

The following member country profile is an excerpt from Chapter 4 of the publication Energy Supply Security 2014 and is not intended as a stand-alone publication.

CHAPTER 4: Emergency response systems of individual IEA countries

The ability of the International Energy Agency (IEA) to co-ordinate a swift and effective international response to an oil supply disruption stems from the strategic efforts of member countries to maintain a state of preparedness at the national level. Energy security is more than just oil, as the role of natural gas continues to increase in the energy balances of IEA countries. The most recently completed cycle of Emergency Response Reviews (ERRs) reflected this change by assessing, for the first time, the member countries' exposure to gas disruptions and their ability to respond to such crises. This chapter provides general profiles of the oil and natural gas infrastructure and emergency response mechanisms for 29 IEA member countries.

Each country profile is set out in the following sequence:

Key data

Key oil data, 1990-2018

Key natural gas data, 1990-2018

Total primary energy source (TPES) trend, 1973-2012

Infrastructure map

Country overview

OIL

Market features and key issues

Domestic oil production

Oil demand

Imports/exports and import dependency

Oil company operations

Oil supply infrastructure

Refining

Ports and pipelines

Storage capacity

Decision-making structure

Stocks

Stockholding structure

Crude or products

Location and availability

Monitoring and non-compliance

Stock drawdown and timeframe

Financing and fees

Other measures

Demand restraint

Fuel switching

Other

GAS

Market features and key issues

Gas production and reserves

Gas demand

Gas import dependency

Gas company operations

Gas supply infrastructure

Ports and pipelines

Storage

Emergency policy

Emergency response measures

Germany

Key data

Table 4.10.1 Key oil data

	1990	2000	2005	2010	2011	2012	2018*
Production (kb/d)	102.7	85.8	113.2	76.1	79.9	79.1	59.7
Demand (kb/d)	2 681.8	2 766.8	2 620.7	2 469.6	2 396.6	2 388.3	2 238.7
<i>Motor gasoline</i>	724.0	665.1	542.4	454.3	453.5	426.8	-
<i>Gas/diesel oil</i>	1 107.8	1 163.1	1 110.0	1 096.2	1 050.4	1 076.2	-
<i>Residual fuel oil</i>	212.9	168.1	175.8	147.5	142.8	134.2	-
<i>Others</i>	637.0	770.5	792.4	771.6	749.8	751.2	-
Net imports (kb/d)	2 579.1	2 681.0	2 507.5	2 393.5	2 316.7	2 309.2	2 179.0
Import dependency (%)	96.2	96.9	95.7	96.9	96.7	96.7	97
Refining capacity (kb/d)	1 507.0	2 275.3	2 323.2	2 465.7	2 465.7	2 465.7	-
Oil in TPES** (%)	35	37	34	32	33	33	-

* Forecast.

** TPES data for 2012 are estimates.

Table 4.10.2 Key natural gas data

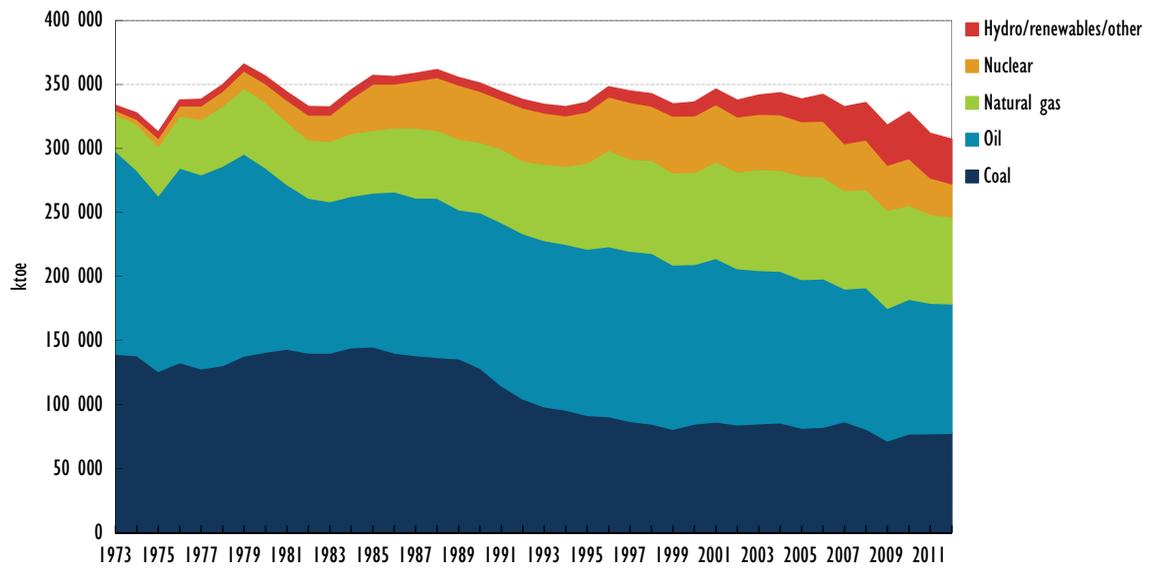
	1990	2000	2005	2010	2011	2012*	2018**
Production (mcm/y)	18 919	22 049	19 850	13 042	14 828	12 298	8 760
Demand (mcm/y)	69 723	87 728	98 193	90 040	81 546	87 201	82 374
<i>Transformation</i>	15 872	15 679	22 550	24 006	22 425	0	-
<i>Industry</i>	25 123	27 227	24 433	26 174	26 004	0	-
<i>Residential</i>	17 455	29 802	36 558	27 893	20 770	0	-
<i>Others</i>	11 273	15 020	14 652	11 967	12 347	0	-
Net imports (mcm/y)	50 804	65 679	78 343	76 998	66 718	74 903	73 614
Import dependency (%)	72.9	74.9	79.8	85.5	81.8	85.9	89
Natural gas in TPES (%)	16	21	24	22	22	22	-

