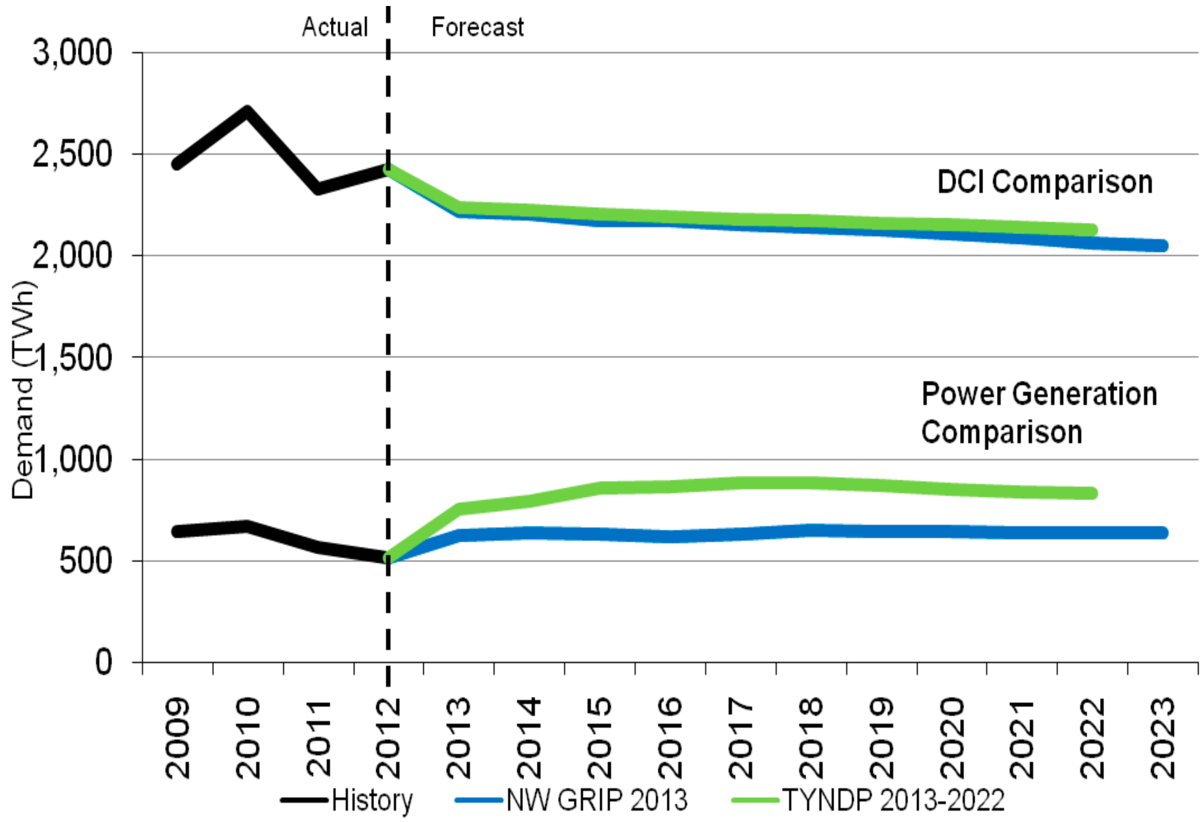


Figure 24
North West Europe Yearly Demand Breakdown

Figure 25 shows the demand breakdown between DCI demand and gas fired power generation demand compared between this GRIP data and the TYNDP 2013-2022 figures. The GRIP DCI demand over the period hardly deviates from the TYNDP 2013-2022 data, there is only negligible difference. The Power Generation comparison does however show a significant change from the TYNDP 2013-2022 data to the GRIP data. The original TYNDP 2013-2022 data shows a considerable increase in the use of gas for power generation over the start of the period, which remains steady until the end of the period. The updated GRIP gas demand for power generation however, has only a minor increase in 2013 and then shows a continued plateauing of demand across the whole period. This change in the power generation demand averages out to be 24% decrease over each year of the period compared to TYNDP 2013-2022 forecast. This power generation decrease explains the total overall annual demand decrease for the region.

There are numerous reasons the projection for gas demand for power generation would change so significantly, and these reasons are covered in chapter 2 section 2.3, but the factors would include:

- Low Carbon Price from EU ETS
- Abundance of cheap coal displaced from the American merit order
- High global LNG prices
- Continued economic difficulties within Europe



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average
% Differences DCI	-1%	-1%	-2%	-1%	-1%	-1%	-2%	-2%	-3%	-3%	-2%
% Differences PG	-17%	-19%	-26%	-28%	-29%	-29%	-26%	-24%	-24%	-24%	-24%

Figure 25
DCI vs. Power Generation Comparison between the TYNDP 2013-2022 & NW GRIP 2013 annual

3.2.4 Peak Demand

Daily peak demand is of vital importance, as it is the main criteria for network design. Each national network in the North West region has to be able to handle its peak daily demand to be fit for purpose. The chart below shows the historical regional peak demand days over the last 4 years. These days do not necessarily correlate with national peak demand days for the same period. The chart is also consistent with the ENTSOG TYNDP 2013-2022 as it highlights the three high daily demand scenarios used in that publication, with updated figures. For further information on the different methodological descriptions please see the TYNDP 2013-2022. The TSOs of the North West region view the Design-Case as the primary high daily demand scenario, as it ensures the most robust development of the network. It is interesting that the high daily demand scenarios remain consistently high during the duration of the next 10 years, highlighting that even if annual demand is potentially declining in certain countries, high daily demand remains consistent.

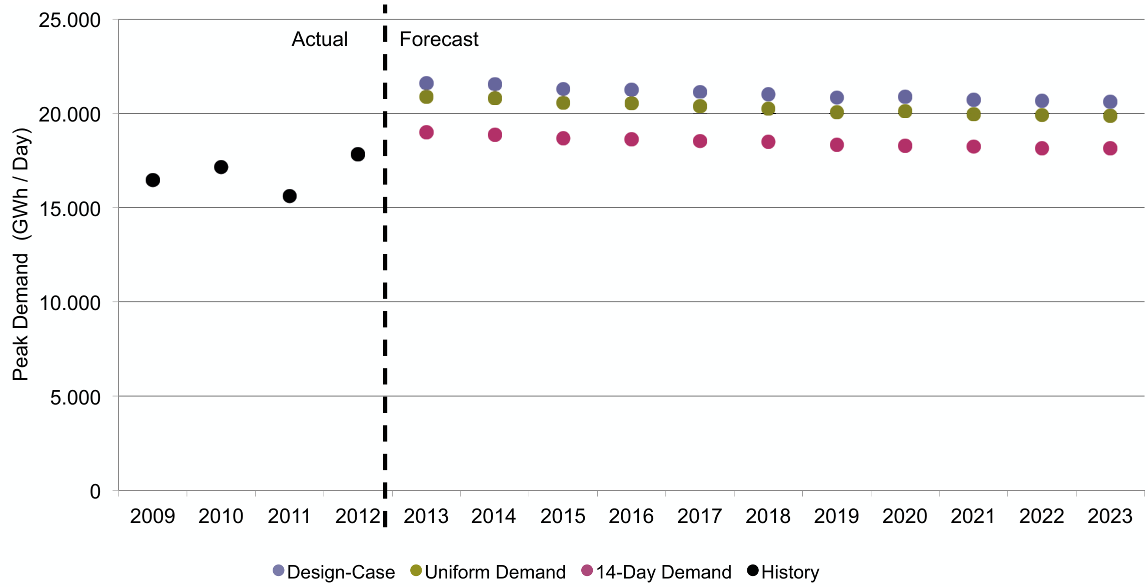


Figure 26
North West Europe Peak Demand Outlook

Figure 27 shows a comparison between the Design-Case peak scenario figures from the TYNDP 2013-2022 and the NW GRIP. The chart only shows a very small decrease in the peak demand of the region over the period. This further highlights the fact that whilst annual demand volumes may fluctuate and decline, the requirement for peak capacity remains almost unchanged and is a fundamental requirement for the safe and efficient operation of a network.

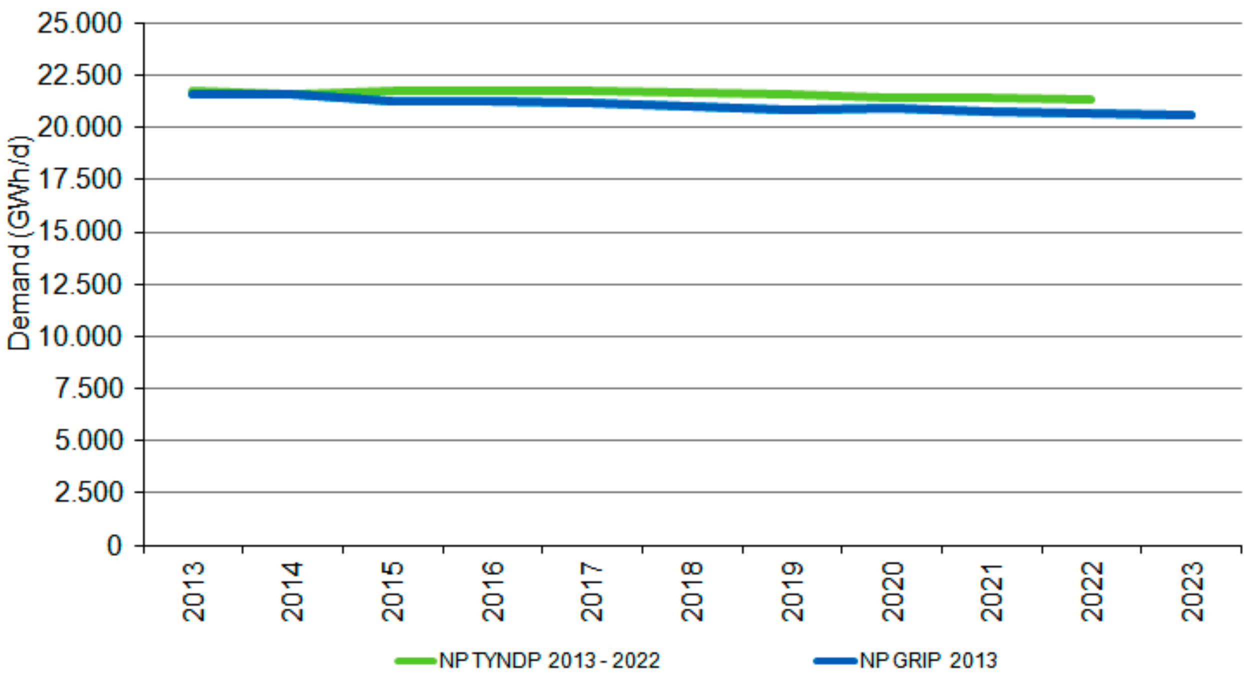
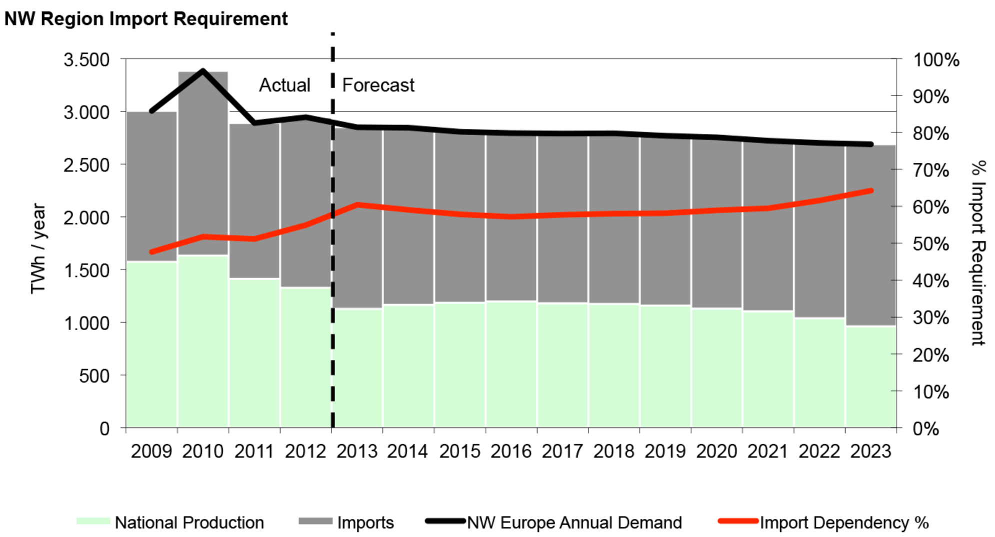


Figure 27
Comparison of Design-Case - Peak Demand Scenarios

3.3 SUPPLY

Whilst the North West region does have the vast majority of Europe's indigenous gas resources, these resources are expected to gradually decline over the next 10 years. Figure 28 shows that the North West region will become more and more reliant on imports, with imported gas forecast to make up 64% of the total North West demand by 2023. The increased regional dependency on imported gas further highlights how investment is required for the regional gas system to be able to deal with this change in supply configuration.

Transmission System Operators have limited access to supply information, as it is not a core business requirement; however such supply information could be useful for network planning purposes. With the need to replace declining national production with imported gas from outside the region, it is important to know where the gas will come from in the future, given the long lead time needed to complete gas infrastructure projects. The connection to new supply sources or the expansion of existing sources will require further investment during the next decade.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Import Dependency	48%	52%	51%	55%	60%	59%	58%	57%	58%	58%	58%	59%	59%	62%	64%

Figure 28
North West Europe Annual Supply[25]

On the supply side the only data that the TSOs can accurately provide is regarding National Production. The difference between the TYNDP 2013-2022 figures and the GRIP figures is stark. The TYNDP 2013-2022 shows a decline at the beginning of the period, followed by a strong downward trend towards the end of the period. In contrast the GRIP figures show a dip in National Production in 2013 followed by an arc in the supply curve. The chart below shows that 2017 is the year that both curves dissect. TSOs of the region expect to see a continued decline in National Production figures, but it is interesting to see that based on external factors this decline could be slowed down over the ten year period.

[25] The North West Europe Annual Supply chart is made up from the National Production figures for the region from the TYNDP 2013-2022 and the regions Annual Demand. The chart assumes all National Production is used within the NW region

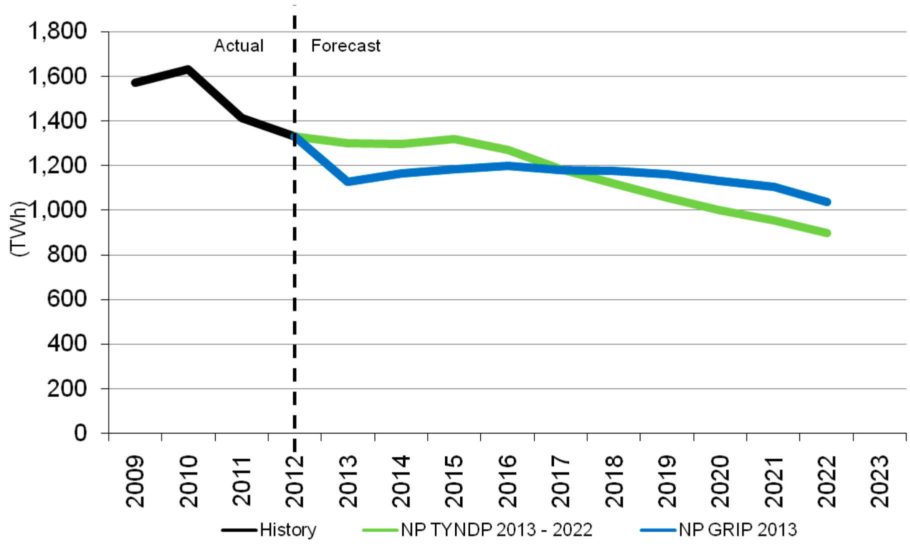


Figure 29
Annual National Production Comparison

3.3.1 Supply source diversification

Using information from the TYNDP 2013-2022 under the source diversification assessment (supply maximisation simulations), table 4 shows how many NW balancing Zone (12 in all) can be reached by the different supply sources on an average demand day. The situation for 2013 (with FID projects) and for 2022 (with Non-FID projects) is summarised, each time for two different supply penetration levels (5% to 20% and >20% of the demand)

If the FID and Non-FID projects of the region are realised, then there is a significant increase in the number of Zones that can access different sources of gas. The biggest increase comes from Russian supply, where in 2013 only 4 Zones could reach 20% of their demand covered by Russian supply, while 9 Zones could potentially reach that level by 2022.

