2011

Assessment of the Long-Term Transmission Capacity Requirements

Market area cooperation of the companies bayernets GmbH, Eni Gas Transport Deutschland S.p.A., GRTgaz Deutschland GmbH, GVS Netz GmbH, Open Grid Europe GmbH and Thyssengas GmbH

bayernets erdgas transport systeme · Eni Gas Transport Deutschland · GRTgaz Deutschland · GVS Netz · Open Grid Europe The Gas Wheel · Thyssengas Erdgaslogistik

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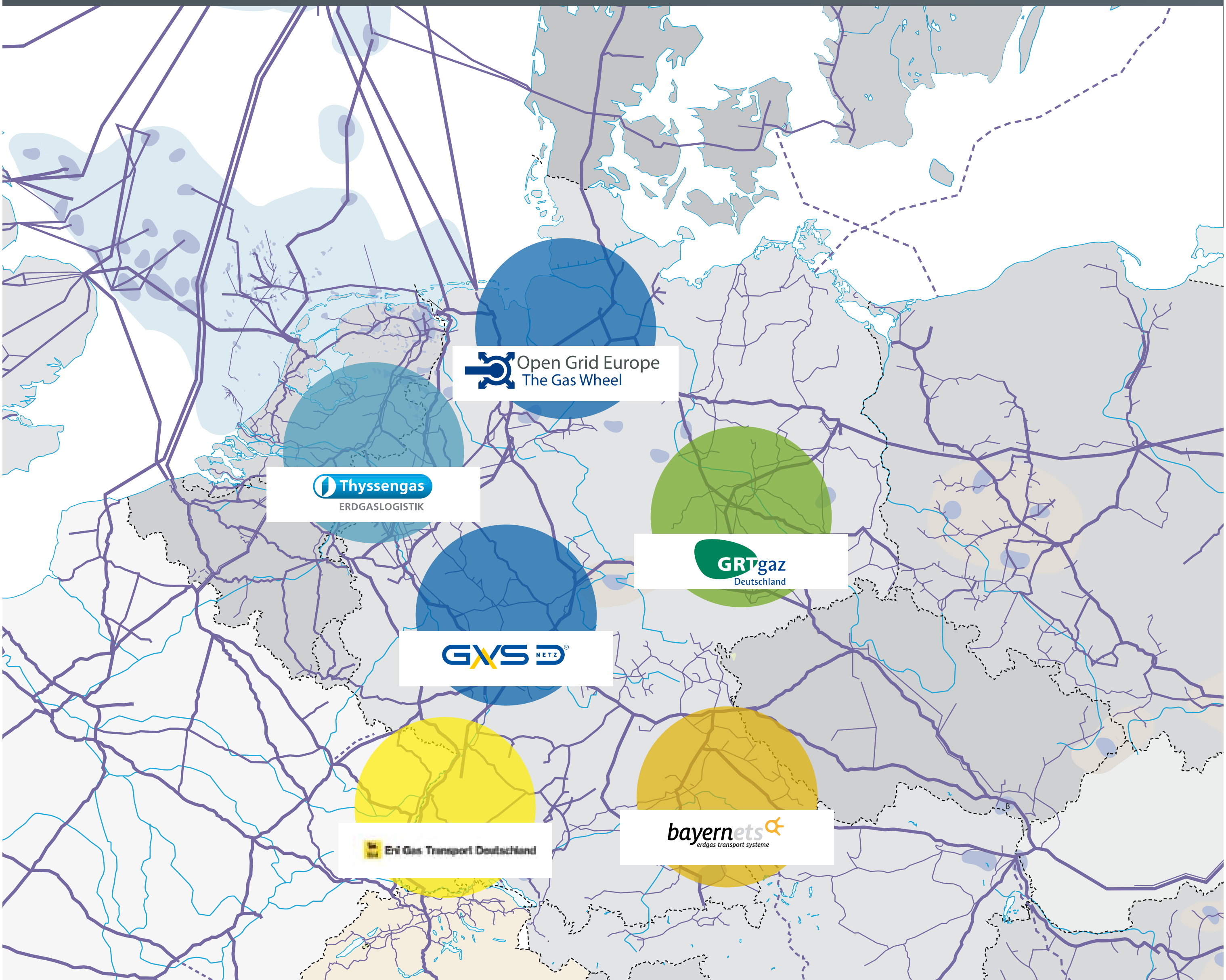
Open Grid Europe
The Gas Wheel
Thyssengas
ERDGASLOGISTIK
GRTgaz
Deutschland
Eni Gas Transport Deutschland
bayernets
erdgas transport systeme

Foreword

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Dear Reader,

in this document, we – the cooperation partners in the market area of NetConnect Germany – present the results of our assessment of the long-term capacity requirements for your consideration.

All players in the German and European gas transmission industry have already seen fundamental change taking place at a feverish pace, and the European parliament has now accelerated the process of change with its Third European internal energy market package. We have seen the first Independent Transmission Operators (ITOs) appear in Germany, and the first period of revenue regulation for the gas sector has begun. The merging of market areas under cooperation agreements continues to advance.

On 1 October 2008, bayernets and the present Open Grid Europe (formerly E.ON Gastransport) merged their market areas to form the newly established NetConnect Germany (NCG) to be responsible for managing balancing groups, operating the Virtual Trading Point and procuring control energy on behalf of the cooperation partners. Just one year later, the market areas of Eni Gas Transport Deutschland, GRTgaz Deutschland and GVS Netz were added to the NCG market area. A further step saw the integration of the L-Gas market area of Open Grid Europe as well as the H-Gas and L-Gas market areas of Thyssengas into NCG. This cooperation creates a natural gas market area with transmission system pipelines which have a total length of some 20,000 kilometres and which, if connected end-to-end to form a single pipe string, would stretch almost half way around the world.

The need to further develop the transmission system within the NCG market area and make it fit for the future is not only dictated by the legal/regulatory framework. We also have a corporate and socio-political responsibility to deploy innovative concepts in the continued development of sustainable transmission systems going forward, and to continually adapt them in line with future requirements.

As cooperation partners we have jointly analysed the situation we face in terms of system engineering in the market area of NCG, what developments we can expect from the measures already implemented, and what they mean for the market. We start by considering the long-term developments on the gas market as they affect transport demand and capacity developments as being embedded in the development of the legal and regulatory framework since the very beginning of market liberalisation. The demand for natural gas can be expected to stagnate or fall slightly. Nevertheless the transmission system will play an essential part in the transition to the renewable age and beyond.

In the short and medium term however, it is the regulatory framework that will impact most on the transmission system. The growing demands being placed on transmission flexibility by increasingly volatile trading mean that a whole range of load flow scenarios have to be considered across the entire system. This in turn entails individual restrictions for each cooperation partner, with gas pressure at interconnections points, compressor power and routes being just some of the factors which play a part. Then there is also the experience gained from working with our cooperation partners in the past.

When considered from all these different angles, the report paints a picture which presents the current aspects of and requirements for the existing transmission system while establishing a basis for the debate about the future development of this transmission system.

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1. Introduction

The amended version of the German Gasnetzzugangsverordnung (Gas Network Access Ordinance - 'GasNZV') as adopted in 2010 added a number of new requirements relating to network expansion and network connection. They include in particular Section 17 'Determining the Long-Term Capacity Requirements', Section 33 'Network Connection Obligation for Biogas', Section 38 'Capacity Reservation for Operators of Storage, LNG and Production Installations as well as Gas-Fired Power Plants' and Section 39 'Right to Capacity Expansion for Operators of Gas-Fired Power Plants and Storage, LNG and Production Installations'.

Section 17 GasNZV requires transmission system operators to assess – by April 1 each year – their long-term market area-wide capacity requirements having regard to the aspects specified in Section 17(1) Numbers 1 to 10 GasNZV.

The present publication is the first implementation of this requirement by bayernets GmbH (bayernets), Eni Gas Transport Deutschland S.p.A. (Eni D), GRTgaz Deutschland GmbH (GRTgaz D), GVS Netz GmbH (GVS Netz), Open Grid Europe GmbH (Open Grid Europe or OGE) and Thyssengas GmbH (Thyssengas or TG) – referred to below as the 'cooperation partners' – for the market area of NCG (referred to below as the NCG market area). The cooperation partners see it as the first step in the obligation they are expected to have to meet from 2012 onwards to prepare a Germany-wide 10-year network development plan (see for example the key points on the German Energy Industry Act (EnWG) Amendment of the Federal Ministry of Economics and Technology dated 27 October 2010, referred to below as the 'outline paper' [BMWi 2010]). The development of the European gas market is presented in Chapter 2 of this document, with a description of the European and German legal and regulatory framework. The results of the two 10-year network development plans of the European Network of Transmission System Operators for Gas ('ENTSOG') are also presented. The cooperation partners present the NCG market area and the market-area-spanning cooperation partners in Chapter 3.

In Chapter 4 the cooperation partners comply with their annual commitment under Section 17 GasNZV to assess the long-term capacity requirements for the first time as of 1 April 2011. 1 January 2011 – the date on which the four market areas NCG, Open Grid Europe L-Gas, Thyssengas H-Gas and Thyssengas L-Gas existed – has been selected as the key date for the market areas to be analysed.

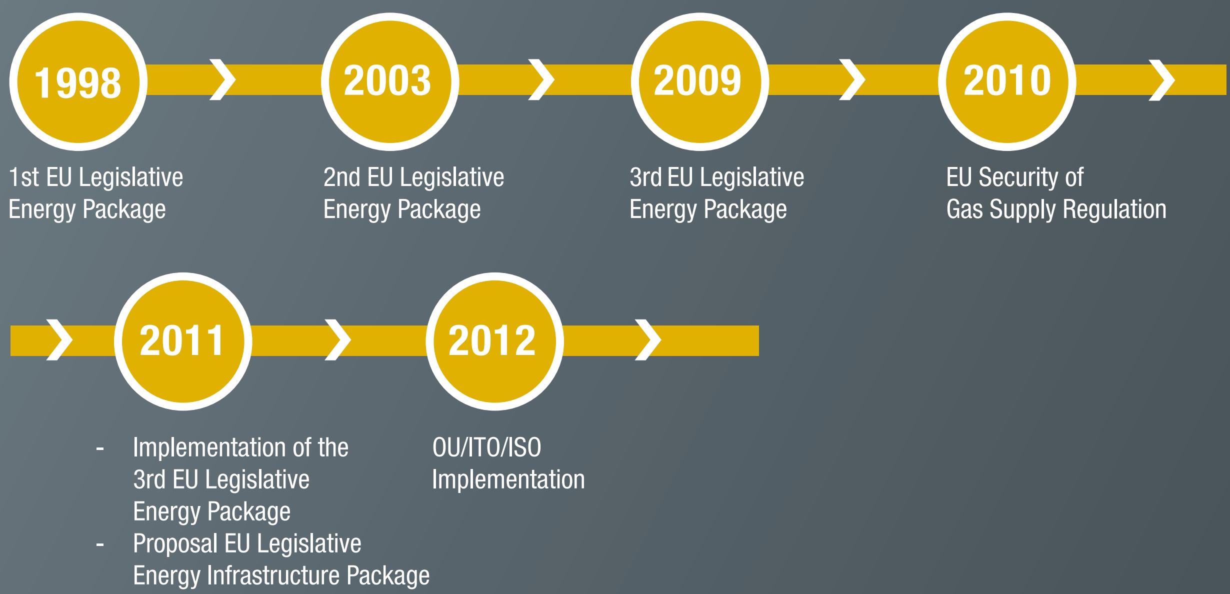
The projects adopted by the cooperation partners as well as the resulting changes in entry and exit capacities over the next ten years at border crossing points, market area crossing points and storage connection points are listed in table format in Chapter 5.

Chapter 6 summarises the results and discusses the outlook for the future.

2. Development of the European Gas Market

Fig. 2.1

Development of European gas market directives and regulations



2.1 European legal and regulatory framework

Development of European directives and regulations

The first EU directive relating to the European gas market was enacted in 1998 [EU Directive 98/30]. Its objective was the development of a single European market in the gas sector and it provided for non-discriminatory third-party access to the natural gas transmission system. It imposed on transmission system operators an obligation to operate, maintain and expand safe, reliable and efficient transmission systems, having due regard to economic conditions and environmental protection (see also Fig. 2.1).

The second EU directive concerning the European gas market, adopted in 2003, introduced regulated network access on the basis of published tariffs, allowing the possibility for new infrastructure systems to be exempted from regulated network access, subject to the granting of an exemption [EU Directive 2003/55].

While the Gas Network Access Regulation adopted in 2005 [EU Regulation 1775/2005] contains no explicit provisions for network development, this topic was dealt with in detail in the third European legislative package concerning an internal energy market, adopted in 2009. The requirements of the package include

- an obligation on independent transmission operators (ITOs) to draw up a ten-year network development plan each year (third EU directive on the European gas market [EU Directive 2009/73]),
- an obligation on European transmission system operators to draw up regional investment plans at two-year intervals (second European Gas Network Access Regulation [EU Regulation 715/2009]),
- an obligation on the European Network of Transmission System Operators for Gas (ENTSOG) to draw up a ten-year network development plan for the entire Community every two years [EU Regulation 715/2009] and
- an obligation on the Agency for the Cooperation of Energy Regulators (ACER) to provide opinions on the draft Community-wide network development plan of ENTSOG (Regulation Establishing an Agency for the Cooperation of Energy Regulators (ACER) [EU Regulation 713/2009]).

European Security of Gas Supply Regulation

The European Security of Gas Supply Regulation [EU Regulation 994/2010] was adopted in 2010 and superseded the old European Security of Supply Directive. The main requirements of the new Regulation include

- an infrastructure standard based on an N-1 formula by which the total capacity of gas transmission systems including border crossing points, national production and storage facilities and LNG terminals of the member state or a region must be adequate to satisfy total gas demand in the event of disruption of the single largest gas infrastructure during a day of exceptionally high gas demand occurring with a probability of once in 20 years,
- an obligation to establish bidirectional ("reverse flow") capacities at all cross-border interconnections (exemptions are possible),
- an obligation on Member States to define protected customer groups within the framework set out in the Regulation (at least household customers),
- an obligation on gas companies to ensure a supply standard, i.e. to ensure supplies to the groups of protected customers mentioned above in the event of the failure of the largest infrastructure system both on seven consecutive days with full load and for 30 days with extraordinarily high gas consumption,
- an obligation on Member States to draw up prevention and emergency plans,
- Extended information obligations during a declared gas crisis, and
- an obligation on Member States to inform the EU Commission of agreements with producers from non-EU countries and gas delivery contracts with a term of more than one year.

Communication of the EU Commission on the evolution of European energy infrastructure

At the end of 2010, the EU Commission presented a communication on priorities for energy infrastructure up to 2020 [COM (2010) 677]. The declared objective of this communication is to prepare energy transmission systems for the requirements of the 21st century.

In the opinion of the EU Commission, it will be necessary to invest a total of EUR one trillion in energy infrastructure in order to meet the energy and climate protection targets for 2020. Of this amount, about EUR 200 billion will be required for investments in gas and electricity infrastructure. The EU Commission assumes that investments of the order of EUR 100 billion will not be made by the market as a result of delays in planning approval processes and an absence of economic incentives.

The EU Commission has made a number of proposals designed to encourage these investments which may not otherwise be made by the market:

- Defining certain priorities for the European energy infrastructure which are necessary by 2020 to achieve the energy and climate protection targets.
- By 2012 identifying specific projects needed to reach the targets which have been set. These projects will then be designated as being 'of European interest'.
- Support for the projects 'of European interest' through new tools such as improved planning approval processes, financial subsidies, regional cooperation and improved information and communication processes.

The EU Commission proposes that by 2020 all EU Member States should ideally be able to receive gas supplies via at least three of the following five sources or corridors:

- Northern corridor (Norway)
- Eastern corridor (Russia)
- Mediterranean corridor (Africa)
- LNG
- A fourth corridor, still to be developed, linking the EU with the Caspian Sea and the Middle East

Other major focuses of gas infrastructure are to be the north/south connection of Eastern Europe, the integration of the Baltic market and a North-South corridor in Western Europe, i.e. from the Iberian peninsula and Italy to North-West Europe.

2.2 ENTSOG network development plans

ENTSOG ten-year network development plan 2010-2019

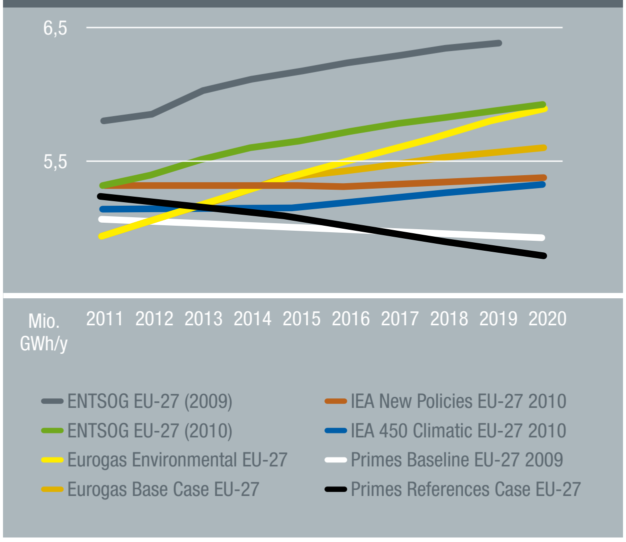
The European transmission system operators commenced dialogue with the EU Commission, European associations and network users concerning a ten-year network development plan in 2008, thereby pre-empting their obligation to submit non-binding European network development plans at two-year intervals from 3 March 2011 onwards (see Chapter 2.1).

As a basis for discussion, they presented European investment projects and developments in cross-border capacities on the basis of these projects in a first European capacity development report (GTE+ Capacity Development Report 2008 [GTE+ 2008]).

In an intermediate step, demand scenarios were added to the capacity development report in dialogue with the EU Commission, European associations and network users (GTE+ Demand Scenarios v. Capacity report, 2009 [GTE+ 2009]). In a process of public dialogue, the report was then expanded into a comprehensive European network development plan (ENTSOG Ten Year Network Development Plan 2010-2019 [ENTSOG 2009]) by including European gas supply scenarios.

Fig. 2.2

European demand scenarios [ENTSOG 2011]



The European Regulators' Group for Electricity and Gas ("ERGEG") supported this process and developed its recommendations concerning a European network development plan in two stages (ERGEG recommendations on the 10 year network development plan, evaluation of responses [ERGEG 2009] und 10 year network development plan for gas, final ERGEG recommendations [ERGEG 2010a]). At the end of 2010, ERGEG submitted comprehensive comments on the first European network development plan, criticising among other things the lack of a top-down approach (ERGEG evaluation of the European 10 year network development plan 2010-2019 [ERGEG 2010b]).

ENTSOG ten-year development plan 2011-2020

In February 2011, i.e. before the start of the formal ENTSOG recognition process on 3 March 2011 under the EU Third Internal Energy Market Package, ENTSOG published a revised version of the European network development plan (ENTSOG Ten Year Network Development Plan 2011-2020 [ENTSOG 2011]).

Key aspects of this network development plan include:

- a description of the development of the European gas transmission infrastructure
- a European ENTSOG demand scenario ('high daily demand') and a comparison of this scenario with those produced by third parties (see Fig. 2.2 and 2.4)
- a European gas supply scenario (see Fig. 2.3 and 2.4)
- a description of the modelling methods used, the scenarios used for modelling and the main results of modelling (see Fig. 2.5 on page 11)
- structured descriptions of the European transmission networks and their operators
- structured project descriptions
- detailed results of modelling the European transmission system

To model the European transmission system, 67 scenarios divided into three groups called reference scenarios, security of supply scenarios and market integration scenarios, were analysed.

Five reference scenarios represent possible gas flow situations on the basis of the peak load day as defined in the European security of supply regulation (see Chapter 2.1) and assuming that the transmission systems are fully available.

Fig. 2.3

European aggregated gas supply potential [ENTSOG 2011]

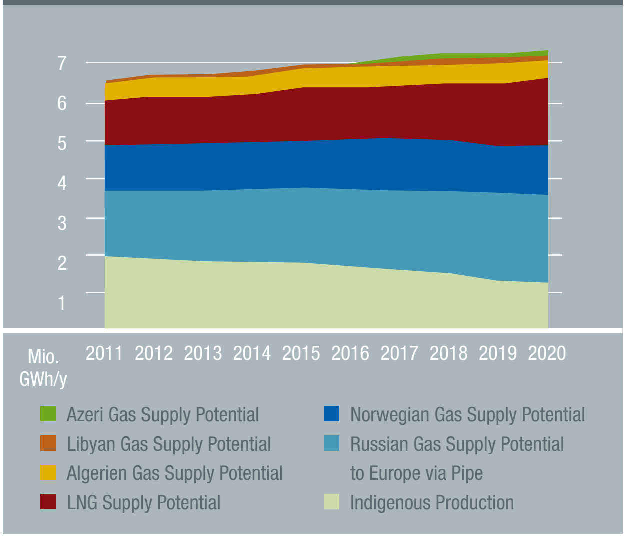
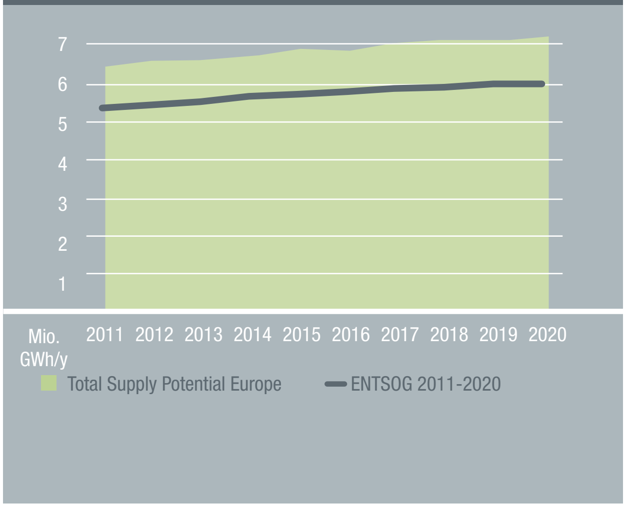


Fig. 2.4

Comparison of the ENTSOG demand scenario and aggregated gas supply potential [ENTSOG 2011]



Five security of supply scenarios are based on the following assumptions of the non-availability of gas transmission or LNG infrastructures:

- Disruption of Russian gas supplies via the Ukraine
- Disruption of Russian gas supplies via Belarus
- Disruption of Norwegian gas supplies to the UK
- Disruption of North African gas supplies to Italy
- Disruption of LNG supplies from Qatar to Europe

An overview of the main modelling results of these security of supply scenarios up to 2020 is shown in Fig. 2.5 (page 11).