* 2012 data are estimates.

** Forecast.

Note: This section on the emergency response systems of individual member countries was written by the IEA. All countries provided valuable information and comments. All opinions, errors and omissions are solely the responsibility of the IEA.

Figure 4.10.1 Total primary energy source (TPES) trend, 1973-2012



Map 4.10.1 Oil infrastructure of Germany



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Map 4.10.2 Gas infrastructure of Germany



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Country overview

Germany has very little domestic oil and natural gas production and relies heavily on imports. It has a diversified and flexible oil and natural gas supply infrastructure, which consists of crude, oil product and natural gas pipelines and crude and oil product import terminals. Natural gas is imported into Germany exclusively by cross-border pipeline. The country has no liquefied natural gas (LNG) infrastructure, although some German companies have booked capacities in overseas LNG terminals.

Oil continues to be the main source of energy in Germany although its share of the energy mix has declined markedly since the early 1970s. It now represents approximately 33% of Germany's total primary energy supply (TPES).

Natural gas demand in Germany has declined more than 11% since 2005. Demand was 87.2 billion cubic metres (bcm) in 2012, down from 90 bcm in 2010 and 98.2 bcm in 2005. According to government-commissioned analysis, the total consumption of natural gas in Germany is expected to continue to decline over the long term. The share of natural gas in Germany's TPES is currently around 22%.

Since 1998, the German oil stockholding agency (EBV) has been solely responsible for meeting Germany's 90-day stockholding obligation. Germany's Oil Stockholding Law (1978, amended in 1987 and 1998) stipulates that the EBV shall constantly maintain stocks of oil and petroleum products at a level equivalent to or above 90 days of net imports. There is no minimum stockholding obligation on industry, so industry-held commercial stocks are held in addition to the EBV stocks.

There are several legal tools available to German authorities for natural gas emergency response. These include ordinances that can be used to restrict the sale, purchase or use of goods, both in terms of quantity and time, or permit them only for certain priority purposes, to ensure that vital energy needs are met.

There are no compulsory natural gas storage requirements in Germany, and no state-owned storage facilities. Operators of gas storage facilities must grant other companies access to their storage facilities and auxiliary services at a fair market price. There are 50 gas storage facilities in Germany, with a total capacity of 22.7 bcm. German firms also have access to natural gas storage in Haidach, Austria which has a capacity of 2.6 bcm.

