

2012

OIL & GAS SECURITY

Emergency Response of IEA Countries

FRANCE

Key Figures	2
Overview	3
1. Energy Outlook	4
2. Oil	5
2.1 Market Features and Key Issues	5
2.2 Oil Supply Infrastructure	7
2.3 Decision-making Structure for Oil Emergencies	9
2.4 Stocks	10
3. Other Measures	14
3.1 Demand Restraint	14
3.2 Fuel Switching	15
3.3 Others	15
4. Natural Gas	16
4.1 Market Features and Key Issues	16
4.2 Natural gas supply infrastructure	18
4.3 Emergency Policy for Natural Gas	21

List of Figures

Total Primary Energy Supply	4
Electricity Generation, by Fuel Source	4
Crude Oil Imports by Source	5
Oil Consumption, by Product	6
Oil Demand in 2011 (kb/d)	5
Refinery Output vs. Demand	7
Oil Storage Capacity in France, by type	9
Total Emergency Reserves, by location	12
Oil Consumption by Sector	15
Natural Gas Consumption, by Sector	16
Natural Gas Imports, by Source	17
The Natural Gas Grid	20
Natural Gas Storage Capacity	20



International
Energy Agency

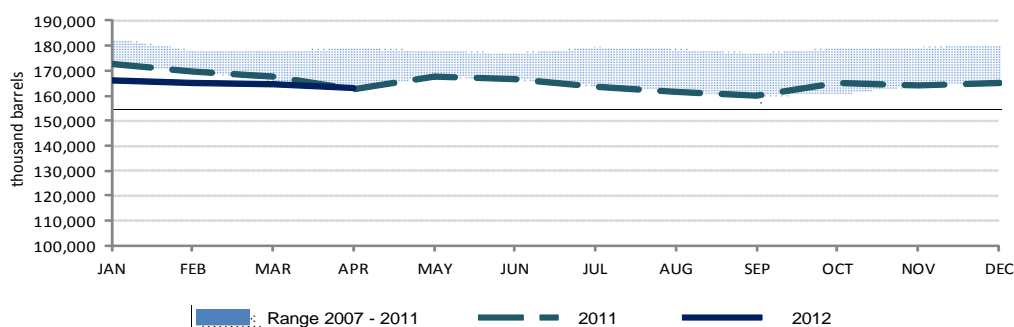
KEY FIGURES

France

Key Oil Data

	1985	1990	1995	2000	2005	2009	2010	2011
Production (kb/d)	69.1	71.4	61.4	43.6	35.9	26.4	30.5	30.5
Demand (kb/d)	1 753.2	1 826.0	1 919.9	1 999.6	1 990.9	1 868.4	1 831.5	1 791.5
<i>Motor gasoline</i>	387.9	393.2	362.9	318.4	250.7	199.2	184.9	180.6
<i>Gas/diesel oil</i>	688.6	737.0	845.0	923.1	1 000.1	984.6	983.4	965.5
<i>Residual fuel oil</i>	197.9	174.1	151.8	136.4	118.1	98.4	92.0	82.9
<i>Others</i>	478.7	521.7	560.3	621.7	622.0	586.1	571.2	562.4
Net imports (kb/d)	1 684.1	1 754.6	1 858.5	1 956.0	1 955.0	1 842.0	1 801.0	1 761.0
Import dependency	96.1%	96.1%	96.8%	97.8%	98.2%	98.6%	98.3%	98.3%
Refining capacity (kb/d)	2 386	1 820	1 768	1 902	1 951	1 986	1 997	1 997
Oil in TPES	39.6%	36.8%	33.4%	31.8%	31.2%	30.9%	28.9%	-

End-Month Total Oil Stock Levels¹ - Five Year Range

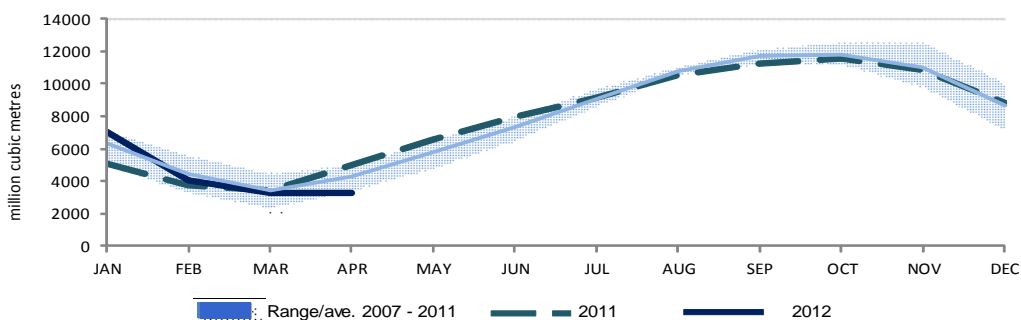


Key Natural Gas Data

	1985	1990	1995	2000	2005	2009	2010	2011 *
Production (mcm/y)	5 729	2 857	3 353	1 878	1 149	911	777	587
Demand (mcm/y)	31 430	28 232	33 491	39 753	47 170	44 557	49 127	41 519
<i>Transformation</i>	689	500	639	3 333	6 307	6 606	8 684	-
<i>Industry</i>	13 852	12 699	14 395	16 292	13 297	10 782	12 035	-
<i>Residential</i>	8 665	7 540	9 088	19 079	16 685	16 444	16 013	-
<i>Others</i>	8 224	7 493	9 369	1 049	10 881	10 725	12 395	-
Net imports (mcm/y)	25 701	25 375	30 138	37 875	46 021	43 646	48 350	40 932
Import dependency	81.8%	89.9%	90.0%	95.3%	97.6%	98.0%	98.4%	98.6%
Natural Gas in TPES	11.9%	11.4%	12.2%	13.9%	14.9%	15.0%	16.1%	-

* based on monthly data submissions to the IEA.

End-Month Natural Gas Stock Levels² - Five Year Range



1 -Primary oil stocks on national territory; these exclude utility stocks and including pipeline and entrepot stocks where known.

2 -Stocks held on national territory, as reported to the IEA in monthly data submissions.

OVERVIEW

France has very little domestic oil and natural gas production and relies heavily on imports. It has well diversified import sources for both oil and gas, which is supplied by crude, product and gas pipelines and by crude, product and LNG port terminals.

Oil represents just over 29 percent of the total primary energy supply (TPES) and has declined slightly in recent years.

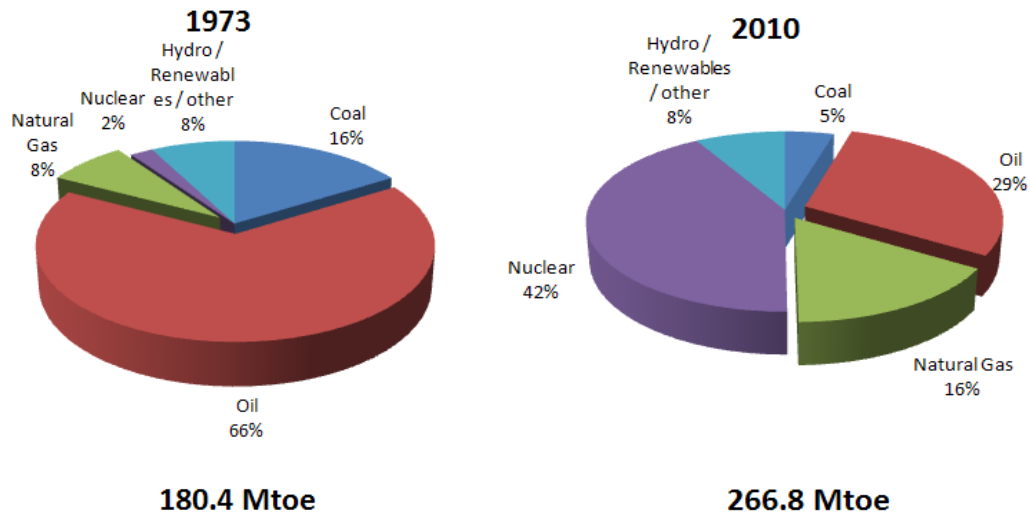
The share of natural gas in the country's TPES is relatively stable at 16 percent and demand is expected to remain relatively flat until 2020. Gas demand in the residential sector is likely to decrease while gas demand for electricity generation and in the industry sector is expected to grow.