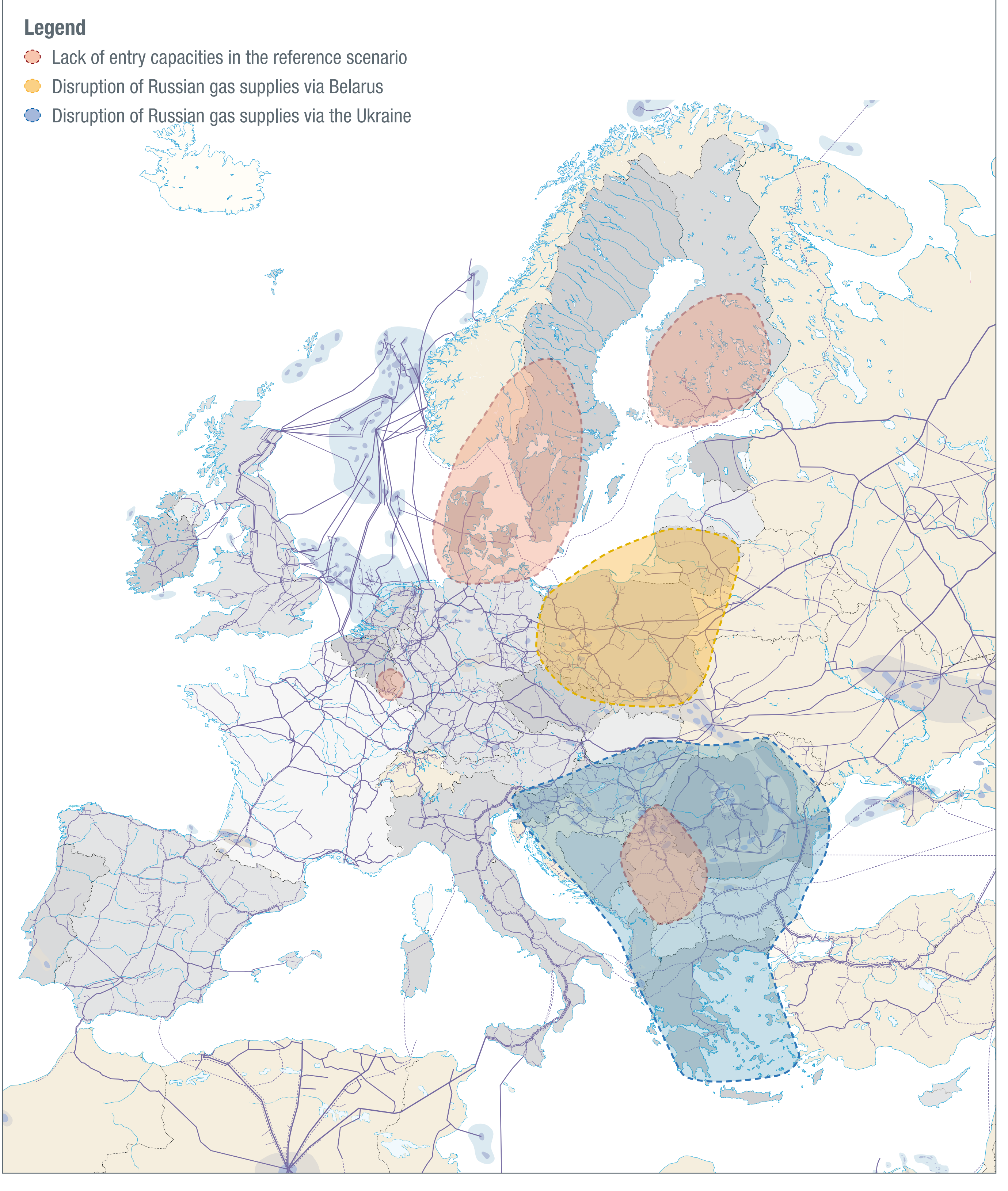
The scenarios represent a rough approximation of the infrastructure standard of the European security of supply regulation as described in Chapter 2.1. It should be noted however that – by analogy with the European security of supply regulation – three of the five scenarios assume the failure of a gas transmission infrastructure or gas liquefaction plant but that this infrastructure is not – as stated in the European security of supply regulation – within the EU or on EU borders. It is a matter of debate therefore whether these scenarios can have any significance for an assessment of capacity requirements in Germany.

Irrespective of these unresolved fundamental issues which have far greater implications for the so-called market integration scenarios – for which in our opinion there is a total absence of any legal basis – the ENTSOG results show that the quantities of gas required in Germany over the next ten years can be transported with the infrastructure as it exists and as will be further developed in projects, for which the final investment decision has been taken (FID projects).

As Fig. 2.5 shows, with the transport infrastructure as it presently exists and as it will evolve in FID projects to 2020, the reference scenario contains limited entry capacities into the EU Member States of Luxembourg and Denmark bordering Germany. The security of supply scenario known as 'disruption of Russian gas supplies via Belarus' also shows limited entry capacities in the EU Member State of Poland which borders Germany. The conclusions to be drawn from the ENTSOG ten year network development plan 2011-2020 for the NCG market area are presented in Chapter 4.7.

Fig. 2.5

Overview of regions shown in the European network development plan to 2020 as having reduced flexibility in the reference case and on the failure of a gas infrastructure (based on [ENTSOG 2011])



2.3 German legal and regulatory framework

Fig. 2.6 gives an overview of the development of German gas market laws and regulations since the first EU Gas Market Directive.

The amendment of the 'Energiewirtschaftsgesetz' [Energy Industry Act, EnWG 2003] implemented the requirements of the first European Gas Market Directive [EU Directive 98/30] and introduced negotiated network access (see Fig. 2.6).

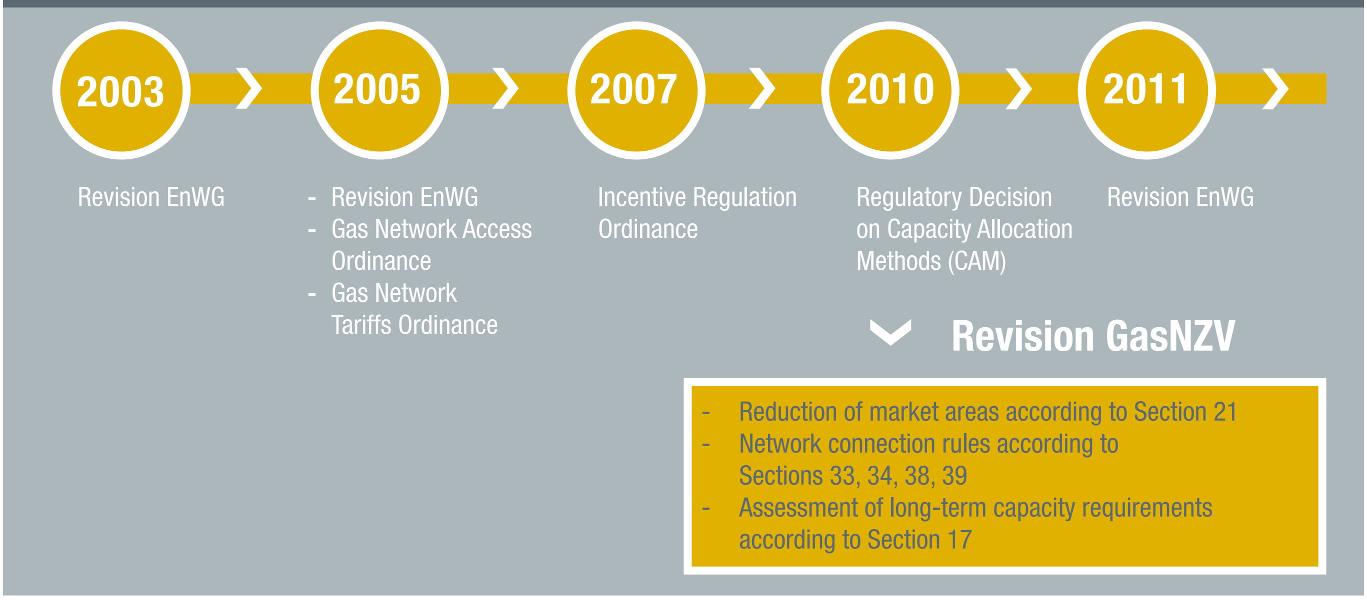
The amended version of EnWG introduced in 2005 in transposition of the second EU Gas Market Directive of 2003 [EU Directive 2003/55] introduced regulated network access. Section 28a EnWG covers the exemptions from regulated network access for new infrastructures described in Chapter 2.1. It also imposed on operators of energy supply networks an obligation to operate, maintain and, if expansion is economically viable, to expand a safe, reliable and efficient energy supply network on a non-discriminatory basis (Section 11 (1) EnWG).

In 2011, a new amended version of the German Energy Industry Act will transpose into German law the requirements from the provisions of the third European legislative package concerning an internal energy market. Irrespective of the specific unbundling model to be adopted, the new Energy Industry Act will lay down uniform requirements for all transmission system operators to produce network development plans in accordance with Article 22 of EU Directive 2009/73 (see outline paper, [BMWi 2010]).

Because multiple gas transmission system operators are active in Germany by contrast with most other EU Member States, the new Energy Industry Act is designed to attach particular importance to cooperation between these operators. According to the outline paper published at the end of 2010, "the coordination of network operation and expansion between all the network operators concerned is in the interest of security of supplies and cost effectiveness."

Fig. 2.6

Development of German gas market laws and regulations since the first EU Directive on the European gas market



According to the outline paper, the EnWG amendment makes particular provision for the following requirements in relation to network development:

- In the planning process, a distinction must be drawn between the basic assumptions for the planning of network expansion (cf. Art. 22 (3), EU Directive 2009/73) and the specific network development plan. The parameters used by the companies as a basis for their scenarios must be disclosed to the competent authorities in advance. Network operators must consult with all the stakeholders involved as regards the joint network development plan.

- The network development plan finalised following consultation must be submitted to the Federal Network Agency ('BNetzA') annually; the first plan is to be submitted on 3 March 2012.

- Planned projects must be converted into investment projects. For this purpose, the BNetzA will be given powers of enforcement under Art. 22 (7) Sub-paragraph 1 Letter a) and b) of EU Directive 2009/73. In the course of a tender procedure (Art. 22 (7) Sub-paragraph 2 Letter b of EU Directive 2009/73) the BNetzA will be offered the option of having the proposed infrastructure constructed by third parties.

Section 17 of the amended version of the German GasNZV of 2010 requires transmission system operators to assess long-term capacity requirements every year. Details of these provisions and their first-time implementation by the cooperation partners as of 1 April 2011 are described in this document. Cost regulation, initially introduced by the EnWG (2005) and the Gas Network Tariffs Ordinance (GasNEV), was supplemented in 2007 by the 'Anreizregulierungsverordnung' (ARegV – Incentive Regulation Ordinance). Under incentive regulation, a revenue path is indicated for each company during each regulatory period on the basis of company-specific costs and an efficiency value achieved on the basis of benchmarking. The objective is to offer incentives for efficient operation and cost reduction.

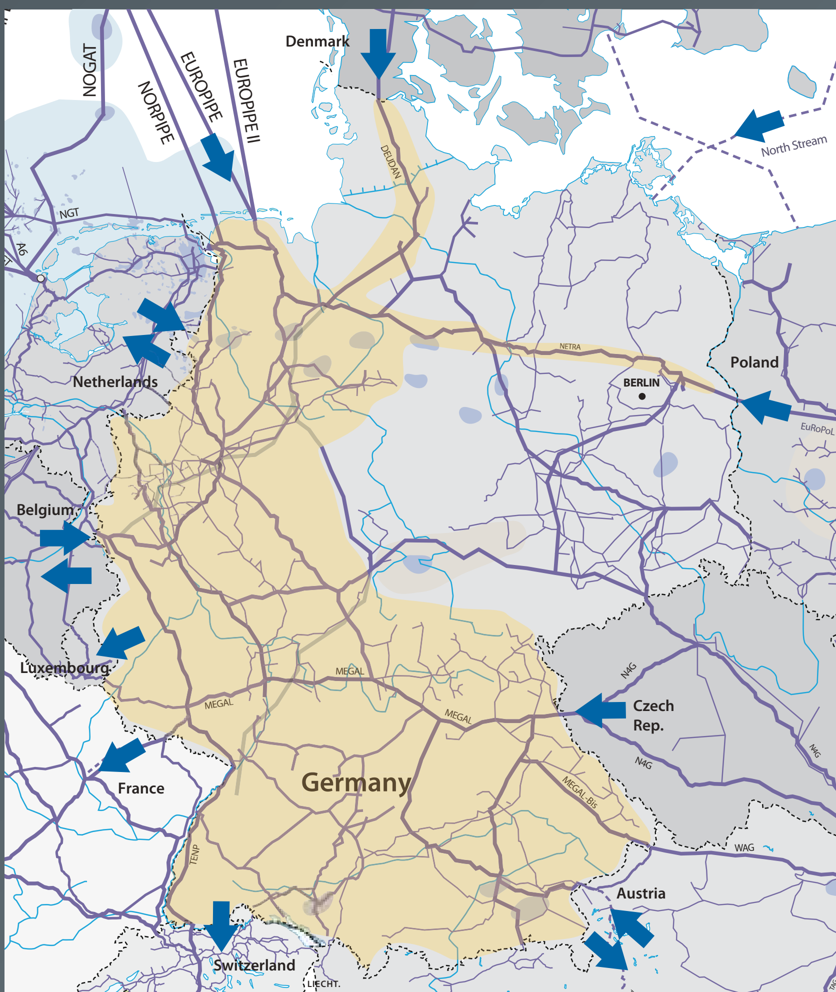
Pure cost cutting measures represent an obstacle to investment. To ensure the necessary network investments therefore, ARegV Section 23 gives transmission system operators an opportunity to apply for investment budgets for expansion and restructuring projects. These allow the cost of capital plus a flat-rate percentage of operating costs to be included in the revenue cap within a regulatory period. However, as a result of the two-year time lag in claiming for the cost of capital required under ARegV Section 4, transmission system operators normally lose the first two annual tranches of the cost of capital and of the flat-rate operating costs of an investment project. In addition, the approval practices of the BNetzA are not producing the investment incentives as were originally intended by the legislator with the investment budget instrument. These practices include – for example – the use of the amount for avoiding double recognition, limiting the approval period of investment budgets to the end of the regulatory period which follows the investment budget application, and failing to create incentives for system operators to make savings on the project budget during construction. All in all therefore, the regulatory regime appears to continue to stifle investment with the result that the EU's ambitious investment objectives will prove difficult to achieve.

3. Market Area Cooperation

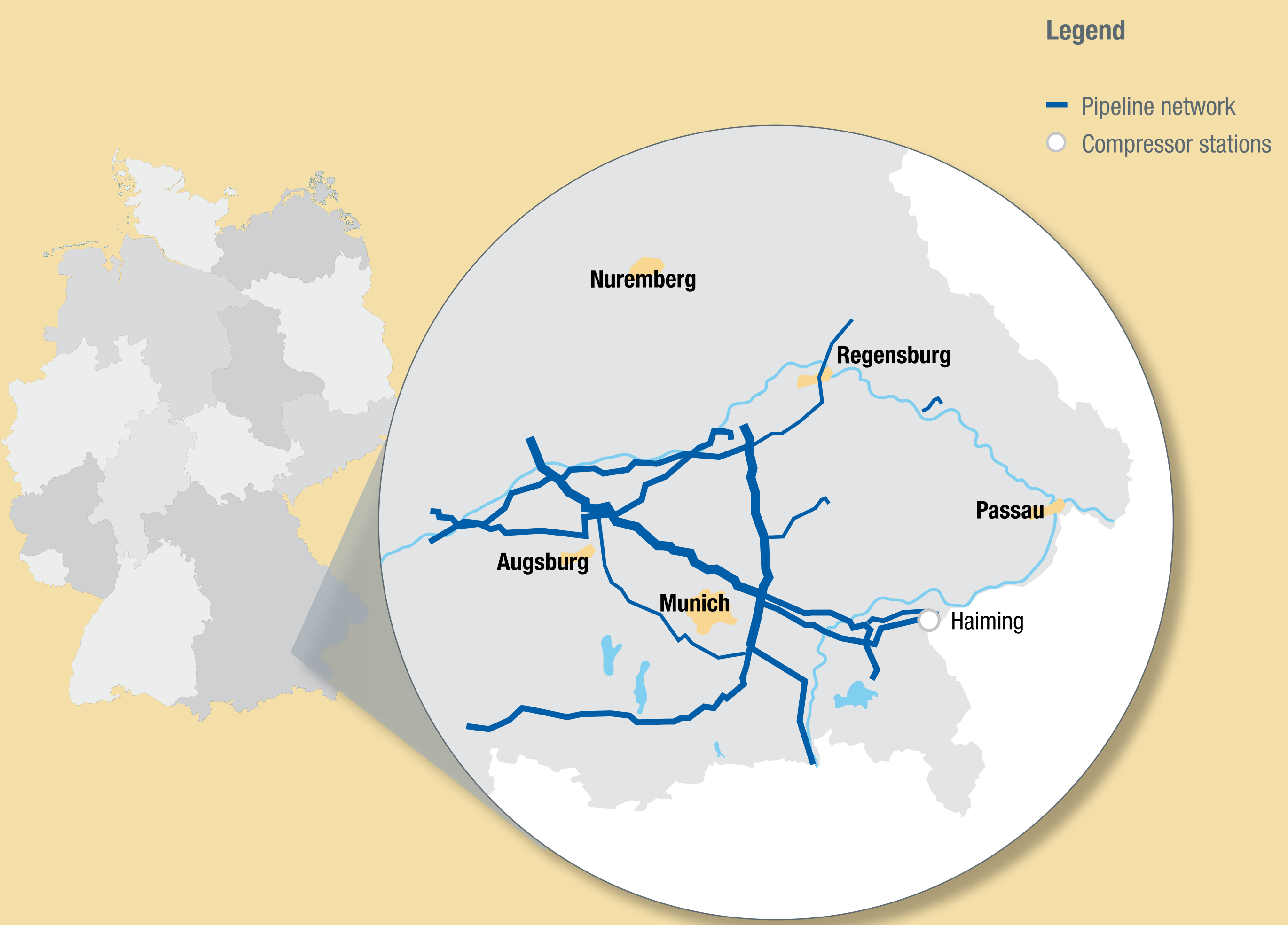
On 1 October 2008, bayernets and Open Grid Europe (formerly E.ON Gastransport) combined their market areas in the newly established NetConnect Germany. The market areas of Eni D, GRTgaz D and GVS Netz were added just one year later. A further step saw the integration of the L-Gas market area of Open Grid Europe as well as the H-Gas and L-Gas market areas of Thyssengas into NCG.

The chief tasks of the NCG are to provide balancing group management, to operate the Virtual Trading Point and to procure control energy on behalf of the cooperation partners.

In the following chapters the cooperation partners will briefly introduce themselves with details of network structure data.



3.1 bayernets GmbH



bayernets GmbH was established on 1 January 2007 and is a wholly owned subsidiary of Bayerngas GmbH based in Munich. bayernets operates a transmission system that has an approximate length of 1300 km and an average pipe size of DN 500. The network is located in the south of Bavaria and covers an area of around 36,000 km².

bayernets ensures the transmission of natural gas to supply this area and connect underground storage facilities and end customers, and provides transit to other networks. In eastern Bavaria, bayernets operates with its own import capacities at the important border crossing point of Burghausen/Überackern in the European integrated network, and guarantees the secure supply of Tyrol to the south via Kiefersfelden. bayernets has 41 downstream system operators, eight of whom are directly connected to its network. bayernets is a byword for security of supply and technical safety as well as market-driven, convenient gas transport services. bayernets aspires to implement and assure efficient, non-discriminatory access to its high-pressure network. In 2010 bayernets embarked on organising an independent transmission operator (ITO) based on the Third Internal Energy Market Package.