Oil

Market features and key issues

Domestic oil production

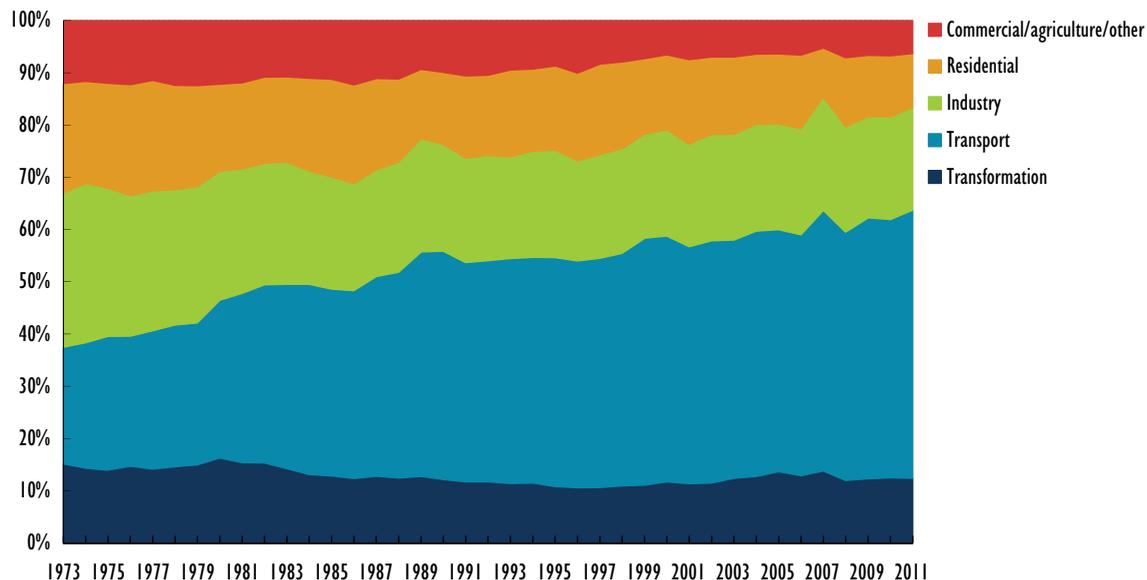
Oil remains the most significant (although declining) energy source in Germany, accounting for 33% of TPES in 2012, up slightly from 32% in 2010. However, Germany has very little domestic crude oil production – equivalent to just over 2% of oil demand – and the government expects that production will slowly decline in the foreseeable future. According to figures of the International Energy Agency (IEA), German crude oil production (excluding non-conventional oils) averaged 56 thousand barrels per day (kb/d) in 2012, up from 55 kb/d in 2011 and 49 kb/d in 2010.

Oil demand

In 2012, Germany's oil demand was 2.4 mb/d, down from 2.5 mb/d in 2010 – continuing a downward trend since 1998. The road transport sector is the largest consumer of oil

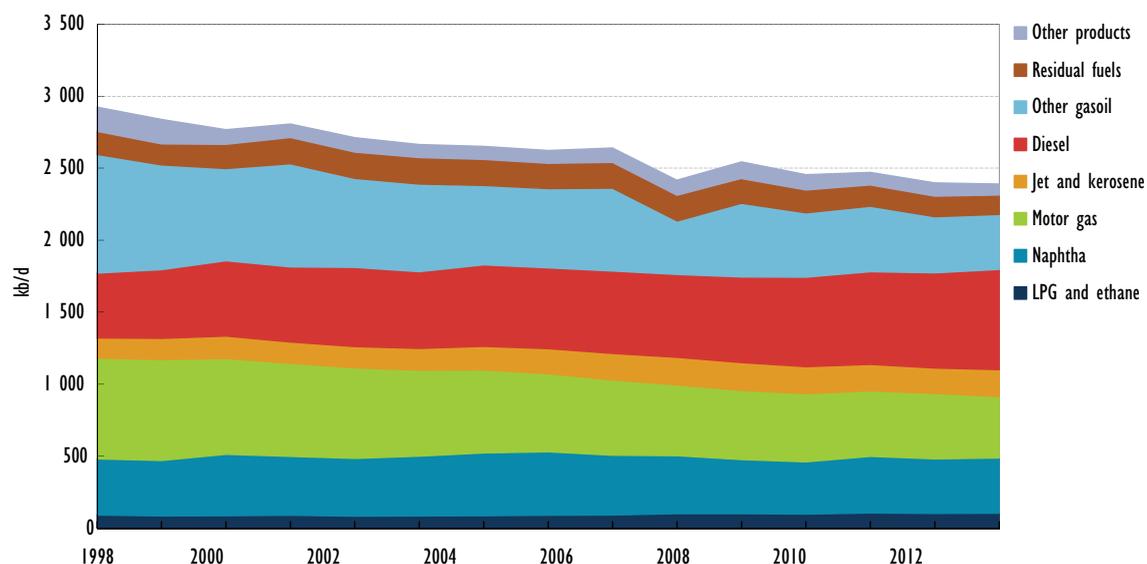
in Germany, consuming 51% of total oil supply in 2011, with diesel alone accounting for 29% of oil product demand in 2012 (up from 15% in 1997). Industry was a distant second at 20% of total oil product demand in 2011. Its share has been relatively constant over the past decade.

Figure 4.10.2 Oil consumption by sector, 1973–2011



The trend of decreasing oil consumption is expected to continue, with the Association of the German Petroleum Industry Association (MWV) forecasting a 14% decrease in oil consumption for the period from 2010 to 2025. Key factors influencing the demand outlook include the promotion of biofuels and alternative fuels, energy taxation levels and efficiency standards for buildings and cars.