The use of industry held stocks (by lowering industry stockholding obligations) is central to France's emergency response policy for both oil and gas.

1. Energy Outlook

Total Primary Energy Supply (TPES) in France stood at 266.8 Mtoe in 2010, up 3.25% from 2009 but still more than 3% lower than the 2005 TPES of 275.8 Mtoe. France's TPES has declined significantly since its peak in 2005, although much of the recent decline may be attributable to the 2007-2008 economic crisis.

Total Primary Energy Supply

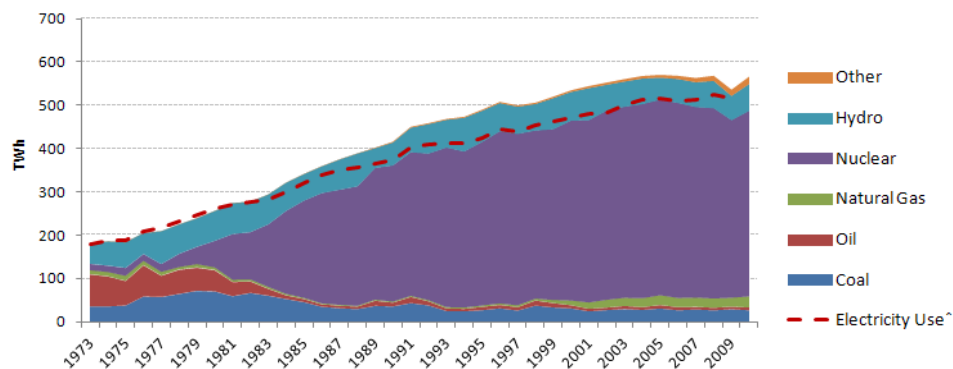


(Data excludes energy trade)

Source: Energy Balances of OECD Countries, IEA

Oil's share in the country's TPES has declined markedly since the early 1970s, from 66% in 1973 to just 29% in 2010. Coal also declined from 16% of TPES to 5% during the same period. Oil and coal have been replaced by nuclear energy which increased from a negligible 2% in 1973 to 42% of TPES in 2010, and natural gas which has gone from 8% to 16% of TPES.

Electricity Generation, by Fuel Source



Source: Energy Balances of OECD Countries, IEA

2. Oil

2.1 Market Features and Key Issues

Oil Reserves and Domestic Production

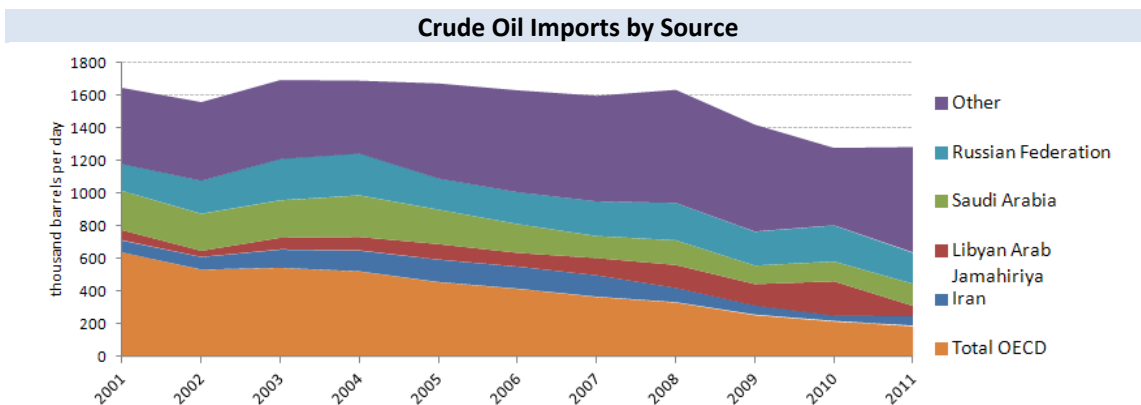
Oil remains a significant although declining energy source in France, accounting for 29% of TPES in 2010, down from just over 31% in 2009. However, France has very little domestic oil production – equivalent to only 1-2% of oil imports and declining steadily. Total oil production averaged 33 kb/d in 2010.

Imports/exports and import dependency

France's net oil imports were 2,116 kb/d in 2010 (approximately 98% of domestic oil consumption), consisting of 1,297 kb/d of crude oil and 500 kb/d of middle distillates (414 kb/d of which is gas/diesel oil). France has relatively well diversified crude import sources, with a range of OPEC countries (notably Libya and Saudi Arabia) accounting for around 43% of imports, and countries from the former USSR accounting for a further 32%. With regard to products, nearly 50% of refined product imports came from OECD countries (85% of this from Europe), with another 30% from the former USSR.

Crude oil is imported into France through three main sea ports (at Marseille, Le Havre and Saint-Nazaire). More than 73 Mt of crude oil was unloaded at these ports in 2010, 50% at the port of Le Havre and 40% at Marseilles. After unloading, the oil is processed in refineries near these ports or by inland refineries connected to the ports by pipelines, except for some oil which transits France via pipeline to Switzerland and Germany.

Finished refined oil products are imported into France through seven sea ports, including the three used for crude oil imports. Four of these sea ports are also used to export refined product.



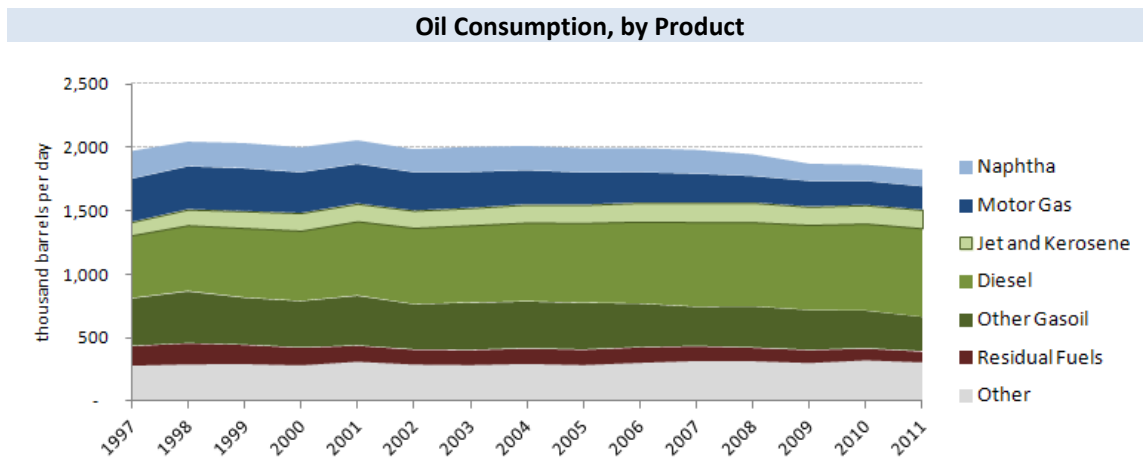
Source: Monthly Oil Statistics, IEA

Oil Demand

In 2010, France's oil demand was 1,861 kb/d, down from 1,870 kb/d in 2009. French oil demand has been trending downwards since 1999 but the rate of decrease has accelerated since 2008. Transport consumed 55% of total oil supply in 2009, with diesel alone accounting for 37% of oil product demand (up from 24% in 1996). Industry was a distant second at 19% of total oil product demand in 2009. Its share has been relatively constant over the past decade.

Oil Demand in 2011 (kb/d)	
LPG and Ethane	139
Naphtha	131
Gasoline	181
Kerosene	150
Diesel	699
Heating/other Gasoil	273
Residual Fuels	83
Other Products	170
Total Products	1,825
Source: IEA Monthly Oil Statistics	

The decreasing trend of oil consumption is likely to continue, with the French Administration forecasting a 20% decrease in demand for the period 2005-2020.