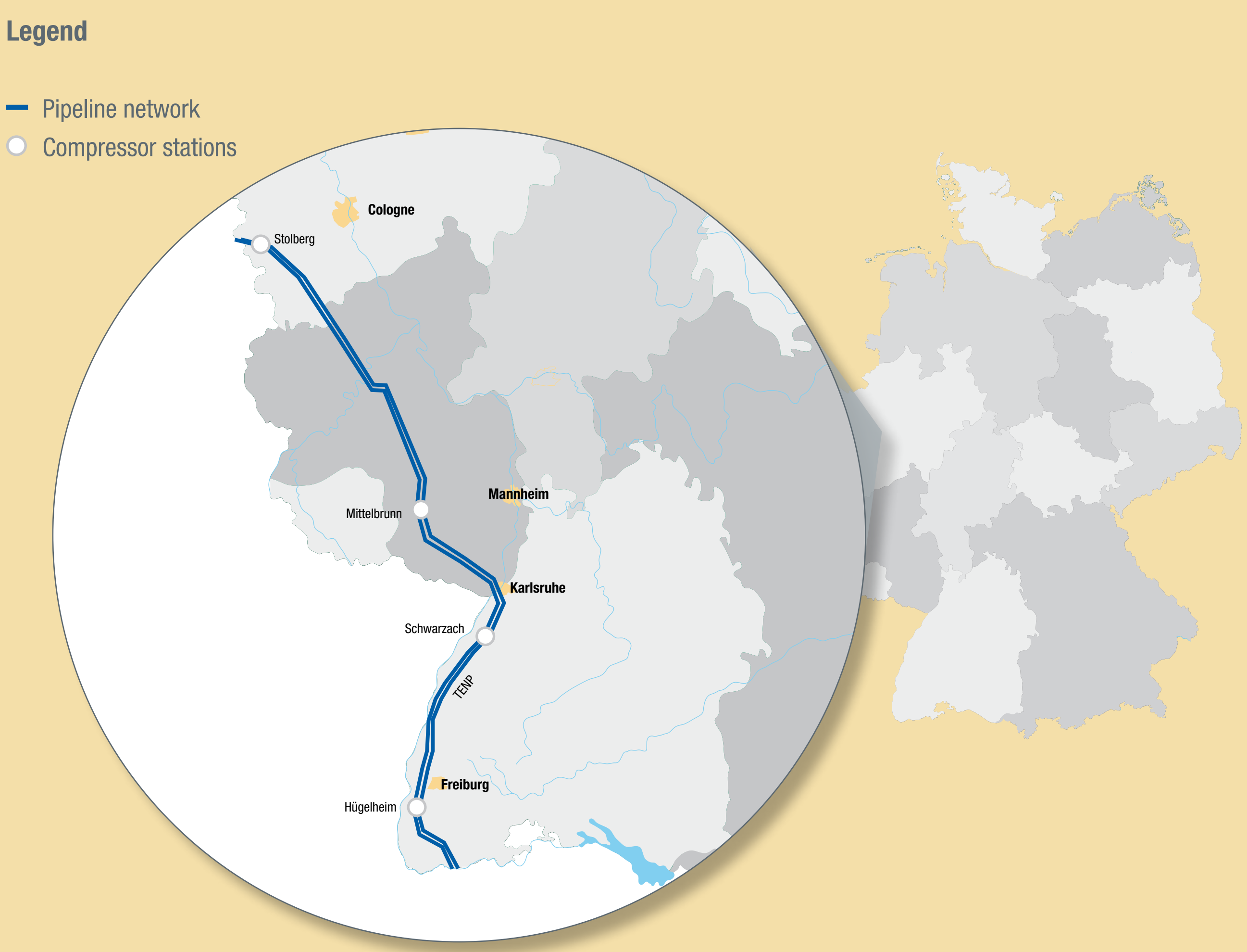
To be able to play an active part in the ongoing development of the gas industry in both Germany and Europe going forward, bayernets has been active as a market area-spanning system operator since 2008 and on 1 October 2008 set up NetConnect Germany (NCG) together with Open Grid Europe GmbH as a joint market area. More partners in the shape of GVS Netz GmbH, GRTgaz Deutschland GmbH and Eni Gas Transport Deutschland S.p.A. joined the market area on 1 October 2009.

Having grown from being a regional to a national transmission system operator within the space of just a few years, bayernets sees itself as being well prepared to handle the changes that are taking place in Europe and the imminent growth in international and European regulatory demands.

Length of Transmission System per diameter-class		
Length of Transmission System	km	1,314
A (nominal diameter DN: x ≥ 1000 mm)	km	-
B (nominal diameter DN: 700 mm ≤ x <1000 mm)	km	325
C (nominal diameter DN: 500 mm ≤ x <700 mm)	km	362
D (nominal diameter DN: 355 mm ≤ x <500 mm)	km	355
E (nominal diameter DN: 225 mm ≤ x <355 mm)	km	141
F (nominal diameter DN: 110 mm ≤ x <225 mm)	km	104
G (nominal diameter DN: x <110 mm)	km	27
Length of Medium Pressure System	km	-
Length of Lower Pressure System	km	-
Annual Quantities offtaken	TWh	71.9
Exit points from High Pressure System	Number	152
from Lower Pressure System	Number	-
Simultaneous Maximum Annual Offtake Load	MWh/h	16,186.6
Date/time of Simultaneous Maximum Annual Offtake Load		12.1.2009 9:00-10:00 a.m.

as per 31 December 2009

3.2 Eni Gas Transport Deutschland S.p.A.



Eni Gas Transport Deutschland S.p.A. (Eni D) is a wholly-owned subsidiary of Eni S.p.A. On 16 November 2005 Eni D took over the operation of part of the TENP gas transmission system which comprises two pipelines. The first pipeline (36“-38“) was commissioned in 1974 and the second (40“) was completed in 2006. Several sections of this second pipeline have been in operation since 1978.

The pipeline crosses Germany over a length of around 500 kilometres, from Bocholtz on the German/Dutch border where the TENP transmission system connects to the Dutch gas grid operated by Gas Transport Services B.V. (GTS), to the German/Swiss border near Wallbach, where the TENP system connects to the transmission system operated by Transitgas AG.

The physical direction of flow is north-south.

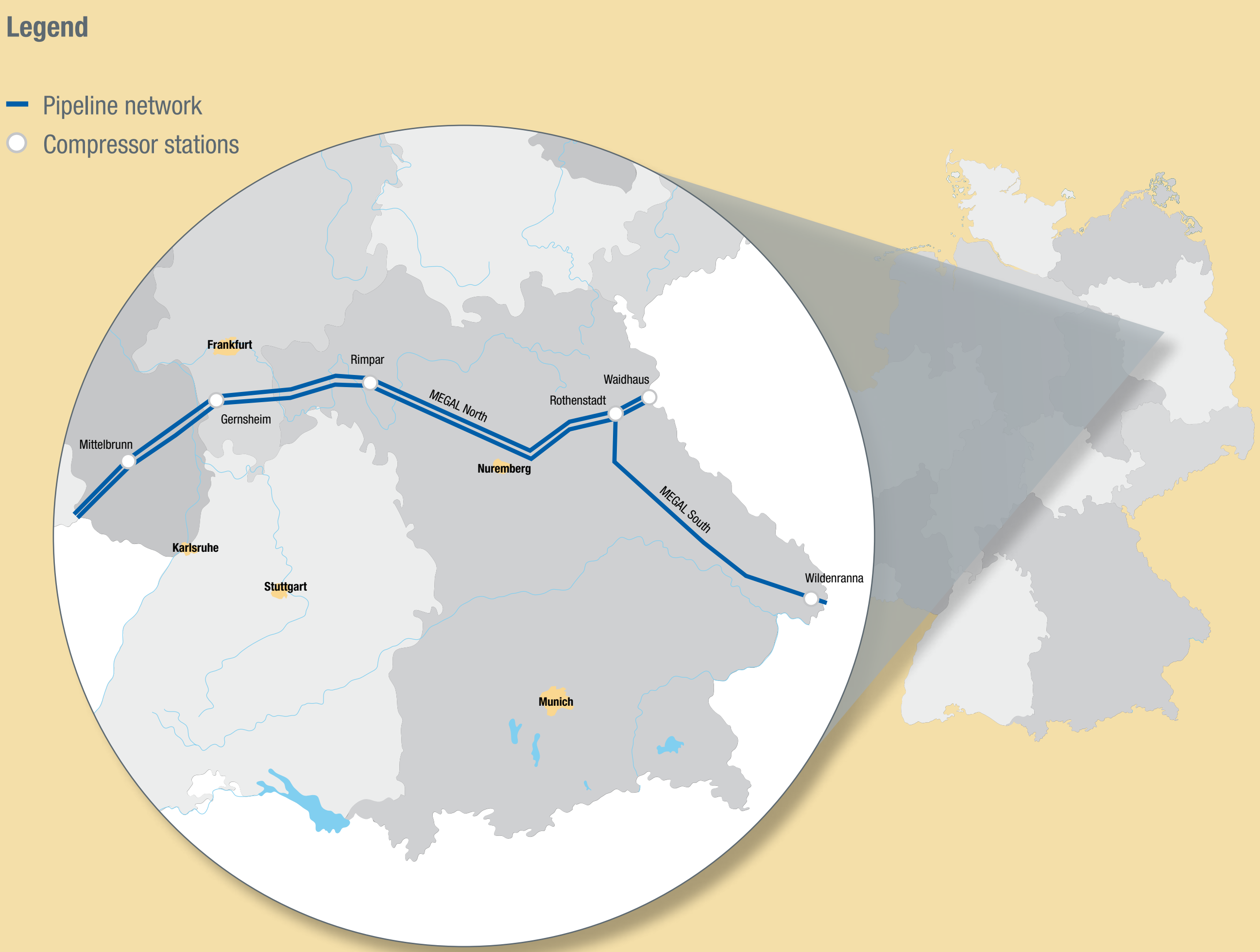
The system has four compressor stations at Stolberg, Mittelbrunn, Schwarzach and Hügelheim.

In 2007 the TENP transmission system was connected to the Belgian natural gas network with a pipeline linking the Stolberg network interconnection with the Eynatten/Raeren metering station on the border between Germany and Belgium.

Length of Transmission System per diameter-class		
Length of Transmission System	km	1,009
A (nominal diameter DN: x ≥ 1000 mm)	km	-
B (nominal diameter DN: 700 mm ≤ x <1000 mm)	km	453
C (nominal diameter DN: 500 mm ≤ x <700 mm)	km	556
D (nominal diameter DN: 355 mm ≤ x <500 mm)	km	-
E (nominal diameter DN: 225 mm ≤ x <355 mm)	km	-
F (nominal diameter DN: 110 mm ≤ x <225 mm)	km	-
G (nominal diameter DN: x <110 mm)	km	-
Length of Medium Pressure System	km	-
Length of Lower Pressure System	km	-
Annual Quantities offtaken	TWh	68.5
Exit points from High Pressure System	Anzahl	21
from Lower Pressure System	Anzahl	-
Simultaneous Maximum Annual Offtake Load	MWh/h	14,207.9
Date/time of Simultaneous Maximum Annual Offtake Load		15.1.2009

as per 31 December 2009

3.3 GRTgaz Deutschland GmbH



GRTgaz Deutschland GmbH is one of Germany's largest supra-regional transmission system operators.

GRTgaz D has been a market area-spanning system operator within the market area of NetConnect Germany since 1 October 2009.

It operates one of the major pipeline systems for the import of Russian natural gas into Western Europe. The network connects the Czech Republic, Germany, Austria and France.

The two pipelines that make up the MEGAL system – MEGAL North and MEGAL South – meet via an interconnector at Rothenstadt.

MEGAL North comprises two parallel lines having lengths of 459 km and 449 km, with gas flowing east-west. Four compressor stations are currently required to operate MEGAL North which is run at a pressure of 80 bar.

The MEGAL South pipeline runs for a distance of 167 km and is operated at a pressure of 67.5 bar. Gas flow is bi-directional. Two compressor stations are required to operate MEGAL South.

The MEGAL pipeline system has two gas import points at Waidhaus and Oberkappel and two export points at Medelsheim and Oberkappel. There are also interconnections with the supra-regional METG line in Gernsheim as well as with TENP at Mittelbrunn and from Rimpar to the Ruhr area. The networks of Creos, Gas-Union Transport, E.ON Gas Grid, EWR Netz, bayernets, Energienetze Bayern, E.ON Bayern and Open Grid Europe are all directly connected to the pipeline network of GRTgaz Deutschland.

Since the merger with the NCG market area, it has been possible to use 24 % of the entry capacity of GRTgaz D as firm freely allocable capacity throughout the market area. Most of the remaining capacity is offered subject to allocation restrictions at the present time.

Length of Transmission System per diameter-class		
Length of Transmission System	km	1,095
A (nominal diameter DN: x ≥ 1000 mm)	km	842
B (nominal diameter DN: 700 mm ≤ x <1000 mm)	km	243
C (nominal diameter DN: 500 mm ≤ x <700 mm)	km	3
D (nominal diameter DN: 355 mm ≤ x <500 mm)	km	4
E (nominal diameter DN: 225 mm ≤ x <355 mm)	km	2
F (nominal diameter DN: 110 mm ≤ x <225 mm)	km	1
G (nominal diameter DN: x <110 mm)	km	-
Length of Medium Pressure System	km	-
Length of Lower Pressure System	km	-
Annual Quantities offtaken	TWh	240.8
Exit points from High Pressure System	Number	26
from Lower Pressure System	Number	-
Simultaneous Maximum Annual Offtake Load	MWh/h	51,233.0
Date/time of Simultaneous Maximum Annual Offtake Load		24.12.2009 4:00-5:00 p. m.

as per 31 December 2009

3.4 GVS Netz GmbH

Legend

- Pipeline network
- Compressor stations

GVS Netz GmbH was established on 1 July 2007 and is a wholly-owned subsidiary of Gasversorgung Süddeutschland GmbH based in Stuttgart. GVS Netz operates a transmission system with a length of 1,923 km and nominal diameters up to DN 700. The system's area broadly coincides with that of the German state of Baden-Württemberg which is roughly 36,000 km². There are around 120 gas distribution networks downstream of the GVS network, including around 50 directly downstream.

GVS Netz guarantees the safe, cost-effective and non-discriminatory transport of natural gas within its network territory. It ensures the transport of natural gas to supply all domestic, commercial and industrial customers and to connect two underground storage facilities within the network's territory. GVS Netz has two border crossing points into Switzerland, one near Basel and another – Thayngen-Fallentor – near Schaffhausen. The Austrian province of Vorarlberg, the Principality of Liechtenstein and the Swiss canton of Graubünden (Grisons) are also supplied with natural gas via a border crossing point near Lindau. To be able to boost transmission capacity as the need arises, GVS Netz operates two compressor stations along the Karlsruhe-to-Ulm alignment – these are the Blankenloch station near Karlsruhe and the Dornstadt-Scharenstetten station located about 10 km before Ulm.

GVS Netz is a market area-spanning system operator and together with bayernets, Eni D, GRTgaz D and Open Grid Europe and Thyssengas forms the NCG market area encompassing all the systems and subnetworks of the market area partners.

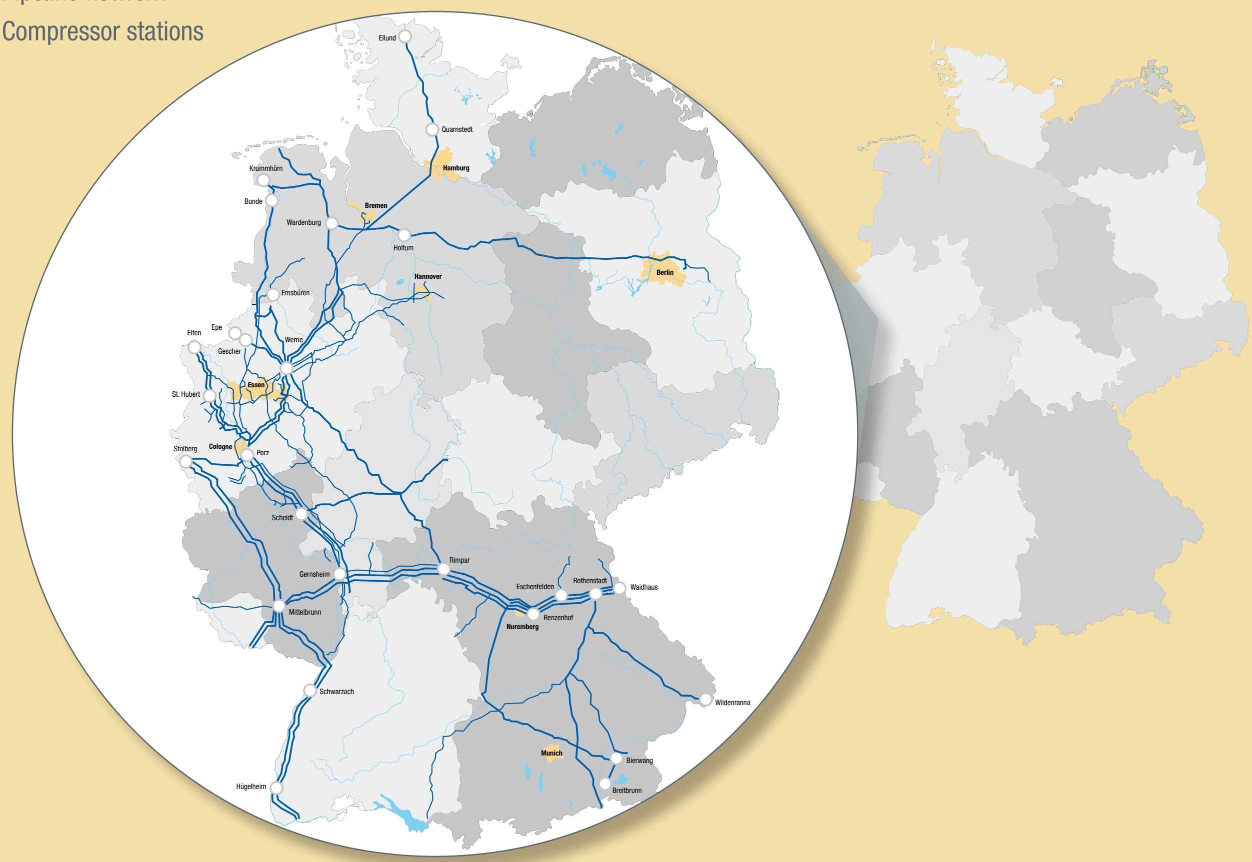
Length of Transmission System per diameter-class		
Length of Transmission System	km	1.923
A (nominal diameter DN: x ≥ 1000 mm)	km	-
B (nominal diameter DN: 700 mm ≤ x <1000 mm)	km	82
C (nominal diameter DN: 500 mm ≤ x <700 mm)	km	210
D (nominal diameter DN: 355 mm ≤ x <500 mm)	km	803
E (nominal diameter DN: 225 mm ≤ x <355 mm)	km	751
F (nominal diameter DN: 110 mm ≤ x <225 mm)	km	76
G (nominal diameter DN: x <110 mm)	km	-
Length of Medium Pressure System	km	-
Length of Lower Pressure System	km	-
Annual Quantities offtaken	TWh	75,4
Exit points from High Pressure System	Number	196
from Lower Pressure System	Number	-
Simultaneous Maximum Annual Offtake Load	MWh/h	20.122,0
Date/time of Simultaneous Maximum Annual Offtake Load		12.1.2009 9:00-10:00 a. m.

as per 31 December 2009

3.5 Open Grid Europe GmbH

Legend

- Pipeline network
- Compressor stations



Open Grid Europe operates Germany's largest gas transmission network with an approximate length of 12,000 km. A workforce of around 1800 staff with decades of experience in both engineering and marketing are committed to our customers.

As a subsidiary of E.ON Ruhrgas, we have over 80 years of expertise in the gas transmission business. We have been trading as Open Grid Europe since September 2010. We were the first German company to set up as an Independent Transmission Operator (ITO) under the EU Third Internal Energy Market Package, and within the scope of this package Open Grid Europe independently fulfils all tasks necessary for the company's business operations.

Our core activities include:

- design/construction: concept creation, project management, engineering and construction management
- operational: maintenance, control and monitoring of the transmission system and storage facilities
- capacity management: capacity determination, central master data maintenance, developing new standards for the gas industry
- marketing: contract conclusion and management, contract history documenting, providing the Entrix+ online platform
- billing: technical and contractual quantity determination, invoicing, exchanging data with other system operators

Our network's annual exit volume of around 650 billion kWh is roughly equivalent to two-thirds of German gas consumption. We operate approx. 100 compressor units with a total power of around 1,000 MW.

We see our task as actively shaping the European gas transmission market and optimising network access to meet the needs of our customers. By 2012 alone we shall be investing some EUR 400 million in expanding the European integrated network. As one of the founders of NetConnect Germany, we are a pioneer in market area cooperation in the field of gas transmission. With our modern, efficient pipeline network and our comprehensive range of services, Open Grid Europe will continue to help shape dynamic developments on the European gas transmission market with forward-looking transport solutions for natural gas.