SUPPLY SOURCE	FID PROJECTS	FID PROJECTS	NON-FID PROJECTS	NON-FID PROJECTS
	Number of Zones with 5% to 20% in 2013	Number of Zones with 20% plus in 2013	Number of Zones with 5% to 20% in 2022	Number of Zones with 20% plus in 2022
National Production	3	9	3	9
Norwegian	0	10	0	12
LNG	3	7	3	9
Russian	3	4	1	9
Algerian	0	1	2	2

Table 6
Supply Source Diversification (Source TYNDP 2013-2022)

3.3.2 Supply source dependency

The TYNDP 2013-2022 also completed a Supply Source Dependency analysis, which highlighted that there were only two Zones in the whole North West region which had a supply dependency equal to or above 20% (average demand). These two specific cases are:

- The German balancing Zone GASPOOL, which has a supply dependency on Russian gas of between 20% and 40%. This will be explained in more detail later in the report (chapter 4 section 4.2.1)
- The French balancing Zones of TIGF & PEG South which has a supply dependency on LNG of 40% and 60% respectively. This will be explained in more detail later in the report (chapter 4 section 4.2.1)

It is important to highlight that LNG by its global nature, is already a diversified source of supply. LNG will play a significant role in gas supply in the North West region in the coming decades, with six of the countries in the region having already built or are in the process of building reception terminals for LNG.

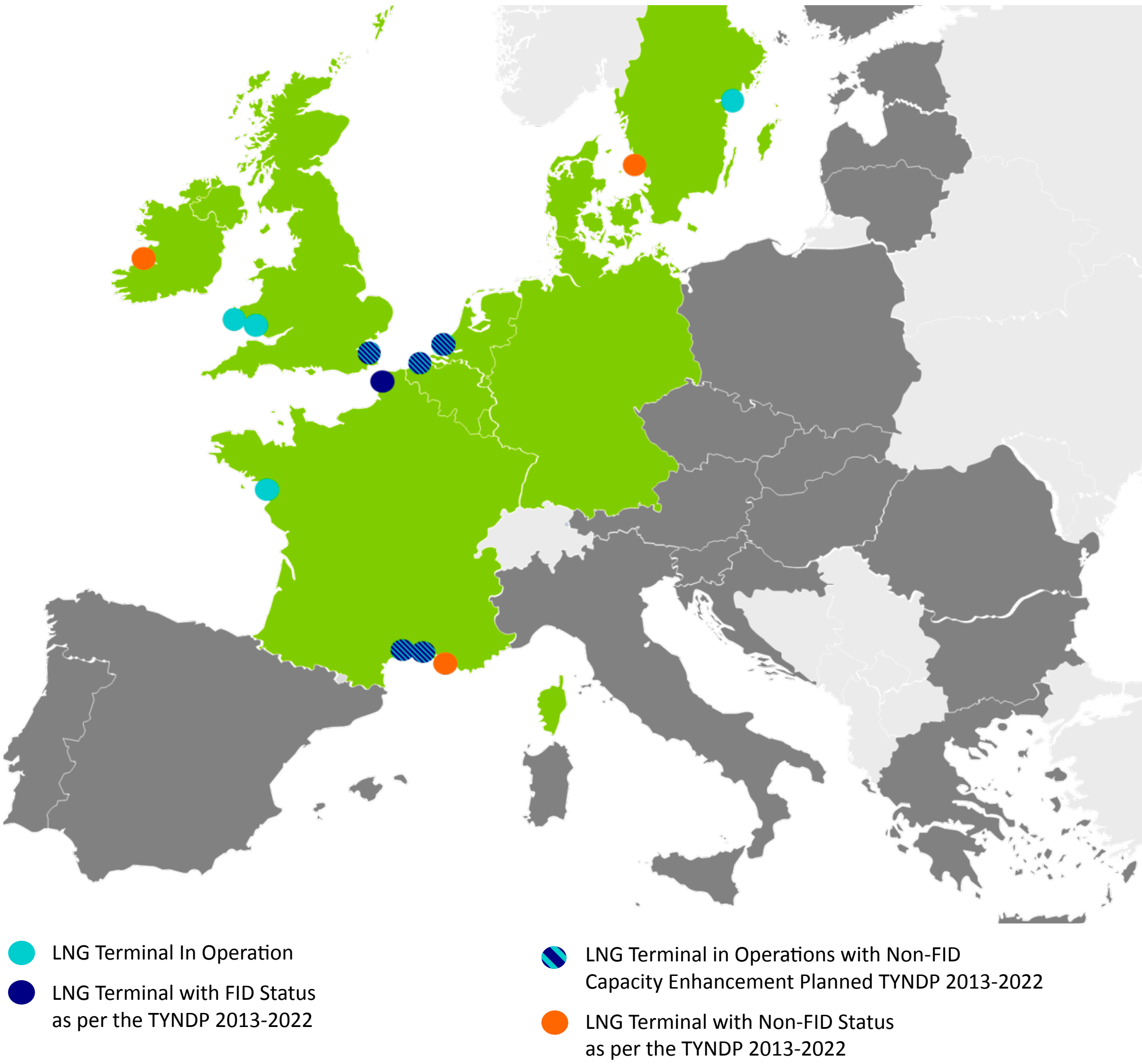


Figure 30
North West Europe LNG Map

3.4 UNCONVENTIONAL GAS IN NORTH WEST EUROPE

There are indications that significant reserves of shale and coalbed methane gas (unconventional gas) exist in North West Europe. However, there is a large amount of uncertainty surrounding the economic viability of its extraction. The TSOs of the North West region have a limited knowledge of how unconventional gas production will develop in the coming years, due to the uncertainty that surrounds the extraction process. Regardless of the fact that estimates on the amount of unconventional gas recoverable varies, the map below shows that almost every country in the North West region has the geology to potentially harvest unconventional gas in the future.

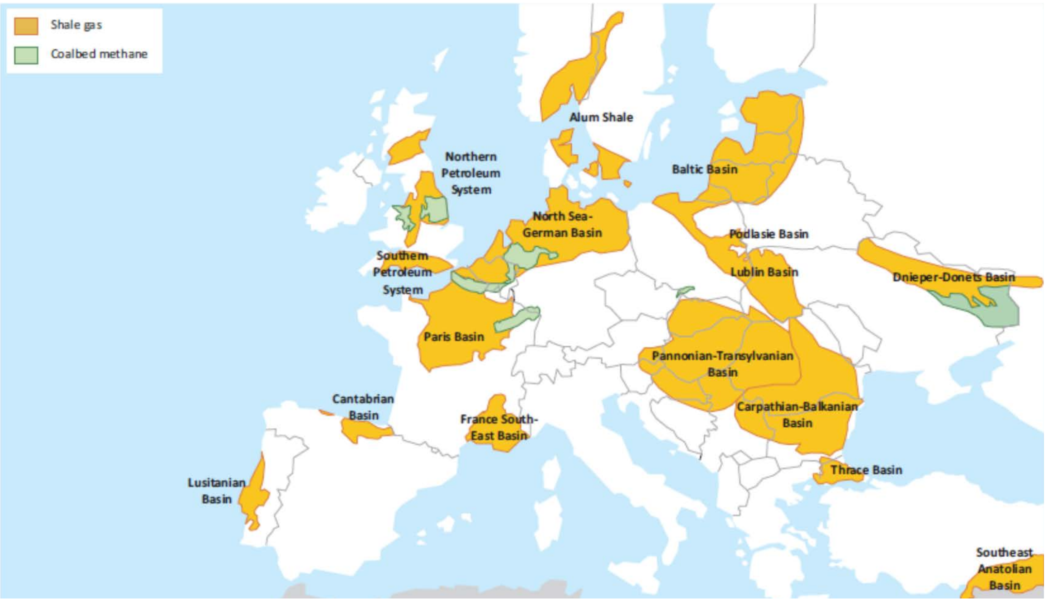


Figure 31

Major Unconventional Natural Gas Resources Map of Europe [26]

The on-going decline of indigenous conventional gas production in the North West region and the continued growth of imports from outside the EU means that unconventional gas could be seen as a promising development in the future. With the well-meshed and integrated network of the North West region, it offers a ready-built transportation network, should unconventional production become a reality.

Yet there are numerous regulatory and environmental hurdles to overcome before unconventional gas can become an influential supplier to the North West Region, including the fact that the region is densely populated. The perception that unconventional gas extraction could impact ordinary citizens means it has become a political issue. It is therefore important to follow the development of unconventional gas on a country by country basis within the region, with very diverging approaches being taken.

Overall, there is a considerable amount of uncertainty surrounding the future of unconventional gas in the North West region. It is unlikely to have any significant impact on gas supplies of the North West region in the outlook of this GRIP. Yet in the longer term, should regulatory and environmental obstacles be overcome, there is the potential for unconventional gas to play a role in the North West gas supply mix.

[26] The map was created and is copyrighted by the OECD/International Energy Agency, and taken from: World Energy Outlook Special Report: Golden Rules for a Golden Age of Gas © OECD/IEA 2012, fig.3.7, p.121

3.5 PIPELINE CAPACITY ENTERING & EXITING THE NW REGION

Although the North West region is not a homogenous entry/exit system, it is useful to get a perspective of how inter-linked the region is to its neighbouring countries. Figure 32 shows the amount of firm entry and exit capacity available on a daily basis on the combined border of the North West region. The chart breaks down the capacity available into Entry & Exit and from EU & non EU countries. It shows that there is substantially more capacity available entering into the NW region than there is capacity leaving the region.

Due to the regions geographical and historical links with non-EU supplier countries like Norway and Russia, and the continued decline in National Production in the region, it is no surprise that there is a significant amount of entry capacity into the region from those countries.

When you take away the non-EU countries exit and entry capacity, then there is still three times more entry capacity from EU countries coming into the region, than there is exit capacity. This is related to the history of the region as a major demand centre, and how historically the European network was set-up to flow from East to West.

Figure 32 does not show any major yearly deviations in capacity figures, again highlighting how mature the North West market is. The most significant capacity development is surrounding the exit capacity to EU countries which increase approximately 80 GWh/per day over the period, mainly as a result of the increasing capacity on the French-Spanish border.

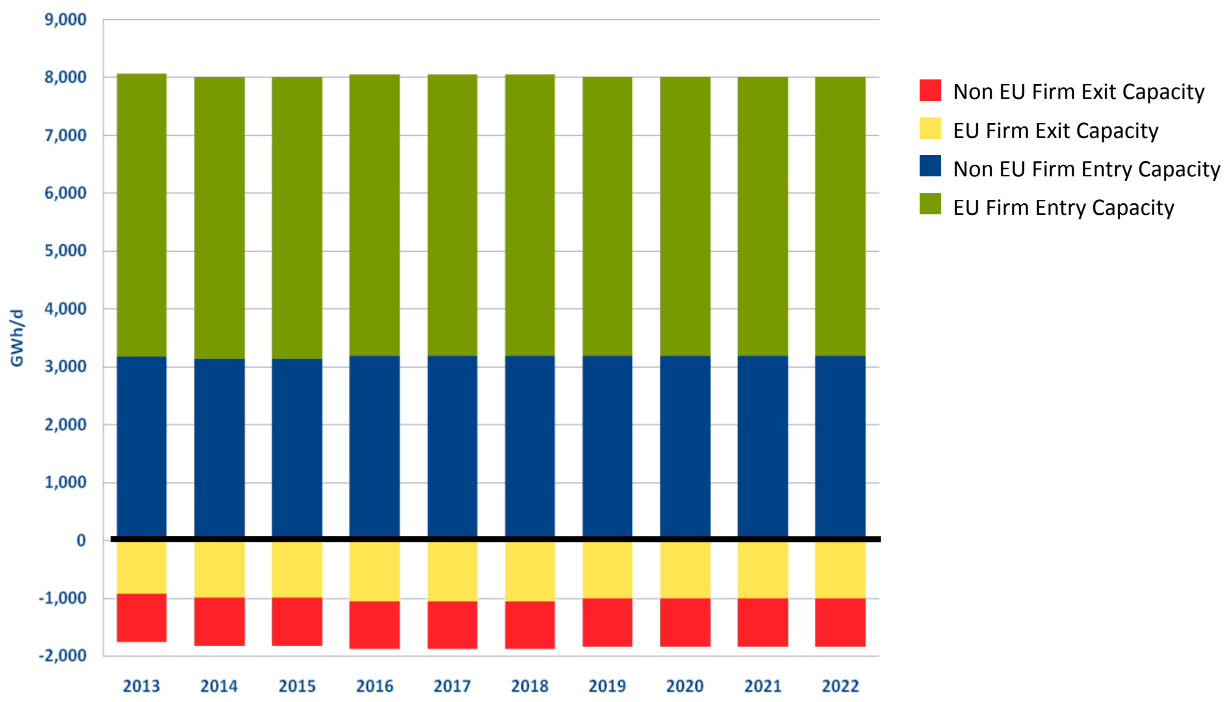


Figure 32
NW Region Pipeline Capacity, FID

Image courtesy of NW European TSOs

4.0 In Depth Analysis of TYNDP 2013-2022 Identified Issues in the North West Region

4.1 INTRODUCTION

In this chapter an explanation of the ENTSOG TYNDP 2013-2022 assessment process is given, followed by the findings of the TYNDP 2013-2022 for the North West region. The projects in the North West that mitigate the findings of the TYNDP 2013-2022 are briefly touched upon in these paragraphs. An in depth analysis of these projects concludes this chapter.

4.2 ENTSOG TYNDP 2013-2022

The 2013-2022 ENTSOG TYNDP 2013-2022 assesses the European gas system against various levels of supply and demand, and two different infrastructure clusters across a 10-year range. The TYNDP 2013-2022 analyses to what extent existing gas infrastructure plus FID-projects can fulfil various future capacity demands. If this demand cannot be met, the TYNDP 2013-2022 assesses, in a second step, if including non-FID projects also can fulfil this demand. When this is not the case a potential investment gap exists, because the market has not yet shown interest to solve the potential issue. This could have a negative impact on the ability of the respective Zones' infrastructure to sustain the supply-demand balance which could lead to cross-border congestion.

All the projects included in FID and Non-FID clusters are the result of executed auctions, open seasons, national plans or market initiatives. See chapter 5 (Background to North West European Infrastructure Projects) for a detailed description of processes relating to the origin of the projects.

The TYNDP 2013-2022 analysis has been carried out on a top-down European level, using Entry/Exit Zones as basic blocks and cross-border capacity as the basic links between these blocks. Therefore the assessment is at cross-border level, combined with UGS and LNG terminals aggregated at Zone level. The characteristics of the Entry/Exit Zones have been established bottom up, where each TSO determined the capacity between the Zones using hydraulic calculations. A detailed description of the cases considered can be found in the Methodology chapter of the TYNDP 2013-2022.[27]

The results of the TYNDP 2013-2022 assessment give an overall indication of the level of infrastructure-related Market Integration. For the purpose of the TYNDP 2013-2022, Market Integration was defined as a physical situation of the interconnected network, which under optimum operation of the system, provides sufficient flexibility to accommodate variable flow patterns that result from varying market situations.

The four different assessments carried out by the TYNDP 2013-2022, which together result in the level of infrastructure-related Market Integration, are:

- **I Resilience Assessment**: potential investment gaps in the European gas system under normal Situations (Reference Case) and in Supply Stress through the calculation of Remaining Flexibility of each Zone of the system
- **II Supply Dependency Assessment:** the dependence of some Zones on a single supply source
- **III Network Adaptability Assessment:** the ability of the system to adapt to various supply patterns
- **IV Supply Source Diversification Assessment:** the capability of the system to enable its Zones to access different supply sources

ENTSOG also executed two pilot assessments, Import Route Diversification and Import Dependency. Neither of these assessments resulted into relevant findings for this GRIP, and therefore was not included.

4.2.1 TYNDP 2013-2022 findings from a regional perspective

The following paragraphs detail the TYNDP 2013-2022 analysis and list the findings of each TYNDP 2013-2022 assessment that are relevant to the North West region. For the purpose of this GRIP these findings are accompanied by a detailed description from the relevant TSO point-of-view.