Source: Monthly Oil Statistics, IEA

Taxes and maximum price mechanism

The oil products market is fully liberalised. Wholesale and retail prices are mainly influenced by the relevant quotation prices and exchange rates, which are driven by global market fundamentals and expectations. Government influence is mainly limited to determining the level of excise duty and other taxes, and in the case of motor fuels the biofuels blending obligation.

The tax difference between gasoline and diesel in France is EUR 17.2 euro cents per litre. The “bonus malus” scheme also favours diesel vehicles as it focuses solely on CO₂ emissions which are lower from diesel engines. Automotive diesel taxes put France in the lower half of the range of OECD countries, while taxes on gasoline put France in the upper half.

Oil Company Operations

Total is the main oil company in France. It is a French multinational oil company, one of the six largest publicly owned oil and gas companies in the world. Total operates in all aspects of both the upstream and downstream sectors including oil and gas exploration, refining, petroleum product retailing, international crude oil and product trading, and chemicals manufacturing. Total operates five out of the eight refineries currently operating in continental France. Another two refineries are operated by Esso, and one by Ineos/Petrochina. One refinery operated by Petroplus and one by Lyondell Basell are currently stopped but (as of 1 May 2012) not yet closed.

The French motor fuel market is very competitive. There were 12,158 filling stations in France in 2009, with 7,298 owned by oil companies and other independent brands, and 4,860 (more than one third) owned by supermarkets/hypermarkets.

The total number of filling stations has declined over the past three decades, with numbers dropping from 40,400 in 1980 to 15,600 in 2000, and a further decline to 12,158 in 2009 – a decline of 22% since 2000. During this same period (2000-2009) the number of petrol stations owned by hypermarkets has increased from 4,362 to 4,860, a gain of 11.4%. The decrease in the number of filling stations is the result of competition from supermarkets/hypermarkets, an overall decline in consumption, and regulation mandating the upgrading of facilities. The trend towards the closure of filling stations is likely to continue but the rate of decline is decreasing.

2.2 Oil Supply Infrastructure

Refining

France had eleven refineries in operation in 2011, ten in continental France and one (the smallest) on Martinique Island in the French Caribbean. Total French refining capacity was 82.3 Mt (81.5 Mt in continental France). Due to a significant reduction in French refining capacity (-15.3 Mt/y) in 2010/11, refining capacity in 2011 was down significantly from previous years where it had been relatively stable at around 98 Mt/y (2010 refining capacity was 97.6 Mt/y). In 2012, two additional refineries have been stopped and will further reduce French refining capacity to 68.7 Mt/y.

The largest refinery operator in continental France is Total with five refineries with total refining capacity in 2011 of 41.2 Mt. The next largest operator is Esso with two refineries with a total refining capacity in 2011 of 16.9 Mt. The other refinery operator is Ineos/Petrochina with one refinery and a 2011 refining capacity of 9.8 Mt. Two other refinery operators – Lyondell-Basell and Petroplus – had a refining capacity in 2011 of 6.3 Mt and 7.3 Mt respectively, but both operators mothballed their refineries (one each) in late 2011/early 2012.

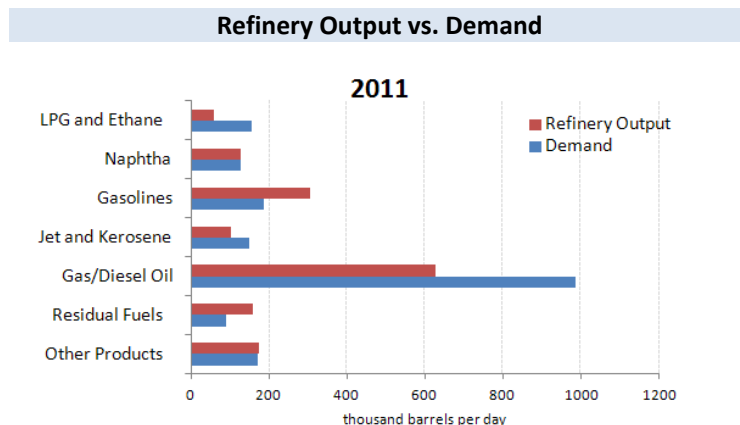
Lyondell-Basell announced the decision to close its Berre refinery on 26 September 2011 and ceased operations in January 2012.

Petroplus announced that it had “idled” its Petit Couronne refinery (and two other refineries in Belgium and Switzerland) in December 2011 after lenders froze the credit lines the company needs to pay for crude oil. On 20 January 2012 the company announced its intention

to sell the refinery within the next four months and on 25 January 2012 *Petroplus Raffinage Petit-Couronne SAS*, which owns the Petit Couronne refinery, went to court to file for rehabilitation proceedings (“redressement judiciaire”). The court appointed *FHB Administrateurs Judiciaires* as administrator for a number of Petroplus assets including the Petit-Couronne refinery. The French government has said it wants to help save the refinery from closure and has offered to help Petroplus to find a buyer.

The mothballing of Lyondell-Basell’s Berre refinery (which stayed on the market for sale for 2012) and Petroplus’ Petit Couronne refinery (also on the market until at least April 2012) illustrates the difficult business environment where lower profits from processing crude oil into fuels have forced refiners to cut costs and shut plants across Europe. In France the closure of the Berre and Petit Couronne refineries were the third and fourth refinery closures in the past two years where, in addition to the Berre and Petit Couronne refineries, Petroplus closed its Reichstett refinery in Bas-Rhin and Total closed its Flandres refinery at Dunkirk, bringing continental France’s number of operating refineries from twelve down to eight in 2010-2012.

Total also reduced the capacity of its Normandie refinery from 16.3 Mt/year in 2010 to 11.6 Mt/year (-4.7 Mt/year) in 2011 by shutting down an atmospheric distillation unit. However, the company made a commitment in March 2010 not to close nor sell any more of its French refineries over the next five years (beyond the Flandres refinery closure).



Source: Monthly Oil Statistics, IEA

Planned investments in expanding or upgrading refinery capacity in France from 2011-2015 are limited. Total plans to invest EUR740m in its Normandie refinery from 2010-2014 to reduce atmospheric distillation capacity from 16.3 Mt/year to 11.6 Mt/year, to shut down gasoline production units (catalytic cracking), to increase the processing capacity of the distillate hydrocracking unit (the 2.4 Mt/y hydrocracking unit has been operating since 2006), and to build a new hydrodesulfurization unit. Other recent investments included Esso's investment of EUR 35 million in its Port-Jérôme-Gravenchon refinery from 2010-2011 to upgrade diesel production through the construction of a diesel hydrofiner unit.

Ports and Pipelines

Since the closure of Total's Dunkerque refinery, crude oil is imported into France through three main sea ports. The oil is either processed in refineries near these ports, or by inland refineries connected to the ports by pipelines. Traffic on the whole decreased drastically (-20%) between 2006 and 2010 due to a drop in net imports from 82 Mt to 65 Mt per year. The total amount of crude oil unloaded at French ports in 2010 was 73.1 Mt, some of which transited France via pipeline to Switzerland and Germany.

There are two major crude oil pipelines in France. The first of these is the South European Pipeline System (SPSE) from Fos (Marseille) to Karlsruhe (Germany) via Lyon. The SPSE has a maximum authorised flow of 70 Mt/y, but only utilised 21% of this capacity in 2010. It supplies refineries in France (Feyzin), Switzerland (Cressier) and Germany (Miro). This pipeline is declining economically, with its utilisation rate down 30% since 2000 - only 15 Mt of crude oil transited the SPSE in 2010.

The economic efficiency of the SPSE has been weakened by the closure of refineries (like Reichstett in 2010 and recently Cressier), declining EU oil consumption, and competition with the Transalpine (TAL) pipeline in Germany. The Review Team noted questions about the long-term viability of this pipeline (especially the Lyon – Karlsruhe section) and encouraged the Administration to closely monitor developments and assess the impacts of a closure of part of this pipeline.