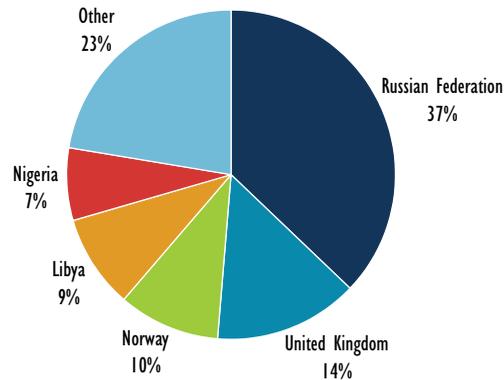
Figure 4.10.3 Oil demand by product, 1998–2012



Imports/exports and import dependency

Germany's total oil imports were 2.6 mb/d in 2012. Imports included 1.9 mb/d of crude oil and 713 kb/d of products (420 kb/d of which was middle distillates and motor gasoline). Germany also exported around 386 kb/d of crude and products in 2012. The country has relatively diversified crude import sources, with the Russian Federation accounting for 37% of imports, the United Kingdom for 14% and Norway and Libya for 10% and 9% respectively in 2012. Fully 54% of refined product imports came from the Netherlands, followed by 17% from Belgium and 8% from Russia.

Figure 4.10.4 Crude oil imports by origin, 2012



Oil company operations

Germany has a highly deregulated and competitive oil market. A large number of companies operate in the German oil sector, including a large number of independents in the refining and retail sectors. The German government does not have an ownership stake in any of the companies operating in the oil sector.

Oil supply infrastructure

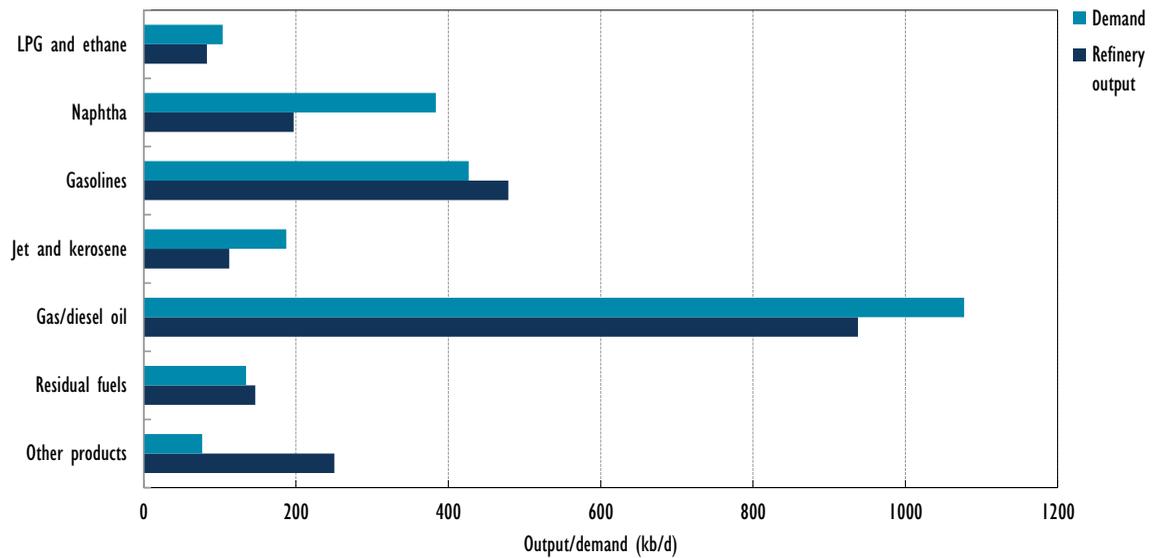
Refining

Germany has one of the largest refining capacities in Europe and is among the largest oil refiners in the world. As of the end of 2012 Germany had 13 refineries with a total crude oil atmospheric distillation capacity of 2.1 mb/d – or 104.4 million tonnes per year (Mt/y) – according to government figures.

German refining capacity has undergone some rationalisation in recent years. This is driven partly by changing local market conditions that have resulted in a decline in demand for gasoline and domestic heating oil. High crude oil prices and the changing structure of global refining have also increased pressure on refining margins.

One significant development in the rationalisation of German refining capacity was the decommissioning of the ConocoPhillips-owned Wilhelmshaven refinery at the end of 2010. With a capacity of 272 kb/d (13.5 mt/y), the refinery was the second largest in Germany at the time and chiefly produced for export. The site remains in use for storage of refined products.