I Resilience Assessment - Reference Cases Results

The Resilience Assessment performed in the TYNDP 2013-2022 focuses on testing the ability of the infrastructure to transport large quantities of gas under severe climatic conditions. In such situations there should be a high level of supply available on a short-term basis and the necessary infrastructures are in place to deliver gas to the relevant markets. The Resilience Assessment modelling shows how much flexibility is available in the European gas system even in situations of very high daily demand. Under the Reference Case in both the Design-Case demand situation (based on peak day planning assumptions of the TSOs) and the 14-day Uniform Risk Situation (high demand over a longer period), three Zones of the North West region have been identified where the Remaining Flexibility (percentage of entry capacity still available in the simulations) would fall below 1%. As indicated in red on the maps below, cross-border congestion was identified for Denmark, Sweden and Luxembourg. The TYNDP 2013-2022 also assessed the impact of supply disruptions, but these did not result in additional findings in the North West region.

The Design-Case Situation and 14-day Uniform Risk Situation produce very similar results in terms of investment gaps and remedies. In both situations, the Reference Cases show the persistent effect of the

[27]See http://www.entsog.eu/publications/TYNDP 2013-2022

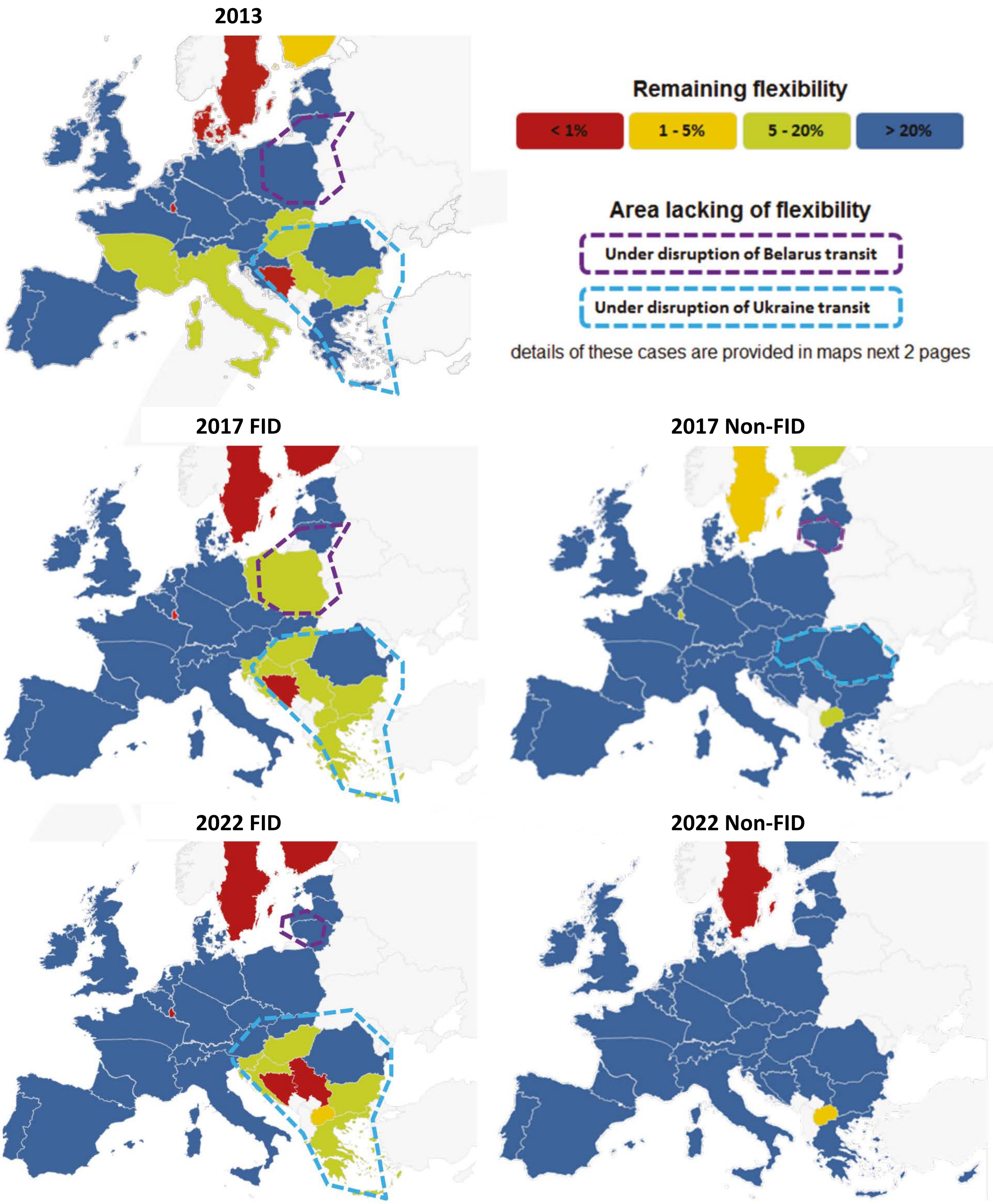
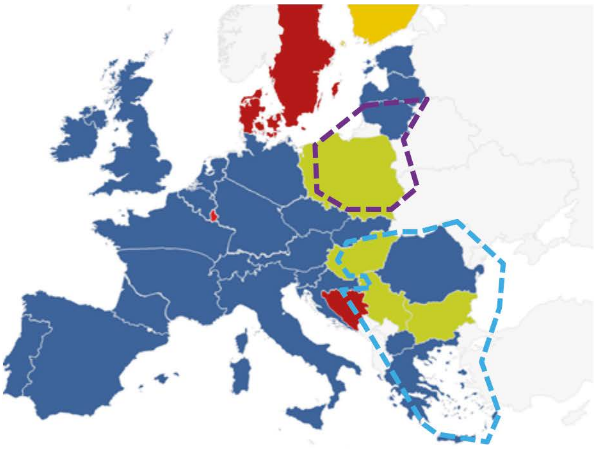
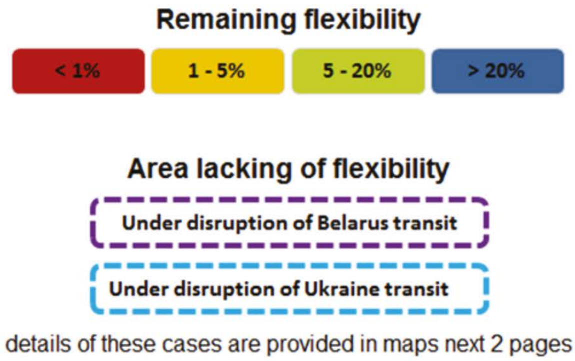


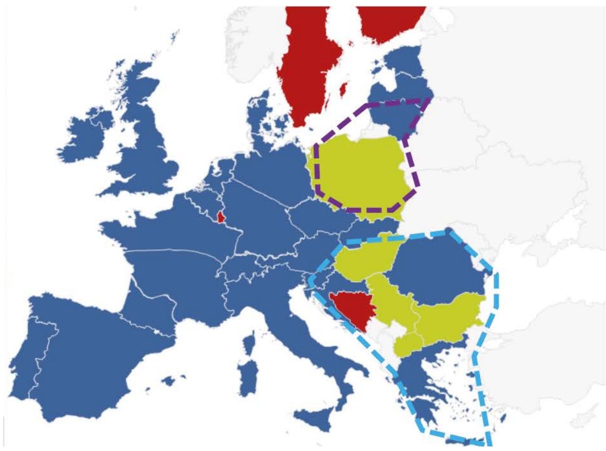
Figure 33
Infrastructure Resilience under Reference Cases

2013

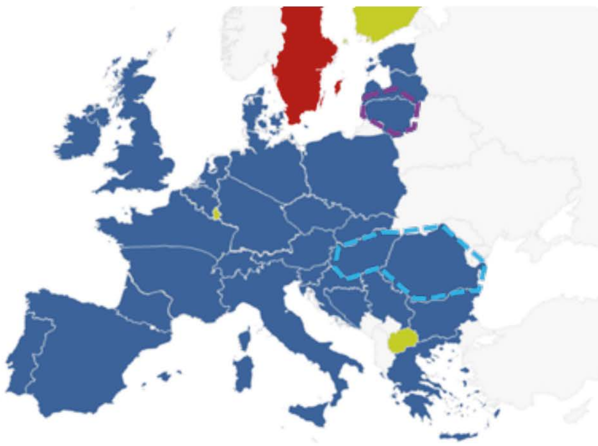




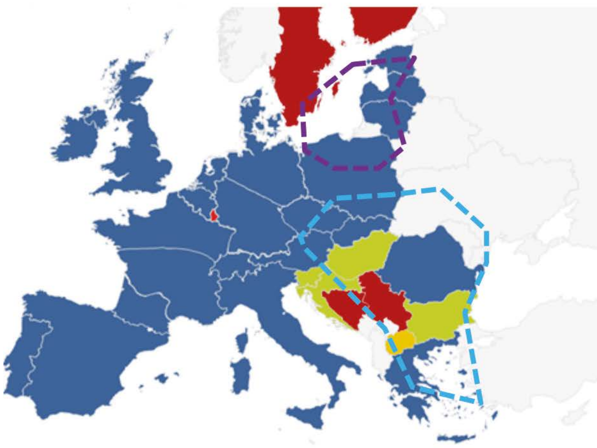
2017 FID



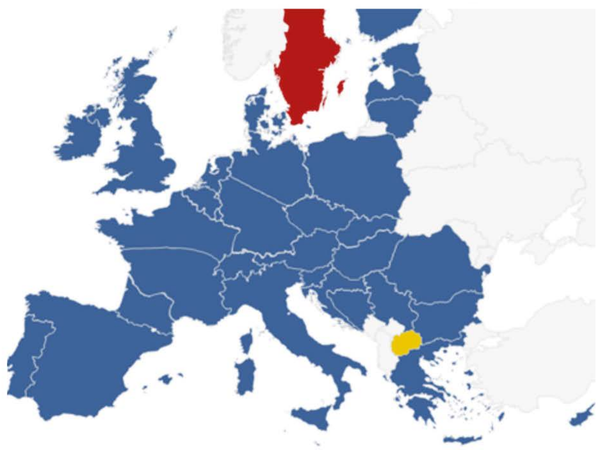
2017 Non-FID



2022 FID



2022 Non-FID



lack of decided projects in Sweden and in Luxembourg. In Denmark FID projects and in Luxembourg Non-FID projects exist that could completely mitigate the highlighted investment gaps before 2023. In Sweden's case, the TYNDP 2013-2022 identified issues which can only be partly solved with existing FID or non-FID projects.

I.A Resilience Assessment - Reference Cases - North West Europe

The cross-border congestion identified for Denmark in 2013 is known to be related to the limited firm capacity at the German-Danish border. As illustrated by the TYNDP 2013-2022 (all assessments for the Zone after 2013 show a strongly increased flexibility) an FID project already exists to overcome the challenges of cross-border capacity, diversification and Security of Supply that have been identified in previous TYNDP 2013-2022 and GRIP reports.

Cross-border congestion identified in Luxembourg can, as shown in the TYNDP, be completely mitigated by 2022, by including Non-FID projects. In a common Open Season process, launched by Creos with GRTgaz in spring 2013, a binding market survey for additional capacity of 9GWh/d or 40GWh/d from France to Luxembourg was not successful. Further studies and negotiations are ongoing. Fluxys Belgium is also evaluating to upgrade its infrastructure towards Luxembourg in order to increase capacity. The Luxembourg cross-border congestion is described further in section 4.3.3.

The combination of a projected demand growth in Sweden compared with a low winter supply situation produced the results as per the TYNDP 2013-2022. It has, however, to be noted that the balance of Denmark and Sweden is currently ensured through the interruptible and short-term firm capacity offered from Germany to Denmark. The FID-project Ellund will therefore have a positive effect on the cross-border congestion identified for Sweden. This is illustrated in the TYNDP 2013-2022 for the year 2017 in which the remaining flexibility increases from <1% to 1-5% for Sweden and from <1% to >20% for Denmark. Nevertheless, Sweden is unlikely to significantly increase its flexibility without creating one more cross-border point. This fact is illustrated by the TYNDP 2013-2022.

In 2022 the Swedish flexibility remains below 1% both with FID and Non-FID projects according to the TYNDP 2013-2022. In essence there is a need for a 'second' cross-border point to Sweden. There are two options identified: an increase of firm capacity to Sweden through Denmark and/or a tie-in to the transmission system from an LNG-terminal(s). Sufficient interconnection capacity through Denmark will also depend on the interconnection capacity between Germany and Denmark and on the Danish demand. LNG market growth will in turn only happen if it is appropriately matched with LNG supply. In addition, Swedegas regards a tie-in to the transmission system from an LNG-terminal(s) as an opportunity from a Security of Supply perspective.

I.B Resilience Assessment - Low LNG delivery results

Due to the globalised market for LNG, ENTSOG decided to provide a view of what the impacts would be if LNG were not to reach Europe. Figure 34.1 illustrates the effect of a minimum send-out of all LNG terminals under Design-Case and 14-day Situations in Europe. Zones having direct access to LNG are identified with a specific pictogram. Such simulations also provide information on the impact of local events as the technical disruption of the single LNG terminal of a country impacting the send-out, or some climatic conditions impacting LNG delivery to the terminals.