The other major crude oil pipeline in France is the Le Havre to Grandpuits (PLIF) pipeline, with a maximum authorised flow of 11.5 Mt/y and an utilisation rate of 34%.

There are four major product pipelines in France:

- The most important product pipeline is the Le Havre to Paris (LHP) as it is the only one that supplies Paris and the Paris airports. It has a maximum authorised flow of 25 Mt/y.
- Donges-Melun-Metz (DMM), with a maximum authorised capacity of 3.2 Mt/y supplies the east of France from the port of St Nazaire.
- Fos-Lyon-Geneve (PMR) with a maximum authorised capacity of 19.2 Mt/y links Fos-sur-Mer to Lyon and supplies Geneva.
- Lavéra-Wantzenau, Dunkerque-Vatry (ODC) is the French section of the NATO Central European Pipeline System, with a maximum authorised capacity of 30 Mt/y.

The key development since 2006 is the new PSM pipeline between Manosque and the Etang-de-Berre to double the drawdown capacity for crude oil and refined product stored in the salt caverns. The maximum drawdown capacity of the new pipeline is 320 kb/d - complementing the original pipeline that has a capacity of about 300 kb/d. About 6.2 mcm of crude oil and refined oil products are stored at the Manosque site.

Storage capacity

French oil storage capacity has been in decline in recent years, with approximately 100 oil depots closed since 2001 due to factors such as urbanisation, increased competition driving cost reduction, and the regulation of industrial risks. In terms of the number of oil product depots eligible for strategic stockholding, the number has dropped from 235 to 203 sites since 2006, a decline of 13.6%. The general storage practices for emergency stocks are both segregated and co-mingled.

Oil Storage Capacity

	Maximum storage capacities (M.m3)		Public stocks (M.m3)	
	Public	Industry	Crude oil	Refined oil products
Refineries	-	28	1.2	2.7
Depots	0.034	11.5	0.2	3.4
Caverns	-	6.5	3.5	2.7

Source: French Administration

It is possible that the ongoing decline in oil product depots could have implications for emergency preparedness and supply infrastructure resilience, and further study may be required to ascertain whether this is the case. Potential implications could be in relation to resilience when facing internal disruptions such as industrial action, or external supply interruptions. The impact of the closures could also vary between different geographical areas.

2.3 Decision-making Structure for Oil Emergencies

The Minister of Industry, Energy and the Digital Economy within the Ministry of Economics, Finance and Industry, is responsible for energy security of supply issues in France. Under this Minister and the Minister for the Environment, the General Directorate for Energy and Climate Change (DGEC) is responsible for formulating and implementing energy and climate change policy.

Within the DGEC, the Directorate for Energy (DGEC/DE) is responsible for the oil and gas sector with regard to security of supply, the monitoring and supervision of strategic stocks, and managing supply emergencies. It is responsible for the preparation and maintenance of oil emergency response plans, and during an oil supply emergency it acts as the National Emergency Strategy Organisation (NESO).

The French NESO can draw on a large number of staff when necessary from the CPSSP/SAGESS stockholding agency and from the DGEC/DE Sub-Directorate of Security of Supply and New Energetics, whose primary role is to guarantee French oil supply security.

The Administration does not hold regular emergency response exercises either within government or in conjunction with industry, but it considers that the need to train NESO staff is met by the regular need to respond to domestic emergencies such as industrial accidents, industrial action, and local product shortages. The monitoring of relevant information is likewise part of the normal routine, as is the communication of that information and related analyses to other levels including government ministers, ministerial cabinets, and energy companies.

In order to effectively carry out its role, the DGEC/DE maintains a network of relationships with other government departments and professional organisations. Approximately 100 professionals from industry and the distribution sector are appointed on a voluntary basis to act as participants during a national crisis. They may also be involved during local crises (either at the administrative level of the “zone de défense” or at the level of the “département”). The oil operators are involved in finding and implementing solutions to deal with oil emergencies.

As soon as an emergency develops, the DGEC/DE can adapt its organisation to the specific nature of the emergency. In the case of a major emergency, the DGEC/DE activates an emergency cell which monitors market conditions and is in permanent contact with the “prefects” (local representatives of the government either in the “zone de défense” or in the “département”). However, there is no NESO Handbook or other published set of procedures available for NESO staff or other possible participants in an oil emergency response action.

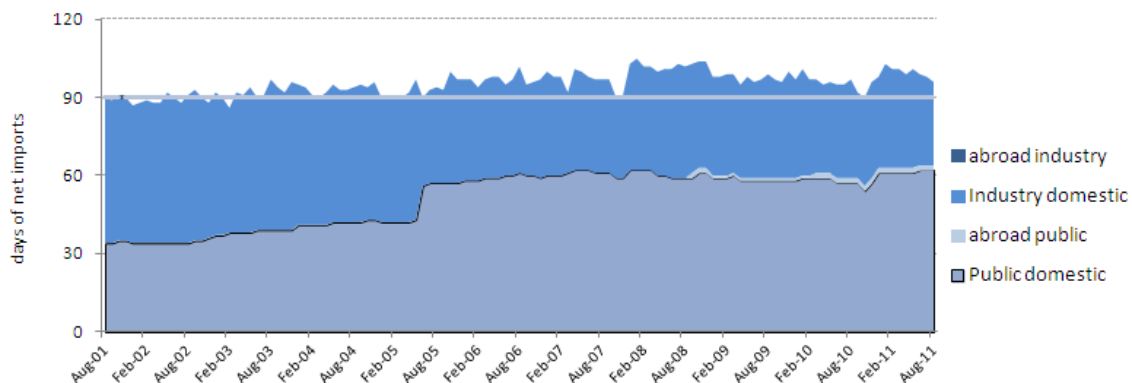
2.4 Stocks

Stockholding Structure

All industry operators are required to hold the equivalent of 29.5% of the volume of oil released for domestic consumption during the previous calendar year (about 90 IEA days). These compulsory industry stocks fully cover France’s IEA 90-day obligation.

France consistently meets its 90-day IEA obligation, but the country holds little storage in excess of the obligated amount. The French 90-day stock holding obligation for 2011 was 19,684 thousand tonnes of oil equivalent (ktoe), and the actual amount of stock held as of August 2011 was 21,211 ktoe. The amount of stock held in excess of the 90-day obligation was therefore 1,527 ktoe – or 7 IEA days.

France’s Compliance with IEA 90-day Obligation



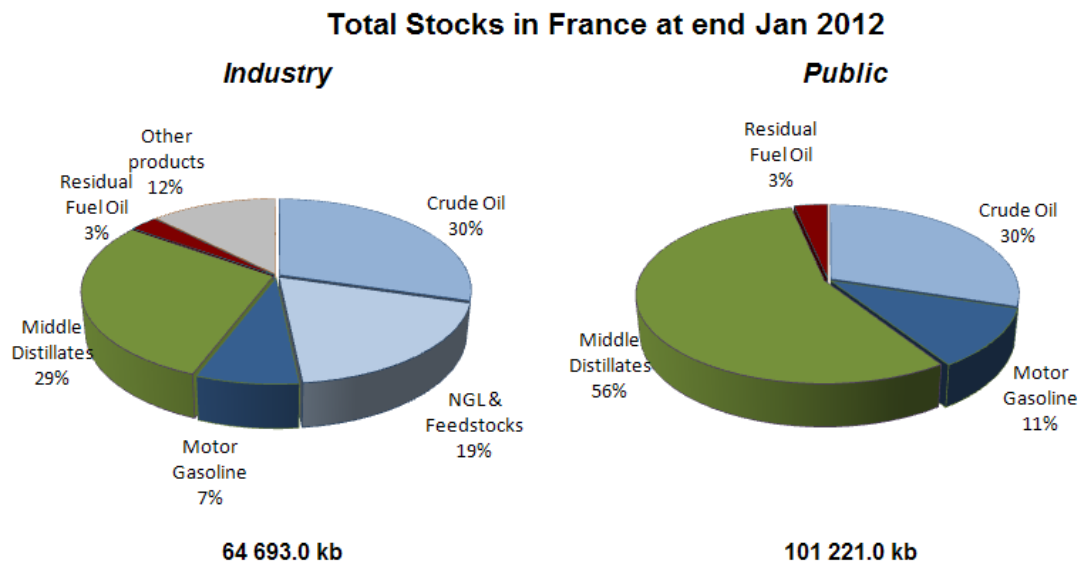
In meeting the 29.5% stockholding requirement, industry operators are obliged to hold a portion of the stocks through a central stockholding agency, CPSSP/SAGESS. They may choose to delegate either 56% or 90% of their stockholding obligation to the agency. Therefore, these companies are obliged to be directly responsible for either 44% or 10% of their strategic reserve obligation.