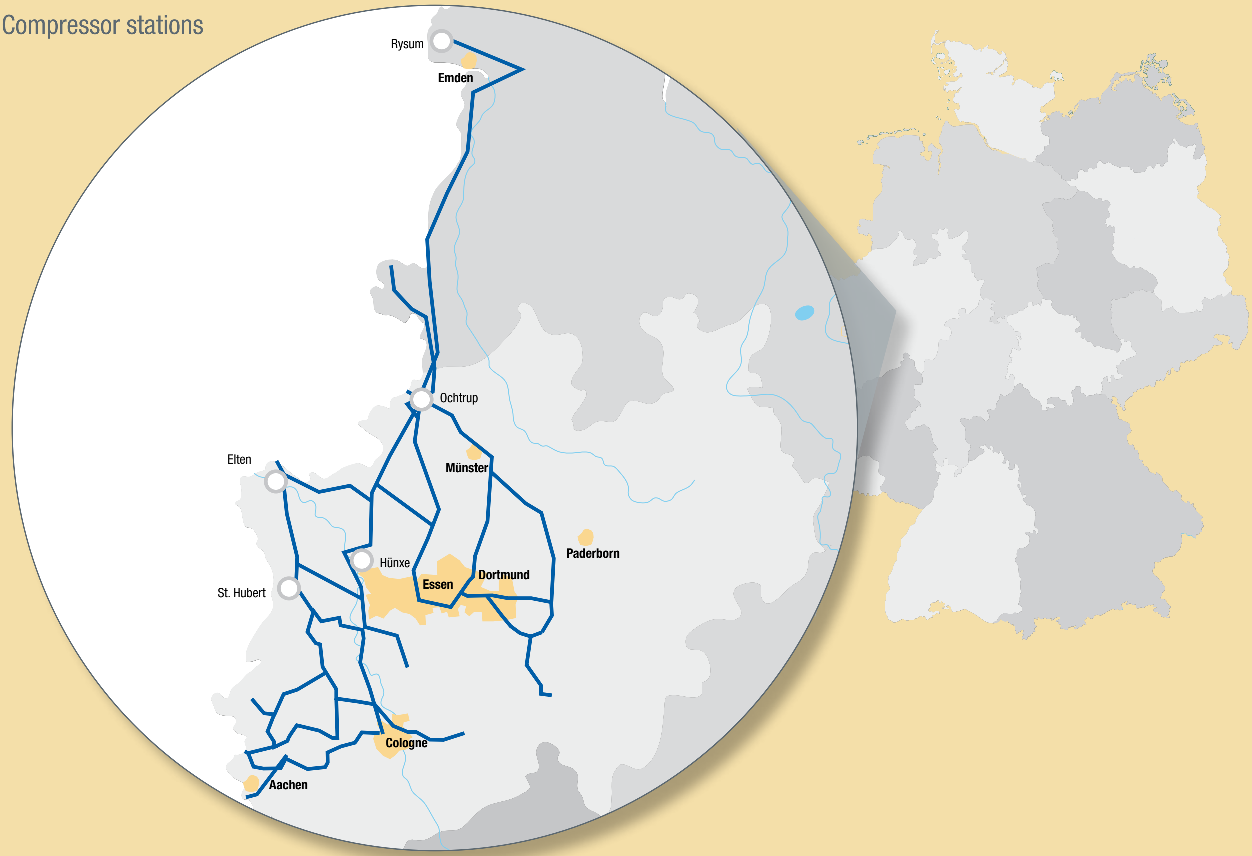
Length of Transmission System per diameter-class		
Length of Transmission System	km	11,551
A (nominal diameter DN: x ≥ 1000 mm)	km	3,062
B (nominal diameter DN: 700 mm ≤ x <1000 mm)	km	3,433
C (nominal diameter DN: 500 mm ≤ x <700 mm)	km	2,014
D (nominal diameter DN: 355 mm ≤ x <500 mm)	km	1,059
E (nominal diameter DN: 225 mm ≤ x <355 mm)	km	1,305
F (nominal diameter DN: 110 mm ≤ x <225 mm)	km	574
G (nominal diameter DN: x <110 mm)	km	105
Length of Medium Pressure System	km	-
Length of Lower Pressure System	km	-
Annual Quantities offtaken	TWh	658.6
Exit points from High Pressure System	Number	1,047
from Lower Pressure System	Number	-
Simultaneous Maximum Annual Offtake Load	MWh/h	142,484.1
Date/time of Simultaneous Maximum Annual Offtake Load		15.12.2009 9:00 p. m.

as per 31 December 2009

3.6 Thyssengas GmbH

Legend

- Pipeline network
- Compressor stations



Thyssengas GmbH based in Dortmund is a non-affiliated gas network operator and one of Germany's leading natural gas transmission system companies. We take an active part in designing the gas transport market, and are continually optimising the natural gas logistics on which such a market depends. Each year, up to 100 billion kilowatt hours of natural gas are transported safely and reliably over a 4,200 km long pipeline network to distribution network operators, industrial companies and power plants.

Thyssengas are specialists and innovators in natural gas transport. The company was first established in 1921 and operated the very first German transmission pipeline that was built in 1910 (running from Duisburg-Hamborn to Wuppertal-Barmen). Today we are a non-affiliated, independent 'carrier' for both international and national gas traders. Our transport system extends over wide areas of North Rhine-Westphalia and as far as Lower Saxony. We provide natural gas transmission that is safe and environmentally sound – from state boundaries to the consumer centres. Almost 300 Thyssengas specialists are constantly adding new services to the traditional functions of gas transport; with innovative products we aspire to offer our customers greater flexibility in their use of the transmission system. Our activities range from the booking of gas transport capacity to constantly analysing gas fed in by natural gas traders in the interests of consumer protection.

Competition and the demand for energy continue to grow. As a gas logistics provider, we aspire to develop new combinations of services for this dynamically expanding market that will deliver real benefits to our shippers as they compete on the heating market.

Length of Transmission System per diameter-class		
Length of Transmission System	km	4,216
A (nominal diameter DN: x ≥ 1000 mm)	km	4,216
B (nominal diameter DN: 700 mm ≤ x <1000 mm)	km	148
C (nominal diameter DN: 500 mm ≤ x <700 mm)	km	457
D (nominal diameter DN: 355 mm ≤ x <500 mm)	km	676
E (nominal diameter DN: 225 mm ≤ x <355 mm)	km	604
F (nominal diameter DN: 110 mm ≤ x <225 mm)	km	698
G (nominal diameter DN: x <110 mm)	km	1,513
Length of Medium Pressure System	km	120
Length of Lower Pressure System	km	-
Annual Quantities offtaken	TWh	73.9
Exit points from High Pressure System	Number	1,048
from Lower Pressure System	Number	8
Simultaneous Maximum Annual Offtake Load	MWh/h	26,900.0
Date/time of Simultaneous Maximum Annual Offtake Load		7.1.2009 11:00 a. m.

as per 31 December .2009

4. Long-Term Transmission Capacity Requirements Assessment

In this chapter the cooperation partners are for the first time meeting their commitment under GasNZV Section 17 to 'determine the long-term capacity requirements' as of 1 April 2011. 1 January 2011 – the date on which the four market areas NCG, Open Grid Europe L-Gas, Thyssengas H-Gas and Thyssengas L-Gas existed – has been selected as the key date for the market areas to be analysed.

Because the information and findings described in GasNZV Section 17(1) Numbers 3, 4 and 6 are closely related, the corresponding descriptions have been summarised in Chapter 4.3. Accordingly, Chapters 4.1 and 4.2. refer to Section 17(1) Numbers 1 and 2, Chapter 4.4 refers to Section 17(1) Number 5 and Chapters 4.5 to 4.8 relate to Section 17(1) Numbers 7 to 10.

4.1 Development of the supply/demand relationship

The outlook with regard to future natural gas demand and its effects on the natural gas transmission system can only be analysed and described in the context of the long-term development of energy demand structures and the complex interaction between the factors involved.

Given the long lead times and the high costs of implementing changes in the energy system, analysis periods of up to 50 years ahead are regarded as being reasonable.

Long-term studies take into account a large number of external factors when assessing future developments in energy demand and developing recommendations for action. Experts believe that the following aspects have a significant influence on the conclusions reached by studies into the future development of energy demand and their interpretation:

- socio-demographic factors
  - changes in population
  - the number of private households
- development in building stock
  - energy efficiency
  - occupancy
- changes in energy demand
  - space heating
  - hot water
  - commercial and industrial process heat demand
- changes in economic performance
  - national
  - international
- developments in energy productivity
- developments in fuel prices
- the development of environmental and climate policy conditions in a global, European and national context

These and other external factors which have a decisive impact on developments in the demand for energy have been taken into consideration in a number of studies and long-term scenarios since the early 1970s.

Natural gas demand

Long-term investigations such as the 2010 study commissioned by the German Federal Ministry of Economics and Technology (BMWi) entitled "Energieszenarien für ein Energiekonzept der Bundesregierung" (Energy Scenarios for an Energy Concept of the German Government) [Prognos 2010] predict that energy consumption as a whole and natural gas demand in Germany will fall in the long term.

This trend in energy demand was also identified in recent studies such as the report by the commission of enquiry on "Sustainable Energy Supplies" of 2002, and the investigations on "Long-Term Scenarios for Sustainable Energy Use"/Krewitt et al 2004/ carried out for the Federal Environmental Agency.

The declining energy demand is attributed primarily to the political framework for climate protection, with emissions trading and the advancement of renewable energy sources. Although all of the studies predict that natural gas as a fuel will have an important part to play in reducing environmentally harmful emissions of greenhouse gases, especially carbon dioxide, this role is seen as having only a temporary impact given that renewable energy sources are regarded as playing a leading long-term role going forward.

The long-term scenarios of the Prognos study [Prognos 2010] assumed that

- there will be a significant increase in the international and national prices of the fossil fuels natural gas, oil and steam coal (the border crossing price of natural gas is predicted to rise from 2.7 cents/kWh in 2008 to 3.2 cents/kWh in 2050 – the price base is 2008 in this case),
- the population of Germany will shrink from 82.1 million to 73.8 million by 2050,
- the size of households will fall while the number of households will rise,
- economic output will increase by an average of 1 % per year from 2010 to 2050,
- depending on the scenario, the demand for electricity will fall by between 6 % in the reference scenario and 20 - 24 % in the target scenarios,
- there will be improvements in thermal insulation standards and an increased deployment of renewable energies in the housing sector, and
- the coming years will see improvements and changes for example in material efficiency and commercial/industrial production portfolios.

In the study these and other input and reference parameters result in a reduction in final energy demand as a whole. For example, in the conservative reference scenario, it is predicted that the energy consumption of private households will fall from about 2,500 PJ/a in 2008 to 1,886 PJ/a by 2050. Even in the relatively short period up to 2020, energy consumption is already forecast to fall to 2,278 PJ/a.

For the reference scenario, [Prognos 2010] predicts that consumption of natural gas in private households will shrink from about 894 PJ/a in 2008 to 743 PJ/a in 2020, a decline of about 17 %. Natural gas consumption in the industrial sector is set to fall from about 890 PJ/a in 2008 to around 783 PJ/a in 2020, a drop of about 12 % in demand. A summary of the natural gas demand for the reference scenario is given in the following Table 4.1 and Fig. 4.1 [Prognos 2010].

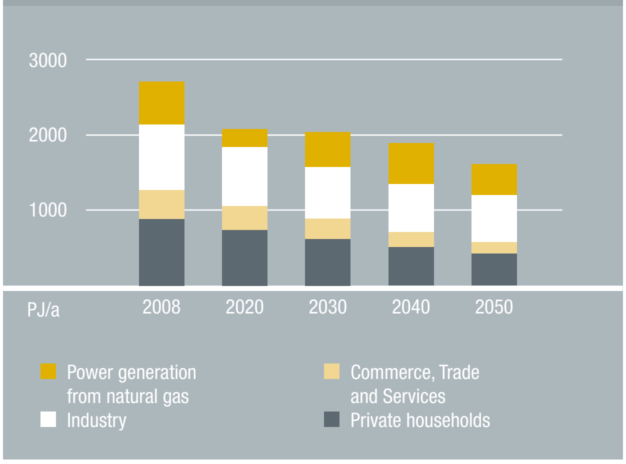
In the various target scenarios considered, even more pronounced reductions in energy consumption are predicted, although these are based on a range of non-conservative assumptions [Prognos 2010].

Tab. 4.1: Changes in gas consumption – Reference scenario according to [Prognos 2010]

Gas consumption (PJ/a)	2008	2020	2030	2040	2050
Private households	893.8	743.4	618.3	515.9	427.1
Commerce, Trade and Services (CTS)	386.1	323.6	267.6	204.2	154.1
Industry	888.9	783.1	685.2	635.5	627.0
Power generation from gas	563.0	233.0	458.0	539.0	405.0

Fig. 4.1

Change in natural gas consumption by sectors in Germany [Prognos 2010]



Private households and commerce/trade/services

Taking into account the regional peculiarities of the networks under review, a switch – albeit less marked – from oil to gas is anticipated in spite of a reduction in the annual energy demand of existing network connections in the 'households and CTS' market segment.

It is expected that the growing use of geothermal will displace the use of gas in some conurbations in the longer term.

System operators do not expect the drop in the requirement for gas in this segment to be offset by the oil/gas switch or additional connections.

Gas-fired power plants and gas-fired cogeneration plants

Gas-fired power plants and gas-fired cogeneration (CHP) plants are particularly well suited to supporting the sustainability aspirations in electricity generation and the associated efforts to reduce CO_2 emissions.

In contrast with the expectations indicated in the Prognos study for power generation from natural gas, a number of cooperation partners are receiving an increasing number of requests to connect gas-fired power plants and gas-fired CHP plants.

We should also bear in mind that increasing numbers of ageing electricity and heat generating facilities will either be decommissioned or replaced in the coming years. It is anticipated that a significant part of this gap will be filled by gas-fired power plants and CHP installations which will then make a major contribution to securing energy supplies.

There is also a discernible trend among German "Stadtwerke" and industrial installations to expand gas-fired CHP plants, a trend corroborated by the assessment of the "Integrierte Energie- und Klimaschutzprogramm" (Integrated Energy and Climate Protection Programme - 'IEKP') adopted by the German government in August 2007 which predicts that the share of electricity from gas-fired combined heat and power will double from 12.5 % to 25.0 % by 2020.

Use of natural gas as fuel for vehicles

In the medium term, system operators expect that the growing diversification of fuels will lead to a rise in the proportion of natural gas used to power road vehicles. The addition of biogas to natural gas in particular can bring about a significant drop in CO_2. However, the impact on the demand for natural gas will be minimal in terms of volume, and will directly depend on the transport strategies and incentive policies of the EU and the German government.

Natural gas supply

The supply of natural gas for the years up to 2030 is generally regarded as being secure (e.g. [BP 2010], [BMWi 2006]). Studies and extrapolations indicate that conventional natural gas reserves will be sufficient for around 65 years according to current statistics [BP 2010]. Further growth in supply is anticipated from the development of unconventional gas (e.g. in North America) and biogenic gases.

German L-Gas

A medium to long-term decline in domestic L-Gas production is generally assumed in Germany. It is almost impossible to make any accurate statements about the long-term availability of German L-Gas at the present time given the many variables involved (e.g. gas price, exploration efforts, unconventional production). Discussions are currently ongoing with other market players such as producers, system operators and traders in an effort to collect data that is as resilient as possible. On the basis of published data, Open Grid Europe is predicting that the production of L-Gas in Germany will cease in 10-15 years. In just a few years however, production capacities will have dropped to such an extent that even with a minimal drop in consumption some form of offset will be needed in the near future (within the next 10 years).

Biogas

The objective of the GasNZV is to inject six billion cubic metres of biogas by 2020 and ten billion cubic metres by 2030 each year into the natural gas grid. Biogas installations are to be hooked up to the gas grid as a matter of priority to attain this goal, and system operators have an obligation to expand the network to allow this to happen so far as is commercially viable.

At present (base year 2010) some 54,000 cubic metres of biogas is injected into the German gas grid every hour [Sieverding 2010]. The very first connection of a biogas plant located in the Saarland to the transmission system of Open Grid Europe is planned for 2011.

If implemented, the injection from a proposed biogas plant into the network of Thyssengas will also require the upgrade of a station for returning the gas to the upstream network.

4.2 Findings of market surveys on long-term capacity requirements

This Chapter 4.2 starts by describing the findings of market surveys conducted into binding long-term capacity requirements under Section 17(1) Number 2 GasNZV. This is followed by a review of market surveys which are currently ongoing.

Open Season 2008 of Open Grid Europe GmbH

In order to meet the requirements and expectations of shippers and the operators of downstream networks connected to the Open Grid Europe system (both referred to in this section as 'customers') concerning the further evolution of the L-Gas and H-Gas market areas of Open Grid Europe in line with demand, Open Grid Europe developed its network on the basis of a transparent, non-discriminatory open season procedure held in 2008 and 2009. The requirements of customers in the market areas of Open Grid Europe were assessed against the capacity of the network operated by Open Grid Europe.

The open season process followed the ERGEG Guidelines for Good Practice for Open Season Procedures [ERGEG 2007], and involved two phases. The open season procedure began in early 2008 with customers being asked to indicate their capacity requirements on a non-committal basis. From mid May 2008 this was followed by Phase 2, with customers' actually committing to binding capacity contracts.

Given the unexpectedly high demands of customers, unresolved issues of planning and investment security and the need for clarification with the BNetzA, the originally proposed timeframe had to be extended on more than one occasion.

No fewer than 485 non-binding capacity demand requests were received in Phase 1 of the Open Season (the non-binding capacity survey) with a total volume of almost 430,000 MWh/h. This high level of participation and demand for capacity far exceeded the expectations of Open Grid Europe. These requests would have involved a theoretical network expansion scenario of over EUR 7 billion. The demand for capacity shrank to around 30 % of the original requests between Phase 1 and Phase 2; the construction work proposed in this network expansion scenario would have involved investments at a level of approx. EUR 3 billion. This would mean expanding the Open Grid Europe network by about half its present size and would far outstrip the resources of Open Grid Europe.

It therefore became necessary to prioritise individual expansion projects in order to develop a scenario which Open Grid Europe could implement technically, financially and in HR terms. The resulting prioritisation process which has been carried out on a non-discriminatory basis has been undertaken on the basis of criteria suggested by the BNetzA. It takes into account factors such as network efficiency, the strengthening of the national and European integrated networks and European security of supply as well as encouraging competition. The prioritisation process and its impact on the final network expansion scenario has been discussed at a number of meetings with the Federal Network Agency and has been noted approvingly by the latter.

The prioritisation exercise resulted in a final network expansion scenario with an investment volume of approx. EUR 400 million, allowing Open Grid Europe to meet its statutory duty to expand its network in line with demand in spite of the unfavourable regulatory investment conditions.

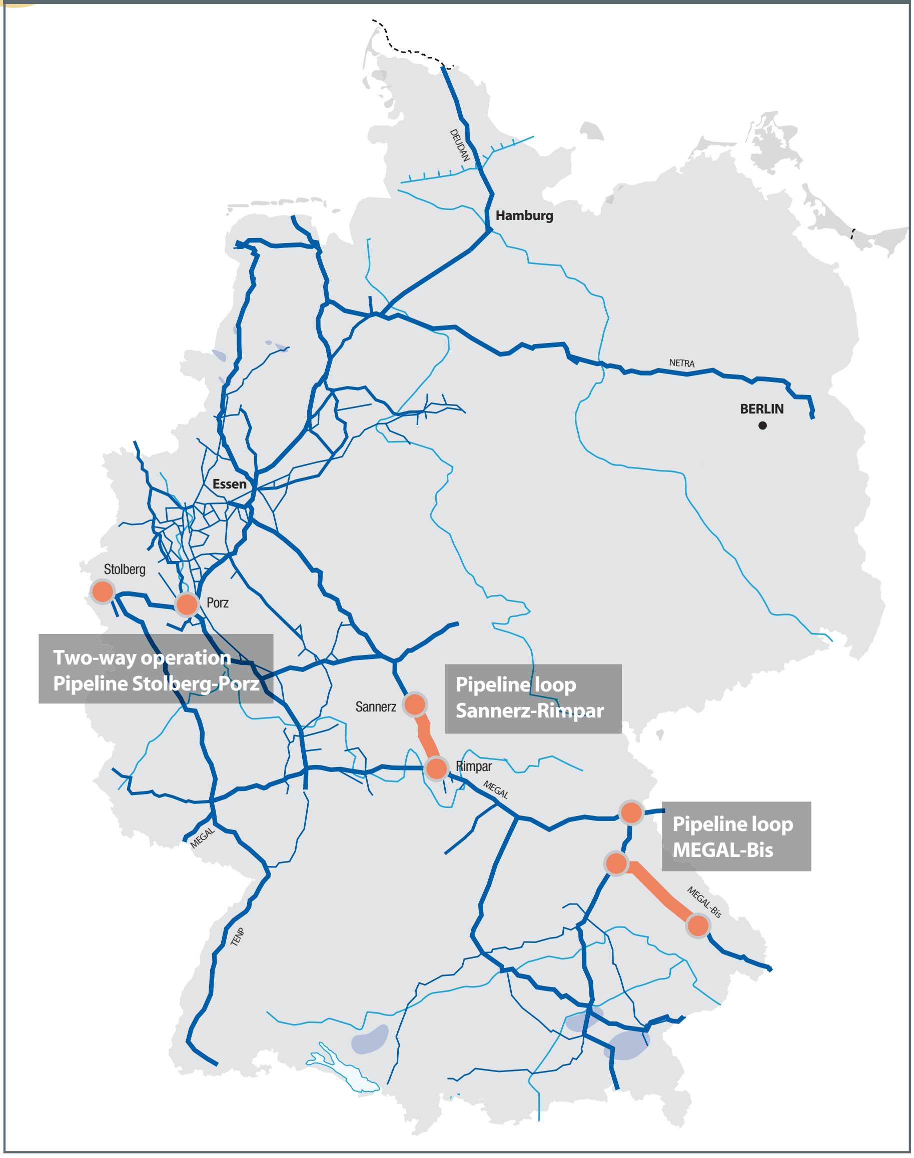
This amount reflects the financial strength of Open Grid Europe as a network operator and does justice to the principle of 'economic viability' in the sense of the Energy Industry Act.

The efficiency of this prioritisation is demonstrated by its outcome. The optimised network expansion scenario will achieve 35 % of all binding confirmed capacity requests. Around 45 % of H-gas and 34 % of L-gas capacity requests that exist in the concluding phase will be realised. Capacities have been allocated to a total of 29 out of 40 customers.

The first additional capacities will be made available to customers starting 1 October 2011. The Open Season 2008 expansion projects – and hence the full provision of capacities – are expected to be completed by 1 October 2012 (see Fig. 4.2).

Fig. 4.2

Final expansion scenario of Open Grid Europe Open Season 2008



Market surveys

A market survey on capacity requirements in the south-east of the bayernets network area is planned for 2011.