Figure 4.10.5 Refinery output vs. demand, 2012



Although total German refinery output is only slightly lower than domestic oil product demand, there are a number of imbalances which require significant imports of some products and the export of others. For example, Germany has been a net importer of diesel since 2010, and in 2012 had a 139 kb/d gas/diesel oil deficit and an overall middle distillates deficit of 230 kb/d. Conversely, the industry had a gasoline production surplus of 80 kb/d in 2012 and has been a net exporter of gasoline fuels and gasoline components since 2004. Germany's net product imports stood at 330 kb/d in 2012.

Demand for diesel increased by 30.9% between 2003 and 2012 while demand for gasoline dropped by nearly 29% during the same period.

Ports and pipelines

Crude oil is imported into Germany through four cross-border pipelines and four main sea ports.

The four cross-border pipelines – which transport oil from Russia, the Netherlands, France and Italy – had a combined throughput in 2012 of 1 294 kb/d (64.1 Mt).

With regard to Germany's oil ports, three are located on the North Sea (Wilhelmshaven, Brunsbüttel and Hamburg), and one other (Rostock) is on the Baltic Sea. The most important oil port for Germany is Wilhelmshaven which has three unloading facilities – two with a maximum capacity of 12 000 m³ per hour and one with a maximum capacity of 16 000 m³ per hour.

After unloading, the oil is processed in refineries near these ports or by inland refineries connected to the ports by pipelines. Four domestic pipelines (with a combined throughput of 484 kb/d (24 Mt) in 2012) connect Wilhelmshaven, Brunsbüttel and Rostock to several refineries.

All the crude oil pipelines are privately owned and operated by oil companies.

Refined oil products are also imported into Germany through four sea ports (one in Bremen plus three of those also used for crude imports) and one product pipeline. The product pipeline runs from Rotterdam and has an annual import capacity of approximately 261 kb/d (12.8 Mt).

Germany also has four cargo ports with infrastructure for product imports. One of these, Bremen, is used solely for product imports. There are also a number of storage sites with anchoring berths in German coastal and riverside towns.

Storage capacity

Germany has an oil tank storage capacity of around 414 mb (65.9 mcm), 173.5 mb (27.6 mcm) of which is stored in caverns (as of the end of 2012).

EBV owns four cavern facilities consisting of 58 caverns in total and, additionally, holds contracts for storing in third-party caverns. The agency also has stored stocks in about 130 above-ground storage facilities.

Looking at the breakdown between crude and product, nearly half of current storage capacity is for crude and the rest is for intermediate and finished products. Refineries account for around one-third of total capacity, in addition to numerous other companies active on the market that collectively account for the other two-thirds of the country's oil storage capacity.

Decision-making structure

The Federal Ministry for Economic Affairs and Energy (BMWi) has the lead responsibility within the federal government for contingency planning and emergency measures. The Ministry's Director-General for Energy Policy is the German delegate to the IEA Governing Board. Decisions on the release of stocks from the German Stockholding Agency (EBV) are prepared in the department of the Director-General for Energy Policy and are taken up by the federal minister of the BMWi. Depending on the nature, cause, severity and history of an emergency, the federal chancellor and other selected ministries (e.g. the Federal Foreign Office, the Federal Transport Ministry) may also be consulted before the decision is taken to release stock. A maximum of 24 hours is required for this decision-making process during an IEA collective action.

The actual release of emergency stocks is authorised under the Oil Stockholding Act by means of an ordinance issued by BMWi. BMWi has a model text for a release ordinance available for immediate use. In the future, release ordinances will be published in the online *Federal Gazette*; it will only take three working days from a release decision until the entry into force of the release ordinance – and therefore until stocks can be made available to industry.

When stocks are released, the BMWi activates its national emergency strategy organisation (NESO) and consults the NESO's Crisis Supply Council (KVR) on issues of implementation, such as the breakdown between crude oil and the individual products of the quantity of supply released. The German NESO is based on close co-operation between the government, the stockholding agency, the EBV and industry for the purposes of crisis management. Key players include the BMWi, the Federal Office of Economics and Export Control (BAFA), EBV and the NESO's Supply Co-ordination Group (KGV), which is made up of supply experts from the oil industry and trade enterprises.

In the absence of a crisis the NESO office may co-ordinate regular emergency response exercises with the participation of BMWi, BAFA, EBV and KGV. Both national and international supply disruption scenarios are considered.

Stocks

Stockholding structure

The majority of Germany's stocks are held by the EBV. Since 1998, EBV has had sole responsibility for fulfilling Germany's 90-day stockholding obligation. The Oil Stockholding Act 2012 stipulates that EBV shall constantly maintain stocks of oil and petroleum products at a level which corresponds to a minimum of 90 days of net imports. The remainder of the stocks held in Germany are commercial stocks. There is no statutory obligation on industry to hold stocks for emergency purposes, so industry stocks are held solely for commercial purposes.