Typically, industry participants such as hypermarkets (which have an obligation due to their sale of vehicle fuels) choose to delegate the maximum amount possible to the agency, and may meet their remaining obligation through the use of tickets. Operators such as refiners usually choose the option of holding 44% of their obligation, and are able to commingle this amount with their operational stocks.

SAGESS (Société Anonyme de Gestion des Stocks de Sécurité) is a privately-owned and managed entity with the sole function of holding and maintaining emergency reserves under the direction of CPSSP (Professional Committee for Strategic Petroleum Stocks). Although a small part of the stockholding obligation delegated to CPSSP is covered through ticketing, SAGESS manages most of the collectively held reserves in France. SAGESS also oversees the depots eligible for strategic stockholding, manages product stock turnover and organises the rental of additional storage capacity from domestic industry participants.

Crude or Products

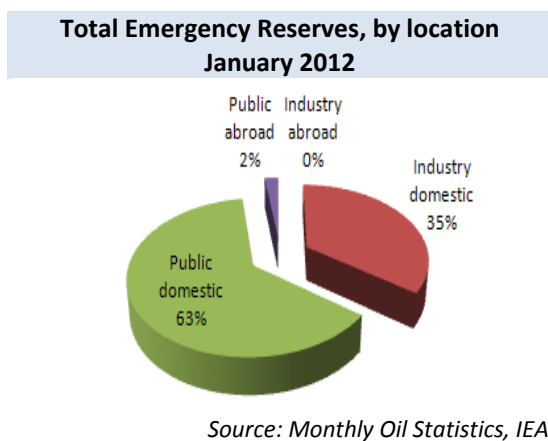
The stockholding requirement covers four product categories: motor gasoline, gas/diesel oil, kerosene/jet fuel and fuel oil. SAGESS has minimum motor gasoline and diesel oil stock requirements for each geographic zone. Companies are allowed to substitute a share of the product obligation with crude oil, in line with EU legislation. There is no specific ethanol storage for the 90-day obligation. The Review Team noted that this may pose a risk to gasoline supplies as strategic gasoline stocks are generally stored as base stocks, meaning they cannot enter the market before ethanol or another additive is added.



Location and Availability

SAGESS owns approximately 4 Mt of crude oil and 7.7 Mt of oil products, which are stored in rented storage capacities (more than 100 depots throughout France). The stocks are mainly co-mingled.

Industry *held* stocks currently represent about a quarter of France's strategic stocks (equivalent to around 28 days of consumption). The stocks are allowed to be co-mingled with commercial stocks.



The process for drawing down stocks is initiated with a political decision of the Ministry of Industry and Energy (which is normally based on an assessment provided by DGEC/DE). Then, orders or rulings are established usually within 48 hours. Different types of measures may be selected:

- agency stocks location exchange (re-localisation);
- agency stocks loan;
- authorisation for industry stock release;
- general lowering of compulsory stockholding obligation;
- releasing of CPSSP tickets;
- sale of agency stocks.

The loan or exchange of agency stocks is allocated according to the market shares of the operators. An industry stock release is managed by the operators themselves, and the speed at which the drawdown can take place depends primarily on their draw down capacities. A stock release via CPSSP tickets requires the agreement of affected operators and may only occur as a last resort because of competition considerations. Bilateral agency stocks may be mobilised in the same way as other stocks.

SAGESS does not usually sell stocks: it loans them out instead. The deadline for reimbursing non-emergency SAGESS stock loans is one month, during which time SAGESS retains full ownership. SAGESS agrees to 2-3 requests per month for such loans. There is a fee for the loan process but no charge (interest etc) for SAGESS loans.

Bilateral stockholding has a marginal role in the French system.

Ticket contracts with industry represent around 15% of the CPSSP stockholding obligation (2.2 Mt of refined oil products). This volume gives CPSSP flexibility in the event that its stockholding obligation decreases following a reduction in oil consumption in any given year – the alternative would be to require SAGESS to sell a portion of its physical stocks.

Ticket contracts between industry operators also represent 22-25% of company obligations to hold strategic stocks directly (these were comprised of 0.7 Mt of crude oil and 0.4 Mt of refined oil products in 2011). The French 90-day stock holding obligation for 2011 was 19.684 Mt, with industry *held* stocks representing about a quarter of the total.

Monitoring and Non-compliance

DGEC is responsible for collecting monthly stock data from the oil operators, and for organising audits (which it can do at any time). It also has the authority to require operators to provide any information deemed necessary during an oil supply emergency. In general, although the government collects stock holding data in the aggregate, it does not hold regularly updated data on the stock levels at each individual storage depot.

If an operator foresees their stocks falling below minimum requirements they have three options: stop selling; loan stock from another company or SAGESS; or purchase additional stock on the spot market. There is a strong disincentive for companies not to meet their emergency stockholding obligations, as failure to do so carries very strong penalties – up to 54 times the avoided cost of compliance. A penalty of up to EUR 1,500 per day can also be imposed if a lack of reporting is established.

Financing and Fees

No financial assistance or public funding is provided to industry in order to maintain emergency reserve requirements

CPSSP oversees stockholding strategy and is managed by a board composed of refiners, other oil industry operators (notably supermarkets), and representatives from the government, including DGEC/DE, with the right of veto. Each year the agency calculates the obligation of the individual operators, incorporating the previous year's consumption, and the fees necessary for building and maintaining the designated stock levels. The new obligation level becomes effective as of 1 July. Industry participants must pay CPSSP the calculated fee to cover the storage costs of the oil delegated to the agency.

3. Other Measures

3.1 Demand Restraint

France has a wide range of oil demand restraint measures – ranging from voluntary to compulsory, and short-term to long-term. These measures – 89 in total – are set out in the Hydrocarbon Resources Plan (PRH).

In the PRH document, the 89 measures are each summarised in a brief sentence, classified into one of eight different categories and assigned a numbered code. The categories cover various fields including: personal transport, goods transport, private premises and dwelling, public premises, industry, and oil deliveries limitation.

Each measure is characterised by the description of the principal actors involved and the oil products to which the measure applies. Description of the measures also includes criteria for their execution, geographical scope, the locus or responsibility for implementation of the measure, duration, legal basis, and mandatory nature. Each crisis is assessed on a case by case basis and dealt with at the appropriate level: ministry (DGEC/DE), defence zone (defence zone prefects) and *département* (prefects). All decisions at the local level are made through the local prefect who in turn reports to the Minister of Internal Affairs.