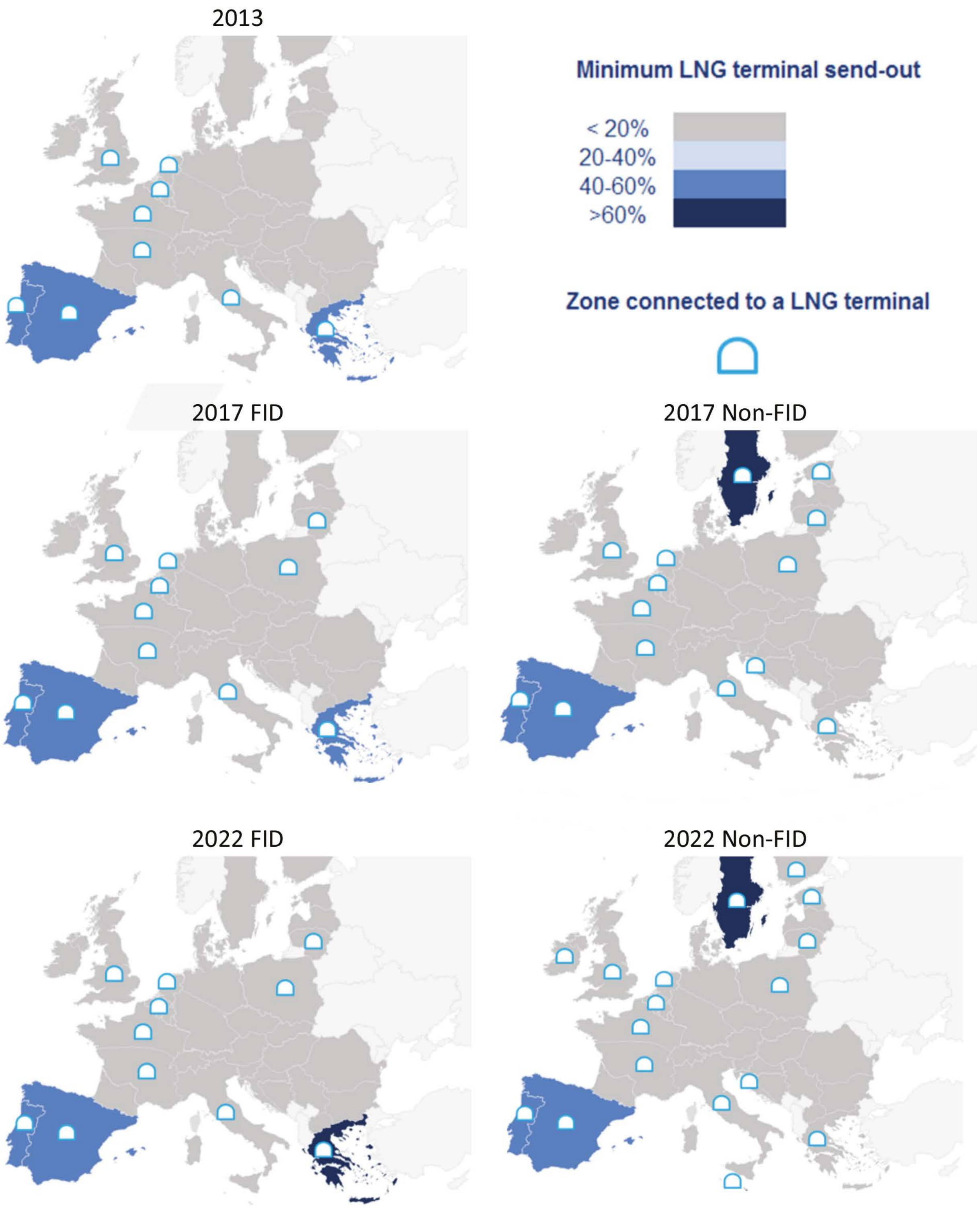


Figure 34.1
Resilience to low LNG delivery under Design-Case Situation

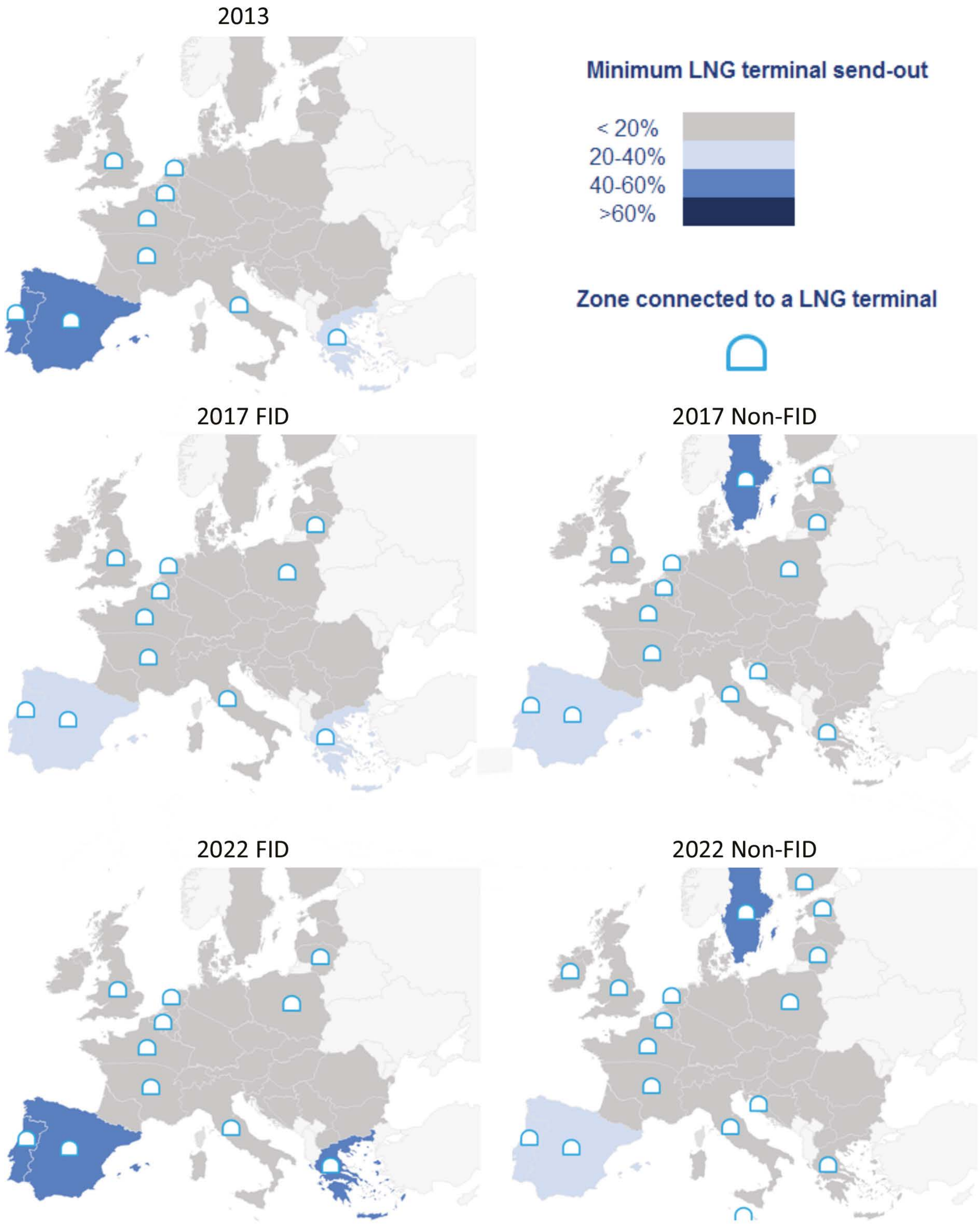


Figure 34.2
Resilience to low LNG delivery under 14-day Uniform Risk Situation

I.C Resilience Assessment - Low LNG delivery results - North West Europe

The TYNDP 2013-2022 identified Sweden as a country with an LNG send-out above 20% utilisation, which is considered as the lower technical limit in the TYNDP 2013-2022. The LNG business in Sweden is, however, separated from the pipeline business. There is an opportunity to tie in an LNG terminal with the existing transmission system and such a decision is likely only if there is demand for new services enabled by a combination of a terminal and the grid. Security of supply will also be a factor in play as a tie in would effectively create a second entry point to Sweden which has been identified as a necessity for a long while, and even more so in the 2013 TYNDP.

II Supply Dependency Assessment

With the Supply Source Dependence Assessment, the TYNDP 2013-2022 aims to identify Zones whose balance depends strongly on a single supply source. Firstly investment gaps persisting under Average Daily Demand Situations were assessed; secondly Zones where Annual Balance relies strongly on a single source were assessed.

II.A Supply Dependency Assessment - Average Day Results - NW Europe

The TYNDP 2013-2022 supply dependency assessment under Average Day conditions identified capacity needs in the North West region for both the German GASPOOL and Net Connect Germany (NCG) connection with Denmark as well as the Denmark-Sweden connection. In 2013 FID situation there is some capacity from NCG and for GASPOOL to Denmark according to the collected TYNDP 2013-2022 data but this is not sufficient to balance Denmark and Sweden for the whole year (modelled as an average day with neutral storage) without use of short-term or interruptible capacity. As was noted before, the balance of Denmark and Sweden is currently ensured through the interruptible and short-term firm capacity offered from Germany to Denmark. By using additionally interruptible capacity this issue is mitigated on the short-term basis.

Likewise with the Reference Case, a lack of firm capacity on the German-Danish border is the cause of the identified situation. Therefore the already planned (FID-project) capacity extension from Germany to Denmark will also solve this identified issue in 2017. This assessment is based on full supply minimisation modelling seeking cases where a Zone will require a supply share of more than 20% from the minimised source.

II.B Supply Dependency Assessment - Annual Basis results

The second assessment related to supply dependency aims at identifying the Zones whose annual balance relies strongly on a given supply source. This dependency is measured as the minimum share of a given supply source required to balance the annual demand and exit flow of a Zone. This assessment is based on full supply minimisation modelling seeking cases where a Zone will require a supply share of more than 20% from the minimised source.

Figure 35 identifies the Zones in the North West region that have a strong dependency on Russian gas and LNG, with different ranges depending on the minimum supply share of the predominant supply. There were no instances identified of a dependency on Algerian, Libyan, Norwegian and Azeri gas.

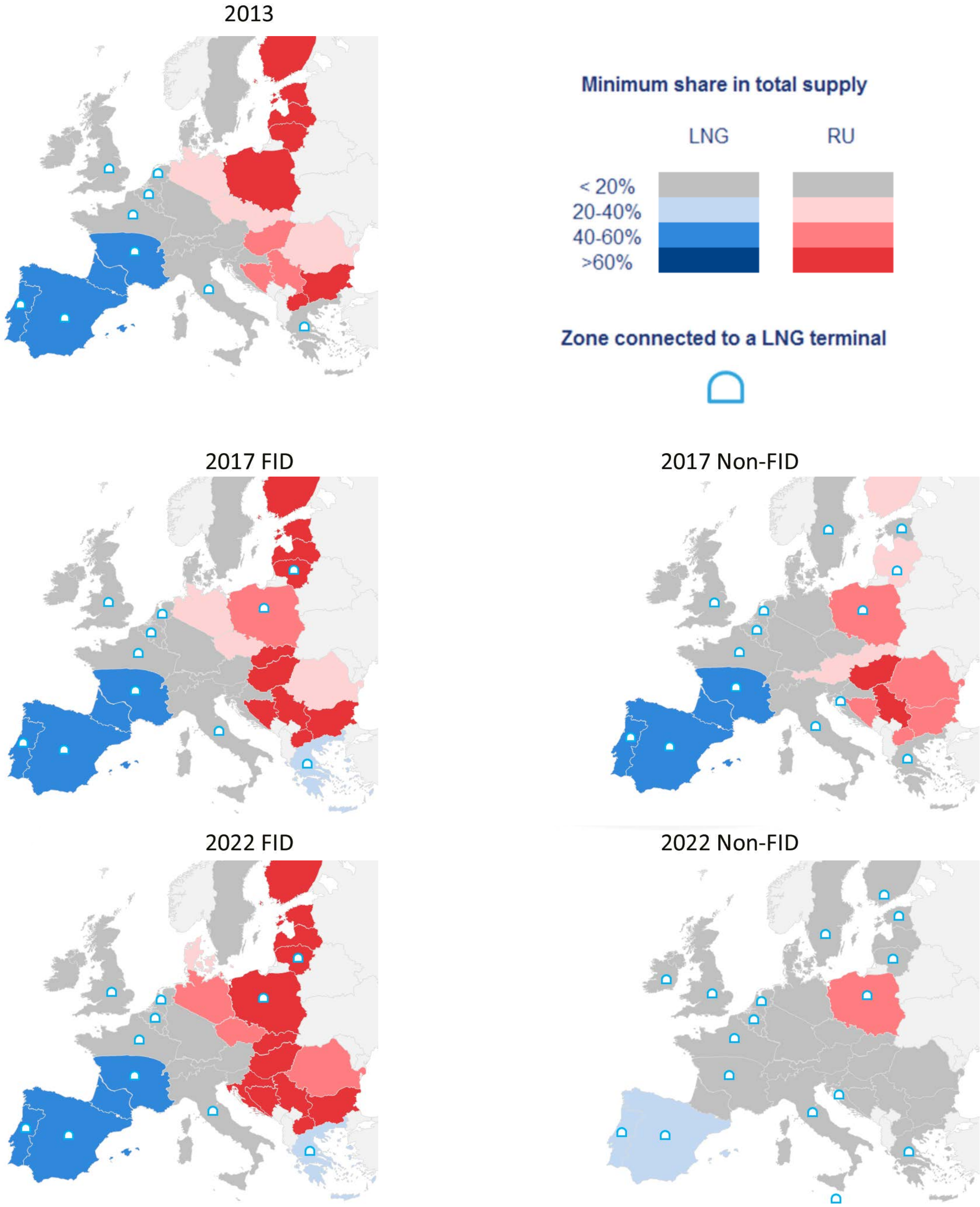


Figure 35
Supply Source Dependence on Annual Basis

II.C Supply Dependency Assessment - Annual Basis results - North West Europe

With the inclusion of FID projects the dependency on Russian gas increases further in Germany (GASPOOL) and in Denmark in the period up to 2022. However, as indicated on the map, this effect is eliminated with the inclusion of non-FID projects. Dependency in these Zones is lowered to <20% already in 2017.

The Annual Balance in the GRTgaz South Zone (FRs) and TIGF Zone (FRt) relies strongly on LNG. As illustrated by the TYNDP 2013-2022 findings, the dependency is mitigated by FID projects and with the inclusion of Non-FID projects can be fully lifted by 2022. It should be noted that LNG is by nature more diverse in its potential origin than pipeline sources; so the need raised by this dependency is not a Security of Supply issue but a market issue enhanced by the fact that LNG prices are global because of the maturity of the worldwide LNG market.

III Network Adaptability Assessment

The assessment of the Adaptability to Supply Evolution looks at the European infrastructure's ability to face very different gas supply mixes resulting from short-term signals or long-term trends. This assessment has been carried out under the 1-day Average demand situation in order to identify the ability to balance every Zone when one of the supply sources move from the Reference Supply to Maximum Potential Supply or Minimum Potential Supply scenarios. Where no flow pattern enables reaching the Potential Supply scenarios, the limiting factor is identified. Among the results identified in the TYNDP 2013-2022, the following is a concern for the North West region:

- The limited ability to decrease LNG to Iberian Peninsula and South of France due to lack of inter-connection with Northern Europe

These limitations are mitigated with the projects identified. This GRIP highlights the French LNG issues, and the GRIP South (which fully covers the whole relevant region) will develop a more detailed and focused approach of these issues.

IV Supply Source Diversification Assessment

The assessment of the Supply Source Diversification at Zone level aims at determining the ability of each Zone to access each identified supply source. It has been carried out under the 1-day Average demand situation through Targeted Maximisation. The supply situation under the Targeted Maximisation cases reflects, source by source, the geographical reach of the Maximum Potential scenario.

This assessment does not identify cross-border congestion but merely identifies how many different sources can be accessed by a Zone (with a minimum of a 5% share).

Issues directly linked to the North West region are:

- The situation in Sweden and Denmark which currently have only one supplier, but which will evolve with the FID projects and even more with the Non-FID projects to 3 to 4 suppliers
- The situation of the Iberian Peninsula, which has limited access to sources, is related to the French-Spanish border and North South French infrastructure and is, detailed in the GRIP South which covers this whole region

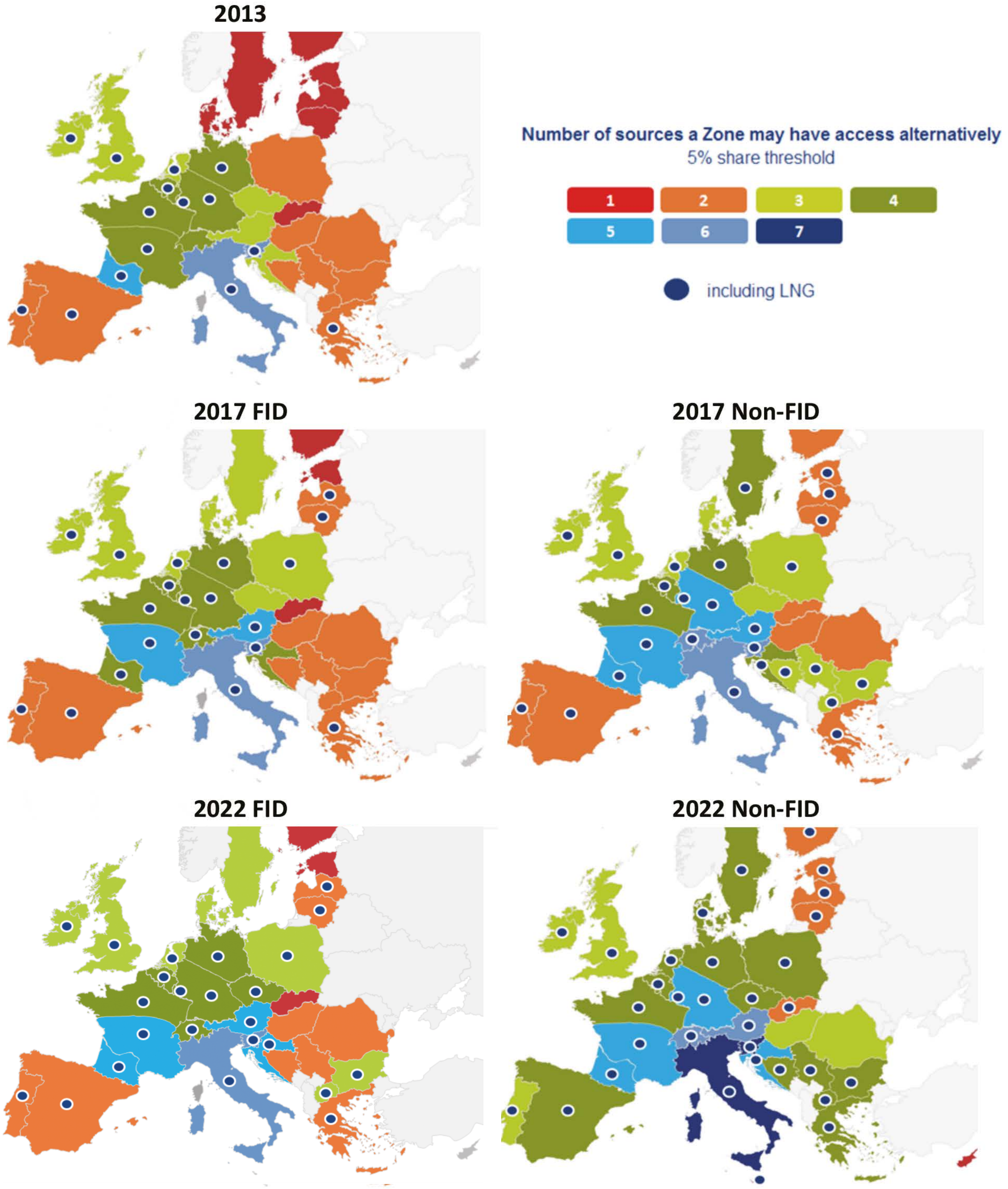


Figure 36
Supply Source Diversification

Image courtesy of NW European TSOs

4.3 PROJECTS ANSWERING TYNDP 2013-2022 NEEDS

4.3.1 Related German-Danish border congestion

The cross-border congestion identified for Denmark in 2013 is known to be related to the limited firm capacity at the German-Danish border. As illustrated by the TYNDP 2013-2022, an FID project already exists to overcome the cross-border capacity constraints, diversification and security of supply that have been identified in previous TYNDP 2013-2022 and GRIP reports.

