FNB Gas
DIE FERNLEITUNGSNETZBETREIBER

Gas Network Development Plan 2020–2030

Consultation

Summary

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Date: 4 May 2020

Foreword

Dear Reader

With the Gas Network Development Plan 2020–2030, the German transmission system operators (TSOs) present their network expansion plan for consultation. This document is the summary; the binding version is exclusively the Network Development Plan 2020–2030.

On the basis of the scenario framework, which has been discussed intensively with the market partners and confirmed by the Bundesnetzagentur (BNetzA – Federal Network Agency), the transmission system operators have identified network expansion measures to provide efficient transportation infrastructure at optimal cost that will also constitute the basis for a secure supply with H-gas and L-gas in the future. As before, the L-to-H-gas conversion will exert a strong influence on the development of the transmission system in the next few years. To what extent substantial changes will be made to the L-to-H-gas conversion planning will essentially depend on the duration of the currently prevailing restrictions as a result of COVID-19. The transmission system operators are maintaining close contacts in this regard with the affected distribution system operators, the BNetzA and the Bundeswirtschaftsministerium (BMWi – German Federal Ministry for Economic Affairs and Energy). The forthcoming market area merger in 2021 and the increasing importance of green gases and hydrogen are further essential components of the present network development plan.

The climate protection targets of an 80–95 % reduction in greenhouse gas emissions by 2050 in comparison to 1990 currently set by the government are already ambitious. These are expected to be replaced in the near future by the new targets of the EU Commission. The EU Commission President Ursula von der Leyen has announced that Europe plans to be the first climate-neutral continent by 2050. The transmission system operators believe that such ambitious targets can be achieved only by integrating, aligning and optimising all available infrastructure. New logistics chains and thus transportation infrastructure will also be created in this way. One of these challenges will be the construction and operation of a Germany-wide hydrogen network, as demand is already emerging in industry, transport and the heating market.

The federal government presented a draft national hydrogen strategy for inter-ministerial consultation at the end of January 2020. According to this, hydrogen is set to play a major role in Germany's decarbonisation strategy. The existing gas infrastructure is part of the national hydrogen strategy from the outset, because it can already be used to transport hydrogen. In the future, infrastructure for the exclusive transport of hydrogen could emerge. The transmission system operators will support the federal government in developing a national hydrogen economy. For this purpose, the transmission system operators drafted a visionary hydrogen network and published a map in February 2020. The pipelines shown in the map are based 90 % on the existing transmission system and will be connected to key demand points for hydrogen in the future.

The transmission system operators expressly welcome the consideration of green gases in the network development plan. The first regions with potential for hydrogen-based gas supply systems by 2030 can thus be shown on the basis of the market partner survey conducted in the previous year. Furthermore, the network operators have dedicated a separate chapter to the topic of green gases and provide an outlook on the future development of the gas transportation infrastructure. The transmission system operators point out that it will be necessary to amend the legal and regulatory conditions in order to approve and implement the identified measures.

The transmission system operators' database has been updated and is available to the general public for this network development plan at www.nep-gas-datenbank.de.

We thank Prognos AG for their co-operation.

Yours faithfully

Your transmission system operators

Executive Summary

The transmission system operators present the results of the network development planning as at 4 May 2020 in the consultation document for the Gas Network Development Plan 2020-2030 and thus fulfil the requirements arising from the Energy Industry Act (EnWG) and the Gas Network Access Regulation (GasNZV). This gas network development plan is based on the scenario framework developed by the transmission system operators and confirmed by the BNetzA on 5 December 2019.

Two scenarios for the development of gas demand in Germany up to 2030 are presented in the scenario framework. The "Technology mix scenario –95 % (dena-TM95)" of the pilot study of the Deutsche Energie-Agentur GmbH (dena – German Energy Agency) and the European Commission's "EUCO30" scenario were used for the energy demand for gas. These scenarios take the current European climate protection targets into consideration.

With the confirmation of the scenario framework the BNetzA tasked the transmission system operators to calculate two modelling variants (base variant and green gas variant) and to include a design variant for Baden-Württemberg.

The transmission system operators have specified in greater detail the plans for a hydrogen network up to 2030 on the basis of the market partner survey that has been conducted. These plans represent a first step towards a national and, in the future, European hydrogen network. The transmission system operators have made the implementation of these measures subject to any change in the existing legal and regulatory conditions.

The measures of the Gas Network Development Plan 2018–2028 are confirmed. The network extension proposal of the transmission system operators is based on the green gas variant. The following extension measures are necessary in consideration of the 10-year timeframe.

Table 1: Network expansion proposal of the transmission system operators up to the end of 2030

	2030		
Network expansion proposal	Natural gas	Green gases	Total
Compressor capacity in MW	405	0	405
Pipelines in km	1,594	1,294	2,888
– of which new build	1,594	151	1,746
– of which conversion	0	1,142	1,142
Investments* in EUR billion	7.8	0.7	8.5

* including GPCM stations, valve stations and other facilities

Source: Transmission system operators

The additional measures in comparison with the previous gas network development plan are largely related to the supply of Baden-Württemberg, the connection of the LNG plants, the necessary extension measures for green gases and the security of supply of the Netherlands.

For the first time the costs of the market area merger have to be determined in the Gas Network Development Plan 2020–2030. Here, the costs for market-based instruments have to be compared with the costs of a potential network expansion. Because of the extensive work and the complexity of the calculations and analyses, the results are not yet available in full at the time the consultation document is published. It is intended to present these results with the Gas Network Development Plan 2020-2030 Draft Document on 1 July 2020.

The L-to-H-gas conversion planning is at a very advanced stage up to 2026 and has already been finalised to a large extent. However, at the time of publication of the Network Development Plan it cannot be ruled out that changes to the conversion plan may be necessary, due to the restrictions in Germany caused by COVID-19 and that delays will result. The transmission system operators are maintaining close contacts in this regard with the affected distribution system operators, the BNetzA and the BMWi.