Crude or products

The different types of stocks held by EBV are: crude oil, gasoline, diesel fuel, light heating oil and kerosene-type jet fuel. The majority of above-ground EBV stocks are stored commingled with commercial stocks, while the storage of the agency's belowground stocks is segregated. The caverns mainly contain crude, and the above-ground facilities mainly contain product.

Location and availability

Germany has a convention of regionalisation in conjunction with the 90-day stockholding obligation. To meet this so-called regionalisation rule, the EBV holds stocks of finished products in each of Germany's five supply regions to ensure that it is capable of meeting a minimum of 15 days' demand for each region if required. The rationale for this is to prevent logistical bottlenecks which could occur if all emergency stocks were stored centrally.

All EBV stocks are fully available at all times.

Monitoring and non-compliance

BAFA monitors the fulfilment of the stockholding obligation. Here, the Oil Stockholding Act stipulates that the EBV must regularly provide the BAFA with the necessary data on stocks and must provide other information as required.

The EBV reports to BAFA on a monthly basis in the form of a standardised oil questionnaire detailing its purchases and sales, the stocks it owns, and delegations. BAFA also has the right to demand additional information and documentation from the EBV in order to monitor compliance with the stockholding obligation. Administrative offences may be punished with a monetary fine of up to EUR 20 000.

Stock drawdown and timeframe

The Oil Stockholding Act stipulates that it must be possible to release all EBV stocks for consumption within 90 days in the case of petroleum products and components, and within 150 days in the case of crude.

Financing and fees

The operations of the EBV are fully funded by contributions from its members. The members of the EBV are those companies that import products subject to stockholding obligations into Germany or manufacture them in Germany. The products subject to this obligation (as of 1 April 2012) are: gasoline, diesel fuel, light heating oil and kerosene-type jet fuel.

Other measures

Demand restraint

Germany has both light-handed and heavy-handed demand restraint measures that it can deploy in an emergency.

The legal basis for demand restraint measures and for various other interventions in the oil market is the Energy Security of Supply Act 1975. A declaration by the federal government that the energy supply is endangered or has been disrupted is normally required before demand restraint measures can be implemented. To ensure that demand restraint measures can be implemented as quickly as possible if needed, a draft ordinance establishing a danger or disruption to Germany's energy supply has been prepared in advance. However, if the measures are being implemented to meet Germany's obligations under the International Energy Program (IEP), a government declaration is not required.

Intervention on the basis of the Energy Security of Supply Act must be proportionate to the disruption to supply, and be as light-handed as possible. Besides demand restraint measures such as speed limits, driving bans, etc., statutory ordinances could be enacted with rules on production, transport, storage, distribution, use and maximum prices of oil and oil products. However, Germany has a preference for stock releases before using demand restraint measures.

Fuel switching

Fuel switching also has limited application in Germany. In the case of electricity, only 1.3% of gross electricity generation was based on oil products in 2012 according to government figures.

In the case of the transport sector, almost all the sector's energy requirements are met using gasoline and diesel fuel. In principle, there is some limited potential for substituting fossil diesel with biodiesel in the short term. The production capacity of Germany's biodiesel manufacturers is roughly 4.9 Mt per year, which is well above current domestic consumption of 2.48 Mt per year.

Overall, Germany has only very limited possibilities for reducing oil consumption in the short term by fuel switching. Consequently, no legislation or policies are in place to promote short-term fuel switching in place at this time.

Other

No other emergency measures exist beyond those discussed.