The requirement for additional capacity from Germany to Denmark was identified through an Open Season by Gasunie Deutschland (GUD) back in 2009. The resulting infrastructure 'Project Ellund' consists of two steps.

Step one increases capacity in Q4 2014 to a level of 310,000 m^3/h and step two increases capacity from the end of 2015/beginning of 2016 to a level of 500,000 m^3/h. Step two was labelled Non-FID by the TYNDP 2013-2022, but has become a FID-project in the meantime.

The projects to complete step one are under construction, aiming to be operational from Q4 of 2014. This step comprises a connection to the Nordeuropäische Erdgasleitung (NEL) in Heidenau (South of Hamburg) and a compressor station in Embsen (South of Bremen).

In step two, which gained FID status by GUD recently, reinforcement of the pipeline route towards Ellund will take place with an anticipated commissioning date at the end of 2015 to the beginning of 2016. This second step entails the construction of a new compressor station in Quarnstedt and looping of the Northern-most pipeline section Fockbek-Ellund. Once the projects related to step two are operational, the exit firm capacity at Ellund in Germany will be around 500.000 m^3/h.

Figure 37 shows the two steps for increasing transport capacity from Germany to Denmark at Ellund, as they appear in the draft German NEP 2013:

- Project 007-01/009-01:
  new compressor station in Quarnstedt
- Project 011-01:
  loop to DEUDAN pipeline from Fockbek to Ellund

Figure 37
German Projects to Increase Capacity

4.3.2 Related to Sweden's dependency on German-Danish border capacity

Sweden is aware of its vulnerable supply position, illustrated in the TYNDP 2013-2022 by the low remaining flexibility even with FID and Non-FID projects as already discussed in section 4.2.1.

The Ellund project is of fundamental importance to Sweden given the anticipated reduction of Danish North Sea production volumes. The project will improve the situation, and also reduce the risk for Sweden. However, Sweden is unlikely to significantly increase its flexibility without creating one more cross-border point. This fact is illustrated by the TYNDP 2013-2022. In 2022, both with FID and Non-FID projects, the Swedish flexibility remains below 1%. As the TYNDP 2013-2022 proposes, further capacity increases would have to be considered post 2020, such as the suggested tie-in from Norway to Denmark, LNG terminals in Sweden (see also section 4.2.1 I.C & II.B) and/or a successive increase from Germany through Denmark. An alternative remedial action would be to increase the firm capacity from Denmark to Sweden, provided that Danish consumption will decrease and consequently more volumes and capacity becomes available for Sweden.

Notwithstanding the fact that the gas balance between Sweden and Denmark is currently ensured through interruptible and short-term firm capacity, the Swedish TSO, Swedegas, is aware that in essence there may be a need for a 'second' cross-border point to Sweden as discussed in section 4.2.1 I.A previously. Priorities regarding the Swedish long-term energy policies largely resonate with those of the other Nordic countries, which are all aiming for carbon neutral energy systems in 2050. Suggested pathways are described in IEA's recent report (http://www.iea.org/etp/). Both Denmark and Sweden are also covered in the BEMIP GRIP (to be published).

Image courtesy of NW European TSOs

4.3.3 Related to Luxembourg cross-border congestion

The TYNDP 2013-2022 Resilience Assessment identifies cross-border congestion in Luxembourg which can be mitigated with Non-FID projects. The methodology for calculating available firm capacity at each interconnection point (IP) of the Luxembourg 'supply only network' is based on a simulation of peak demand at contractual cross-border pressures.

Currently the sum of firm capacity, at contractual pressure, on all of the Luxembourg's TSO (Creos) IPs doesn't cover the needs of the Luxembourg national market demand, as has been confirmed under TYNDP 2013-2022 Resilience Assessment simulations. In order to fulfil legal obligations and duties as the Luxembourg national TSO, Creos has acknowledged that investments are needed for additional pressure commitments or additional infrastructure in order to increase firm entry capacities for Luxembourg.

As shown in the TYNDP 2013-2022 assessment the cross-border congestion can be mitigated by 2022, by including Non-FID projects. Two different infrastructure projects are under investigation in order to comply with the capacity requirements by the end of 2018.

In a common Open Season process, during Spring 2013 Creos and GRTgaz launched the binding market survey for additional capacity of 9 GWh/d and 40 GWh/d from France to Luxembourg, by the end of 2018; this was unsuccessful. In order to comply with future capacity needs and to fulfil the provisions of Article 6 and 8 of Regulation (EU) No 994/2010, Creos has engaged in further negotiations with the national authorities.

Fluxys Belgium is also evaluating to upgrade its infrastructure towards Luxembourg in order to increase capacity. Figure 38 shows the projects to increase Luxembourg's cross-border capacity.

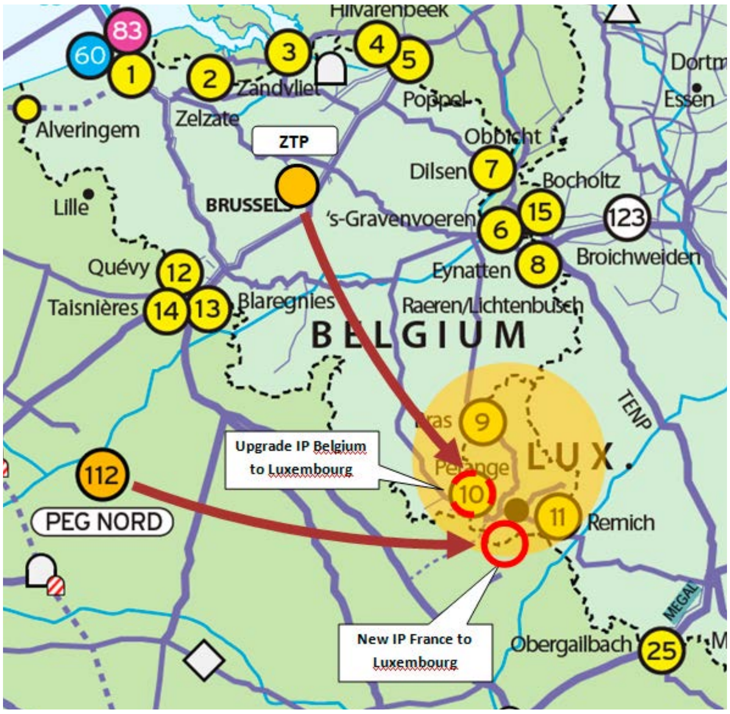


Figure 38
Luxembourg's Proposed Projects

4.3.4 Related to Southern France LNG dependency and North South transport

Firm transmission capacity from GRTgaz Northern Zone to its Southern Zone is currently restricted to 230 GWh per day. Historically, consumption in the South East of France has been supplied with LNG from Fos. This situation has to be improved in order for the South of France to be more widely receptive to other supplies and to mitigate the price dependency of the Southern Zone on the LNG market.

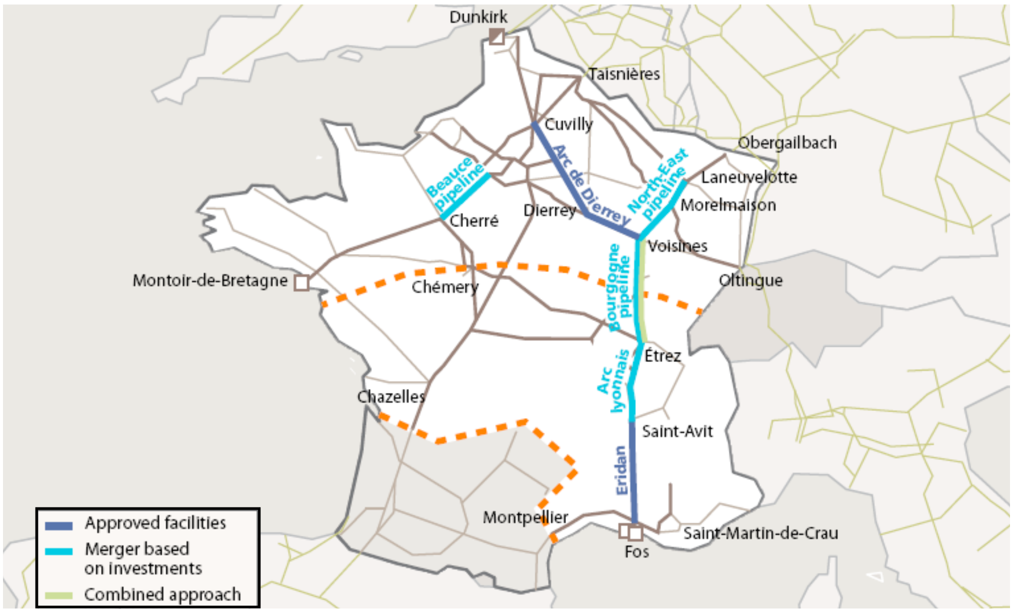


Figure 39

Projects for the merger of the North and South market areas in France

In order to respond to this potential spread between PEG Sud and the other hubs of the North West region, solutions have been identified and are presented in the GRTgaz TYNDP 2013-2022 ('10-Year network development statement on GRTgaz's transmission system'). Even if some major decisions have already been made (reinforcement of the core system in GRTgaz North Zone, with 'Arc de Dierrey' planned for 2015, and in the GRTgaz South Zone, with ERIDAN planned in 2016) other decisions have to be taken to really improve the situation. The different options are:

- For a merger based on investments, GRTgaz estimated that additional investments of €1.8 billion are needed to complete the development of the North South corridor, with commissioning in 2020 at the earliest; the projects involved are described in the map above (Source: GRTgaz TYNDP 2012-2021)
- A study of methods to manage bottleneck situations based on contractual mechanisms by 2016, taking into account the completion of ERIDAN and the Arc of Dierrey, concluded on the feasibility of a merger, but underlines the high levels of variability of the cost of such mechanisms; moreover some physical limits would remain and this solution would not allow access to natural gas at a more competitive price
- Currently a study is being carried out on a third approach; combining investments and contractual mechanisms, with the objective of creating substantial additional capacity or even merging the two Zones

A Cost Benefit Analysis on the different options is on-going in 2013, under the guidance of the French Regulator, in order to choose the best option.

5.0 Background to North West European Infrastructure Projects

5.1 INTRODUCTION

All North West issues highlighted in the TYNDP 2013-2022 were detailed in the previous chapter (In Depth analysis of TYNDP 2013-2022 Identified Issues in the North West Region). Concrete measures (FID and Non-FID projects) to solve the identified capacity issues were examined, as is demonstrated by both the German/Danish and the Luxembourg issues. Due to the extensive TYNDP 2013-2022 modelling and the modelling carried out in national plans, no additional modelling is executed for this North West GRIP.

As was illustrated by the findings of the TYNDP 2013-2022, the TSOs and non-TSO project promoters in North West Europe are well aware of the issues highlighted in the TYNDP 2013-2022. The processes leading up to the projects that will solve the issues have often started years ago. TSOs, for example, constantly analyse their networks, including border points. As a result the North West TSOs are well aware of congestions in the region. Generally, national plans go into far more detail than can be expressed in the TYNDP 2013-2022, because in national modelling all regional specifics are included. Moreover, in national planning, supply and demand are not matched under perfect market conditions, but all aspects related to the entry-exit market Zone model are included. Unlike the TYNDP 2013-2022, national planning therefore includes elements like arbitrage and other market behaviour, thus resulting in capacity issues other than those observed in TYNDP 2013-2022. The TYNDP 2013-2022 should nevertheless be regarded as a valuable addition to this detailed form of modelling from a pan-European point of view, which clearly indicates the relation between certain Zones and projects and includes all major cross-border congestions.

There are various ways to initiate infrastructure projects by TSOs. Some projects are initiated by large import projects (like LNG terminals), others by large storage projects. Due to their size these projects have sufficient economies of scale to be carried out separately. Auctions, Open Seasons or more recently National Plans are additional ways to identify market demand and initiate projects by TSOs. The Supply Regulation 994/2010 also proposed the building of infrastructure based purely on security of supply requirements, again provides a different investment reason.

In this chapter an overview is given of such initiatives in the different countries of the North West region. Storages and LNG-terminals are predominantly developed by third parties and TSO projects connect these facilities to the market. Another reason for major investments is the upkeep and maintenance of the aging of networks. As was written in the North West Specifics chapter, the oldest pipelines date back to the early 1960s. All these incentives to start investment projects are tested against strict legal obligations to economically develop gas networks and are accompanied by consultations between the different TSOs involved.

In general, the daily analyses of the networks and the regular market consultations of the TSOs have over the years lead to a significant increase in cross-border capacity in North West Europe to support a well functioning market, whether this is related to market integration, diversification of sources or Security of Supply. As a result, related cross-border congestion is almost completely mitigated in the region.

Furthermore in this chapter a Matrix is included which lists projects in the North West region and shows which interconnection points they impact. The matrix can also serve to gain access to the detailed project information (update Summer 2013) included in Annex A, where this information is clustered by country. To support consistency and readability the TYNDP 2013-2022 labelling of the projects is used. All new projects, which were not in the TYNDP 2013-2022, will be clearly marked. Furthermore, some projects have obtained the status of 'Project of Common Interest'. These projects can be found at http://ec.europa.eu/energy/infrastructure/pci/doc/2013_pci_projects_country.pdf

5.2 OPEN SEASONS, AUCTION PROCESSES AND OTHER MEANS TO IDENTIFY MARKET DEMAND IN THE NORTH WEST REGION

5.2.1 Belgium

Over the past years, Fluxys Belgium has built up proven experience with Open Seasons through successfully concluding several market consultation processes. Throughout the previous decade, Open Seasons have been organised to capture market interest for new East West and North South transit capacity, for long-term capacity in storage and domestic market entry, and for additional LNG storage and send-out. The most recent Open Season was launched in 2010, as a joint initiative from Fluxys Belgium and GRTgaz to assess the level of interest in long-term transmission capacity from France to Belgium. The process was closed successfully in March 2012, with binding commitments as a result. To make that capacity available, GRTgaz will build a 26 km pipeline from the Pitgam compressor station to the French-Belgian border.

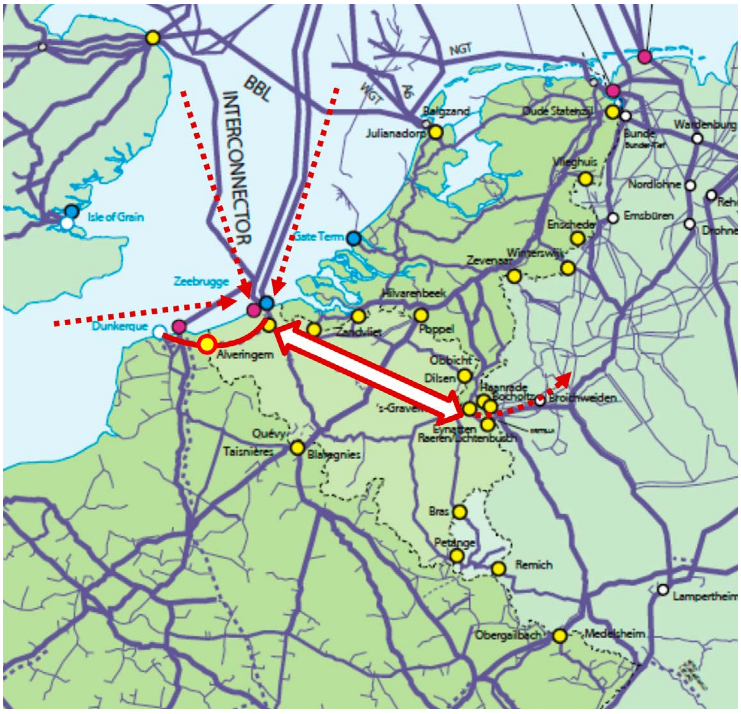


Figure 40
Illustration of new IP linking Dunkirk LNG terminal to Belgium following Open Season, and possible sources for future L-gas replacement in Germany

Fluxys Belgium will build a new interconnection point in Alveringem (near Veurne) and lay a 72 km pipeline between Alveringem and Maldegem. Both transmission system operators aim to commission the new capacity in line with the commissioning of the Dunkirk LNG terminal in late 2015.