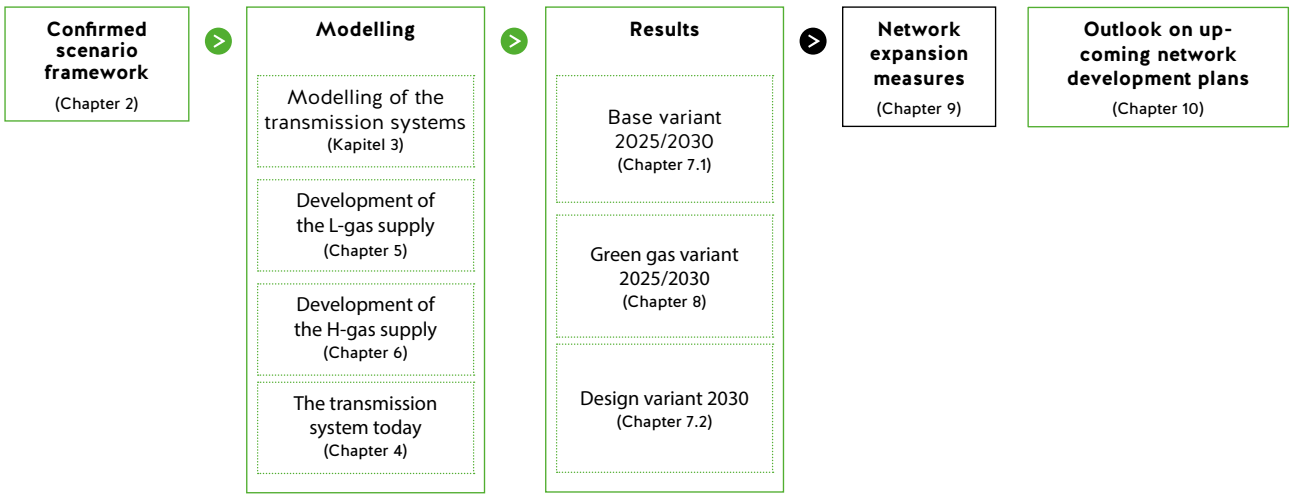
1 Introduction

In accordance with section 15a of the Energiewirtschaftsgesetz (EnWG – Energy Industry Act), the German transmission system operators have to draw up a joint network development plan in even years and submit it to the BNetzA as the competent regulatory authority.

The consultation document on the Gas Network Development Plan 2020–2030 was published on the FNB Gas website (www.fnb-gas.de) on 4 May 2020. The general public and the market will be given the opportunity to express their views in a public consultation running from 4 May 2020 to 29 May 2020. The transmission system operators plan to hold a web-based workshop on 13 May 2020, at which the Gas Network Development Plan 2020–2030 will be explained.

The transmission system operators will provide a database for the general public at www.nep-gas-datenbank.de that contains the input parameters for the modelling, measures and other details about the Gas Network Development Plan 2020–2030. The following figure shows the general structure of the Gas Network Development Plan 2020–2030.

Figure 1: Overview: Structure of the Gas Network Development Plan 2020–2030



Source: Transmission system operators

2 Confirmed scenario framework for the Gas Network Development Plan 2020–2030

The confirmed scenario framework with its results and findings is a key basis for the modelling that is carried out. The BNetzA confirmed the amended scenario framework [FNB Gas 2019a] submitted by the transmission system operators, with some changes, on 5 December 2019. Detailed information on the subject can be accessed at www.fnb-gas.de.

Two scenarios for the development of gas demand in Germany up to 2030 are presented in the scenario framework that fulfil the targets of energy and climate policy. Gas demand is understood to be the demand for natural gas, biomethane and green gases. Scenario I (based on dena-TM95) contains a wide variation in technologies and energy sources. By using the Scenario II (based on EUCO30), consistency with the previous Gas Network Development Plan 2018–2028 is retained. Gas demand in the transformation sector (power plants including own consumption) is based on the BNetzA power plants list. The future trend has been determined using the Prognos electricity market model. The coal phase-out path, as recommended by the "Commission on Growth, Structural Change and Employment" ("Coal Commission") [BMWi 2019], has been included in both scenarios. The capacity reservations and capacity expansion claims currently submitted to the transmission system operators pursuant to sections 38 and 39 GasNZV have also been taken into consideration. In sum, increasing capacity from the gas-based generation of electricity is expected.

Alongside the trends in gas demand, the gas supply was also examined. This analysis included the current domestic production forecast (BVEG) and the supply of green gases.

3 Modelling of the transmission systems

The transmission system operators have further developed the methodology, that was jointly designed in the previous network development plans for the Germany-wide modelling of the transmission systems, in the Gas Network Development plan 2020–2030.

Basic procedure and input parameters for the network modelling

Firstly, the relevant input parameters for the network modelling were determined. Subsequently, within the analysis of the L-gas supply, the conversion areas were identified and the L-gas capacity and quantity balance were drawn up. In addition, the H-gas capacity balance is drawn and, as a result, the additional H-gas capacity demand determined. Based on the results of the distribution of H-gas sources, the required additional H-gas demand is subsequently allocated with the appropriate potential to the regions and, using certain criteria, to cross-border interconnection points. The network modelling of the transmission system operators is then carried out on the basis of these values.

The input parameters for the network modelling include base data that is taken from a variety of sources. The capacity reservations and capacity expansion claims currently submitted to the transmission system operators pursuant to sections 38 and 39 GasNZV and the market partner survey on green gas projects also play an important role. Other important input parameters are capacity demands of distribution system operators, power plants/industry, storage facilities, supply of biomethane, hydrogen and synthetic methane, capacities at German cross-border interconnection points/LNG facilities and the distribution of H-gas sources.

Modelling variants

In the confirmation of the scenario framework the BNetzA tasked the transmission system operators to calculate two modelling variants (base variant and green gas variant) and to include a design variant for Baden-Württemberg (cf. Table 2).

Table 2: Modelling variants of the Gas Network Development Plan 2020–2030

Modelling variant	Base variant 2025/2030	Green gas variant 2025/2030	Design variant for Baden-Württemberg 2030	L-gas balance 2030	H-gas balance 2030
Designation	B.2025/B.2030	G.2025/G.2030	A.2030	L.2030	H.2030
Calculation	2025/2030 in full	2025/2030 in full	2030	Balance analysis	
Reporting date/ period	31 December 2025/31 December 2030		31 December 2030	1 October 2030	
Distribution system operators	Initial value: Internal orders 2020, development: the 10-year verified forecast of the DSOs up to 2025, constant value afterwards		As base variant, deviation involves use of the 10-year forecast of the DSOs and loss of 1.2 GWh/h storage capacity for Baden-Württemberg for 2030	Analysis of the long-term L-gas balances up to 2030	Analysis of the long-term H-gas capacity balance up to 2030
L-to-H-gas conversion	Modelling of the conversion areas, including conversions up to 2031 in order to identify the necessary network expansions measures up to 31 December 2030				
Gas power stations	Inventory according to "2020 – NEP Konsultation" NDP gas database cycle, systemically important power plants directly connected today on interruptible basis in accordance with Chapter 3.2.2, new build in accordance with Chapter 3.2.2, 100 % firm dynamically allocable capacity (fDZK)				
Industry	Constant capacity demand, consideration of the binding additional demand, free allocable capacity approach				
Underground gas storage facilities	Inventory according to "2020 – NEP Konsultation" NDP gas database cycle, new build in accordance with Chapter 3.2.4: 100 % temperature-dependent capacity				
Biomethane	According to NDP Gas database cycle "2020 – NEP Konsultation"				
Hydrogen and synthetic methane	Consideration of market surveys on hydrogen and synthetic methane and grid development plan power 2019–2030, see also Chapter 8				
LNG facilities	New build in accordance with "2020 – NEP Konsultation" NDP gas database cycle, see also Chapter 3.2.6				
IP/VIP	Inventory according to "2020 – SR Konsultation" NDP gas database cycle Need for expansion in accordance with Chapter 6, taking the TYNDP into account				
H-gas sources	Additional demand by distribution of H-gas sources in accordance with Chapter 6.2				
Use of MBIs	Use of commercial instruments for planning purposes, see also Chapter 3.4				
Market area inter-connection points	Discontinuation of market area interconnection points on account of the market area merger				