In the summer of 2010 Thyssengas conducted a market test for a possible 'Emden-Werne-Eynatten' pipeline project. Unlike in other market surveys, on this occasion Thyssengas outlined the possible route of the pipeline and asked power plant operators, storage operators and neighbouring system operators for a non-binding assessment of their additional capacity requirements. Thyssengas promised respondents that the collected data would be treated in confidence so details of it cannot be disclosed. Thyssengas then entered into discussions with interested parties who linked their capacity requirement assessments with an implementation timeframe. At the present time however there are no requests for additional capacity under GasNZV Sections 38 and 39 for projects along the proposed new pipeline.

4.3 Results of load flow simulations, information on existing or predicted physical bottlenecks and on network access refusals

In 2007, network access was reshaped by the GasNZV which introduced the so-called two-contract model. This model allows 'shippers' (transport customers) to book entry and exit capacities for the network independently.

The booking of capacity does not automatically result in the physical flow of gas. However, the capacity which has been booked is reserved for the shipper and entitles him to inject gas into the network (entry capacity) or to withdraw gas from the network (exit capacity) at any time. In figurative terms, the entry capacity extends from the entry point to the so-called virtual trading point (VP), while the exit capacity extends from the VP to the exit point.

At the VP the injected and withdrawn quantities as well as the bought and sold quantities are balanced. This flexibility in gas trading – which system operators cannot influence because of the strict separation between trading and transmission required by statutory provisions – means that system operators have to cater for a large number of different flow scenarios for the system as a whole.

All the transmission system operators involved are required by law to cooperate to ensure that this actually happens in large contiguous areas (market areas). For this purpose, they have concluded a joint cooperation agreement [KoV III] which regulates the mechanisms for gas transmission between system operators. The cooperation agreement is amended from time to time and approved by the BNetzA; it is presently undergoing further revision to incorporate changes arising out of the GasNZV adopted in 2010.

Once a year, downstream system operators (these are mainly distribution network operators) book a maximum firm exit capacity to be provided from the upstream transmission system for handling gas transmission within a market area (internal booking according to GasNZV Section 8 Number 3). Once the booking is confirmed, the upstream transmission system operators are obliged to make available the contractually agreed capacity at network interconnections/exit zones to the downstream network.

Bookings must be confirmed at least in an amount in which the booking by the downstream system operator does not exceed the previous year's level.

The changed legal framework means that transmission system operators face considerable planning risks. Growing competition in gas trading in particular is leading to marked changes in the use of transmission capacities.

Consequently, there is a need for a large number of complex statistical and physical evaluations, the results of which are presented in the sections that follow.

NCG Market Area

The following paragraphs describe the conclusions drawn from load flow simulations of the H-Gas transport systems of the market area-spanning system operators in the NCG market area. The interdependencies which exist among the transmission systems render a separate capacity analysis of individual networks to some extent inconclusive. Freely allocable capacities in the NCG market area cannot usually be created by expanding the pipeline system of any one network operator.

Results and conclusions for bayernets

The bayernets system consists of the so-called main system, with a maximum operating pressure of 67.5 bar, and the Burghausen-Schnaitsee (84 bar) and Amerdingen-Schnaitsee (80 bar) pipelines (indicated by light blue lines in Fig. 4.3 below).

Findings from load flow simulations to determine internal bottlenecks

There are bottlenecks within the bayernets system

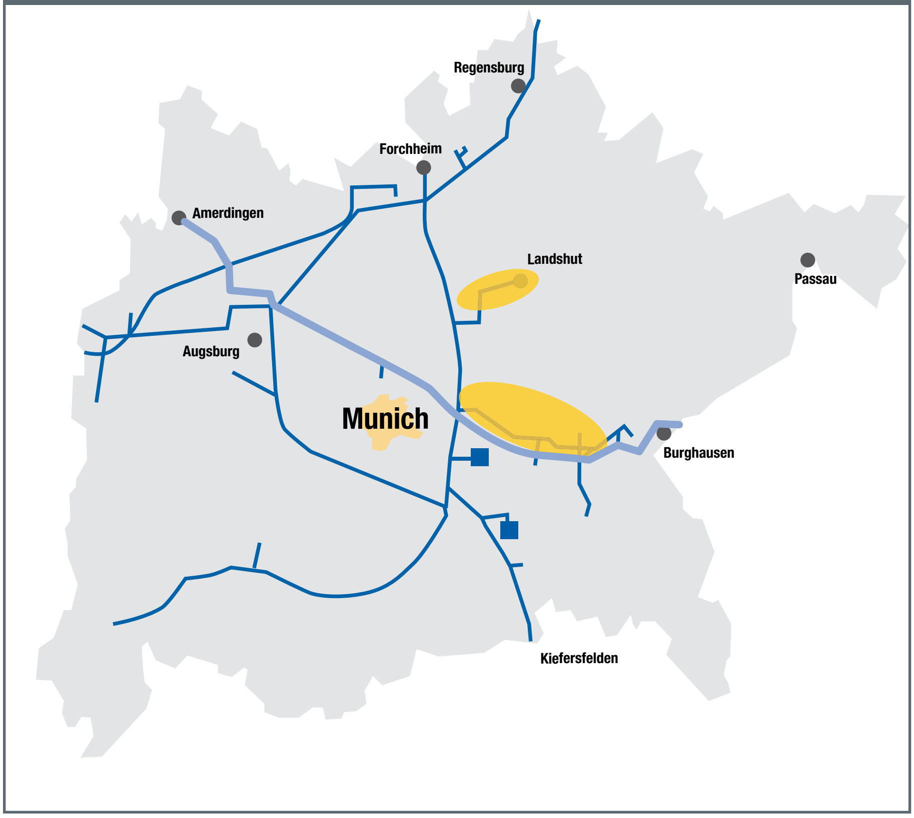
- on a section of the Moosburg-Landshut pipeline and
- on the Finsing-Bierwang pipeline.

The Moosburg-Landshut pipeline is mainly used for feeding gas to the downstream network operators Energienetze Bayern GmbH (ENB) and Stadtwerke Landshut (SWL).

The various sections of the Moosburg – Landshut pipeline are listed in the table below, which also indicates the relevant diameters.

Fig. 4.3

Schematic diagram of bayernets system, also showing internal bottlenecks



Sections by pipeline diameter

Section		Length (m)	Diameter
1201	Moosburg/Rosenau- NKP Moosburg/Lände (ENB)	2,740	DN 400
1201	Moosburg/Lände-NKP Altdorf (SWL)	17,033	DN 150
1203	Altdorf-NKP Dreisesselstraße (SWL)	2,744	DN 200

Because of section 1201 with its nominal diameter of 150 mm, the pressure drop as far as the network interconnection points of Stadtwerke Landshut is so great that the pressure as warranted in the contracts cannot be achieved in the winter half of the year at maximum network load (the requested level of the internal booking). As a result, part of the capacity booked by Stadtwerke Landshut cannot be provided for reasons of fluid mechanics, so bayernets rejected this part of the internal booking.

This bottleneck in the bayernets system could be overcome by replacing section 1201 with a larger-diameter pipeline or by installing a loop line along this section. Alternatively, Stadtwerke Landshut can use a network connection with Energienetze Bayern GmbH to receive gas, in which case implementing the above construction project is not a matter of urgency at the present time.

The Finsing-Bierwang pipeline has a nominal diameter of 500 mm. In order to carry gas from the Überackern/Burghausen border crossing points to the main bayernets system via the Burghausen-Schnaitsee and Finsing-Bierwang pipelines, a compressor station at Haiming/Burghausen was commissioned in 2008, considerably increasing the transmission capacity available. However, a pressure drop of up to 19 bar occurs on the Finsing-Bierwang pipeline at full-load conditions.

Conclusions from load flow simulations concerning bottlenecks in transmission between the bayernets and Open Grid Europe systems

Binding flow limits at network interconnections between Open Grid Europe and bayernets systems were agreed as part of market area cooperation between Open Grid Europe and bayernets as of 1 October 2008. The actual flow required at the network interconnections points (IPs) is determined by the load on the network and capacity deployment at the entry and exit points of the bayernets system. The maximum flow limits agreed with Open Grid Europe and which are of crucial importance in maximum flow scenarios, are insufficient to meet the load on the bayernets network in all load flow scenarios. Open Grid Europe is currently not able to achieve higher transmission rates (see the description below of bottlenecks by Open Grid Europe, Fig. 4.9).

Since bayernets is not in a position to fully provide the capacity booked internally by downstream network operators on a continuous basis, the internal orders of downstream network operators have only been partially confirmed as firm capacity. Capacity requirements in excess of the possible firm capacity were offered as interruptible capacity.

Despite this situation, in order to ensure secure gas supplies to gas users connected directly and indirectly to the system, the capacity shortfall is met by flow commitments at the entry and exit points, with effect for the bayernets systems. Because the flow commitments can only be put out to tender for one year at a time for regulatory reasons and so are not permanently assured, these capacities can only be offered to downstream network operators as interruptible capacity.

The load flows in minimum flow scenarios are decisive for the calculation of firm entry capacities.

Currently, it is not possible to feed gas back to the system of Open Grid Europe. For this purpose, it would be necessary to modify Forchheim gas metering and pressure regulating (GPRM) station for bi-directional operation and to generate the appropriate transfer pressure. Since bayernets cannot currently achieve the transfer pressure required under normal operating conditions, Open Grid Europe would have to reduce the pressure, but this would result in capacity restrictions in the transmission system of Open Grid Europe.

Currently, capacity requests, for example as a result of new network connections for gas-fired power plants and underground storage facilities, can only be met on an interruptible or temperature-dependent (i.e. seasonal) basis or with allocation restrictions. Requests for firm, freely allocable capacities (in the NCG market area) must be rejected.

Improving the network situation without additional investments by other German transmission system operators can be achieved by constructing the proposed Burghausen-Finsing high-pressure gas pipeline. In this way, the gas quantities probably amounting to over 2,900,000 m³/h that will be available at the Überackern/Burghausen border crossing point in the coming years can be used in defined load scenarios to supply new network connections or to meet existing requests. The proposed interconnector from Burghausen to the network node at Finsing near Munich (see Fig. 4.4) would be needed to transport this gas away from the Überackern / Burghausen border crossing point.

There is a need to construct a DN600 gas transmission line (bayernets regional demand) or a DN1200 gas transmission line (supra-regional demand) to satisfy the substantial additional requirement for transport capacity that is already becoming apparent. Alignment surveys and the planning application procedure have now been concluded.

Fig. 4.4

Burghausen-Finsing high-pressure gas pipeline project map

Conclusions from refusals of network access under EnWG Section 25 Sentences 1 and 2

It is not possible to draw any conclusions from the network access requests rejected under EnWG Section 25 Sentence 2 over and above those already presented above. bayernets is repeatedly compelled to refuse capacity requests for the Überackern entry point.

Results and Conclusions of GVS Netz

Study into the development of gas demand and gas transport capacity in the GVS network area

In 2009, GVS Netz with the support of a reputable business consultancy prepared a study into the development of gas demand and transport capacity in the GVS network area. The gas demand was calculated for all urban and rural districts (baseline 2007) and then forecast up to 2030 taking a large number of factors into account. The study came to the following main conclusions:

- At the time when the study was prepared (2009), the transmission network of GVS Netz was able to meet the demand for natural gas of its connected network customers.
- Gas requirements in the network area of GVS Netz will stagnate during the period 2008 to 2030 but there will be significant shifts in capacity to the economically stronger regions. In most districts, gas consumption will decline up to 2030.
- In the north-west of Baden-Württemberg and the Stuttgart region, the demand for gas will grow over the same period. In the medium-term therefore the network load will decrease in the south and east of the network area and will increase or at best remain constant in the north-west of the region and the Stuttgart conurbation.
- New gas-fired power plants and the increasing non-use of opportunities to equalise the gas flow in downstream systems will create the need for network expansion.
- The use of natural gas to produce electricity in Baden-Württemberg will increase by 40 % in the basic scenario (nuclear power phase-out), with gas consumption rising marginally as a result (+0.4 %). Just a 400 MW gas-fired power plant in the Stuttgart area will necessitate a further connection of the network to one of the large supra-regional transmission lines such as the transport system of Trans Europa Naturgas Pipeline GmbH & Co. KG (TENP-Leitungsgesellschaft) or that of MEGAL GmbH & Co. KG Mittel-Europäische Gasleitungsgesellschaft (MEGAL-Leitungsgesellschaft), referred to below as the TENP and MEGAL transport system respectively.

Changes in the demand for transport capacity

Among other things, a natural gas transport system must be designed for the maximum required capacity to ensure that the gas can be reliably transported in times of high demand (peak load). Downstream system operators must therefore tell the upstream system operator well before the start of a calendar year what capacity the upstream system operator should make available (internal bookings). These bookings are added together and form the basis for transport planning by each individual system operator.

The network access regime which currently pertains in Germany encourages gas-to-gas competition with the aim of ensuring that shippers, i.e. gas traders, are able to supply their customers flexibly and with no physical restrictions. For system operators such as GVS Netz however, the desire for gas market liberalisation means that more capacity has to be made available to transmit the gas than was previously the case. This is also due to the fact that gas traders inject their gas into the systems according to the lowest purchase price and not as before according to regional requirements. Consequently gas – in similar fashion to electricity – has to be carried over long distances that are less than ideal in terms of transmission efficiency. This, too, leads to a rise in the peak load in the transmission network (actually transported maximum hourly quantity).

Conclusions from GVS Netz transmission/requests

A substantial increase in internal bookings has now largely exhausted and even exceeded the available transport capacities of GVS Netz GmbH. Beside the less-than-ideal injection of gas into the transmission networks in technical terms, a further reason for this development is that downstream system operators no longer use the network buffer, peak-shaving facilities and other facilities to balance the gas transmission in their networks as was common in the past.

More and more system operators are also actually considering shutting down these facilities, so the booked transport capacities can be expected to stay permanently at a high level or increase further. Some internal bookings could only be offered on an interruptible basis for the 2011 calendar year because not enough firm transport capacity was available.

In the 2008/2009 winter half-year GVS Netz carried about the same amount of energy in its network as in the 2007/2008 winter half-year; however, the highest effectively transported hourly rate was around

10 % higher than in 2007/2008. In the 2009/2010 gas year the annual transported quantity fell by about 8 %, due primarily to the economic crisis, but the maximum hourly quantity remained on the same level as in the previous year. In December 2010 the maximum effectively transported hourly quantity actually rose again by around 2 % compared with the previous historical peak. These findings are a strong indication that more capacity will be needed in the network than before under the new network access regime.

The shortfall in gas transmission capacity in Baden-Württemberg is thrown into sharp relief by requests for the connection of gas-fired power plants with a demand of more than 200,000 m³/h. GVS Netz cannot provide this additional capacity at the present time.

For the Baden-Württemberg regional government this is an unsatisfactory situation because transporting more gas from various different production regions into Baden-Württemberg is an urgent requirement of the Baden-Württemberg regional development plan [BW 2002]: ‘A spatially balanced supply of natural gas from a variety of sources and entry points must be assured. Expanding the transmission pipeline network in line with demand and maintaining the corresponding routes is a cornerstone of the 2002 regional development plan: PS 4.2.9 (G): “The pipeline network for natural gas must be further expanded to meet demand ...”

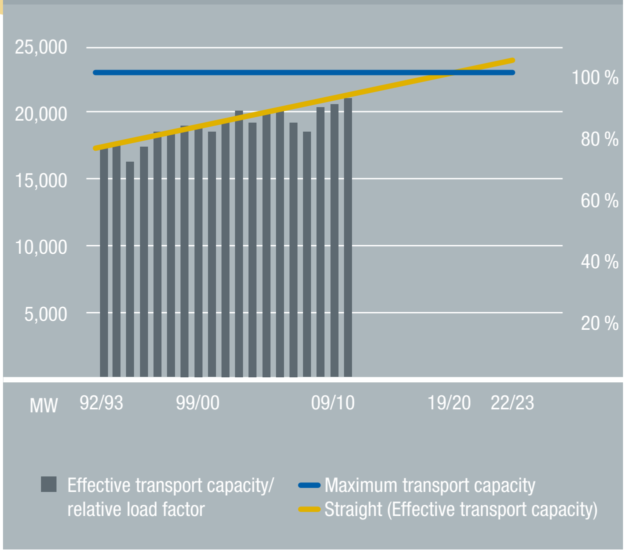
In its Energy Concept 2020 for Baden-Württemberg [BW 2020], the regional government cites another reason to expand the gas transmission system, saying: “…, it is only through increased transport capacities in the networks that greater gas trading among the regions, and hence harmonisation of prices and competition, will be possible.” The regional plans for Mittlerer Oberrhein and Stuttgart also call for the energy supply infrastructure to be expanded, while other regional authorities are expressing similar demands. The demands being made in the political sphere support GVS Netz in its task to ensure the long-distance transmission of gas in Baden-Württemberg in the long term both technically and commercially.

GVS Netz load flow simulations

GVS Netz regularly monitors the load flow distribution in the network so as to detect any congestion as early as possible. Comprehensive load flow simulations are used to analyse and evaluate a wide range of scenarios and identify the most effective technical and commercial measures for increasing transport capacity in individual network sectors and in the system as a whole. The simulations that have been carried out very clearly show that hydraulic conditions in the Black Forest have a decisive effect on overall capacity. Appropriate measures have been developed from these findings. One example of these measures is the construction in 2009/2010 of two changeover regulator stations to integrate the old CEL (Central Europe Line) crude oil pipeline into the GVS transmission system (see Fig. 4.5).

Fig. 4.5

Capacity of the GVS transport system



A further link to the TENP system has been shown to be the best option for improving supplies to the central Neckar region and the Heilbronn area as part of the comprehensive programme of investigations. Consequently, GVS Netz is now planning a high-pressure gas pipeline – to be known as the 'Nordschwarzwaldleitung' (NOS) – running from Au am Rhein in the rural district of Rastatt to Leonberg near Böblingen. This DN 600 pipeline will have an approximate length of 70 km, will run via Ettlingen and Pforzheim and be tied into the existing pipeline system at a number of locations (see Fig. 4.6).

Other potential measures which simulations have shown to be particularly effective in boosting transport capacity in the network include:

- building an approx. 28 km long transverse link from Stuttgart to Reutlingen to connect the Schwabenleitung (Karlsruhe – Stuttgart) to the Schwarzwaldleitung (Villingen – Kirchheim / Teck)
- building an approx. 18 km long DN 500 line from the Pforzheim area to the Heilbronn area to connect the Schwabenleitung (Karlsruhe–Stuttgart) to Kraichtalleitung (Bietigheim-Bissingen –Heilbronn)
- constructing a gas supply station in Illertal near Senden at the interconnection point of the GVS portion of the CEL (DOB) and the transport systems of bayernets and Open Grid Europe GmbH

Implementing these measures could boost the capacity of the GVS transport system by some 10 % and would still leave enough spare capacity to cover an additional 1 % p.a. requirement up to the year 2020.

Market area cooperation

Within the scope of the NCG market area cooperation, the cooperation partners have agreed load flow limits at the interconnecting points between their respective networks. The required gas flow at these network interconnections is a function of the network load at any given time and the occupancy of the entry and exit points in the network of GVS Netz.

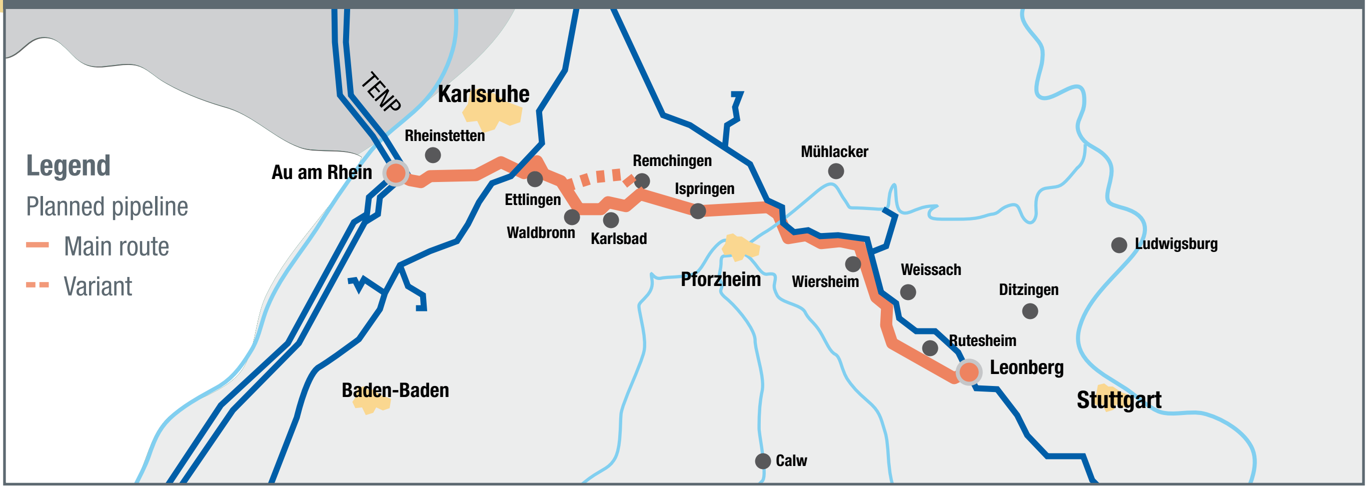
The maximum flow limits agreed with Open Grid Europe and which are of crucial importance in maximum flow scenarios are insufficient to meet the load on the GVS Netz network in all load flow scenarios. Higher transmission rates cannot be achieved or definitely promised at the present time.

Despite this situation, in order to ensure secure gas supplies to gas users connected directly and indirectly to the system, the capacity shortfall is met by flow commitments at the entry and exit points, with effect for the bayernets systems.

The quantity that is to be sold in the network, including the gas quantities which must be accepted by the market area partners in minimum flow scenarios, is decisive for determining firm entry capacities, in the particular case of GVS Netz at the Lampertheim market-area crossing point of Wingas Transport GmbH for example. At the present time, a return supply or transmission of quantities into the networks of market area partners is only possible on a voluntary basis.