Fluxys Belgium considers possible additional investment projects on its backbone system to cope with changing market conditions in the future. These are mainly linked to new supply sources covering demand in the region and in particular bringing LNG sources from Zeebrugge and Dunkirk to supply current L-gas regions in Germany with H gas in the context of the announced reduction of L gas export from The Netherlands as from 2020[28].

5.2.2 Denmark

There is no legal obligation to organize an Open Season in Denmark as basis for system expansion. However in 2009 the Danish TSO, Energinet.dk, chose to follow the good practice guidelines from the EU that recommended the use of Open Season. As a result, the first, and so far the only, Open Season was organised in Denmark in 2009. The shippers were allocated all the capacity reserved in this Open Season, under the conditions precedent that they may match capacity with capacity available in the German system.

There are no new Open Seasons planned, because there are no pending plans to further expand infrastructure in Denmark. However, as Energinet.dk had positive experience with the Open Season in 2009, it is likely that the Danish TSO will continue with this practice in the future.

5.2.3 France

In France, many market consultations have been organized to develop cross border capacities for the past few years. Since 2005, GRTgaz has launched consultations and binding requests for additional capacities with each neighbouring TSO:

- The first one, in 2005, led to the creation of new entry capacity from Germany, growing from 120 GWh/d in 2008 to 620 GWh/d in 2009
- After two consultations organized in 2009 and 2010, cross border capacities with Spain will be enhanced in 2013 at Larrau and in 2015 at Biriatou, in both directions
- In order to consolidate the integration of the French, Belgian and North European markets, Fluxys Belgium and GRTgaz have completed two consultations together, one in 2010 and the other in 2011. Both TSOs will develop their transmission networks accordingly:
  - capacity from Belgium to France will be increased in 2013 at Taisnières
  - and a new interconnection point will be created in 2015 at Veurne to provide non-odorised gas from the new Dunkirk LNG Terminal to the Belgian border
- The consultation conducted jointly by GRTgaz and FluxSwiss in 2012 to increase capacity out of Switzerland towards France by 2016-2018 has not been successful. GRTgaz and FluxSwiss now envisage proposing a product that would require less investment and better reflect current demand. Corresponding capacity could be commissioned by 2017, provided this requirement is confirmed before the end of 2013
- The consultation conducted jointly in 2012 and 2013 by GRTgaz and CREOS Luxembourg in order to increase France's interconnection capacity towards Luxembourg failed to confirm the interest of market operators in the capacity proposed. However, the project could go ahead if Luxembourg confirmed its interest with a view to

[28] http://www.fnb-gas.de/netzentwicklungsplan/netzentwicklungsplan.html

securing its supply (see Luxembourg section for more details)

- Having been requested by several shippers in the past, the increase in exit capacity out of France into Italy via Switzerland is subject to the feasibility of increasing capacity in Switzerland. In light of the uncertainties concerning the latter point and the period from contract to delivery of such works, the date of commissioning of such capacity is planned for the end of the ten year plan

In addition to these market consultations, many projects are initiated by large import projects, in particular LNG terminals, or by large storage projects.

These projects are located in figure 41 and their updated details are given in the appendices.

Figure 41
Map of the infrastructure projects in France

5.2.4 Germany

The last Open Season within Germany was organized in 2009. As requested by the German regulator Bundesnetzagentur (BNetzA) in 2012, the Open Season process was replaced with the German NEP Gas where the TSO present their network development planning results – including the findings obtained during their public consultation – and the determination of long-term capacity demands. It is based on a scenario framework, which has been consulted by the TSO and was confirmed by the BNetzA. The confirmation of the scenario framework implies that the TSOs are required to conduct cost-benefit analyses for the various versions of network access for storage facilities and gas fired power plants[29].

[29]http://www.fnb-gas.de/netzentwicklungsplan/netzentwicklungsplan.html

As a general approach, open seasons are substituted by the NEP. Nevertheless, Fluxys TENP GmbH has developed, in close cooperation with the BNetzA, a process that combines a binding commitment with an auction[30]. This process has been tested in the reverse flow open season and feedback has been given to both BNetzA and CEER in order to further optimise it, where needed. The reverse flow project consists in creating reverse flow capacity from Italy through Switzerland to Germany and Belgium in order to strengthen security of supply as it opens for Northwest Europe additional supply opportunities from Italy. It will also deepen market liquidity by fully connecting the gas trading places in Italy, Germany, Belgium and the UK.

As mentioned in the scenario framework of the German NEP 2014 additional exit capacity at the interconnection point Oude Statenzijl/Bunde in the direction to The Netherlands and at the interconnection point Eynatten in direction from/to Belgium could be required. This is a consequence of the decrease of the Northern European natural gas production. As is elaborated under 5.2.7, additional imports of Russian gas will be transported via Germany to the markets in Germany, The Netherlands, Belgium, the UK and other North West European markets. Therefore new projects are expected to be developed in Germany.

Gasunie Deutschland is developing a project to connect additional imports of Russian gas at the interconnection point Greifswald for markets in Western Europe (Germany, The Netherlands, Belgium, UK and France). The consequences for the infrastructure in Germany will be further analyzed within the German NEP 2014.

With respect to additional imports of Russian gas at the interconnection Area Greifswalder Bodden for markets in Western Europe (Germany, The Netherlands, Belgium and UK -via The Netherlands and Belgium-), NEL Gastransport and GASCADE/Fluxys are also developing an infrastructure project which depends on the investment decision for the 3rd pipe of Nord Stream. The impact for the infrastructure in Germany will be further analyzed within the German NEP 2014.

Scenario Frameworks of the German NEPs 2012 and 2013 showed additional demand to enhance the Southern Bavarian network and the cross border capacity from and to Austria. In the area of Haiming/Burghausen/Überackern four cross border points exist, two interconnection points (Überackern and Überackern 2) and two cross border storage connection points connecting big storages located in Austria to the German TSO Network (Haiming 1/- UGS Haidach and Haiming 2/- UGS 7 fields). As no firm capacity could be provided for filling and withdrawal of the storages on German side of the border, responsible German TSO bayernets GmbH had already to reduce cross border capacity for gas transport at the IPs to shift this capacity to the cross border storage points. To restore and enhance cross border capacity between hubs of NCG and CEGH Baumgarten and to meet further demand of near future caused by enhancements of the Austrian storages as well as to address additional possible demand caused by Austrian pipeline project Tauerngasleitung (TGL), bayernets GmbH builds a new pipeline called 'MONACO I' from Haiming/Burghausen to Finsing (near Munich).

MONACO phase II was planned to connect MONACO I further westwards from Finsing to Amerdingen. Coordinated national calculations in the course of German NEP planning 2013 showed, that a more efficient route of MONACO phase II might exist. If these calculations prove to be stable over time the alternative route will be build from Finsing to Arresting and the phase II project will be promoted by another German TSO instead of bayernets GmbH.

The mentioned projects are schematically illustrated in figure 42.

[30] http://www.fluxys.com/tenp/en/TenpSystemInfo/SouthNorthProject/ReverseFlow

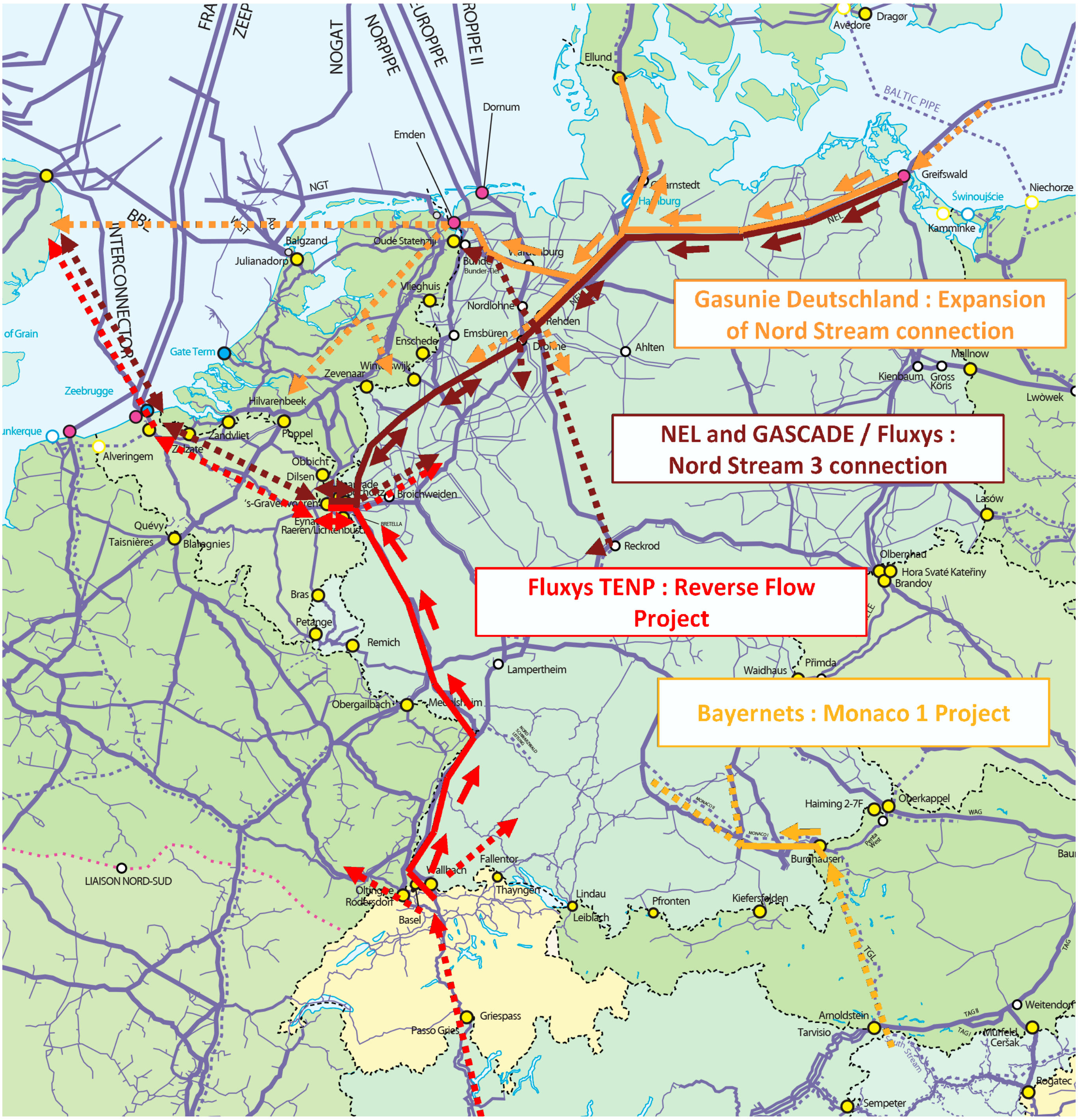


Figure 42
Illustration of projects in Germany

5.2.5 Ireland

In Ireland two market tests were carried out in accordance with Regulation 994/2010 which requires that TSOs shall enable permanent bi-directional capacity on all cross-border interconnections between Member States by 3rd December 2013, unless an exemption is granted. The market tests carried out were:

- Physical Reverse Flow at Moffat Interconnection Point (Market consultation carried out in August 2011)
- Physical Reverse Flow on South North Pipeline between Republic of Ireland and Northern Ireland (Market Consultation carried out in April 2012)

Both of these market tests concluded with Gaslink receiving an exemption from the Competent Authorities to providing physical reverse flow. These two market tests will be repeated later in 2013 in accordance with Regulation 994/2010. Gaslink will also be conducting capacity auctions to meet the requirements of the ENTSOG CAM Network Code.

Approximately 93% of the Irish gas demand is supplied from gas imports from the UK through the Moffat Interconnection Point. The interconnector system also supplies 100% of gas demand to Northern Ireland from Twynholm and to the Isle of Man market from Interconnector 2 (see map below). In addition to this, the interconnector system provides a number of different services to the Republic of Ireland. The majority of the interconnector system consists of a twinned pipeline system; however, there is a 50 km section of single pipeline between Cluden and Brighouse Bay in South West Scotland. This single section of pipeline is one of the main risks to the Irish gas infrastructure and has been addressed in Ireland's Risk Assessment and Preventive Action Plan which was prepared under EU Regulation 994/2010.

Reinforcing the single section of pipeline is the best protective action. The requirement to reinforce this pipeline section has also been of significant note in the network development and capacity statements published by the Irish TSO and the National Regulatory Authorities. The twinning of the single section of the pipeline in South West Scotland has been put forward as a potential Project of Common Interest under the EU Regulation on Guidelines for Trans-European Energy Infrastructure.

Figure 43
Ireland/United Kingdom
Interconnection System

5.2.6 Luxembourg

In close cooperation with the NRA's of France and Luxembourg, GRTgaz and Creos launched a binding request for additional cross border capacities from PEG Nord in France to the Balancing Point in Luxembourg in early 2013. The Open Season was designed in order to support two different infrastructure projects offering 9GWH/d and 40 GWH/d of additional capacities to the Luxembourg market. A binding commitment for long-term capacity has not been submitted.

GRTgaz and Creos shall not pursue any further action in the context of the Open Season. However in order to comply with future capacity needs and to fulfil the provisions of Articles 6 and 8 of Regulation 994/2010 for Luxembourg, Creos has engaged in further negotiations with national authorities.

5.2.7 The Netherlands

During the past decade an extensive investment program with cross-border impact has been carried out in The Netherlands (see figure 44). A pipeline connection with the UK was constructed and came into operation in late 2006. Various interconnections with neighbouring countries were enhanced in three Open Season processes. Import capacity of Norwegian gas in Emden was increased, an LNG terminal was constructed and many UGS projects were carried out. Total investments amounted to several billion Euros.

In 2013 a fourth Open Season was conducted by GTS. The number of agreements for booking capacity in this Open Season remained limited. The outcome of this Open Season was that customer demand can be met by existing infrastructure, there is more demand for transport capacity with shorter terms and there is potential for growth of secondary trading in capacity. According to Dutch law, an Open Season has to be organised every two years.

In the near future (expected in 2014), the interconnection capacity with Germany and Belgium will be further increased and the Bergermeer storage facility will be commissioned. Other projects which affect cross-border capacities may come about to provide sufficient capacity due to changed contractual situations. Furthermore, projects related to the Directive 2010/75/EU on Industrial Emissions are initiated (the Gas Compressor Optimisation Program) and due to the fact that some elements of the Dutch gas network are over 50 years old, projects related to the replacement of ageing assets to ensure that they perform efficiently are executed.

New projects are expected to be developed. These are related to additional imports of Russian gas for the markets in The Netherlands and the UK and will require some reinforcement of the network in the Northern part of The Netherlands. Also additional imports of LNG are expected to materialize at the GATE terminal in Rotterdam. Some minor reinforcements will be necessary to accommodate these additional volumes. Another project is related to export of additional H-gas gas to Germany to compensate decreasing exports of L-gas (see chapter 2.3.1). In view of the proximity of the L-gas market to the Eastern border of The Netherlands, additional H-gas exports are likely to take place at the existing Bocholtz interconnection point or north of this point.

The mentioned transmission projects are indicated in figure 44.