Notes: References in the table relate to the document of the Network Development Plan 2020–2030.

Source: Transmission system operators

Market area merger

The two German market areas NCG and GASPOOL have to be merged into one market area in accordance with the Gas Network Access Regulation by no later than 1 April 2022. The transmission system operators are planning to carry out the merger on 1 October 2021. In order to identify the impact of the market area merger, additional iteration steps are calculated with the NewCap model in the Gas Network Development Plan 2020–2030 for the first time.

In fulfilment of the legal requirement, the aim is to transfer the capacities available in the two separate market areas, as far as possible, in the same quantity and quality in a Germany-wide market area. This objective is a great challenge as the existing exchange capacity between NCG and GASPOOL currently in place is not sufficient on its own to guarantee the freely allocable capacity of the previous capacity offer. In addition to investment in assets, the use of market-based instruments is also an option for maintaining the previous capacity structure. Furthermore assets cannot be realised until the market area merger is implemented.

In order to ensure the goal of having an energy supply that is both secure and cost-efficient, the costs of a possible network expansion (taking depreciation periods into account) can be compared with the costs for using market-based instruments.

Because of the complex calculations to determine the costs (incl. grid expansion) of the market area merger, which have to be performed for the first time in the Gas Network Development Plan 2020–2030, the results of the calculations were not available in full at the time the consultation document was published. These results will therefore be sent to the BNetzA on 1 July 2020 when the draft Gas Network Development Plan 2020–2030 Draft Document is drawn up. The general public will then be invited to participate in the consultation process to be conducted by the BNetzA.

4 The transmission system today

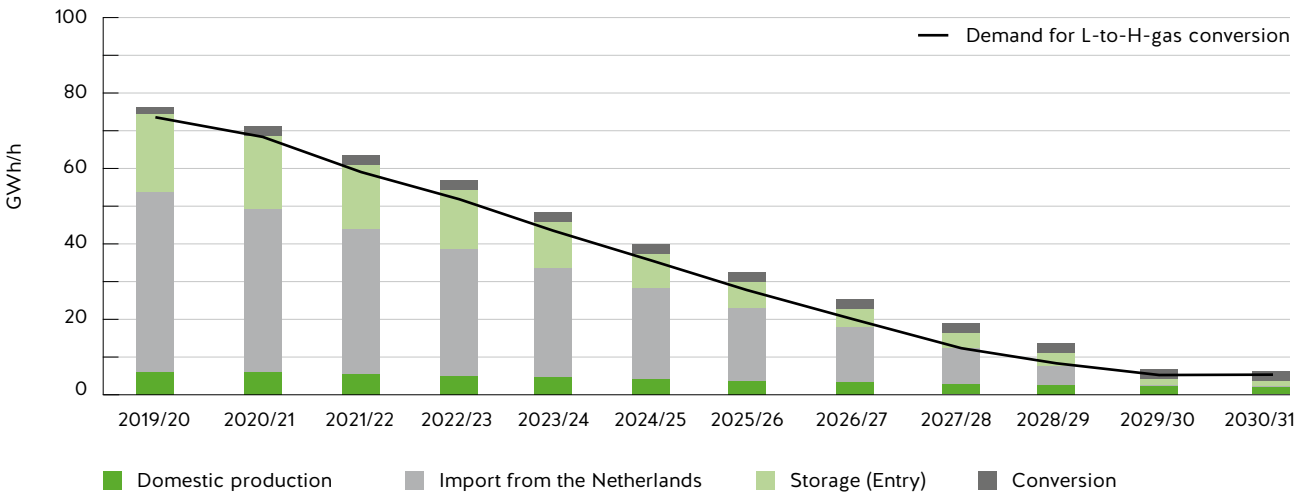
The current transmission system is described in this chapter. In addition, the implementation status of current NDP measures are considered (reporting date: 1 March 2020), because in accordance with section 15a(2) EnWG, the current gas network development plan must include the implementation status of the previous gas network development plan. In this course of this update on the implementation status a total of 127 measures were considered. Of these a total of 61 measures meet the requirement for inclusion in the base network in the Gas Network Development Plan 2020–2030. Compared with the 2019 implementation report, 23 measures have been commissioned and 31 measures are currently under construction. As result of new information in the planning, a planned change to the date of commissioning has been made for eleven measures. Delays have occurred or are foreseeable for eight measures.

5 Development of the L-gas supply

Part of the German gas market is supplied with low calorific value natural gas (L-gas). L-gas originates entirely from production in Germany and the Netherlands. The decline in Germany's domestic production and strongly declining supplies from the Netherlands result in reduced availability on the German market, in terms of both the annual volumes available in Germany and the available capacities. On this matter the German transmission system operators take part in regular meetings with all those involved, in particular with the Dutch transmission system operator Gasunie Transport Services B. V. (GTS) in order to harmonise and update the planning assumptions for future L-gas imports.

The Germany-wide L-gas capacity balance was updated (cf. Figure 2). The capacity balance illustrates the great relevance for planning L-to-H-gas conversion.

Figure 2: Germany-wide L-gas capacity balance



Source: Transmission system operators

Since the L-to-H-gas conversion was launched in 2015, 22 areas with a total of around 600,000 appliances have been converted from L-gas to H-gas (reporting date: October 2019). This corresponds to an annual consumption volume of around 40 TWh and a capacity of approximately 8.6 GWh/h.