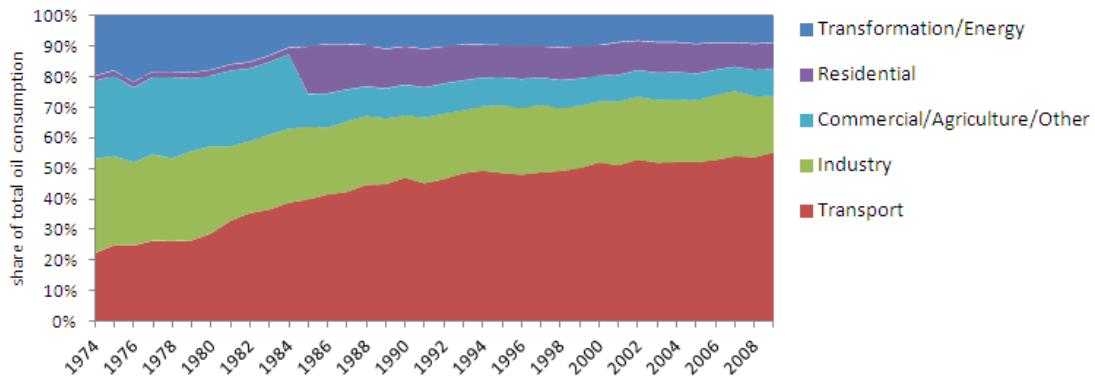
In the June 2001 ARMINES Study, the Administration estimated that oil savings using non-compulsory measures would not exceed 2% of normal consumption. In the case of mandatory rationing, the maximum amount of savings possible would be no more than 9%. With regard to mandatory short-term measures in the transportation sector, including reducing the maximum speed limit on road from 130 to 120 km/h, a saving of less than 5% of domestic consumption could be reached.

The effectiveness of the PRH demand restraint measures is evaluated through routine statistics - in particular from the INSEE, Comité professionnel du pétrole (CPDP) and the energy survey unit of the Ministry. However, the oil savings potential and relative effectiveness of the measures has not yet been comprehensively evaluated as these measures have not been used sufficiently often to verify the ARMINES study estimates – which themselves have not been updated since 2001.

The Energy Code (article L143-1) and the 1992 Decree 92-1466 provide the legal basis for activating the PRH demand restraint measures. In the event of a domestic incident local demand restraint measures would probably be used, and in the event of a regional or global incident or an IEA Collective Action nationwide demand restraint measures could be used, to complement a stock release.

The PRH document is large and complex and contains 89 specific measures but does not include guidelines to assist decision-makers to choose between measures, or operational procedures to ensure the smooth implementation of measures once decisions have been made. A comprehensive operational guidebook and communications plan would assist in this regard, and help to ensure the efficient flow of information between industry, government officials, government ministers and the public in the lead up to, and during and oil supply disruption.

The Administration sees little scope for other oil emergency response measures (besides stock drawdown and demand restraint) such as surge production and fuel switching.

Oil Consumption by Sector¹

Source: Oil Information, IEA

3.2 Surge Production and Fuel Switching

The capacity for short term surge-production in France is negligible and there are no government regulations in this area. Domestic oil production is only equivalent to 1-2% of total consumption, and the existing oil fields are in decline.

The capacity for fuel switching in France is also considered to be negligible and there are no government regulations in this area.

3.3 Others

No other emergency measures exist beyond those discussed.

¹ Total Consumption (including refinery consumption), does not include international marine bunkers.

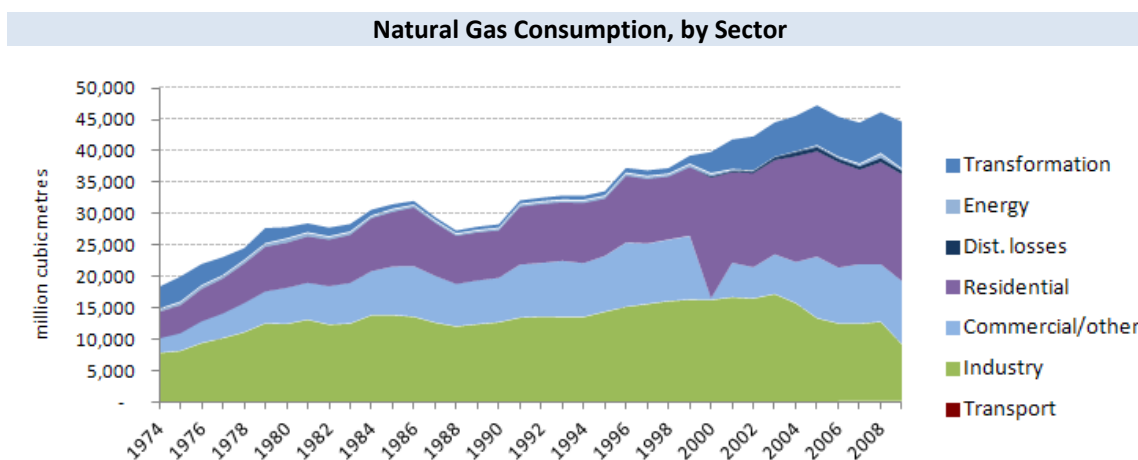
4. Natural Gas

4.1 Market Features and Key Issues

Natural Gas Demand

The share of natural gas in the country's TPES is relatively stable at 16% in 2010 – up from 14.9% in 2005.

With corrections for climatic variations, natural gas demand was 46.3 bcm in 2010, down from 47.2 bcm in 2005. In 2010, the residential sector represented about 55% of total gas consumption, while the industry and transformation sectors represented 28% and 14% respectively.



Source: Natural Gas Information, IEA

According to official government forecasts, natural gas demand is expected to be relatively stable in the period 2007-2020. However, there are a number of uncertainties underlying the Administration's demand assumptions that have the potential to undermine the accuracy of these forecasts.

The government's natural gas demand forecasts depend in part on the success of energy efficiency initiatives resulting from the *Grenelle Environnement laws* and EU energy/climate commitments in reducing natural gas consumption in households and the tertiary sector. The objective of these energy efficiency initiatives is to reduce natural gas consumption in the French household and tertiary sectors by 55-85 TWh by 2020. However, a successful outcome is far from certain.

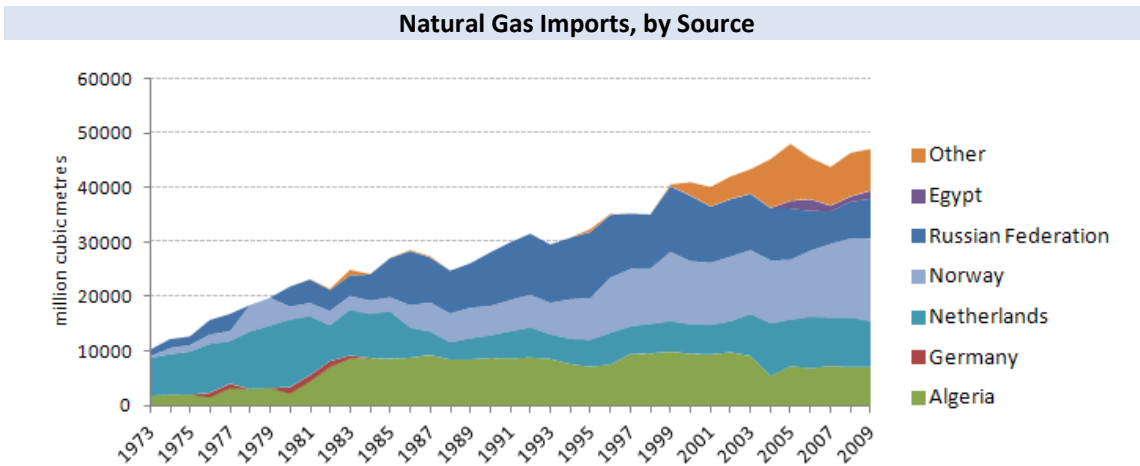
Other sources of uncertainty regarding natural gas demand to 2020 include the proportion of nuclear energy in the electricity mix, carbon price levels, the mid-term effects of the economic and financial crises on consumption, and the relative price of other energy sources. The projected natural gas savings in the household and tertiary sector are intended to offset expected increases in natural gas consumption of 30-50 TWh for electricity generation (due to the phasing out of coal plants and the development of renewable sources of energy) and 25-55 TWh in the industry sector.