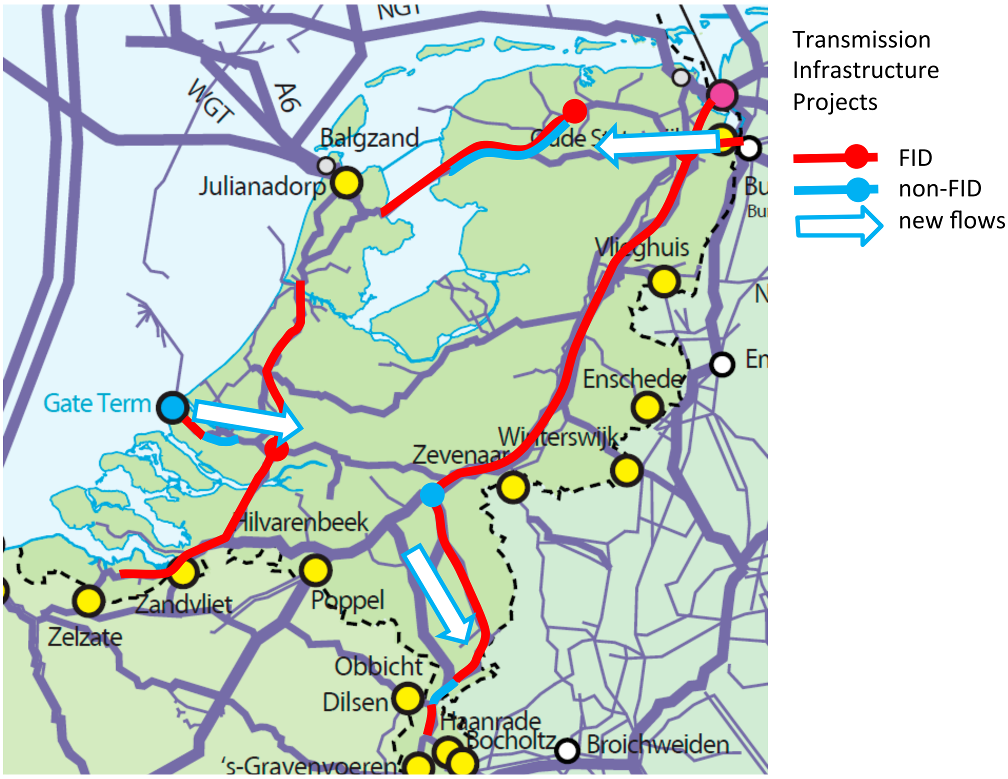


Figure 44
Map of The Netherlands Transmission System Investment Program

5.2.8 The United Kingdom

Every March, National Grid holds an annual long-term entry capacity auction process. In this auction, Firm NTS Entry Capacity is made available in quarterly tranches from Y+2 through to Y+16 (where Y = current Gas Year), and users bid at pre-defined prices steps.

This auction process is where users signal for capacity at an entry point. If the market demand exceeds the capacity available, and subject to an economic test, National Grid may become obligated to release additional capacity on an enduring basis or substitution maybe used to wholly or partially satisfy an investment signal.

NTS Exit Capacity is made available for Users to apply for at, a set indicative price, within the July Annual Application Window from Y+4, Y+5 or Y+6 or via an Ad-hoc process. Investment signals may be triggered through these processes and National Grid NTS produce an Exit Capacity Release Methodology Statement, which provides additional detail and is published on the company website. For information, National Grid is currently engaged with industry participants with a view to developing the arrangements for the long-term release of capacity and a modification to the Uniform Network Code has been raised accordingly[31].

In Northern Ireland, on an annual basis the TSOs are obliged to provide the Regulator with forecast volume and capacity requirements for all their network users in respect of the upcoming gas year and the following four gas years. This information is required by the last business day in June.

[31]Further details of the modification can be found via the following link: http://www.gasgovernance.co.uk/0452

In addition to this requirement, network users are requested to provide their forecast volume and capacity requirements for an additional five years. The ten-year forecasts are used for network modelling and analysis. The results of this analysis, including possible investment scenarios, are published in the Joint Gas Capacity Statement.

5.2.9 Sweden

Investments in Sweden's transmission system have been very marginal since 2004. An Open Season process was carried out for the purpose of preparing for the Skanled project in 2009. A similar Open Season process for Swedegas' LNG Göteborg project is expected to be finalised during Q4 2013.

5.3 PROJECT MATRIX

The project matrix is a table where interconnection points and projects are cross-linked. It contains vertically all the interconnections points that are relevant for the North West region. This means borders between two countries of the North West region as well as borders on the edge of the region, if there is a project identified impacting that border. Whenever a project has an impact on the capacity of such a border, the name of the project together with the relevant country and TYNDP 2013-2022 label is indicated. Whether a project has an impact on an interconnection point of the region, is determined by the project promoter. One interconnection point can obviously be impacted by more than one project, as can a project have impact on the capacity of multiple borders.

The focus of this project matrix is to show if interconnection points relevant for the region are influenced by specific projects. The project matrix can act as a navigation pane for stakeholders. By selecting interconnection points of interest, one can easily identify the projects that have an impact on the related interconnection point capacity. The country where the project is situated and the TYNDP 2013-2022 project label allow for easy navigation to the associated project details in Annex A.

As not all projects (for example storage projects) will affect interconnection capacities, the project matrix will not necessarily contain all projects. On the other hand a detailed overview of each project relevant for the region is available in Annex A.

Projects included in the GRIP 2013, but not included in the TYNDP 2013-2022 will be indicated as new in the matrix.

Image courtesy of NW European TSOs

MATRIX CROSS-BORDER INTERCONNECTION POINTS

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
2	cross-border	Zelzate	Gasunie Transport Services	NL	>	Fluxys Belgium	BE	NL	TRA-F-268	System Enhancements FID update - Gas Transport Services - Gasunie Transport Services B.V.
4	cross-border	Poppel (BE) / Hilvarenbeek (NL)	Gasunie Transport Services	NL	>	Fluxys Belgium	BE	NL	TRA-F-268	System Enhancements FID update - Gas Transport Services - Gasunie Transport Services B.V.
6	cross-border	Eynatten (BE) // Lichtenbusch / Raeren (DE) (Fluxys TENP)	Fluxys TENP	DE	>	Fluxys Belgium	BE	DE	TRA-N-207	Bretella - Fluxys
			Fluxys Belgium	BE	>	Fluxys TENP	DE	DE	TRA-N-207	Bretella - Fluxys
		Eynatten (BE) // Lichtenbusch / Raeren (DE) (GASCADE)	GASCADE Gastransport	DE	>	Fluxys Belgium	BE	DE	TRA-F-289 (*)	Installation of Nord Stream onshore project - GASCADE Gastransport GmbH
								DE	TRA-N-324 (*)	Expansion of Nord Stream connection to markets in western Europe - Exit Eynatten - GASCADE
7	cross-border	Bras	Fluxys Belgium	BE	>	Creos Luxembourg	LU	BE	TRA-N-206	Luxemburg Pipeline - Fluxys Belgium
		Petange	Fluxys Belgium	BE	>	Creos Luxembourg	LU	BE	TRA-N-206	Luxemburg Pipeline - Fluxys Belgium
9	cross-border	Blaregnies (BE) / Taisnières (H) (FR) (Segeo)	Fluxys Belgium	BE	>	GRTgaz	FR	FR	TRA-F-037	Entry capacity increase from Belgium to France - GRTgaz
		Blaregnies (H) (BE) / Taisnières (H) (FR) (Troll)	Fluxys Belgium	BE	>	GRTgaz	FR	FR	TRA-F-037	Entry capacity increase from Belgium to France - GRTgaz
11	cross-border	Bocholtz (Fluxys TENP)	Gasunie Transport Services	NL	>	Fluxys TENP	DE	NL	TRA-N-313 (*)	H-gas transport from NL to D - Gasunie Transport Services B.V.
		Bocholtz (OGE)	Gasunie Transport Services	NL	>	Open Grid Europe	DE	NL	TRA-N-313 (*)	H-gas transport from NL to D - Gasunie Transport Services B.V.
16	cross-border	Bunde (DE) / Oude Statenzijl (H) (NL) (GASCADE)	GASCADE Gastransport	DE	>	Gasunie Transport Services	NL	NL	TRA-F-268	System Enhancements FID update - Gas Transport Services - Gasunie Transport Services B.V.
								NL	TRA-N-314 (*)	Transport from OSZ/Bunde to Julianadorp - Gasunie Transport Services B.V.
			Gasunie Transport Services	NL	>	GASCADE Gastransport	DE	NL	TRA-F-268	System Enhancements FID update - Gas Transport Services - Gasunie Transport Services B.V.
								NL	TRA-N-314 (*)	Transport from OSZ/Bunde to Julianadorp - Gasunie Transport Services B.V.
		Bunde (DE) / Oude Statenzijl (H) (NL) (GUD)	Gasunie Transport Services	NL	>	Gasunie Deutschland Transport Services	DE	NL	TRA-F-268	System Enhancements FID update - Gas Transport Services - Gasunie Transport Services B.V.
								NL	TRA-N-314 (*)	Transport from OSZ/Bunde to Julianadorp - Gasunie Transport Services B.V.
			Gasunie Deutschland Trans-port Services	DE	>	Gasunie Transport Services	NL	DE	TRA-N-316 (*)	Expansion of Nord Stream connection to markets in western Europe - Exit Bunde-Oude - Gasunie Deutschland Transport Services GmbH
		Bunde (DE) / Oude Statenzijl (H) (NL) I (OGE)	Gasunie Transport Services	NL	>	Open Grid Europe	DE	NL	TRA-F-268	System Enhancements FID update - Gas Transport Services - Gasunie Transport Services B.V.
								NL	TRA-N-314 (*)	Transport from OSZ/Bunde to Julianadorp - Gasunie Transport Services B.V.
19	cross-border	Moffat	National Grid Gas	UK	>	Gaslink	IE	IE	TRA-N-060	Twinning of South West Scotland Onshore System - Gaslink
19 (**)	cross-border	Moffat	Gaslink	IE	>	National Grid Gas	UK	IE	TRA-N-059	Physical Reverse Flow at Moffat Interconnection Point - Gaslink
20 (**)	cross-border	Twynholm: Scotland - Northern Ireland (SNIP)	Premier Transmission Ltd	UK	>	Gaslink	IE	UK - N.Irl.	TRA-N-027	Physical reverse flow from Northern Ireland to Great Britain and Republic of Ireland via Scotland to Northern Ireland pipeline - Premier Transmission Ltd
22 (**)	cross-border	Medelsheim (DE) / Obergailbach (FR) (GRTgaz D)	GRTgaz	FR	>	GRTgaz Deutschland	DE	FR	TRA-N-047	Reverse capacity from France to Germany - GRTgaz
								FR	TRA-F-036	Arc de Dierrey - GRTgaz
		Medelsheim (DE) / Obergailbach (FR) (OGE)	GRTgaz	FR	>	Open Grid Europe	DE	FR	TRA-N-047	Reverse capacity from France to Germany - GRTgaz
								FR	TRA-F-036	Arc de Dierrey - GRTgaz
23	cross-border	Überackern (AT) / Burghausen (DE) (2)	bayernets	DE	>	Gas Connect Austria	AT	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
			Gas Connect Austria	AT	>	bayernets	DE	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH

(*) A new project in the GRIP 2014-2023 data collection window, that was not yet in last TYNDP 2013-2022
(**) A possible new interconnection point, or a possible new flow direction on an existing interconnection point

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
23	cross-border	Überackern (AT) / Burghausen (DE) (1)	Gas Connect Austria	AT	>	bayernets	DE	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
27 (**)	cross-border	Griespass (CH) / Passo Gries (IT) (FluxSwiss)	Snam Rete Gas	IT	>	FluxSwiss	CH	CH	TRA-N-230	Reverse Flow Transitgas Switzerland - Fluxys
28 (**)	cross-border	Wallbach (Fluxys TENP/FluxSwiss)	FluxSwiss	CH	>	Fluxys TENP	DE	DE	TRA-N-208	Reverse Flow TENP Germany - Fluxys
								CH	TRA-N-230	Reverse Flow Transitgas Switzerland - Fluxys
31	cross-border	Oltingue (FR) / Rodersdorf (CH)	GRTgaz	FR	>	FluxSwiss	CH	FR	TRA-N-046	Exit capacity increase to CH at Oltingue - GRTgaz
								FR	TRA-F-036	Arc de Dierrey - GRTgaz
31 (**)	cross-border	Oltingue (FR) / Rodersdorf (CH)	FluxSwiss	CH	>	GRTgaz	FR	FR	TRA-N-045	Reverse capacity from CH to FR at Oltingue - GRTgaz
								CH	TRA-N-230	Reverse Flow Transitgas Switzerland - Fluxys
32	cross-border	Larrau	Enagás	ES	>	TIGF	FR	FR	TRA-F-250	Artère de Guyenne (Phase B Girland Project) - TIGF
								FR	TRA-F-039	Iberian-French corridor: Western Axis (CS Chazelles) - GRTgaz
			TIGF	FR	>	Enagás	ES	FR	TRA-F-250	Artère de Guyenne (Phase B Girland Project) - TIGF
								FR	TRA-F-039	Iberian-French corridor: Western Axis (CS Chazelles) - GRTgaz
33	cross-border	Biriatou (FR) / Irun (ES)	ETN (Enagás Transporte del Norte)	ES	>	TIGF	FR	FR	TRA-F-251	Artère de l'Adour (former Euskadour) (FR-ES interconnection) - TIGF
								FR	TRA-F-039	Iberian-French corridor: Western Axis (CS Chazelles) - GRTgaz
								ES	TRA-F-156	CS Border at Biriatou
			TIGF	FR	>	ETN (Enagás Transporte del Norte)	ES	FR	TRA-F-251	Artère de l'Adour (former Euskadour) (FR-ES interconnection) - TIGF
								FR	TRA-F-039	Iberian-French corridor: Western Axis (CS Chazelles) - GRTgaz
								ES	TRA-F-156	CS Border at Biriatou
36	cross-border	Ellund (GUD)	Energinet.dk	DK	>	Gasunie Deutschland Transport Services	DE	DK	TRA-F-015	Ellund-Egtved - Energinet.dk
		Ellund (OGE)	Energinet.dk	DK	>	Open Grid Europe	DE	DK	TRA-F-015	Ellund-Egtved - Energinet.dk
36 (**)	cross-border	Ellund (GUD)	Gasunie Deutschland Transport Services	DE	>	Energinet.dk	DK	DK	TRA-F-015	Ellund-Egtved - Energinet.dk
								DE	TRA-F-231	Extension of existing gas transmission capacity in the direction to Denmark - 1. Step - Gasunie Deutschland Transport Services GmbH
								DE	TRA-N-232	Extension of existing gas transmission capacity in the direction to Denmark - 2. Step - Gasunie Deutschland Transport Services GmbH
37	cross-border	Dragør	Energinet.dk	DK	>	Swedegas AB	SE	DK	TRA-F-015	Ellund-Egtved - Energinet.dk
38 (**)	cross-border	Mallnow	GASCADE Gastransport	DE	>	GAZ-SYSTEM (ISO)	PL	DE	TRA-F-292 (*)	Installing a reverse flow in Mallnow - GASCADE Gastransport GmbH
39	cross-border	Lasów	ONTRAS - VNG Gastrans-port	DE	>	GAZ-SYSTEM	PL	PL	TRA-N-274	Upgrade of PL-DE interconnection in Lasów - GAZ-SYSTEM S.A.
42	cross-border	Opal (DE)/Brandov (CZ)	OPAL Gastransport	DE	>	NET4GAS	CZ	CZ	TRA-F-134	GAZELLE project - NET4GAS, s.r.o.