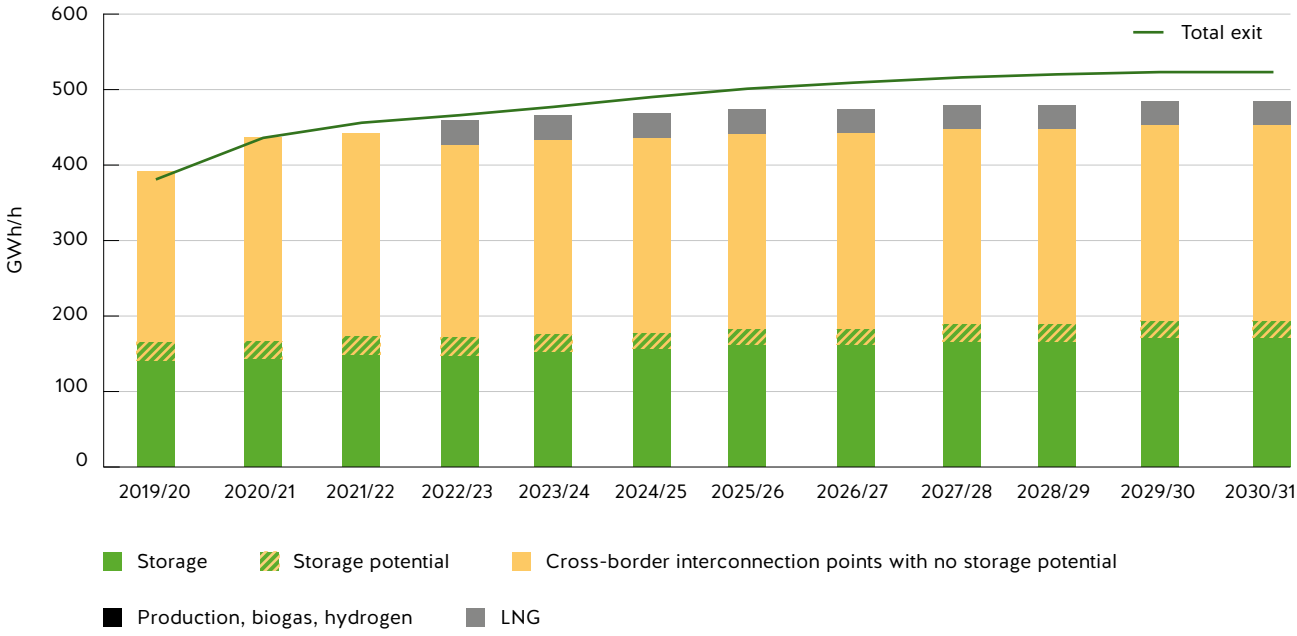
The further conversion planning up to 2030 takes into account the available detailed plans of the distribution system operators. It was detailed in full and for each year. As a result, conversions of more than half a million appliances a year are planned in the next few years. Up to 2030, the L-gas supply area will be strongly reduced and will then only entail areas close to German production. An overview of the conversion planning is included in the network development plan. Further details are published in the NDP gas database.

At the time of publication of the Network Development Plan, due to the restrictions in Germany triggered by COVID-19 and resulting delays in implementing measures, it cannot be ruled out that changes will still be made to the L-to-H-gas conversion plan.

6 Development of the H-gas supply

The Germany-wide H-gas capacity balance was updated. The figure below shows the development over the next few years.

Figure 3: Germany-wide H-gas capacity balance



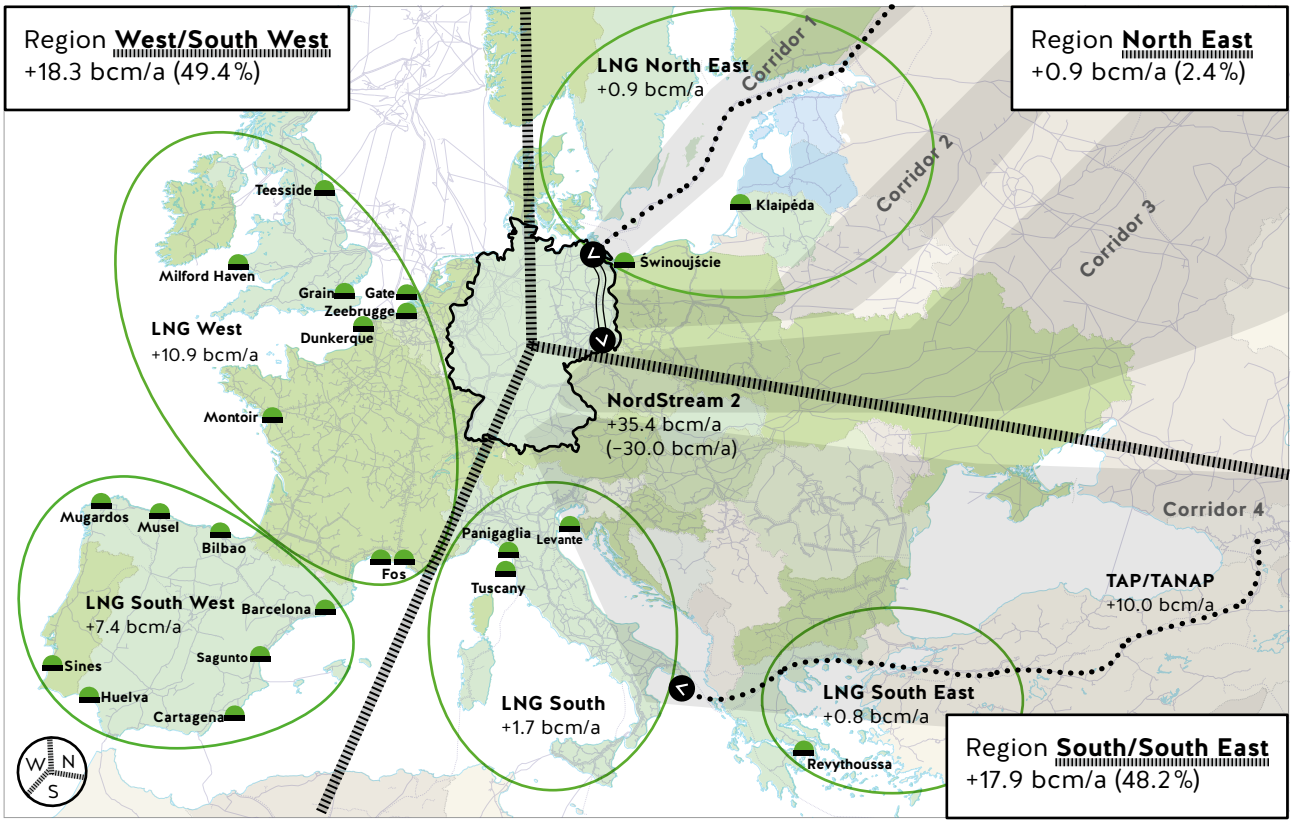
Source: Transmission system operators

In the period under review, demand for H-gas increases from approximately 380 GW in 2019/2020 to approximately 522 GW in 2030/2031. The main reasons for this are the L-to-H-gas conversion, new power plants, the bookings from the 2017 annual auction in the context of “more capacity” and the increased demand in the Netherlands due to security of supply considerations as analysed by GTS.