Gas

Market features and key issues

Gas production and reserves

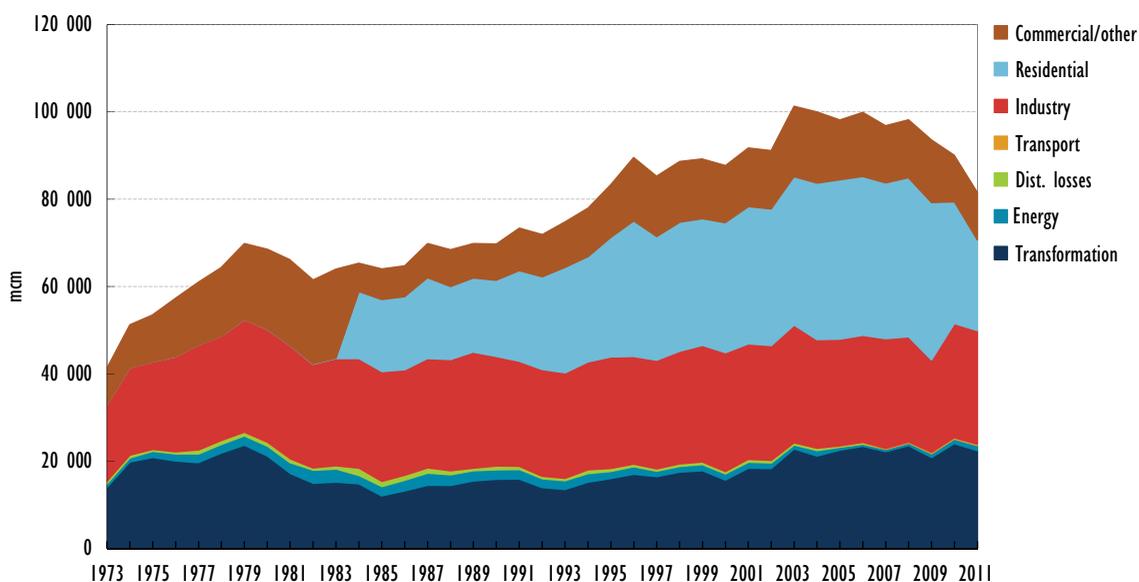
According to IEA figures, the country's natural gas production in 2012 was 12.3 bcm, down from around 13 bcm in 2010 and 19.85 bcm in 2005.

According to government estimates, domestic production is expected to decline by an average of 5% per year in the coming years. However, this does not take into account possible unconventional natural gas production in the future. The legal basis for the extraction of conventional and unconventional gas is the Federal Mining Act. There are no state incentives for any form of natural gas production.

Gas demand

Natural gas demand in Germany has declined by more than 11% since 2005. Demand was 87.2 bcm in 2012, up from 81.5 bcm in 2011 but down from 90 bcm in 2010 and 98.2 bcm in 2005. In 2011 the industry sector represented about 32% of total gas consumption, while the transformation and residential sectors represented 28% and 25% respectively. Significantly for energy security considerations, natural gas demand in the winter months is up to three times higher than in summer.

Figure 4.10.6 Natural gas consumption by sector, 1973–2011

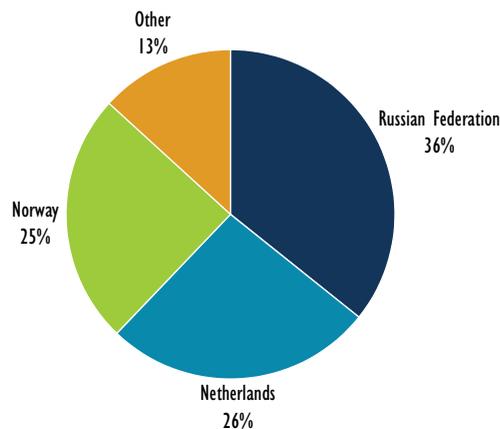


According to government-commissioned analysis, the total consumption of natural gas in Germany is expected to continue to decline over the long term. However, conversely, the share of natural gas in Germany's TPES is expected to rise in the medium term (to 24% by 2025). The projected decline in total natural gas consumption is largely thanks to energy efficiency improvements and savings in various areas such as district heating. The government expects this decline to cancel out a likely increase in natural gas use for electricity generation.

Gas import dependency

The share of natural gas in the country's TPES was 22% in 2012, the same share as in 2011 and 2010 but down from 24% in 2005. Approximately 86% of Germany's natural gas demand is met through imports. Only 14% is produced domestically and domestic production has declined continuously in recent years.

Figure 4.10.7 Natural gas imports by source, 2012



Germany's natural gas imports are geographically relatively diversified. In 2012 the biggest import source was Russia, which supplied 36% of natural gas imports, next was the Netherlands with 26% and Norway with 25%. Germany has no LNG infrastructure, so all the country's natural gas imports are supplied through a number of cross-border pipelines. However, some German companies have booked capacity in overseas LNG terminals, e.g. E.ON Ruhrgas has contracted 3 bcm a year in Rotterdam, the Netherlands.

The government expects that LNG will become an increasingly important source of natural gas for Europe in the future, so it considers access to LNG terminals to be important. For this reason it also encourages German companies to purchase regasification capacity in LNG terminals in neighbouring countries, and to buy LNG volumes from new suppliers. E.ON Ruhrgas had plans to build an LNG terminal in Germany but there was insufficient long-term interest for it to be commercially viable. However, there is a permitted site for an LNG terminal in Germany so it remains a possibility for the future.