Fig. 4.6

Project map of the 'Nordschwarzwaldleitung' high-pressure gas pipeline



Despite this, the restrictions in the network are offset by flow commitments in order to be able to offer a corresponding free allocability of capacities.

Results and conclusions of Eni D

The technical capacity of the Eni D pipeline system is based on the rights of use on the TENP transport system.

The aim of market area cooperation is to jointly maximise technical capacities. Calculations of entry and exit capacities by Open Grid Europe have shown that the existing capacity of Eni D can only partly be offered as freely allocable because of bottlenecks identified throughout the market area network; these are described in detail in the conclusions of Open Grid Europe.

Based on this calculation, and in order to avoid exceeding the values that cause the bottleneck, Eni D currently shows 16 % of its technical entry capacity as freely allocable capacity. 49 % of its own technical entry capacity is offered as freely allocable capacity but subject to interruption in certain temperature and load flow situations. The remaining entry capacity is offered as subject to allocation restrictions at the exit points in its own network.

The interdependencies which exist in the joint market area make it impossible to increase the percentage of freely allocable entry capacities by expanding the network of Eni D.

Results and conclusions of GRTgaz D

The technical capacity of the GRTgaz Deutschland pipeline system is based on the rights of use on the MEGAL transport system.

The aim of market area cooperation is to jointly maximise technical capacities. A calculation of entry and exit capacities in accordance with GasNZV Section 9 (3) shows that only part of the present capacity of GRTgaz D can be offered on a freely allocable basis because of bottlenecks identified in the overall network of the NCG market area.

In the bottleneck-relevant simulation calculations, fluid mechanics studies for additional entry capacities in the South of the system indicated that the conversion of part or all of the technical capacity of GRTgaz D into freely allocable capacity (FAC) or an increase in demand for additional capacity would result in a higher south/north gas flow. Further details of the bottlenecks are given in the description and conclusions section for Open Grid Europe below.

GRTgaz D has had to reject requests for firm freely allocable exit capacity to Austria because – as also explained in the conclusions section of Open Grid Europe below – no additional freely allocable capacity is available at exit points in the south of the NCG market area.

To avoid the need to violate technical constraints in the system, GRTgaz D currently offers 24 % of its technical entry capacity as firm, freely allocable capacity, 60 % as capacity with allocation restricted to exit points on its own network, and 16 % as “conditionally firm” freely allocable capacity, which can be interrupted in certain flow situations.

The interdependencies which exist in the joint market area make it impossible to increase the percentage of freely allocable entry capacities by expanding the network of GRTgaz D.

Description and conclusions of Open Grid Europe

Scenarios are used to calculate the capacities of the transmission network of Open Grid Europe and to maximise the disclosable FAC. These scenarios involve maximising the capacities of combinable groups of entry points in combination with statistically applied realistic exit flow volumes which match them for balance. For each gas year to be calculated, there are a number of congestion-relevant scenarios for the network of Open Grid Europe by which the marketable capacity is determined.

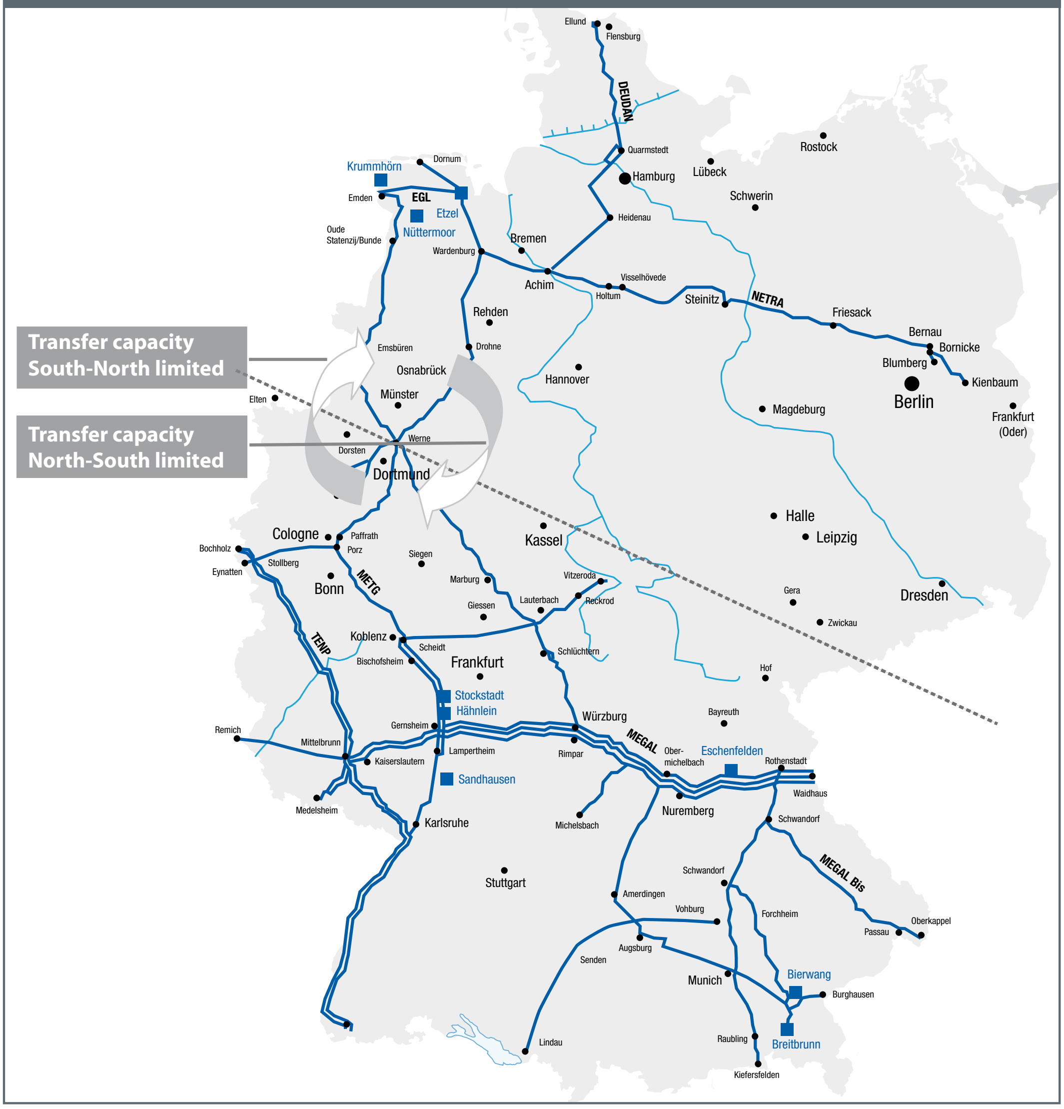
The biggest bottlenecks (described below) in south/north transmission in H-Gas arise from scenarios which describe the summer load case or transitional case (temperature range 8 to 16 °C).

The bottleneck constraints in north/south transmission in H-Gas result from scenarios that describe the winter load case (temperature range -7 and -1 °C). Findings from the load flow simulations are described here by reference to north/south and south/north gas transport. The line drawn in Fig. 4.7 represents a virtual boundary between the north and south components of the Open Grid Europe network and will be used to simplify the explanation.

To the south of this line we find the networks of cooperation partners bayernets and GVS Netz as well as the MEGAL and TENP transport systems with market area cooperation partners GRTgaz D and Eni D.

Fig. 4.7

Schematic diagram of Open Grid Europe H gas system, including project companies



The restrictions identified by the fluid mechanics analyses, which prevent an increase in the firm freely allocable entry and exit capacities of the transmission systems of Open Grid Europe and of all the market area cooperation partners referred to, are described in the sections that follow.

Results of load flow simulations to determine freely allocable capacities at exit points in the north

The desire for an increase in the freely allocable exit capacities in the north may be due to additional demand or the conversion of existing contracts for capacity with allocation restrictions (RAC) to FAC contracts.

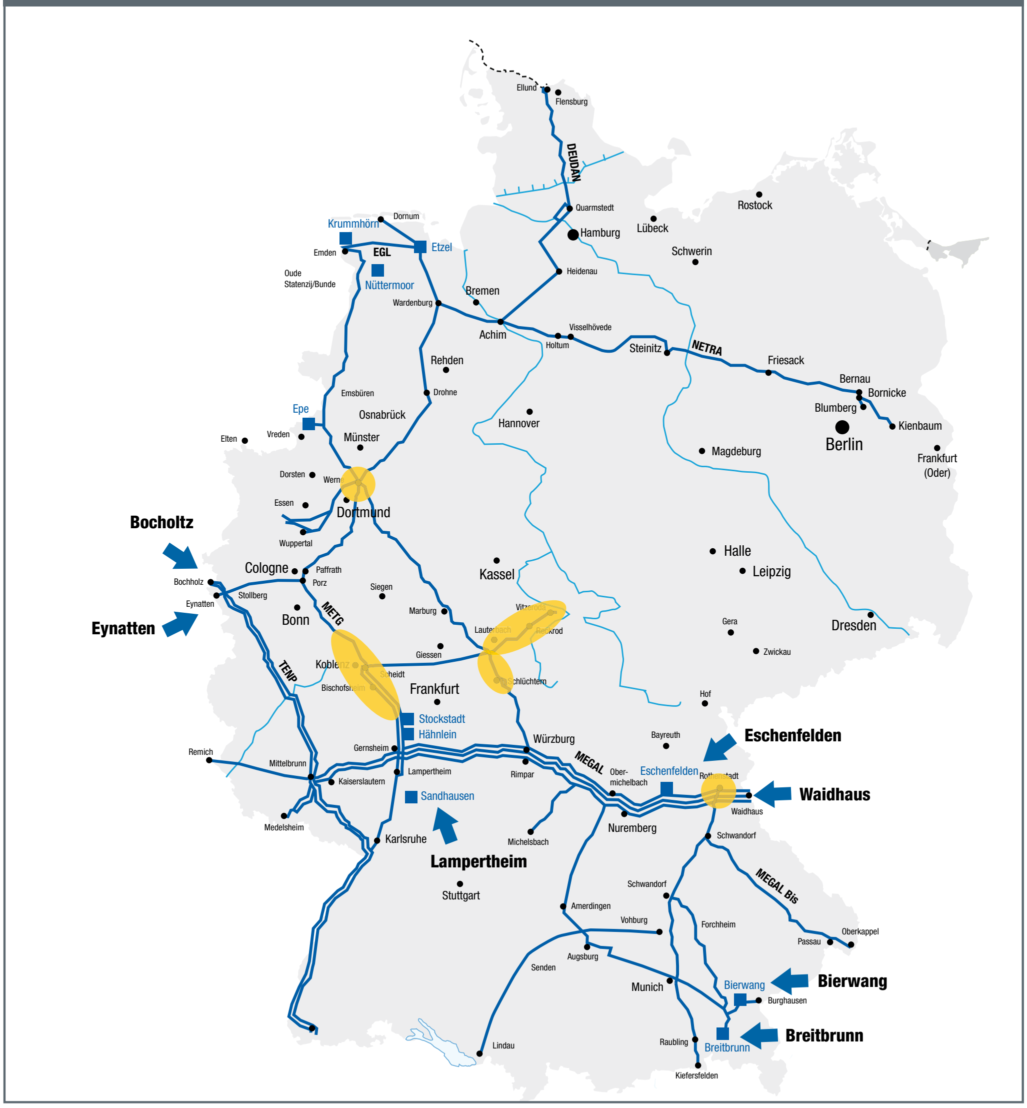
In congestion-relevant simulation calculations, fluid mechanics studies for additional exit capacities in the north and entry capacities in the south (based on the line drawn in Fig. 4.7) indicated a higher gas flow in the south-to-north direction.

To ensure an additional south-to-north flow of gas, these entry quantities must flow northward at the entry points of the southern group from the MEGAL transmission system via the compressor station at Rimpar and Gernsheim and therefore over the mixed gas line (the Rimpar-Schlüchtern-Werne and Gernsheim-Paffrath-Werne pipeline systems).

Further increases in gas transmission capacity in a northerly direction are not feasible given the existing infrastructure. The following bottlenecks have been identified (orange markings in Fig. 4.8). The minimum transfer pressures on the eastern mixed gas ring (Schlüchtern, Reckrod, Vitzeroda) or on the western mixed gas ring (Scheidt) and at the Werne compressor station could not be achieved. The compressor station in Rothenstadt for transmission over the MEGAL transport system to the west and north presents a further bottleneck.

Fig. 4.8

Schematic diagram of bottlenecks for exit points in the north of the H-Gas transport system of Open Grid Europe incl. pipeline companies



Results of load flow simulations to determine freely allocable capacities at exit points in the north

The desire for an increase in exit capacities in the south may be the result of additional capacity demand or the conversion of existing RAC contracts into FAC contracts.

In bottleneck-relevant simulation calculations, fluid mechanics studies for additional exit capacities in the south (with reference to the notional line drawn in Fig. 4.7) resulted in higher capacity utilisation at entry points in the north. This combination generates additional gas flow in the north/south direction.

In order to carry this additional north/south flow, the gas quantities in question would need to be routed from the north via the Werne compressor station to the south. The gas would then flow either through the Werne-Paffrath-Gernsheim pipeline systems or the Werne-Schlüchtern-Rimpar system.

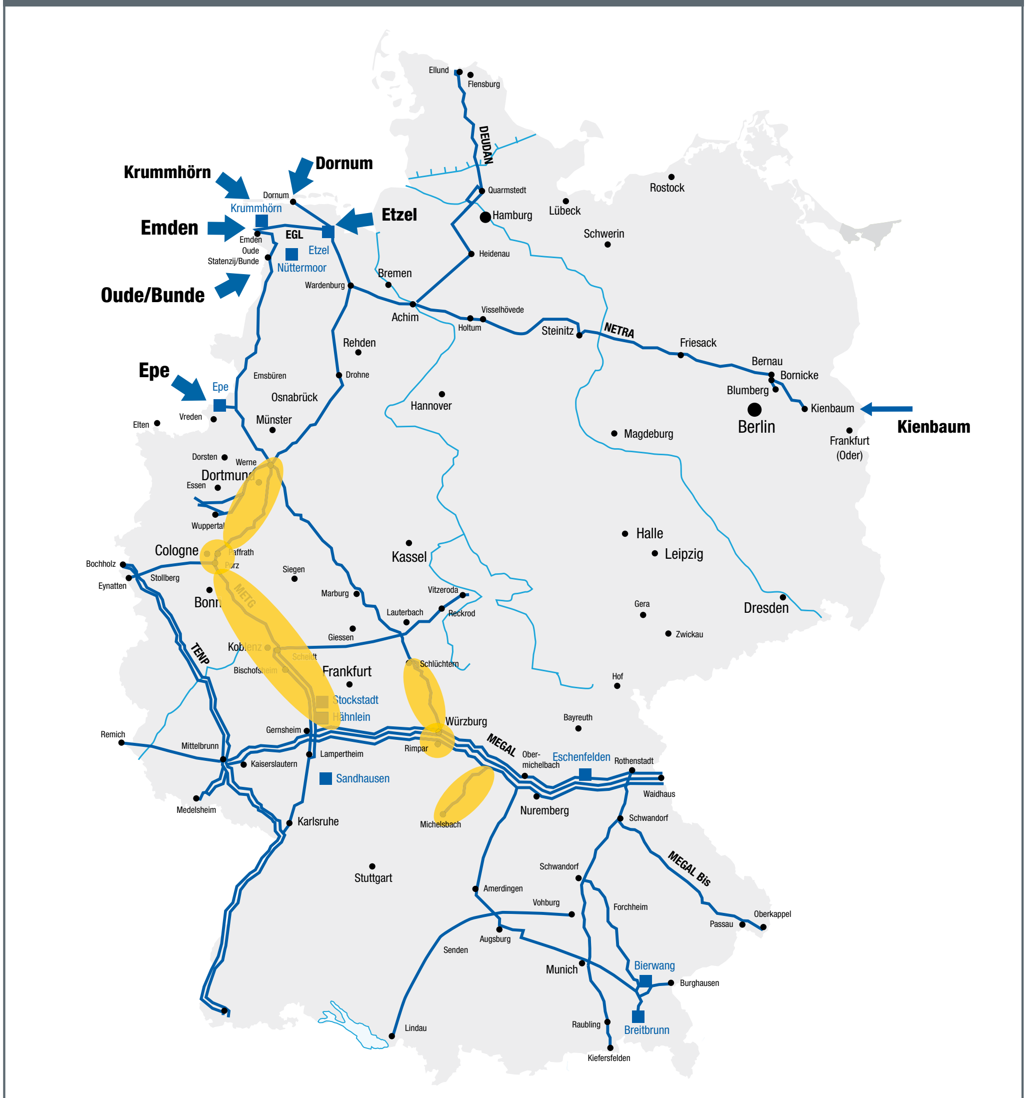
Further increases in gas transmission capacity in a southerly direction are not feasible given the existing infrastructure. The following bottlenecks have been identified (orange markings in Fig. 4.9).

A requested additional exit capacity would increase the load on the Werne-Paffrath-Gernsheim pipelines which would need to be supplied via Werne from the north. Since the maximum allowable operating pressure has been reached, the additional transmission capacities would be exhausted. Additional gas transmission from east to west at the Porz compressor station is also not possible because the contractually agreed transfer pressure at the Eynatten/Raeren exit point could not be guaranteed in this case.

As an alternative to the transport path indicated above, on the eastern mixed gas ring (the Werne-Schlüchtern-Rimpar leg) these additional quantities would fall short of contractually agreed minimum pressures along the Schlüchtern-Rimpar pipeline. On the Werne-Schlüchtern-Rimpar leg this situation could result in higher pressure drops which cannot be offset by existing compressor capacity at Rimpar. In order to feed these additional gas quantities via the Rimpar station into the MEGAL transport system, the transport pressure on the MEGAL system would have to be reduced, but this would take pressures below the contractually agreed minimum levels in the Rimpar area (transfer to E.ON Gas Grid GmbH and GVS Netz).

Fig. 4.9

Schematic diagram of bottlenecks for exit capacities in the south of the H-Gas transport system of Open Grid Europe incl. pipeline companies



Conclusions from refusals of network access under EnWG Section 25 Sentences 1 and 2

It is not possible to draw relevant conclusions from the network access requests rejected under EnWG Section 25 Sentence 2 over and above those already presented above.

Doubt must be cast on the significance of rejected network access requests given that since 1 February 2006 Open Grid Europe has operated an online booking service in which shippers are offered available capacity online for immediate booking without the need for a network access request first. Open Grid Europe does not know the extent to which shippers in the past made no further contact with Open Grid Europe on finding that no capacity was available.

The remaining binding network access requests received by Open Grid Europe have been examined in so-called individual checks, with a positive check resulting in a capacity contract. Because of their geographical and chronological distribution and taking into account the requested capacity, the network access requests that remain following a negative outcome of the individual check (and of which both the requesting shipper and the BNetzA were notified in writing) do not permit us to draw relevant conclusions for capacity requirement calculations over and above those already presented in previous descriptions. Specifically, we have been unable to identify single entry or exit points on which the rejected network access requests were concentrated.

Also, at the start of the Open Grid Europe Open Season 2008 all shippers whose capacity requests were still outstanding were invited to participate in the Open Season procedure and to submit their capacity requests. The reader is asked to refer to our description in Chapter 2.2.

For the future we are assuming that the auction system to be introduced under GasNZV Section 13 from 1 August 2011 on the national primary capacity platform under GasNZV Section 12 will offer more meaningful results. We will then need to analyse both the commercial results of the auction (auction premium) and the failed bids which will count as network access rejections under GasNZV Section 13(1).

Thyssengas H-Gas and Thyssengas L-Gas Market Areas

As a market area-spanning system operator, Thyssengas markets the entry and exit capacities of two market areas: Thyssengas H-Gas and Thyssengas L-Gas.

The Thyssengas H-Gas market area stretches from Emden in the north to Aachen in the south-west and Winterberg /Sauerland in the south-east. It comprises the H-Gas network of the former Thyssengas, VEW Energie and WFG, is supplied from cross border points at Emden (N), Bocholtz (NL) and Eynatten (B) and is connected to storage facilities in Epe, Kalle and Xanten. The technical measures needed to create a bottleneck free market area are already in place, so the size of the required flow commitments has been reduced. It was not possible to assess the measures involved in inclusion in the NCG market area (gas industry products/ investments) by the editorial deadline for this document.

The L-Gas market area extends from the Dutch border near Zevenaar in the north-west through the Lower Rhine and the 'Cologne Bay' (the densely populated area between the cities of Bonn, Aachen, and Düsseldorf/Neuss) as far as the Bergisches Land. L-Gas is injected at the Zevenaar border crossing point and a small amount is injected at the Haanrade border crossing point into an area of limited size north of Aachen. The Thyssengas L-Gas market area intersects the Lower Rhine section of the OGE L-Gas market area. The Thyssengas L-Gas market area is free from bottlenecks. It was not possible to assess the measures involved in inclusion in the NCG market area (gas industry products/ investments) by the editorial deadline for this document.

Thyssengas has analysed bookings as well as internal orders and the use of marketed entry and exit capacities in order to assess capacity requirements.