As a result of the declining domestic production in Europe, the import demand for H-gas will increase in Europe in the coming years. Traditionally, the German transmission infrastructure is heavily characterised by cross-border natural gas streams that are used to supply its neighbouring western and southern European states. Accordingly, it is to be expected that the challenges with regard to cross-border gas exchange will continue to increase in the future.

To cover the additional Germany H-gas requirements, it is assumed that approximately half of this comes from the West/South-West and South/South-East regions.

Figure 4: Coverage of the additional European demand up to 2030



7 Modelling results

Base variant results

The modelling of the base variant produces the following results

Table 3: Base variant results

	Up to the end of 2025	Up to the end of 2030
Modelling result		
Compressor stations (additional capacity and necessary flow reversals)	205 MW	205 MW
Pipeline construction	741 km	743 km
Costs	EUR 3.3 billion	EUR 3.3 billion
Initial network measures		
Compressor stations (additional capacity and necessary flow reversals)	200 MW	
Pipeline construction	851 km	
Costs	EUR 4.5 billion	
Total result		
Compressor stations (additional capacity and necessary flow reversals)	405 MW	405 MW
Pipeline construction	1,592 km	1,594 km
Costs*	EUR 7.7 billion	EUR 7.8 billion

* including GPCM stations, valve stations and other facilities

Source: Transmission system operators

The additional measures in comparison with the previous gas network development plan are largely related to the supply of Baden-Württemberg, the connection of the LNG facilities and the security of supply of the Netherlands.

The resulting network expansion measures are listed in detail in the NDP gas database and are shown comprehensively in the Gas Network Development Plan 2020–2030. This is followed by stating the network expansion measures which contribute to covering the capacity demand for planned gas power stations and LNG plants.

Modelling results for the design variant for Baden-Württemberg

Building on the base variant the design variant for Baden-Württemberg examines an increased trend in demand in Baden-Württemberg for the 2030/2031 modelling year. The demand for terranets of around 35.6 GWh/h in 2030 confirmed by the BNetzA for the design variant is reported in the NDP gas database ("2020 – NEP Konsultation" cycle). This means a capacity increase of around 2.2 GWh/h compared to the base variant. This increase is based on a full consideration of the long-term forecast of the distribution system operators up to 2030 and to a loss of gas storage capacity.

Four different supply variants were considered in order to determine the required network expansion for the additional capacity demand of 2.2 GWh/h in comparison with the base variant. The table below shows the additional investments in the supply variant under consideration that are necessary in comparison with the base variant.

Table 4: Results of the supply variants for 2030

	2030			
	V1 North	**V2 North + East**	**V3 North + West**	**V4 West + East**
Measures in the terranets bw network area				
– Additional compressor capacity in comparison with base variant in MW	7	7	11	11
– Additional pipeline construction in comparison with base variant in km	7	7	7	7
Cost estimate of terranets in addition to the base variant in EUR million	64	64	90	84
Cost estimate in the network of upstream TSOs in addition to the base variant in EUR million	–	50	100	140
Estimated total additional costs in comparison with the base variant in EUR million	**64**	**114**	**190**	**224**

Source: Transmission system operators

As result of the comparison, supply variant 1 in the design variant for Baden-Württemberg is the most cost-effective alternative. The results of supply variant 1 are presented in the NDP gas database.

8 Green gas variant

Basic procedure

The green gas variant is based on the results of the market partner survey. In the course of the market partner survey for green gases, a total of 31 green gas projects were reported to the transmission system operators by 12 July 2019. Some project developers requested that the reported data be anonymised. The transmission system operators included in the modelling only the green gas projects that are intended to be connected to the TSO network.

The green gas variant consists of two forms of modelling:

- **Natural gas modelling:** Review of which pipelines of the existing transmission system can be converted from natural gas to hydrogen. Furthermore, blending of hydrogen or synthetic methane to the existing natural gas in the network is modelled.
- **Hydrogen modelling:** Transportation of hydrogen in a separate hydrogen network (converted[1] or new network expansion measures).

The selection of the modelling depends for the specific project on whether hydrogen pipelines converted for transport are available or whether it makes more sense to build new hydrogen pipelines. If this is not possible, hydrogen or synthetic methane is blended to the natural gas network.

The starting points for the green gas variant are the results of the market partner survey and the potential hydrogen network. The potential hydrogen network is based on considerations on the visionary hydrogen network published by the transmission system operators on 28 January 2020 (cf. Chapter 10). In a first stage of the analysis, pipelines of the visionary hydrogen network, with which the projects in the market partner survey for 2025 and 2030 can be reached, were selected.

1 Converted pipelines are gas pipelines that are used in the transmission system today and that will transport hydrogen instead of methane in the future.

The procedure can be summarised as follows:

1. Identify a potential hydrogen network (basis: green gas projects and visionary hydrogen network)
2. Identify pipelines that can be converted from natural gas to hydrogen (natural gas modelling)
3. Model the hydrogen transport in a separate hydrogen network - converted natural gas pipelines and new pipelines that have been identified (hydrogen modelling)