Imports/exports and import dependency

Import dependence is close to 100%. French natural gas imports are relatively well diversified with significant imports from Algeria, the Netherlands, Norway and the Russian Federation. LNG has traditionally been sourced from Algeria, but a growing proportion now comes from other sources including Qatar. Entry capacities to the French gas network were 260 mcm/d at the end of 2010 – with 77% of this for gas pipelines and 23% for LNG terminals.

France started natural gas trading operations in 2005 – initially through brokers and over-the-counter trades, and then through the Powernext trading platform in 2008. There has been strong growth of traded volumes and the multiple interconnections with other gas markets has led to price convergence with other European hubs such as NCG in Germany, TTF in the Netherlands and Zeebrugge in Belgium. France's geographical location and large number of interconnections has made it into a growing transit hub for European gas, particularly between northern and southern Europe (notably Spain and Italy).

The natural gas industry imports gas into France using a combination of short, medium and long-term supply contracts – with the main emphasis on long-term.



Source: Natural Gas Information, IEA

Domestic Natural Gas Production

Domestic gas production in France is negligible. It is expected to drop sharply from 0.518 bcm in 2012 to 0.177 bcm in 2015, with gas production in the important Lacq gas field in Southwest France expected to end in 2013. France has potentially significant unconventional gas resources but exploration to determine the potential of this resource has halted due to the imposition of a Government ban on hydraulic fracturing or 'fracking'.

In July 2011 the French parliament passed a law banning the use of fracking techniques to explore or extract oil and natural gas. Any companies that plan to use fracking to produce oil or gas in France will have their mining permits revoked, and sanctions for violation of the ban include fines and imprisonment.

The ban has implications for future French oil and natural gas production as the estimated oil and natural gas reserves in France that could potentially be unlocked through the use of fracking techniques are thought to be around 10 years of crude oil, at current rates of consumption, and around 100 years of natural gas.² A commission has been formed to discuss how to reconcile fracking with environmental concerns.

Gas Company Operations

The French gas market has been fully open to competition since 1 July 2007 when the government unbundled the gas transmission network operator GRTgaz. There are two gas transmission system operators (TSOs) in France.

GRTgaz (75% subsidiary of GDF Suez, 25% owned by a public consortium) is the largest TSO in France. It operates around 87% of the gas transmission grid in France. (GDF Suez is vertically integrated and a dominant player in the French gas market, and has the largest gas transport network in Europe).

The second TSO is Total Infrastructures Gaz France (TIGF), a wholly owned subsidiary of Total, which operates the gas grid and gas storage facilities in south-west France. TIGF operates about 13% of the French gas network.

France's 193,700km of gas distribution networks are owned by local communities. They operate through concession agreements linking local authorities to GrDF (a subsidiary of GDF Suez), 22 local distribution companies (mainly located in southwest and eastern France) and Antargaz (which operates the distribution network in the town of Schweighouse).

The number of suppliers, including traders, allowed to supply natural gas in France is approximately 140, including 64 new entrants in the period 1 February 2009 to 31 December 2011. As of end 2011, new providers represent 35.5% of demand in the non-residential sector but only 8.8% of demand in the residential sector.

There are two natural gas storage companies operating underground storage facilities in France: Storengy (a subsidiary of GDF Suez) and TIGF.

4.2 Natural gas supply infrastructure

Ports and Pipelines

France has numerous cross-border gas pipelines, with a total import capacity of 187.5 mcm/d. Also, there are three LNG port terminals in France – one at Fos Cavaou near Marseilles, another nearby at Fos Tonkin, and one at Montoir-de-Bretagne on the Atlantic coast. These terminals are owned by Elengy (except Fos Cavaou which is 70% owned by Elengy and 30% owned by Total). Their combined regasification capacity in 2010 was 72.5 mcm/d.

EDF confirmed in May 2011 its investment in developing a fourth LNG terminal at Dunkerque. That terminal, to enter into service by the end of 2015, will have a regasification capacity of 33.5 mcm/d. There are also plans to expand the capacity of the existing terminals as Fos Tonkin (1.5 bcm/year) and Montoir (2.5-6.5 bcm/year) from 2015. Another LNG terminal development is also under consideration – the Fos Faster project led by Vopak (90%) and Shell (10%). It is expected to be commissioned by the end of 2016 at the earliest, with an initial regasification capacity of 8 bcm/year.

² Source: US Department of Energy (DOE) – Energy Information Administration (EIA); *World Shale Gas Resources: An Initial Assessment of Fourteen Regions Outside the United States*; February 2011.

There are several other projects planned to increase the entry capacities into the natural gas network, including work to boost existing interconnectors with Belgium, Spain and Germany:

- German interconnections – the development of interconnection capacities with Germany at Obergeilbach (6.5 mcm/day) was commissioned in 2009.
- Entry point Taisnières H – an *open season* held in 2008/2009 resulted in the decision to develop the entry capacity of the Franco-Belgian interconnection (4.6 mcm/day).
- Spanish interconnections – two *open seasons* conducted successively in 2009 and 2010 helped to decide the creation of new capacity at border points of Larrau and Biriadou, amounting respectively to 15.3 mcm/day and 5.6 mcm/day. They will be commissioned in 2013 and 2015 and will be bi-directional.

The gas transmission system consists of approximately 37,500km of pipelines operated by two TSOs. GRTgaz is the largest TSO with 32,500 km of pipelines whose network covers 87% of the country. The other TSO, TIGF, has a 5,000 km pipeline network in the south-west of the country. The networks of the two operators are interconnected in Castillon-la-Bataille (Dordogne) and Cruzy (Hérault).

The French transmission grid has three balancing zones: Northern GRTgaz, Southern GRTgaz, and South-Western TIGF. In 2009 the Northern, Eastern and Western balancing zones were merged into the Northern zone. Any supplier must balance the volumes of gas entering and leaving each zone.

The national regulatory authority (Commission de régulation de l'énergie) is considering ways to further increase and streamline access to the French market such as moving from three to two zones (or even a single zone). Even with three zones several interconnection points are currently saturated, hindering the development of an integrated European market and increased competition. These bottlenecks could also hinder the transmission of gas to areas where it is needed in the event of a gas supply disruption.

Other complicating factors in the French network are issues regarding gas odourisation, and the use of both low and high calorific gas.

Natural gas in the French network is odourised at a very early stage (for user safety reasons) which means it cannot be freely sent to some neighbouring countries (who either do not odourise their gas or odourise it at a lower level in the network) if needed in a natural gas supply crisis. The reason this is an issue is that the odourisation additive can cause problems at the industrial level (e.g. electricity generation plants). This potentially puts France in breach of EU directives on the free flow of gas, but so far the issue has been managed through dialogue at the EU level.

One sector of the network in the north of France uses L-gas – a low calorific gas from the Netherlands which cannot be used interchangeably with the H-gas (high-calorific) in the rest of the network. The main potential threats to the L-gas network would be a long-term technical failure of the interconnection with Belgium (or retention of L-gas in Belgium due to a domestic supply shortfall), or a disruption in L-gas supply from the Netherlands. There is some limited storage of L-gas in the north of France (12 TWh in Gournay), and there are conversion units at Dunkirk that can convert H-gas into L-gas if the need arises. Also, four other European countries use L-gas and the Netherlands' production capacity is flexible. Accordingly, neither the Administration nor industry, view the use of L-gas as posing a significant risk in security of supply terms.

France is continuing to develop its gas transmission network with EUR5-6 billion in investments planned until 2020. The enhancements are intended to increase network fluidity and foster the integration of new infrastructure including gas power plants and LNG terminals.

In addition to the gas transmission network, France has a 193,700km gas distribution network which 77% of the population can access.

The Natural Gas Grid



Source: IEA

Storage

There are two main underground gas storage operators in France.

Storengy, a 100% subsidiary of GDF Suez, operates 13 storage sites in France. Nine in aquifers (centred on the Paris Basin), three in salt caverns (in southeast France), and one depleted reservoir. Storengy's total storage capacity is 10.4 bcm (around 80% of French storage capacity), with a maximum withdrawal rate of 230 mcm/d.