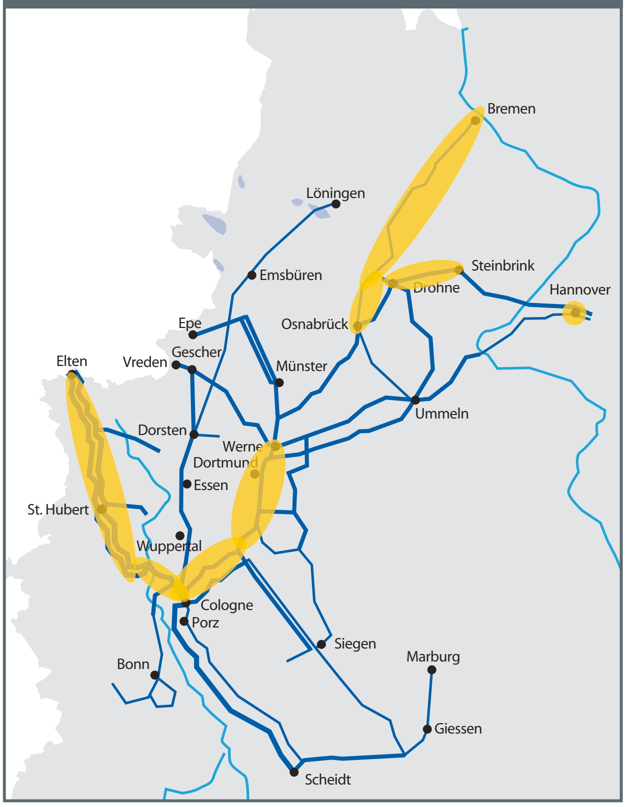
An analysis of bookings of interruptible capacity at entry and exit points does not indicate an acute requirement for capacity, and this holds true even if it is assumed that shippers who have booked on an interruptible basis actually wanted firm capacity. This conclusion can be explained in particular by the fact that interruptible capacity in the Thyssengas network was not interrupted as a rule in 2010. We should point out however that an informal request to convert interruptible to firm capacity was not pursued any further following discussions with the network connection user.

Thyssengas also assumes that there will be no future acute demand on the injection side in the Thyssengas system in the future either, with the creation of other injection alternatives in the wider NCG market area. However the experience gathered from awarding entry capacities at auctions (see also Chapter 4.4) should provide more detailed information that will have to be used in future when determining capacity requirements, according to Section 17(1) GasNZV.

Nor does Thyssengas see any need for additional capacity owing to increased internal bookings following the change in the method of calculation. Thyssengas has in the past made capacity for internal orders available on the basis of a linear regression, and so is not anticipating any internal orders which it cannot meet. This assessment is generally confirmed by an analysis of the actual use of internally booked capacity. A downstream system operator has however made Thyssengas aware of a requirement for additional capacity of around 35 MW to cater for new connections.

Fig. 4.10

Schematic diagram of the Open Grid Europe L-Gas transmission system



L-Gas market area of Open Grid Europe

Initially, it may be helpful to consider the topological features of Open Grid Europe's L-Gas transmission system:

The L-Gas transmission system of Open Grid Europe (see Fig. 4.10) extends from Bremen via Hanover and the Ruhr and Lower Rhine regions to Koblenz. The main characteristic of this transmission system (which has developed organically) is its significance for regional gas distribution, with a large number of exit points (approx. 900). The system does not carry gas in transit to other countries but mainly supplies gas to downstream network operators in Germany. All the entry points are located in the northern part of the system. Many of these points compete directly for entry to the system as they are directly connected to each other, sometimes over very short distances, or must carry gas for onward transmission via a common bottleneck. The Elten entry point occupies a special position as it is 'isolated' in fluid mechanics terms from the other entry points by the Werne compressor station, and only a small sales area can be supplied from Elten. By the same token there are exit points that can only be supplied from the Elten entry point.

In addition, the system also includes 'insular supplies'. These are exit points which can only be supplied from a single entry point because of the technical limitations on transmission possibilities.

The bottlenecks in the L-Gas transport system that are described below are a function of topological features of this network. The congestion on the NETG and in the east are the result of scenarios in which the Elten entry point and the Drohne, Steinbrink and Emsbüren entry points respectively are used only minimally.

Results of load flow simulations to determine freely allocable capacity (FAC) at exit points on the NETG pipeline

If greater exit capacities are required on the NETG pipeline and neighbouring systems, it is necessary, in certain nomination situations, to route gas via Werne compressor station where it is compressed for onward transmission via the Heros-L pipeline. These nomination situations are characterised by low entry flow at the Elten entry point. At this point, a minimum flow that is sufficient to supply the customers downstream of the exit capacities already marketed on the NETG pipeline and neighbouring systems can be generated by flow commitments. In view of the infrastructure available, it is then not possible to carry additional gas from any of the other entry points as the discharge pressure of Werne compressor station is limited to the maximum allowable operating pressure of the Heros-L pipeline. A higher volume flow rate would lead to a greater drop on the Heros-L line, resulting in a pressure below the contractually agreed minimum value on the NETG system.

It also happens that the transmission request cannot be met via the connecting line of the point to the NETG system without breaching minimum pressure limits.

Results of load flow simulations to determine the freely allocable capacity at exit points in the eastern part of the L-Gas transmission system

Additional requests for exit capacity in the eastern section (to the north of Werne compressor station) may in certain circumstances involve a need to carry larger quantities of gas via the Drohne-Steinbrink pipeline. Given the existing infrastructure, it is then not possible to carry additional gas because the operating pressure of this pipeline is limited by the transfer pressures at Drohne and Steinbrink entry points, a higher volume flow rate would lead to a higher pressure drop and pressures would then be below the minimum transfer pressures for the Drohne-Steinbrink pipeline and neighbouring systems.

If the additional capacity requested is not limited by this bottleneck, it cannot be supplied from any other entry point without restriction because the Werne compressor station represents another bottleneck.

For example, in bottleneck-relevant situations it is not possible to feed additional gas from the Vreden entry point to the east, as the gas would need to be compressed at the Werne compressor station and this is already at full load in these situations.

Results of load flow simulations to determine freely allocable capacities at exit points in the north

In individual cases, it may not be possible to allocate firm capacity in response to capacity requests at exit points on isolated networks. There are three main reasons:

- It may only be possible to supply a specific exit point from a specific entry point. In this case, the minimum flow agreed at the entry point (flow commitment purchased by Open Grid Europe for the provision of firm capacities) is needed in full to provide the firm exit capacities already marketed for the isolated system.
- The transmission of additional gas from the only entry point available on the isolated network would lead to high pressure drops on the pipelines between the entry and exit points and it would then not be possible to comply with the contractually agreed minimum pressures on the system.
- It is not possible to serve the requested exit point at the requested minimum pressure with the contractually agreed minimum entry pressure at the only entry point available on the isolated network.

Conclusions from refusals of network access under EnWG Section 25 Sentences 1 and 2

The statements made by Open Grid Europe in the section on the NCG market area also apply to the L-Gas market area of Open Grid Europe.

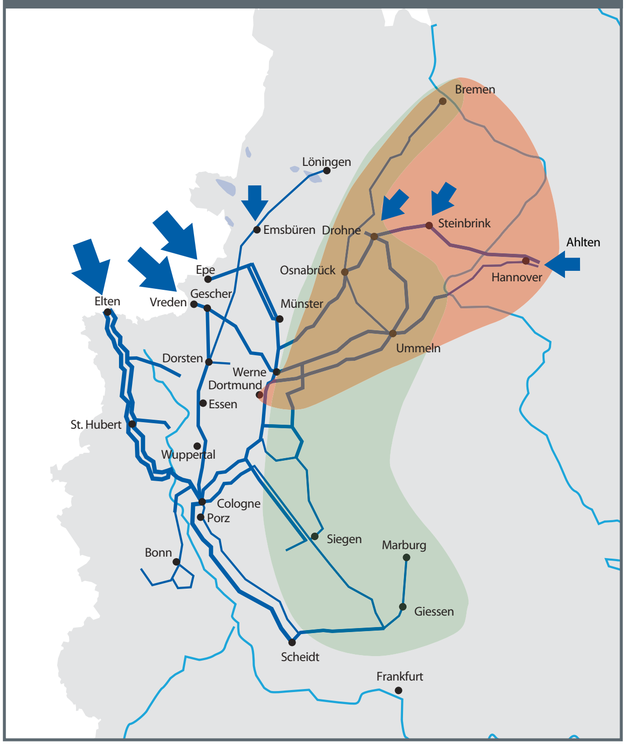
Decline in L-Gas production from German sources

The anticipated decline in production from German L-Gas sources is described in Chapter 4.1. The resulting deficit on the entry side can be addressed by a number of different measures:

- Production of L-Gas:
  If sufficient L-Gas is available from the Netherlands, transmission capacity to German production sites could be established (i.e. to the eastern L-Gas area in the case of the Open Grid Europe system). Conditioning plants could be constructed at central points on the network of Open Grid Europe or strategic points on the Gasunie Deutschland network with a view to producing L-Gas from H-Gas in line with demand.
- Switching:
  L-Gas demand could be met by the physical switching of exit points and pipeline systems to reflect the reduced availability of L-Gas. Here again, it would be necessary to invest in expansion projects to carry the new H-Gas quantities to the areas affected by the changeover. In addition, all consumers' appliances would need to be adapted to the new gas quality.

Fig. 4.11

Two variants for the regional changeover from L-Gas to H-Gas



Both alternatives would call for considerable investment. In the long term, a physical switch would probably be more economically viable as the high running costs of L-Gas production would call the viability of this solution into question.

In terms of capacity, about one-third of the present L-Gas system would be affected. This assumes that there will be no significant change in L-Gas demand in the future. Fig. 4.11 shows two regional switching variants selected from the many options which are available.

4.4 Experience with auctions on the joint primary capacity platform (capacity allocation procedure under Section 13(1) GasNZV)

The primary capacity platform is currently being developed and is intended to be commissioned by 1 August 2011 within the scope of the timetable laid down in the GasNZV.

As the primary capacity platform is not yet available, no capacity allocation procedures in accordance with GasNZV have been conducted and so no experience with these procedures is to hand.

4.5 Opportunities for increasing capacity by cooperating with transmission or distribution system operators

Section 9(2) GasNZV requires transmission system operators and the operators of downstream networks to work together to maximise technical capacities. If insufficient technical capacity can be offered on a firm and freely allocable basis, transmission system operators may deploy a range of commercially viable measures to boost the supply of firm, freely allocable capacities. These measures must be examined and applied in the following order:

- Use of flow commitments
  Contractual agreements with third parties (e.g. shippers, transmission system operators) specifying a particular gas flow at an entry or exit point.
- Offering capacities with allocation conditions
  This is possible, for example, by limiting the free allocability of entry and exit capacities.
- Excluding selected entry/exit points from free allocability

A system operator downstream of the market area-spanning system must use line pack as part of his network control operations to smooth load spikes which occur at network interconnections between his network and the upstream network, if possible (Section 11 [KoV III]).

The scope for market area-spanning system operators to use downstream line packs is very limited however. Downstream system operators are only required to use their line packs to regulate capacity if this is technically possible and commercially feasible. Because the use of line packs has so far gone unrecognised in the the revenue/incentive regulation, downstream system operators see no incentive for using their line packs.

Before any network interconnection (= gas transfer point) with neighbouring transmission or distribution system operators is constructed, its technical parameters ('interconnection conditions') are agreed. As part of the continuing evolution and optimisation of the gas transmission network, possible amendments to interconnection conditions are discussed with the relevant neighbouring transmission or distribution system operators. If the system operators involved agree to a change, the network interconnection agreement (see Section 7 GasNZV) is amended accordingly.

In Germany this is done in accordance with Section 20(1b) EnWG and [KoV III].

At European level it takes places as part of the general duties of cooperation within ENTSOG (Art. 4 of EU Regulation 715/2009) and the duty to produce the European network development plan (Art. 8 (3b) of EU Regulation 715/2009) and regional investment plans (Art. 12 (1) EU Regulation 715/2009).

4.6 Findings on capacity requirements resulting from merging market areas

Under Section 21 GasNZV, the number of market areas in Germany is to be further reduced. The merging of market areas increases the possible combinations of entry and exit capacities and limits the ability to offer firm freely allocable capacities in real geographic terms.

Firm freely allocable capacity allows the independent booking and use of capacity throughout the entire market area. Booking entry capacity enables shippers to allocate gas from an entry point to the VP; exit capacity allows shippers to allocate gas from the VP to a booked exit point in that market area. The use of these enhanced combination facilities (flexibility) by shippers within a joint market area imposes greater requirements on the transport capability of the systems than was the case before market area cooperation.

Whenever a market area is enlarged, capacity models must be reviewed and taken into account when calculating existing and new capacities. Merging historically evolved gas transmission systems with large numbers of entry and exit points to form a single market area coupled with the requirement for free allocability of capacities results in a highly complex capacity calculation. From the characteristics of firm FAC indicated above, we can conclude that it will not be possible to maintain the overall level of FAC following a spatial and hence fluid-dynamic enlargement of the network.

Market area cooperation will usually result in a reduction of firm FAC in the absence of any appropriate countermeasures. The behaviour of shippers and hence the demand for firm FAC is also more difficult for the system operator to predict in enlarged market areas.

In the long term, the level of firm freely allocable capacities at their present high level of quality can only be maintained and increased by investing in the pipeline network.

NetConnect Germany market area cooperation

In order to create and safeguard the free allocability of as many entry and exit capacities as possible in the joint NCG market area, the cooperation partners have developed capacity models which are used as a basis for determining the capacity in the networks concerned. Joint network calculations are carried out and/or calculations prepared by the cooperation partners are matched at the network interconnections.

When designing entry and exit capacities, the cooperation partners use the following instruments to ensure firm freely allocable capacities in the NCG market area:

- Flow commitments (FC)
- Interruptible capacities (iFAC)
- Temperature-dependent capacities (TDC(t))
- Capacities subject to allocation restrictions (RAC)
- Conditionally firm freely allocable capacities (cFAC)

The cooperation partners also deploy all appropriate capacity instruments so far as is necessary to avoid restrictions in the use of interruptible capacities.

The cooperation partners work together in partnership to avoid or minimise restrictions on capacity contracts, using all available technical resources and options at their disposal.

If one cooperation partner makes capacity requests to another cooperation partner which the existing transmission system of that cooperation partner cannot accommodate, then ways of meeting these requests may be examined as part of expansion plans of a third cooperation partner, e.g. in an Open Season Procedure.

4.7 Findings from Community-wide network development plans

The main results of the current ENTSOG ten-year network development plan are described in Chapter 2.2. Although this ten-year network development plan was published before the third internal energy market package entered into force and formal comments by ACER and the EU Commission on the ENTSOG Articles of Association were therefore not to hand by publication date, we can state that at the present time, apart from the creation of reverse flow capacities on the German-Danish border currently under discussion, there are no discernible effects on the present document so far as the NCG market area is concerned. Regarding the entry capacities that are lacking in the reference scenario for Luxembourg, April 2011 sees the start of the binding phase of the Open Season of the transmission system operators Creos (Luxembourg) and GRTgaz (France) for expanding the border-crossing capacity from France to Luxembourg, so the German-Luxembourg border crossing will not be examined here.

4.8 Capacity bookings under Section 38 GasNZV and connection requests under Section 39 GasNZV received and rejected

Open Grid Europe has received three booking requests according to Section 38 GasNZV following the entry into force of the GasNZV on 9 September 2010. Two requests related to gas-fired power plants and one request was for storage facilities. As of 1 March 2011, these requests were still under consideration according to Section 38(3) Sentence 3.

Thyssengas has received one booking request under Section 38 GasNZV from a power plant operator for 900 MW to 1200 MW (according to variant). Since the capacity of 100 MW that can be booked with Thyssengas must be seen as inadequate for the size of the request, a procedure according to Section 39 GasNZV is likely to be initiated, necessitating an agreement between the system operators concerned and the party making the request. This applies in particular when we remember that the requested capacity is not needed twice when determining the capacity requirements within a market area.

5. Projects

The business activities of the partners in the market area cooperation are subject to regulation by the BNetzA. Since 2005, the BnetzA has monitored compliance with the Energiewirtschaftsgesetz (EnWG – Energy Industry Act), ordinances and other mandatory requirements.

Under the EnWG, operators of energy supply networks have a statutory duty to expand their networks so as to adequately meet energy transmission requests if they can be reasonably expected to do so in terms of technical feasibility and economic viability. The following extracts from the EnWG illustrate key elements of operators' network expansion obligations:

Section 11(1) EnWG:
"Operators of energy supply networks shall operate and maintain safe, reliable, efficient networks in a non-discriminatory way and shall expand such networks in line with demand, provided that such expansion is economically viable."

Section 15(3) EnWG:
"Operators of transmission lines shall ensure that their networks are capable, on a durable basis, of meeting demand for gas transmission services and, without limitation, shall contribute to security of supplies by ensuring that their networks have appropriate transmission capacity and reliability."

On the basis of these statutory requirements, the cooperation partners propose to implement the projects described below.

The individual projects are of course at different stages in the design and implementation process. Chapter 5.1 describes major projects for which the cooperation partners have taken the final investment decision. The re-sulting changes in entry and exit capacities over the next ten years are in-dicated in tables in Chapter 5.2.

5.1 FID projects

Open Grid Europe

The FID projects of Open Grid Europe are based on the open season procedure conducted in 2008/9. This procedure surveyed existing and potential shippers to establish their binding transmission capacity requirements. The results of the procedure indicated whether additional expansion was needed, and where.

As indicated in Section 4.2, the open season procedure of Open Grid Europe was based on the Guidelines for Good Practice for Open Season Procedures issued by the European Regulators' Group for Electricity and Gas (ERGEG). It was not possible to implement all of the pipeline construction projects which would have been theoretically possible on the basis of the open season results. In close cooperation with the BNetzA therefore, the projects were assigned priorities developed on the basis of criteria proposed by the BNetzA and which were accepted by the BNetzA. The major expansion projects are described below; there are also a large number of smaller schemes to be implemented but these are not described in any detail here.

Sannerz – Rimpar loop line

The new line will have a nominal diameter of 1000 mm (DN 1000), will be designed for a pressure of 100 bar (DP 100) and will run for approx. 67 km from Sannerz in Hesse to Rimpar in Bavaria (see Fig. 5.1).

The new line will be used to carry part of the H-Gas from northern Germany, reaching Sannerz via Werne, in a southerly direction to the MEGAL transport system. The gas will be transferred to the MEGAL system at Rimpar, the site of the two Rimpar compressor stations of Open Grid Europe and the MEGAL pipeline company through which the gas may be transferred to the MEGAL system either uncompressed or with its pressure boosted by either or both of the two compressor stations.

The tie-in point at Sannerz will be immediately upstream from the Sannerz pressure regulating station on the line between Lauterbach and Sannerz. The connection at Rimpar will require the construction of a new gas metering and pressure regulating station by the MEGAL pipeline company. As part of this major expansion project, the maximum discharge pressures of the compressor stations are to be reviewed, the control tolerances reduced and the effective gas transmission pressures at the station outlet are to be increased, to the extent that this is possible.

Basically this line will be constructed as a loop line, following the route of the existing natural gas transmission line. At the boundary between the states of Hesse and Bavaria, three alignment options with a length of approx. 10 km have been considered in the Sinntal (Hesse) and Zeitloff (Bavaria) areas. In addition to the parallel routing option, other large-scale deviations have been considered in this area. These possible alternatives have been investigated in the regional planning procedure and submitted to the authorities for review and assessment.

The regional planning procedure was completed in January 2011. The detailed planning application procedure is due for completion in January 2012 and commissioning is scheduled for 1 October 2012.

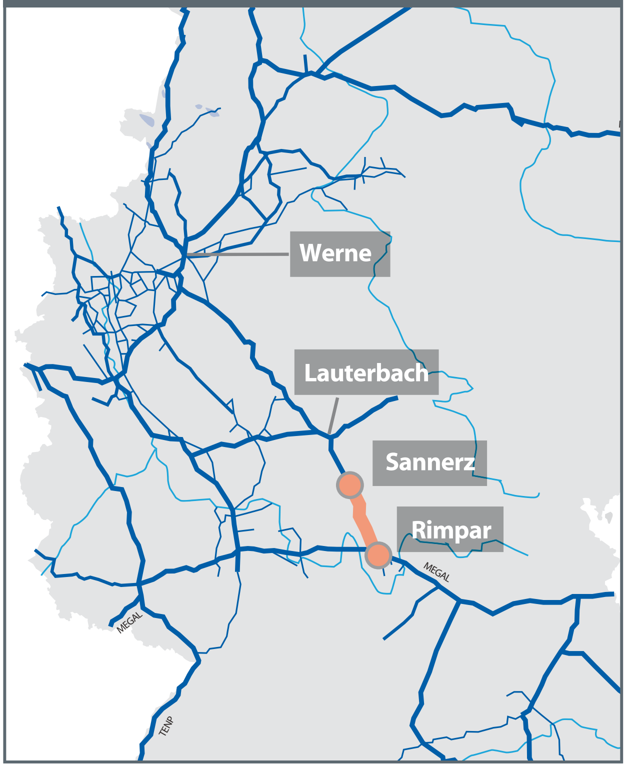
MEGAL Bis partial loop line

The second of the two major new build projects is a loop line to be constructed over part of the route of an existing MEGAL pipeline in connection with other work which will be necessary at existing facilities of the MEGAL pipeline system. MEGAL is the owner of a natural gas pipeline system extending from the Czech-German border at Waidhaus to the German-French border at Medelsheim, including a line from the German-Austrian border at Oberkappel to Schwandorf (MEGAL Bis).

MEGAL has concluded long-term contracts for the use of the MEGAL pipeline system with its shareholders Open Grid Europe and GDF Suez Energie Deutschland; GDF Suez Energie Deutschland has assigned its right to use the system under these contracts to GRTgaz Deutschland. The new loop line will have a nominal diameter of 1000 mm (DN 1000), will be designed for a pressure of 100 bar (DP 100) and will run for approx. 72 km from Schwandorf in Oberpfalz to Windberg in Lower Bavaria (see Fig. 5.2).