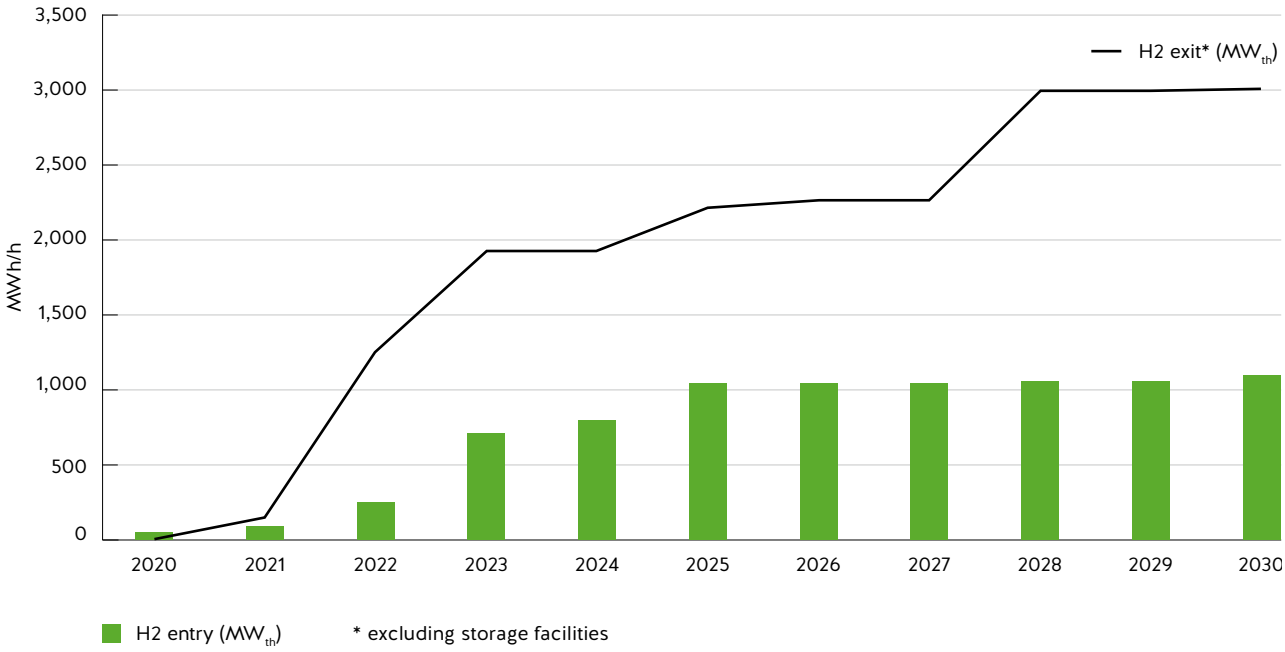
The transmission system operators have taken a maximum blending concentration of 2 % as the basis for modelling the green gas variant. The definition is based on the assessment by the transmission system operators that up to this concentration, the methane-hydrogen blend will be as compatible as possible with the consumers without causing a significant need for investment both in the network infrastructure and on the consumer side. The transmission system operators do not rule out the possibility that higher blending concentrations will also become feasible in the future. The market participants are requested to submit their assessment in the course of the consultation on this aspect.

Hydrogen injection requests for blending are generally subject to the examination of the compatibility of the blended gas with the gas composition requirements according to the currently valid regulations. Furthermore, interoperability with directly and indirectly affected gas infrastructure has to be checked.

Input parameters for the modelling

In accordance with the criteria described in the scenario framework, 21 green gas projects of the market partner survey have been taken into consideration in the hydrogen modelling for the Gas Network Development Plan 2020–2030. The Germany-wide hydrogen capacity balance presented in Figure 5 was produced from the market partner survey.

Figure 5: Germany-wide hydrogen capacity balance in the survey of market partners



Source: Transmission system operators

Overall, there is shortage in the energy balance, i.e. there is a higher demand for hydrogen than can be covered by existing hydrogen sources. The shortage amounts to 1,166 MW_{th} and 1,906 MW_{th} for the 2025 and 2030 modelling years respectively. The shortage/additional demand has to be covered by other hydrogen sources.

Consideration of the grid development plan power

To cover the hydrogen demand resulting from the market partner survey, power-to-gas plant capacities from the grid development plan power (GDP power) must be taken into account.

Germany-wide the electrolysis capacity from the GDP power total 400 MW_e and 1.600 MW_e for the 2025 and 2030 modelling years respectively. This is equivalent to a thermal output of 300 MW_{th} in 2025 and of 1,200 MW_{th} in 2030.

Regional approach in the hydrogen modelling

The transmission system operators have carried out a regional approach and summarised project reports in the vicinity of the green gas projects.

The majority of the green gas projects reported in the course of the market partner survey are located in the federal states Lower Saxony, Schleswig-Holstein and North Rhine-Westphalia. The transmission system operators have therefore conducted a joint consideration of these projects in the "West" balancing area. In this region, there is a shortage in the energy balance for the 2025 and 2030 model years, which has to be covered by additional hydrogen sources.

Firstly the electrolysis capacity from the GDP power is taken into consideration to cover the shortage in the West region. But as solely the electrolysis capacity from the market partner survey and the GDP power is not sufficient to cover the hydrogen demand, the transmission system operators have included other potential sources of hydrogen. Additional sources are hydrogen from the Netherlands, domestic production of "green" hydrogen from onshore wind farms where feed-in subsidies have expired, and capacity from gas storages.

Results of the green gas variant

The additional network expansion measures of the natural gas and hydrogen modelling for 2025 and 2030 in comparison to the base variant in the Gas Network Development Plan 2020–2030 are summarised in Table 5.

Table 5: Results of the green case variant

	Up to the end of 2025	Up to the end of 2030
Modelling result in addition to the base variant		
Compressor stations	0 MW	0 MW
Pipelines	471 km	1,294 km
– of which converted pipelines	389 km	1,142 km
– of which new hydrogen pipelines	63 km	94 km
– of which new H-gas pipelines	19 km	57 km
Additional costs in comparison with the base variant		
Conversion of natural gas pipelines	EUR 82 million	EUR 310 million
New construction measures, hydrogen modelling	EUR 128 million	EUR 220 million
New construction measures, natural gas modelling	EUR 84 million	EUR 132 million
Additional total costs	EUR 294 million	EUR 662 million

Source: Transmission system operators

Based on the results of the base variant, total costs for the green gas variant of around EUR 8.0 billion for up to 2025 and of around EUR 8.5 billion for up to 2030 are produced. The resulting network expansion measures are listed in detail in the NDP gas database in the "2020 – NEP Konsultation" cycle.

9 Network expansion measures

To implement the requirements of section 15a(1) EnWG, the transmission system operators propose the network expansion measures of the green gas variant. Deviating from this, four measures are intended to be taken into consideration in the dimensioning of the design variant for Baden-Württemberg in the network expansion proposal. A list of the measures can be found in Appendix 1 of the Network Development Plan 2020–2030. All the details of the network expansion measures and the base network measures are contained in the NDP gas database cycle in the "2020 – NEP Konsultation" cycle.

The transmission system operators have taken note of the legal opinion of the BNetzA, according to which the development of infrastructure purely for hydrogen is currently not covered by the legal framework of section 15a(1) sentence 2 EnWG and thus cannot be the subject of the binding part of the network development plan.

The BNetzA expects, however, as do the transmission system operators, that the ongoing discussion on the future role and integration of green gases will result in an appropriate development and more detailed specification of the legal framework.

For this reason, the transmission system operators propose the measures presented in the green gas variant to convert the natural gas pipelines to hydrogen transmission and to construct new infrastructure purely for hydrogen for inclusion in the binding part of the network development plan subject to the proviso below. The implementation of these measures is subject to a change in the existing statutory and administrative regulations to the effect that the legal framework currently applicable to the construction, operation and use of and access to (natural) gas supply networks is extended to the construction, operation and use of and access to networks purely for hydrogen.