TIGF, a 100% subsidiary of Total, operates two storage sites in France. These are both in aquifers in southwest France at Izaute and Lussagnet. TIGF's total storage volume is 2.7 bcm (around 20% of French storage capacity).

Natural Gas Storage Capacity in France

Type of gas storage	Volume (bcm)	Withdrawal capacity (mcm / day)
Aquifers	11,96	204.77
Salt caverns	1.07	75.34
Depleted reservoir	0.08	0.567
Total	13.11	280.68

Source: French Administration

Several projects are underway to develop the existing storage capacities:

- In 2008, TIGF was authorized to increase the storage capacity in Lussagnet, allowing an increase of the working gas volume of about 0.46 bcm. These developments should be carried out in stages over the next ten years (0.046 bcm/ year).
- The potential development of existing Storengy sites is about 0.7 bcm by 2018, approximately 60% in the salt caverns and 40% in aquifer sites. These projects are spread over all the existing sites and are at varying stages of completion.

There are also projects on new locations:

- Hauterive sites: at first, two salt caverns will be created for a total working gas volume of about 0.15bcm in 2017. The creation of additional cavities is under study.
- South of Alsace (salt cavern): this project would represent an additional volume of 0.16 bcm for maturity after 2018.
- Landes (salt caverns): this project led by EDF and aimed at developing new salt cavern storage was awarded an exclusive exploration permit.

There is also some storage capacity available in Belgium and Germany, with direct interconnections to the French network, that can be used to supply the French market but the available quantities are limited.

There are no “strategic stocks” (i.e. government mandated stocks) of natural gas in France like there are for oil.

Decree No. 2006-1034, dated 21 August 2006, sets out the principles for natural gas storage access and use. The Decree also confers rights for storage capacity to providers who directly supply end consumers. An amended order in February 2007 determined the amount of storage rights associated with each customer on the basis of the characteristics of its consumption.

Natural Gas Supply Security

According to the Administration, the French natural gas network meets the N-1 standard at a level of 130%. This means that it has the resilience to satisfy total gas demand even in the event of an outage of the single largest gas infrastructure, during a day of exceptionally high gas demand.

The maximum gas supply capacity of France’s natural gas infrastructure (pipelines imports + LNG regasification + peak storage output) is 528 mcm/d, and peak daily natural gas demand is estimated around 363 mcm/d. This leaves 165 mcm/d (or 31%) “spare” capacity in the natural gas network.

In terms of possible outages in the natural gas network – the largest single source of supply from storage is 67 mcm/d, the largest single import point on the natural gas pipeline is 54.9 mcm/d and the largest single LNG regasification terminal has a capacity of 36.3 mcm/d. The network’s spare capacity is therefore large enough to cope with an outage at all three of these points simultaneously. The storage volume would also come close to coping with the complete cessation of pipeline imports for up to 46 days (total French natural gas storage capacity is 12.3 bcm, with a peak output of 270 mcm/d).

4.3 Emergency Policy for Natural Gas

The main domestic regulatory tool available to the French administration in case of an interruption to the natural gas supply is the Order on National Emergency Measures together with a National Contingency Plan aimed at the prevention and management of a natural gas supply crisis. The Plan includes emergency measures, the legal framework in which they are embedded and fixed principles regarding their implementation.

Activation of the National Contingency Plan requires a decision by the Minister responsible for energy and is implemented in the case of: disruption or interruption of gas supply; inability to ensure balance between supply and demand on the French market; dysfunction of gas networks and gas facilities located on the national territory; other crises affecting the operation of the gas system; and France's participation in the implementation of emergency measures decided in collaboration with one or more EU Member States or the EU.

Another important development with regard to natural gas emergency policy in France has been the implementation (ongoing) of EU Regulation 994/2010 on measures to safeguard security of gas supply. Implementation of the Regulation requires the completion of a natural gas security Risk Assessment and the development of Emergency and Preventive Action Plans – in collaboration with neighbouring EU Member States when necessary.

There is no link between the measures to respond to a gas supply disruption and those to respond to an oil supply disruption.

Decree No. 2004-251 on public service obligations in the gas sector requires natural gas suppliers to ensure continuity of supply to domestic customers, including in the case of a 1-in-50 year cold winter or a 1-in-50 year case of extremely low temperatures for a 3-day peak period. To meet this obligation, Decree No. 2006-10343 on access to underground storage of natural gas sets out conditions of access to underground gas storage. It does this through a system of unitary right of access to storage capacity (defined by consumer category and geographic area) so that gas suppliers can access sufficient capacity based on the structure and the consumption patterns of their customers.

Section 13 of the Decree on access to underground storage of gas also provides that on 1 November of each year every natural gas supplier is required to have stored gas volume corresponding to at least 85% of its storage rights relating to its domestic customers and customers with 'missions of general interest' (MIG).

Section 12 of the Decree also requires each supplier that supplies end-use customers to submit a declaration to the Minister of Energy by 1 May each year confirming that the supplier is able to ensure supply to its customers. The document must include: information on customer consumption; the supplier's storage capacity; its supply policy; and details of any other flexibility instruments at its disposal.

Within three months of receipt of the declaration, the Minister of Energy may require a provider to store more gas within the working volume of storage corresponding to its rights of access to storage capacity. As of November 2011 the Minister of Energy has never required a provider to obtain additional gas for storage.

3 Décret n° 2006-1034 du 21 août 2006 relatif à l'accès aux stockages souterrains de gaz naturel.

Beyond the natural gas storage and public service obligations around natural gas supply, the French emergency response process for natural gas disruptions is relatively informal although this may change when EU Regulation 994/2010 on gas supply security is fully implemented. As of March 2012 there is no set of published emergency response procedures such as an Emergency Response Handbook, and the Administration does not organise regular joint government-industry emergency response exercises. There is a basic reliance on personal contacts between government and industry, and these are maintained through the daily operational contact that the Administration has with natural gas sector players.

In a gas supply crisis the key focus of industry participants is meeting their legal commitments to maintain consumer supply. This was the case during the 2009/10 crisis when an interruption to the flow of Russian gas via Ukraine occurred in conjunction with an acute cold snap and domestic industrial action. During this time the gas companies had daily contact with the Administration through a designated emergency contact and maintained their normal focus on meeting their commitments to their customer. No other measures were taken and supply was maintained.

The Review Team noted that the bundle of supply obligations provides a good measure of security and that these in conjunction with the informal emergency response arrangements have worked so far. However, these arrangements are not being audited and they rely to a certain extent on the goodwill of the historical incumbent supplier. As market liberalisation continues to progress, this relationship may become less effective and may also lead to the development of free rider issues.

Strategic Gas Stocks and Drawdown

See the “Storage” section for additional information.

Demand Restraint

French natural gas security of supply relies primarily on diversification of import sources, infrastructure and supply routes, and extensive gas storage facilities. There is little scope for demand restraint to address a gas supply emergency in France.

Fuel Switching

France has no specific policies to promote fuel switching. The potential for short-term fuel switching is not known precisely, except in the power generation sector. The volume of interruptible contracts has declined significantly in past years and now represents less than 5% of total winter demand.

In the power generation sector, only one EDF plant at Montereau (with daily consumption of 1.39 mcm/d) has the flexibility to switch from gas to fuel oil. According to the Administration, there are no barriers that would prevent the Montereau plant from switching to fuel oil in the event of a gas crisis.

Interruptible Contracts

The potential for reducing natural gas demand through the use of interruptible contracts is considered marginal. The low volume of interruptible contracts is exacerbated by the fact that the network is not designed to supply only priority consumers – it is not possible for the operators to only switch off supply to non-priority customers as supply is defined by geographical area only. However, gas supply companies (not operators) can ask customers with interruptible contracts to shutdown. It is up to the supplier to manage this – not the operator. It is also possible to cut off some of the industrial customers directly.

Surge Production

The capacity for short term surge-production in France is negligible and there are no government regulations in this area. Domestic natural gas production is only equivalent to 1-2% of total consumption, and the existing natural gas fields are in decline.

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

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