Because of its comprehensive cross-border pipeline infrastructure and its central location within Europe, Germany is becoming an important natural gas transit hub, with significant amounts of natural gas from Russia and Norway transiting the country for delivery to other markets. Over the past five years the country has improved its gas market by implementing an entry/exit system in compliance with European Union regulations, reducing the number of market areas to two, and substantially improving competition and price formation in the markets – making the market more liquid.

Gas company operations

The natural gas industry in Germany consists of a production tier, three main market or trading tiers, transport system operators and natural gas storage companies.

Gas supply infrastructure

Ports and pipelines

Natural gas is imported into Germany exclusively by cross-border pipelines. There are a large number of these pipelines, bringing gas from Norway, Russia, the Netherlands, and to a lesser extent from Denmark and the United Kingdom.

Natural gas deliveries from Norway reach Germany via three pipelines – Norpipe, Europipe I and Europipe II – with a total combined capacity of 54 bcm. Gas deliveries from Russia reach Germany via three pipeline networks – Nord Stream (since November 2011) with an initial capacity of 55 bcm, Yamal with a 33 bcm capacity, and the Ukraine pipeline system with a total capacity of 120 bcm. Some of the gas from both Norway and Russia transits Germany to other countries in Europe.

Natural gas (L-Gas) from the Netherlands is also transported to Germany via four main pipelines (or interconnection points).

With regard to the domestic pipeline network, there are 14 TSOs in Germany. The largest of these is Open Grid Europe which has a 12 000 km pipeline network, followed by ONTRAS, the second largest TSO, with 7 200 km.

Storage

Germany has 50 gas storage facilities with a total capacity of 22.7 bcm. All the gas is stored in caverns or in porous rock storage facilities and there is potential for further expansion thanks to a favourable geological situation. Germany's natural gas storage facilities are owned by numerous private companies (E.ON Gas Storage is the largest), and are well dispersed geographically. In addition to this storage capacity, German firms also have access to natural gas storage in Haidach, Austria which has a capacity of 2.6 bcm.

More cavern storage facilities are in the planning stage or under construction (with a total additional volume of around 8.2 bcm). A porous rock storage facility owned by Storengy is also being planned in Behringen, with storage volume of 2.3 bcm and a working gas capacity of 1 bcm.

There are no compulsory natural gas storage requirements in Germany and no state-owned storage facilities. Operators of gas storage facilities must grant other companies access to their storage facilities and auxiliary services at a fair market price.

Emergency policy

There are no compulsory natural gas storage requirements in Germany, and no state-owned storage facilities. All natural gas stocks in Germany are held by private companies for commercial reasons.

In an emergency, the federal government has the responsibility for triggering Germany's natural gas emergency response measures by declaring a state of emergency. The lead agency for natural gas security is the Ministry of Economics and Technology (BMW). BMW is responsible for natural gas legislation and for emergency response co-ordination at the national and EU level. The regulatory authority, with responsibility for implementation of non-market-based emergency response measures during a natural gas supply emergency, is the Federal Network Agency.

Natural gas emergency policy at the regional level also involves the *Länder* (regional governments) and municipal energy suppliers. The *Länder* have responsibility for implementing some aspects of non-market-based emergency measures in conjunction with the Federal Network Agency.

In the event of a natural gas emergency, certain groups of customers are protected from interruption to their natural gas supplies. These protected customers represent 50% to 60% of demand. Protected customers are defined as households and district heating installations delivering heating to households.

Another important development with regard to gas emergency policy in Germany has been the implementation of EU Regulation 994/2010.

Emergency response measures

As stated above, the Energy Security of Supply Act permits the enactment of ordinances to restrict the sale, purchase or use of goods (i.e. demand restraint), both in terms of quantity and time, or permit them only for certain priority purposes.

Fuel-switching capacities are not included in German security of supply policy measures. Although some generators and larger industrial customers are equipped with fuel-switching facilities, only limited information is available on the overall volumetric potential of substitution effects in the case of an emergency. There are no regulations in place promoting, restricting or monitoring fuel-switching capabilities. The government expects companies to assume individual responsibility for backup solutions where necessary and possible in order to obtain a higher level of security of supply for their plant.

Companies equipped with fuel-switching capability would consider utilising this capacity in the case of a gas supply emergency. There are no restrictions to switching from natural gas to other fuels.

Interruptible contracts are concluded with industrial clients, especially with those who have fuel-switching capacity. In terms of the quantity of gas sold, a maximum of approximately 10% to 20% of contracts with clients are interruptible contracts. There are no government policies to encourage the uptake of interruptible contracts.

There are no other gas emergency policies in place, such as encouraging the ability to surge natural gas production.