In addition to being subject to the necessary expansion of the applicable legal framework for the construction, operation and use of and access to networks purely for hydrogen, the implementation of the network expansion measures resulting from the project plans is also subject to the conclusion of a realisation timetable between the project plan developer and the respective transmission system operator based on section 39 GasNZV.

The "South Elbe-Achim pipeline" measure is dimensioned with a smaller pipeline diameter in the base variant (ID 636-01) than in the green gas variant (ID 767-01). If the measures to construct hydrogen infrastructure cannot yet be confirmed at the time the BNetzA makes the decision on the network development plan, the measure under ID 636-01 would be necessary to cover the demand of the base variant.

For all new measures to construct a hydrogen infrastructure (ID 730-01 to ID 743-01) transmission system operators are available for implementation. In view of the necessary change in the existing legal and regulatory regulations, the decision which company implements which measure can take place at a later point in time.

The transmission system operators propose the network expansion measures that have been identified with an investment volume of around EUR 8.0 billion for the requirements of 2025 and of around EUR 8.5 billion in total for the requirements of 2030.

The costs for the expansion of the transmission infrastructure are composed in detail as follows:

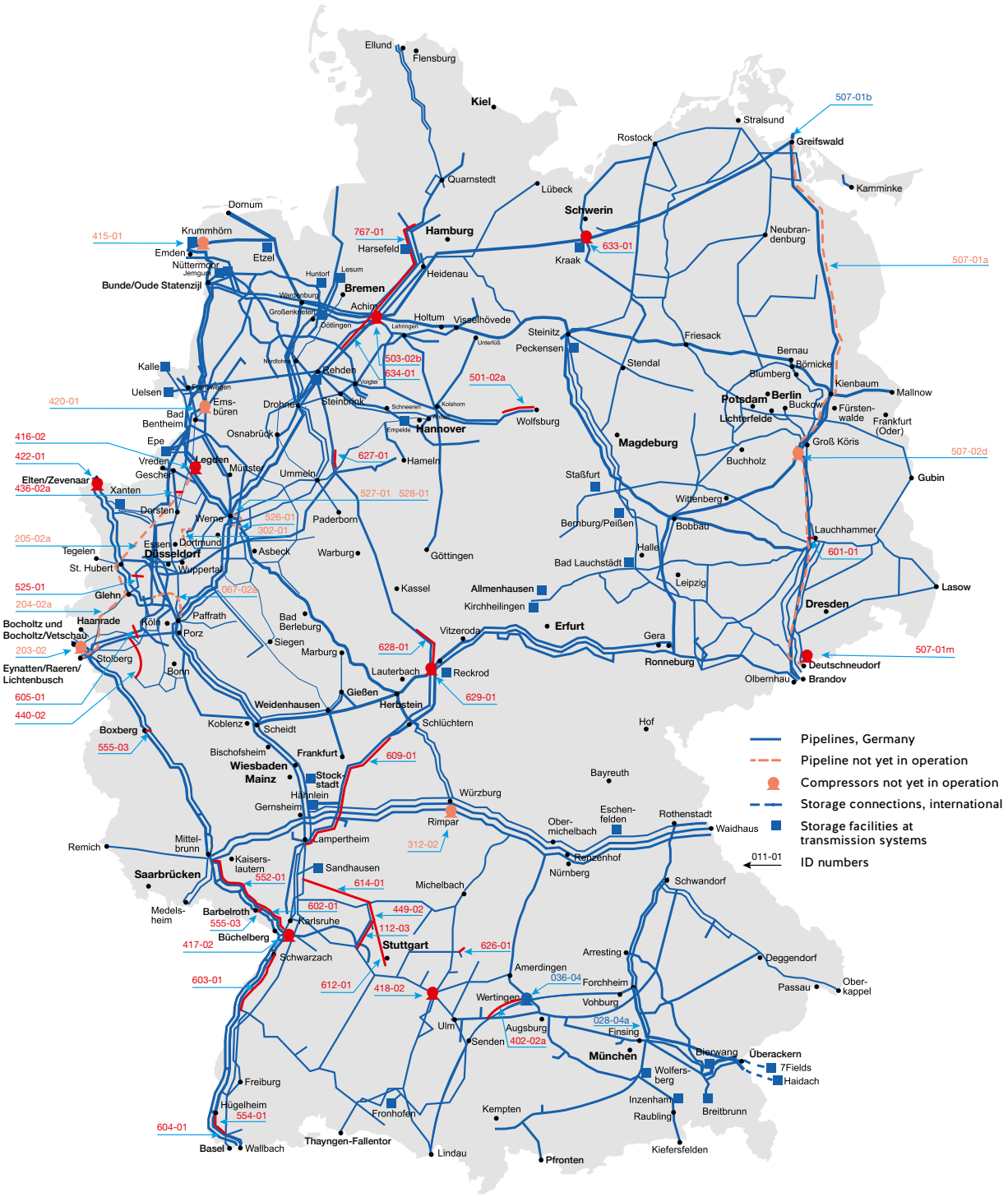
Table 6: Network expansion proposal of the transmission system operators

	2025			2030		
Network expansion proposal	Natural gas	Green gases	Total	Natural gas	Green gases	Total
Compressor capacity in MW	405	0	405	405	0	405
Pipelines in km	1,592	471	2,064	1,594	1,294	2,888
– of which new build	1,592	82	1,674	1,594	151	1,746
– of which conversion	0	389	389	0	1,142	1,142
Investments* in EUR billion	7.7	0.3	8.0	7.8	0.7	8.5