(*) A new project in the GRIP 2014-2023 data collection window, that was not yet in last TYNDP 2013-2022
(**) A possible new interconnection point, or a possible new flow direction on an existing interconnection point

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
61	cross-border	Haiming 2 7F / Haiming 2-7F (bayernets)	E.ON Gas Storage	AT	>	bayernets	DE	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
			bayernets	DE	>	E.ON Gas Storage	AT	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
		Haiming 2 7F / Haiming 2-7F (OGE)	E.ON Gas Storage	AT	>	Open Grid Europe	DE	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
			Open Grid Europe	DE	>	E.ON Gas Storage	AT	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
62	cross-border	Haidach (AT) / Haidach USP (DE)	astora	AT	>	bayernets	DE	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
			bayernets	DE	>	astora	AT	DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
(**)	cross-border	Alveringem	GRTgaz	FR	>	Fluxys	BE	BE	TRA-F-205	Alveringem-Maldegem - Fluxys Belgium
								FR	TRA-F-040	Reverse capacity from France to Belgium at Veurne - GRTgaz
(**)	cross-border	New IP France/Luxemburg	GRTgaz	FR	>	CREOS	LU	FR	TRA-N-044	New interconnection to Luxembourg - GRTgaz
								LU	TRA-N-013	OS GRTgaz/Creos - Creos Luxembourg S.A.
(**)	cross-border	Le Perthus	TIGF	FR	>	Enagas	ES	ES	TRA-N-161	Iberian-French corridor: Eastern Axis-Midcat Project (Pipeline Figueras-French border) - Enagás S.A.
								FR	TRA-N-252	FR-ES interconnection (MIDCAT) - TIGF
								FR	TRA-N-256	Iberian-French corridor: Eastern Axis-Midcat Project (CS Montpellier and CS Saint Martin de Crau) - GRTgaz
								FR	TRA-F-041	Eridan - GRTgaz
								FR	TRA-N-253	Est Lyonnais pipeline - GRTgaz
			Enagas	ES	>	TIGF	FR	ES	TRA-N-161	Iberian-French corridor: Eastern Axis-Midcat Project (Pipeline Figueras-French border) - Enagás S.A.
								FR	TRA-N-252	FR-ES interconnection (MIDCAT) - TIGF
								FR	TRA-N-256	Iberian-French corridor: Eastern Axis-Midcat Project (CS Montpellier and CS Saint Martin de Crau) - GRTgaz
								FR	TRA-F-041	Eridan - GRTgaz
								FR	TRA-N-253	Est Lyonnais pipeline - GRTgaz
(**)	cross-border	Porto-Vecchio	Interconnector GALSI	IT	>	GRTgaz	FR	FR	TRA-N-042	New interconnection IT-FR to connect Corsica - GRTgaz
								IT	TRA-N-012	GALSI Pipeline - Edison
(**)	cross-border	Interconnector PL-DK	Gaz-System (ISO)	PL	>	Energinet.dk	DK	PL	TRA-N-271	PL - DK interconnection (Baltic Pipe) - GAZ-SYSTEM S.A.
			Energinet.dk	DK	>	Gaz-System (ISO)	PL	PL	TRA-N-271	PL - DK interconnection (Baltic Pipe) - GAZ-SYSTEM S.A.
(**)	cross-border	Gormanston	BGE (UK)	UK	>	Gaslink	IE	IE	TRA-N-071	Physical Reverse Flow on South North Pipeline - Gaslink
(**)	cross-border	Haiming-Oberkappel (OGE) - DE / Burghausen (Transit) - TGL	Tauerngasleitung GmbH	AT	>	Open Grid Europe	DE	AT	TRA-N-035	Tauerngasleitung Gas Pipeline Project - Tauerngasleitung GmbH
		Haiming (bayernets) - DE / Burghausen (Austrian Hub) - TGL	Tauerngasleitung GmbH	AT	>	bayernets	DE	AT	TRA-N-035	Tauerngasleitung Gas Pipeline Project - Tauerngasleitung GmbH
								DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH

(*) A new project in the GRIP 2014-2023 data collection window, that was not yet in last TYNDP 2013-2022
(**) A possible new interconnection point, or a possible new flow direction on an existing interconnection point

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
		Haiming (bayernets) - DE / Burghausen (Transit) - TGL	Tauerngasleitung GmbH	AT	>	bayernets	DE	AT	TRA-N-035	Tauerngasleitung Gas Pipeline Project - Tauerngasleitung GmbH
								DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
		Haiming (bayernets) - DE / Burghausen-Auerbach (Austrian Storage) - TGL	Tauerngasleitung GmbH	AT	>	bayernets	DE	AT	TRA-N-035	Tauerngasleitung Gas Pipeline Project - Tauerngasleitung GmbH
								DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH
		Haiming (OGE) - DE / Burghausen-Auerbach (Austrian Storage) - TGL	Tauerngasleitung GmbH	AT	>	Open Grid Europe	DE	AT	TRA-N-035	Tauerngasleitung Gas Pipeline Project - Tauerngasleitung GmbH
								DE	TRA-N-241	MONACO section phase I (Burghausen-Finsing) - bayernets GmbH
								DE	TRA-N-240	MONACO section phase II (Finsing-Amerdingen) - bayernets GmbH

MATRIX INTRA-COUNTRY BALANCING ZONE INTERCONNECTION POINTS

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
108 (**)	intra-balancing zone	Drohne	Gascade	DE	>	Open Grid Europe	DE	DE	TRA-N-291 (*)	new net connection from Rehden to Drohne (new covenant from NEP2012) - GASCADE Gastransport GmbH
114	intra-balancing zone	Liaison Nord Sud	GRTgaz	FR	>	GRTgaz	FR	FR	TRA-N-043	Val de Saône project - GRTgaz
								FR	TRA-F-036	Arc de Dierrey - GRTgaz
								FR	TRA-F-041	Eridan - GRTgaz
		Liaison Sud Nord	GRTgaz	FR	>	GRTgaz	FR	FR	TRA-N-043	Val de Saône project - GRTgaz
								FR	TRA-F-036	Arc de Dierrey - GRTgaz
								FR	TRA-F-041	Eridan - GRTgaz
115	intra-balancing zone	PIR MIDI	GRTgaz	FR	>	TIGF	FR	FR	TRA-F-250	Artère de Guyenne (Phase B Girland Project) - TIGF
								FR	TRA-F-039	New compression station at Chazelles - GRTgaz
								FR	TRA-N-252	FR-ES interconnection (MIDCAT) - TIGF
								FR	TRA-N-256	Developments to create an Eastern axis -MidCat- for the ES-FR interconnection - GRTgaz
			TIGF	FR	>	GRTgaz	FR	FR	TRA-F-250	Artère de Guyenne (Phase B Girland Project) - TIGF
								FR	TRA-F-039	New compression station at Chazelles - GRTgaz
								FR	TRA-N-252	FR-ES interconnection (MIDCAT) - TIGF
								FR	TRA-N-256	Developments to create an Eastern axis -MidCat- for the ES-FR interconnection - GRTgaz
(**)	intra-balancing zone	Gernsheim	Gascade	DE	>	Open Grid Europe	DE	DE	TRA-F-289 (*)	Installation of Nord Stream onshore project - GASCADE Gastransport GmbH
(**)	intra-balancing zone	Stolberg	Fluxys TENP	DE	>	Gascade	DE	DE	TRA-N-208	Reverse Flow TENP Germany - Fluxys

(*) A new project in the GRIP 2014-2023 data collection window, that was not yet in last TYNDP 2013-2022
(**) A possible new interconnection point, or a possible new flow direction on an existing interconnection point

MATRIX CROSS-BORDER INTERCONNECTION POINTS WITH NON-EU (IMPORT)

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
224	non-eu import	Greifswald / GOAL	Nord Stream	RU	>	Gasunie Ostseeanbindungsleitung	DE	DE	TRA-N-321 (*)	Expansion of Nord Stream connection to markets in western Europe - Entry Greifswald - Gasunie Ostseeanbind-ungsleitung GmbH
								RU	TRA-N-267	Nord Stream 3 - Nord Stream AG
								RU	TRA-N-069	Nord Stream 4 - Nord Stream AG
		Greifswald / NEL	Nord Stream	RU	>	NEL Gastransport	DE	DE	TRA-N-323 (*)	Expansion of Nord Stream connection to markets in western Europe - Entry Greifswald - NEL
								RU	TRA-N-267	Nord Stream 3 - Nord Stream AG
								RU	TRA-N-069	Nord Stream 4 - Nord Stream AG
(**)	non-eu import	Statpipe - NO / Harald platform - DK	Gassco	NO	>	Maersk Oil and Gas AS	DK	DK	TRA-N-218	Tie-in of Norwegian off-shore natural gas transmission system to Danish off-shore natural gas infrastructure - Maersk Oil and Gas AS

MATRIX LNG ENTRY INTERCONNECTION POINTS

NR	POINT TYPE	NAME LOCATION	System Operator 1	CC		System Operator 2	CC	CC	TYNDP CODE	NAME - PROMOTOR
300	LNG entry	Zeebrugge LNG	Fluxys LNG	BE	>	Fluxys Belgium	BE	BE	LNG-N-229	LNG Terminal Zeebrugge - capacity extension & 2nd jetty - Fluxys LNG
302	LNG entry	Isle of Grain	Grain LNG	UK	>	National Grid Gas	UK	UK	LNG-N-290 (*)	Isle of Grain - Phase 4 Expansion - National Grid Gas plc
304	LNG entry	Montoir de Bretagne	Elengy	FR	>	GRTgaz	FR	FR	LNG-N-225	Montoir LNG Terminal Expansion - Elengy
								FR	TRA-N-048	Developments for Montoir LNG terminal expansion at 12,5bcm - 1 - GRTgaz
								FR	TRA-N-048	Developments for Montoir LNG terminal expansion at 12,5bcm - 2 - GRTgaz
								FR	TRA-N-257	New line Between Chemery and Dierrey - GRTgaz
305	LNG entry	Fos Cavaou	Fosmax LNG	FR	>	GRTgaz	FR	FR	LNG-N-227	Fos Cavaou LNG Terminal Expansion - Elengy
								FR	TRA-N-269	Fosmax (Cavaou) LNG expansion - GRTgaz
								FR	TRA-F-041	Eridan - GRTgaz
								FR	TRA-N-253	Est Lyonnais pipeline - GRTgaz
		Fos Tonkin	Elengy	FR	>	GRTgaz	FR	FR	LNG-N-226	Fos Tonkin LNG Terminal Expansion - Elengy
								FR	TRA-N-255	Fos Tonkin LNG expansion - GRTgaz
								FR	TRA-F-041	Eridan - GRTgaz
316	LNG entry	Gate Terminal (I)	Gate Terminal	NL	>	Gasunie Transport Services	NL	NL	TRA-N-192	Entry capacity expansion GATE terminal - Gasunie Transport Services B.V.
								NL	LNG-N-050	Gate terminal phase 3 - Gate Terminal B.V.
(**)	LNG entry	Dunkerque LNG	GRTgaz	FR	>	GRTgaz	FR	FR	TRA-F-038	Developments for the Dunkerque LNG new terminal - GRTgaz
								FR	LNG-F-210	Dunkerque LNG Terminal - EdF
								FR	TRA-F-036	Arc de Dierrey - GRTgaz
(**)	LNG entry	Fos LNG	GRTgaz	FR	>	GRTgaz	FR	FR	TRA-N-254	Developments for the Fos faster LNG new terminal - GRTgaz
								FR	LNG-N-223	Fos Faster LNG Terminal - Fos Faster LNG
								FR	TRA-F-041	Eridan - GRTgaz
								FR	TRA-N-253	Est Lyonnais pipeline - GRTgaz
(**)	LNG entry	Gothenburg LNG	Swedegas AB	SE	>	Swedegas	SE	SE	LNG-N-032	Gothenburg LNG (preliminary) - Swedegas AB
(**)	LNG entry	Shannon LNG	Shannon LNG	IE	>	Gaslink	IE	IE	LNG-N-030	Shannon LNG Terminal - Shannon LNG

(*) A new project in the GRIP 2014-2023 data collection window, that was not yet in last TYNDP 2013-2022
(**) A possible new interconnection point, or a possible new flow direction on an existing interconnection point

Conclusions

This North West Gas Regional Investment Plan report has developed from the first edition which was published in 2011. The report has been shaped in close collaboration with stakeholders, especially through the good coordination between the NW TSOs and the North West Gas Regional Investment Plan.

The report provides, amongst other areas, an in-depth regional analysis of the TYNDP 2013-2022 results. The solutions have already been identified at an earlier stage by the concerned TSOs and they have developed their investment plans to solve these issues:

- Cross border congestion on the Danish-German border has been identified by the Danish and German TSOs. This will be solved by a project whose project status recently moved from non-FID to FID
- The vulnerable supply position of Sweden is improved by the above mentioned project but vulnerability remains. Solutions have been identified but no decision has been made
- Cross border congestion in Luxembourg has been identified by CREOS, and solutions have been examined with GRTgaz and Fluxys Belgium. Currently, no decision has been reached, partly due to the failed market consultation
- Firm transmission capacity from GRTgaz Northern Zone (PEG Nord) to its Southern Zone (PEG Sud) is currently restricted to 230 GWh per day. In order to respond to the potential price spread between PEG Sud and the other hubs of the NW region, solutions have been identified and studied, combining investments and contractual mechanisms. Currently, the different solutions are analysed with the French regulator (CRE) and the market players

The results from the TYNDP 2013-2022 must be seen as a minimum level since supply and demand in the TYNDP 2013-2022 is matched under perfect market conditions. No arbitrage or other market behaviour is included in the TYNDP 2013-2022 analyses. Thus congestions, other than those observed in TYNDP 2013-2022 may well be possible and is, for example, also reflected by the various projects in the Annex of this GRIP.

The Supply and Demand figures included in this report show the enduring importance of gas in the energy mix in NW Europe, but they also show the growing dependency on imports. Depletion of German and Dutch L-gas supplies will result in conversion of L-gas markets. This process will start in Germany before 2020 due to depleting German supplies and will continue in Germany after 2020 on a larger scale due to depleting Dutch L-gas supplies.

The role of gas in the energy and power generation mix and the increase of intermittent renewable energy sources (RES) adds additional challenges to the flexibility in gas supply and gas infrastructure.

Further challenges to network development are the ever decreasing long-term capacity commitments by the market. Any investment should be given long-term predictable returns. In the absence of long-term commitments, alternative ways have to be explored in order to provide sufficient confidence to investors.

The TSOs of the NW region hope you have found this report useful and informative. The TSOs encourage all readers to get involved in the development of the next iteration of the North West Gas Regional Investment Plan, in order to improve the report further.

Disclaimer

GRIP co-authors have prepared this Report based on information collected and compiled from their internal source, from stakeholders and from other sources. GRIP co-authors do not audit or verify the truth or accuracy of any such third parties' information.

The content of the Report (hereinafter referred to as 'Content') is provided on an 'as is' basis. GRIP co-authors do not guarantee the accuracy, completeness or timeliness of the Content. GRIP co-authors are not responsible for any errors or omissions, regardless of the cause, for the results obtained from the use of the Content.

In no event shall GRIP co-authors be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses, including, without limitation, lost income or lost profits and opportunity costs, in connection with any use of the Content.

All analyses and forecasts are mere statements of opinion as of the date they are expressed and not statements of fact or recommendations. When making decisions of any nature, any party shall rely exclusively on its own information, forecast, skill, judgment and experience and not on the Content.

Image courtesy of NW European TSOs

Glossary

ABBREVIATION	FULL NAME
ACER	The European Agency for the Cooperation of Energy Regulators
ACM	Dutch Energy Regulator
BBL	Balgzand Bacton Line
BNetzA	Bundesnetzagentur, the German Regulator
CAM	Capacity Allocation Mechanism
CCGT	Combined Cycle Gas Turbine
CEER	Council of European Energy Regulator
CNG	Compressed Natural Gas
CRE	Commission de Régulation de l'Energie, French Regulator
CREG	Belgian regulator for electricity and gas
CREOS	Lexembourg's TSO
DSO	Distribution System Operator
ENTSOG	European Network of Transmission System Operators for Gas
ETS	Emissions Trading Scheme
FID	Final Investment Decision
Gaslink	Irish TSO
GB	Great Britain
GRI NW	Gas Regional Initiative North West
GRIP	Gas Regional Investment Plan
GRTgaz	French TSO
GTS	Gasunie Transport Services (The Netherlands)
GUD	Gasunie Deutschland
GWh	Giga Watt hours
HHI	Herfindahl-Hirschman Index
H-gas	High calorific gas
IEA	International Energy Agency
IP	Interconnection Point
IUK	Interconnector UK
L-gas	Low calorific gas
LNG	Liquefied Natural Gas
Mtoe	Million Tonnes of Oil Equivalent
NBP	UK gas hub
NCG	NetConnect Germany (Gas hub in Germany)
NEP	Netzentwicklungsplan (the German Network Development Plan Gas)
NPG	Nord Pool Gas
NRA	National Regulatory Authority

ABBREVIATION	FULL NAME
NW	North West
NW GRIP	North West Gas Regional Investment Plan
OBA	Operational Balancing Agreement
OGE	Open Grid Europe (A German TSO)
Ofgem	UK energy regulator
PEG	French gas hub
SoS	Security of Supply
TTF	Title Transfer Facility, the Dutch gas hub
TSO	Transmission System Operator
TWh	Tera Watt hours
TYNDP 2013-2022	Ten Year Network Development Plan
UGS	Underground Gas Storage
ZTP	The Belgian gas hub

ENTSOG AISBL
Avenue de Cortenbergh 100
B-1000 Brussels
T +32 (0)2 894 51 00
info@entsog.eu
www.entsog.eu