Fig. 5.1

Sannerz–Rimpar loop line



At Schwandorf, the loop line will connect to the southern section of the Weiden (Rothenstadt)-Forchheim pipeline; at Windberg the loop line will be connected to the existing MEGAL–Bis. As the two parallel pipelines are to be operated at different pressures, it will be necessary to install metering and pressure regulating stations at the connection points (Schwandorf and/or Windberg).

The regional planning procedure was completed in 2010 and the subsequent detailed planning application procedure has commenced.

The new loop line should be ready for operation by 1 October 2012.

Fig. 5.2

MEGAL–Bis partial loop line

Two-way operation of the Stolberg-Porz pipeline

In the Open Grid Europe Open Season procedure conducted in 2008, requests were received for exit capacities at Eynatten, entry capacities at Eynatten and entry capacities at Bocholtz. The following operations were necessary to allow the two-way transmission of these capacities over the 85 km Stolberg-Porz pipeline between the Porz and Stolberg compressor stations:

- Reversal of compressor units 11 and 12 at Porz for compression of gas received from Stolberg and onward transmission towards Scheidt (METG). Compressor units 11 and 12 were installed to boost the pressure of gas for transmission from Porz to Eynatten (Lichtenbusch). As a result of the entry capacities at Eynatten and Bocholtz for which requests were received during the Open Season procedure, flow may be reversed between Verlautenheide 3 and Porz, on the Stolberg-Porz pipeline. To onward-transmit these quantities from Porz, it will be necessary for compressor units 11 and 12 to be used for the compression of gas for transfer to the METG pipeline.
- Modification of the connections of compressor units M5/M6 in Porz for compression from Stolberg towards Paffrath and Scheidt.

Compressor units 5 and 6 must be connected so as to allow the compression of gas received from Verlautenheide 3. This connection is necessary in order to ensure the compression of the large gas flows at flowing conditions (as a result of the relatively low inlet pressure) received from Verlautenheide 3 for onward transmission towards Paffrath and Scheidt.

- Verlautenheide 3 gas metering and pressure regulating station must be modified for two-way operation and a fourth metering and pressure regulating run must be installed.
- Installation of a connecting line, operated at station inlet pressure, from a point on the TENP pipeline upstream from Stolberg compressor station to the Lichtenbusch-Stolberg pipeline.

The work is due for completion by 1 October 2011.

bayernets

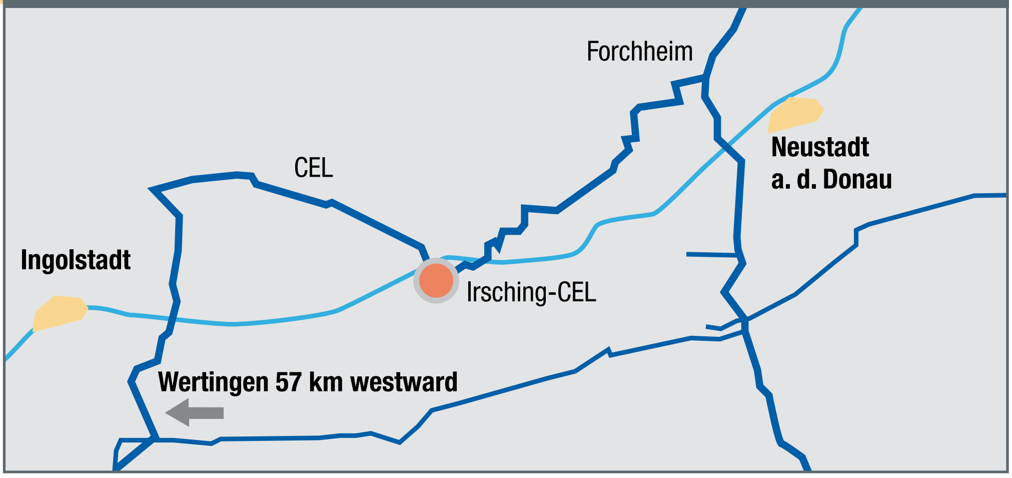
Irsching project

The joint Senden-Vohburg pipeline (CEL) of Open Grid Europe and bayernets is supplied solely via Wertingen gas metering and pressure regulating station on the western section of the CEL. However, exit capacities are mainly required at the eastern end of the CEL.

Owing to the current network structure, the pressure conditions in the system, the current and expected demand for exit capacities and the needs to ensure security of supplies, it is necessary to expand the network in line with demand. Under the existing supply concept it proposed to install a new gas metering and pressure regulating station at Irsching, complete with connecting line and tie-ins to the two Forchheim-Irsching pipeline systems of Open Grid Europe (DN800, PN100) and CEL (DN 500, PN 60) (see Fig. 5.3).

Fig. 5.3

Irsching project map



Compliance with emission limits imposed by the '13th BImSchV' and the 'TA-Luft'

The 13th Federal Immission Control Act (or '13th BImSchV' for short) entered into force in July 2004. This ordinance implements the 2001 European Large Combustion Plant Directive and aims to further reduce emission levels. The 13th BimSchV governs gas turbine plants with a total thermal output of over 50 MW. It is the thermal output of a site that is decisive. Thermal outputs of less than 50 MW are governed by the 'TA-Luft' (Technical instructions on air quality control) dated 24 July 2002 which came into force on 1 October 2002.

According to the amended 13th BImSchV and the TA-Luft, the construction, quality and operation of gas turbine plants must meet the following emission limits for daily averages within a load range from 70 to 100 %:

Constituent	Limit
Nitrous oxides (NOx*)	75 mg/Nm³
Carbon monoxide (CO)	100 mg/Nm³

* with a thermal output >100 MW: 50 mg/Nm³ NOx.

The cooperation partners operate installations which do not at the present time meet the requirements of the 13th BImSchV or TA-Luft. Consequently there is a requirement for these old plants to be upgraded by no later than 1 October 2015 or July 2012 in the case of the TA-Luft. Gas turbines with a NOx emission of under 20 tonnes p.a. are exempt from this upgrade.

A range of engineering options are available to meet the new emission limits depending on the particular type of gas turbine. These measures range from the retrofitting of individual components through upgrading the combustion system to the total replacement of the drive.

The table below lists the specific measures that are proposed with the aim of broadly maintaining the transport capacities already provided by these installations:

Owner	Plant	Action
OGE	Emsbüren Machine Unit 2	Convert to LE combustion system
OGE	Emsbüren Machine Unit 3	Gas turbine replacement
OGE	Gernsheim Machine Unit 1	Replace core turbine with LE version
OGE	Gernsheim Machine Unit 2	Replace core turbine with LE version
OGE	Gernsheim Machine Unit 3	Replace core turbine with LE version
OGE	Krummhörn Machine Unit 3	Use of EKOL firetube
OGE	Waidhaus Machine Unit 2	Convert to LE combustion system
OGE	Waidhaus Machine Unit 3	Convert to LE combustion system
OGE	Werne Machine Unit 5	Convert to LE combustion system and recuperator
OGE	Werne Machine Unit 6	Convert to LE combustion system and recuperator
OGE	Werne Machine Unit 7	Use of carbon monoxide catalyst
OGE	Werne Machine Unit 8	Use of carbon monoxide catalyst
TENP	Stolberg Machine Unit 1	Gas turbine replacement
TENP	Stolberg Machine Unit 2	Convert to LE combustion system
TENP	Mittelbrunn Machine Unit 1	Convert to LE combustion system and recuperator
TENP	Mittelbrunn Machine Unit 2	Convert to LE combustion system and recuperator
TENP	Mittelbrunn Machine Unit 3	Gas turbine replacement
TENP	Schwarzach Machine Unit 2	Gas turbine replacement
TENP	Schwarzach Machine Unit 3	Convert to LE combustion system
TENP	Hügelheim Machine Unit 1	Convert to LE combustion system
TENP	Hügelheim Machine Unit 2	Convert to LE combustion system
MEGAL	Mittelbrunn Machine Unit 1	Convert to LE combustion system
MEGAL	Mittelbrunn Machine Unit 2	Convert to LE combustion system
MEGAL	Mittelbrunn Machine Unit 3	Convert to LE combustion system
MEGAL	Wildenranna Machine Unit 1	Compressor replacement
MEGAL	Wildenranna Machine Unit 2	Compressor replacement
MEGAL	Waidhaus Machine Unit 1	Machine train replacement
MEGAL	Waidhaus Machine Unit 2	Machine train replacement
MEGAL	Waidhaus Machine Unit 3	Machine train replacement
MEGAL	Waidhaus Machine Unit 5	Machine train replacement
METG	Porz Machine Unit 3	Convert to LE combustion system
METG	Porz Machine Unit 5	Machine train replacement
METG	Porz Machine Unit 6	Machine train replacement
METG	Scheidt Machine Unit 1	Machine train replacement
METG	Scheidt Machine Unit 4	Convert to LE combustion system
NETG	Elten Machine Unit 4	Convert to LE combustion system
NETG	Elten Machine Unit 1	Machine train replacement

5.2 Capacity development taking account of FID projects

The tables below show the predicted change in capacities at the entry and exit points of the market area over the next ten years, taking into consideration the FID projects described in Chapter 5.1 above.

The capacity figures given in the tables were determined on 1 January 2011 – for OGE on 1 February 2011 – and are indicated in million kWh/day (based on 24 hours) and apply for the 1 January of the calendar year shown in the column header. They represent the total of freely allocable capacities and capacities subject to allocation restrictions, as defined in the GasNZV.

It should be noted that these figures are non-binding and are based on the assumptions that the projects presented in Section 5.1 above will be implemented to schedule, that adequate flow commitments will be available and that they will be approved by the BNetzA. Regarding the figures for Open Grid Europe in particular, at the time of going to print it was already apparent that a number of capacities will have to be reduced because of an absence of flow commitments.

Tab. 5.1: Development of entry capacities at cross-border points

	Entry capacities at cross-border points (million kWh/day)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AT-DE Burghausen/Überackern (bayernets)	6	6	6	6	6	6	6	6	6	6
AT-DE Kiefersfelden (bayernets) *	0	0	0	0	0	0	0	0	0	0
AT-DE Oberkappel (OGE)	13	13	25	25	25	25	25	25	25	25
AT-DE Oberkappel (GRTgaz D)	133	133	133	133	133	133	133	133	133	133
BE-DE Eynatten/Raeren (OGE)	96	94	142	148	148	148	148	148	148	148
BE-DE Eynatten/Raeren (Eni D)	38	38	38	38	38	38	38	38	38	38
BE-DE Eynatten/Lichtenbusch (TG)	1	1	1	1	1	1	1	1	1	1
CZ-DE Waidhaus (OGE)	571	571	571	571	571	571	571	571	571	571
CZ-DE Waidhaus (GRTgaz D)	458	458	458	458	458	458	458	458	458	458
DK-DE Ellund (OGE)	4	4	4	4	4	4	4	4	4	4
NL-DE Bocholtz (OGE)	42	69	119	119	119	119	119	119	119	119
NL-DE Bocholtz (Eni D)	371	371	371	371	371	371	371	371	371	371
NL-DE Bocholtz-Vetschau (TG)	15	15	15	15	15	13	13	13	13	13
NL-DE Bunde/Oude Statenzijl (H, OGE)	109	75	75	75	75	75	75	75	75	75
NL-DE Elten/Zevenaar (OGE)	110	270	263	263	263	263	263	263	263	263
NL-DE Haanrade (TG)	5	5	5	5	5	5	5	5	5	5
NL-DE Vreden/Winterswijk (OGE)	301	311	311	311	311	311	311	311	311	311
NL-DE Zevenaar (TG)	224	224	224	224	224	224	224	224	224	224
NO-DE Dornum (OGE)	474	474	481	481	481	481	481	481	481	481
NO-DE Emden EPT1 (OGE)	220	220	242	242	242	242	242	242	242	242
NO-DE Emden NPT (OGE)	79	75	75	75	75	75	75	75	75	75
NO-DE Emden EPT1 und Emden NPT (TG)	74	74	74	74	74	74	74	74	74	74

* No flow possible for fluid mechanics reasons, reverse flow capacities (interruptible) are marketed.

Tab. 5.2: Development of exit capacities at cross-border points

	Exit capacities at cross-border points (million kWh/day)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DE-AT Burghausen/Überackern (bayernets) *	0	0	0	0	0	0	0	0	0	0
DE-AT Kiefersfelden (bayernets)	2	2	2	2	2	2	2	2	2	2
DE-AT RC Lindau/Leiblach (GVSN)	26	26	26	26	26	26	26	26	26	26
DE-AT Oberkappel (GRTgaz D)	13	13	13	13	13	13	13	13	13	13
DE-AT Oberkappel (OGE)	73	94	186	186	186	186	186	186	186	186
DE-BE Eynatten/Raeren (OGE)	237	282	260	260	260	260	260	260	260	260
DE-BE Eynatten/Raeren (Eni D)	82	82	82	82	82	82	82	82	82	82
DE-CH RC Basel (GVSN)	9	9	9	9	9	9	9	9	9	9
DE-CH Tayngen-Fallentor (GVSN)	13	13	13	13	13	13	13	13	13	13
DE-CH Wallbach (OGE)	218	218	218	218	218	218	218	218	218	218
DE-CH Wallbach (ENI D)	371	371	371	371	371	371	371	371	371	371
DE-DK Ellund (OGE)	0	17	17	0	0	0	0	0	0	0
DE-FR Medelsheim/Obergailbach (OGE)	118	118	118	118	118	118	118	118	118	118
DE-FR Medelsheim/Obergailbach (GRTgaz D)	543	543	543	543	543	543	543	543	543	543
DE-LU Remich (OGE)	28	27	27	27	27	27	27	27	27	27
DE-NL Bunde/Oude Statenzijl (H, OGE)	218	211	211	211	211	211	211	211	211	211
DE-NL Elten/Zevenaar (OGE)	0	1	1	1	1	1	1	1	1	1

* No flow possible for fluid mechanics reasons, reverse flow capacities (interruptible) are marketed.

Tab. 5.3: Development of entry capacities from other market areas

	Entry capacities from other market areas (million kWh/day)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ahlten (L-Gas, OGE from EGMT)	14	14	14	14	14	14	14	14	14	14
Broichweiden Süd (H-Gas, TG from WGT)	11	11	11	11	11	13	13	13	13	
Bunder Tief (H-Gas, OGE from GuD)	34	39	39	39	39	39	39	39	39	39
Drohne (L-Gas, OGE from GuD)	65	54	54	54	54	54	54	54	54	54
Emsbüren (H-Gas, TG from GuD)	27	0	0	0	0	0	0	0	0	0
Emsbüren (L-Gas, OGE from GuD)	78	78	78	78	78	78	78	78	78	78
Quarnstedt (H-Gas, OGE from GuD)	0	17	17	0	0	0	0	0	0	0
Kienbaum (H-Gas, OGE from WGT)	67	67	67	67	67	67	67	67	67	67
Lampertheim I (H-Gas, OGE from WGT)	37	23	23	23	23	23	23	23	23	23
Lampertheim IV (H-Gas, GVSN from WGT)	75	75	75	75	75	75	75	75	75	75
Nordlohne (L-Gas, OGE from GuD)	4	4	4	4	4	4	4	4	4	4
Steinbrink (L-Gas, OGE from EGMT)	33	33	33	33	33	33	33	33	33	33
Steinitz (H-Gas, OGE from Ontras)	67	67	67	67	67	67	67	67	67	67
Wardenburg (H-Gas, OGE from GuD and Statoil Dtschld. Transport)	6	6	0	0	0	0	0	0	0	0

EGMT: Erdgas Münster Transport GmbH & Co. KG, GuD: Gasunie Deutschland Transport Services GmbH, Ontras: ONTRAS - VNG Gastransport GmbH, Statoil Dtschld. Transport: Statoil Deutschland Transport GmbH, WGT: Wingas Transport GmbH

Tab. 5.4: Development of exit capacities to other market areas

	Exit capacities to other market areas (million kWh/day)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bunder Tief (H-Gas, OGE to GuD)	0	2	2	2	2	2	2	2	2	2
Etzel (H-Gas, OGE to Statoil Dtschld. Transport)	129	129	129	129	129	129	129	129	129	129
Lemförde (L-Gas, OGE to EGMT)	1	1	1	1	1	1	1	1	1	1
Reckrod I (H-Gas, OGE to WGT)	1	2	2	2	2	2	2	2	2	2
Steinitz (H-Gas, OGE to Ontras)	25	34	34	34	34	34	34	34	34	34
Wardenburg (H-Gas, OGE to GuD and Statoil Dtschld. Transport)	0	24	24	24	24	24	24	24	24	24

EGMT: Erdgas Münster Transport GmbH & Co. KG, GuD: Gasunie Deutschland Transport Services GmbH, Ontras: ONTRAS - VNG Gastransport GmbH, Statoil Dtschld. Transport: Statoil Deutschland Transport GmbH, WGT: Wingas Transport GmbH

Tab. 5.5: Development of entry capacities from storage facilities (the entry point transmission system operator is indicated in brackets)

	Entry capacities from storage facilities (million kWh/day)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bierwang (OGE)	205	205	205	205	205	205	205	205	205	205
Breitbrunn (OGE)	92	92	92	92	92	92	92	92	92	92
Emlichheim – Kalle – 1 (TG)	126	126	126	126	126	126	126	126	126	126
Epe H (OGE)	72	72	72	72	72	72	72	72	72	72
Epe KGE/EGS (TG)	0	147	147	147	147	147	147	147	147	147
Epe L (OGE)	98	98	98	98	98	98	98	98	98	98
Epe – I (TG)	206	206	206	206	206	206	206	206	206	206
Epe – III (TG)	80	80	80	80	80	80	80	80	80	80
Eschenfelden (OGE)	17	17	17	17	17	17	17	17	17	17
Epe KGE/EGS (TG)	0	147	147	147	147	147	147	147	147	147
Etzel (OGE)	192	192	192	192	192	192	192	192	192	192
Fronhofen (GVSN)	19	19	19	19	19	19	19	19	19	19
Grounau-Epe L2 (OGE)	24	24	24	24	24	24	24	24	24	24
Nüttermoor (OGE)	71	71	71	71	71	71	71	71	71	71
Sandhausen (GVSN)	12	12	12	12	12	12	12	12	12	12
Wolfersberg (bayernets) *	6	6	6	6	6	6	6	6	6	6
Xanten – I (TG)	71	71	71	71	71	71	71	71	71	71

* Offered as firm capacity from October to March only, interruptible capacity is possible in other months.

Tab. 5.6: Development of exit capacities to storage facilities (the exit point transmission system operator is indicated in brackets)

	Exit capacities to storage facilities (million kWh/day)									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bierwang (OGE)	141	141	141	141	141	141	141	141	141	141
Breitbrunn (OGE)	67	67	67	67	67	67	67	67	67	67
Epe – II (TG)	46	46	46	46	46	46	46	46	46	46
Epe H (OGE)	113	113	113	113	113	113	113	113	113	113
Epe L (OGE)	38	38	38	38	38	38	38	38	38	38
Eschenfelden (OGE)	13	13	13	13	13	13	13	13	13	13
Etzel (OGE)	57	77	77	77	77	77	77	77	77	77
Friedeburg-Etzel (OGE)	0	21	21	21	21	21	21	21	21	21
Fronhofen (GVSN)	5	5	5	5	5	5	5	5	5	5
Grounau-Epe H1 (OGE)	37	72	72	70	70	70	70	70	70	70
Grounau-Epe L1 (OGE)	0	0	49	49	49	49	49	49	49	49
Hähnlein (OGE)	9	9	9	9	9	9	9	9	9	9
Krummhörn (OGE)	27	19	19	19	19	19	19	19	19	19
Nüttermoor (OGE)	51	51	51	51	51	51	51	51	51	51
Sandhausen (GVSN)	5	5	5	5	5	5	5	5	5	5
Stockstadt (OGE)	13	13	13	13	13	13	13	13	13	13
Wolfersberg (bayernets) *	4	4	4	4	4	4	4	4	4	4
Xanten – 2 (TG)	25	25	25	25	25	25	25	25	25	25

* Offered as firm capacity from April to September only, interruptible capacity is possible in other months.

6. Summary and Outlook

With this document, the cooperation partners are for the first time fulfilling their obligation under GasNZV Section 17 to provide a market-area-wide assessment of long-term capacity requirements. Following a review of developments on the European gas market in Chapter 2 and a presentation of the NCG market area in Chapter 3, the actual assessment is presented in Chapter 4 and offers a number of main conclusions:

- Year on year, demand for gas in Germany will stagnate and if anything shrink over the medium term, and be characterised by a marked change in purchasing patterns.
- It is expected that a medium-term reduction in the annual gas offtake by private households and by commerce, trade and services will lead to a regional or local increase in consumption through growth in the demand for output from gas-fired power plants and gas-fired CHP plants.
- In the long term, the level of firm freely allocable capacities at their present high level of quality can only be maintained and increased by investing in the pipeline network.
- Except for the creation of reverse flow capacities on the German-Danish border that are already under discussion, there are no other conclusions for the NCG market area arising from the current European ENTSOG network development plan.
- A number of cooperation partners have received initial reservation requests under GasNZV Section 38 but no general inferences can be drawn from these at the present time.

There are a number of requirements for transmission system expansion on both a national and international level that must be recognised. These include in particular:

- connection of biogas production plants
- connection of gas storage facilities
- connection of gas-fired power plants
- connection of households (via regional and local distribution networks)
- connection of industrial installations (directly or via regional and local distribution networks)
- a switch from L-Gas to H-Gas because of a diminishing availability of L-Gas
- further development of cross-border capacities
- reverse flow capacities
- merging of market areas (national and international)

How these different scenarios and requirements should be evaluated will be a matter for consultation as the German network development plan evolves. This process of consultation must find a political as well as a social consensus as to which investments can be considered as economically viable.

The cooperation partners appeal to legislators and the BNetzA to provide reasonable incentives for investments required in the gas transmission network.

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