* including GPCM stations, valve stations and other facilities

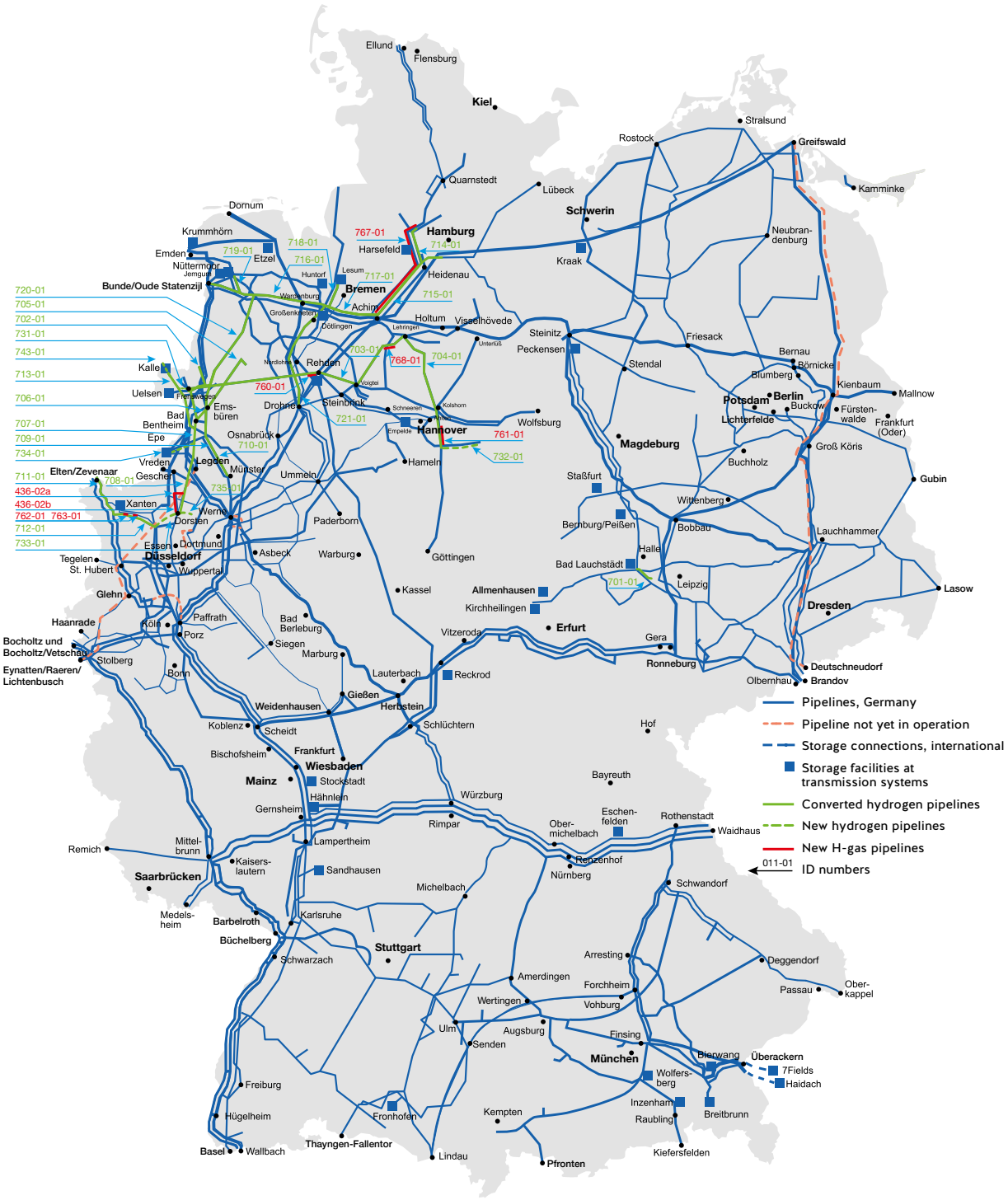
Source: Transmission system operators

Figure 6: Network expansion proposal of the transmission system operators (1/2)



Source: Transmission system operators, reporting date: 1 March 2020

Figure 7: Network expansion proposal of the transmission system operators (2/2)



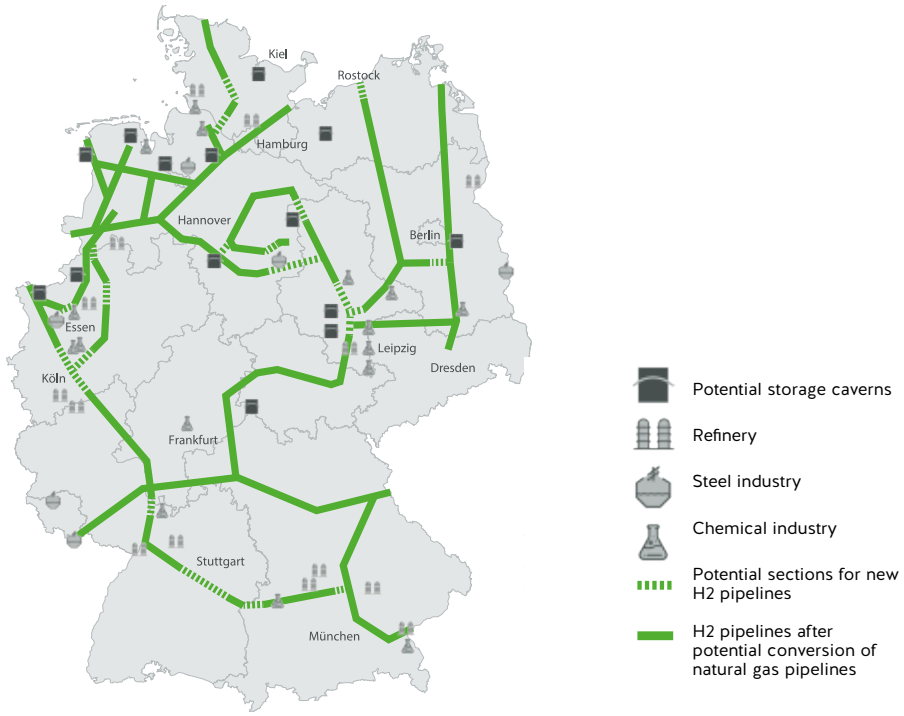
Source: Transmission system operators, reporting date: 1 March 2020

10 Outlook on upcoming network development plans

Visionary hydrogen network

Against the background of the increasing interest in hydrogen in a variety of sectors, especially in industry, the transmission system operators developed a possible future vision for a trans-regional hydrogen network and published this in January this year. The pipelines of the visionary network connect regions where hydrogen is produced and regions where hydrogen is consumed by using natural gas infrastructure that is largely (over 90 %) already in place. It comprises a total length of around 5,900 km. Within the reach of the hydrogen network are gas storage caverns, industrial consumers, major metropolitan areas, 80 % of the German vehicle fleet and regions with large supplies of renewable energy sources for producing hydrogen as well as potential hydrogen import locations. The transmission system operators will continuously develop this visionary hydrogen network on the basis of new findings.

Figure 8: Vision for a hydrogen network



Disclaimer: This map is a schematic representation and thus has no claim to completeness regarding storage facilities and consumers.

Source: Transmission system operators

Integrated network planning

Against the background of the targets in energy and climate policy, sector coupling or the integrated consideration of sectors and their infrastructure is of central importance. The gas TSOs believe a joint energy infrastructure plan is required in order to guarantee a safe and reliable energy supply with electricity and gas networks and to secure the demand for transmission and transport capacity on a permanent basis.

Within the dena grid study III the gas transport system operators are included for the first time. Work is being conducted together with the electricity transmission system operators and other stakeholders on common input parameters and anchor points for the individual gas and electricity network planning. This furthermore involves enhancing the interfaces between the network planning processes. The gas TSOs will continue actively to accompany this process.