Ten-Year Development Plan for the GRTgaz Transmission Network 2011-2020 Period

GRTgaz

Shaping the future of gas transmission

Table of Contents

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Philippe Boucly, Chief Executive Officer

Dear Sir or Madam,

This year we are publishing the sixth edition of the *Ten-Year Development Plan for the GRTgaz Network,* which now fits into the framework defined by the decree of 9 May 2011. This change in the regulatory framework corresponds to the transposition of European directive no. 2009/73/EC, one of whose objectives is to harmonise transmission in Europe in order to promote the integration of markets. This alignment with best practices is a reminder, if needed, of the pioneering role played by GRTgaz in its previous versions.

While 2010 was the year of recovery for gas consumption, the beginning of 2011 saw fundamental challenges to the energy policies of various countries, following the disaster at Fukushima. The consequences for electricity generation from renewable energy sources and natural gas have not been fully quantified yet, but it already seems certain that gas infrastructures will play a key role in facing this new challenge.

In France, the gas landscape is changing, notably with the announced construction of a new LNG terminal in Dunkirk. It is also changing with the decision by GRTgaz to strengthen the North-South link by looping the Rhône pipeline for a cost of € 484 million: this project received decisive financial support from the European Commission and was approved by the Commission de régulation de l'énergie. These developments are renewing interest in assessment to merge the North and South Zones and reassert France's role as European gas platform, alongside the other major gas countries.

The result is an ambitious schedule of investments facilitated by the introduction of a new shareholder. Indeed, on 12 July 2011 a stake of GRTgaz capital was purchased by a public consortium called Société d'Infrastructures Gazières comprising CNP Assurances, CDC Infrastructure and Caisse des Dépôts.

Transparency and dialogue are two of the important principles on which GRTgaz founds its efforts vis-à-vis the various market actors. Many exchanges occurred this year, particularly in the framework of the «Concertation Gaz» process at the national level and as part of ENTSOG and the Gas Regional Initiatives at the European level: these have made it possible to better define transmission demand and infer the likely developments to our infrastructure, as described in this publication.

I hope you enjoy your reading and that this document will continue to foster reflection and dialogue with users of the French transmission network so that we can continue to develop our works to meet the market needs.

Plan Summary

In a European context characterised by a strong desire for integration and by the need to secure gas supplies, GRTgaz is developing its network to meet market demand.

Currently, the allocated percentage of existing capacities is high; the utilization rate of allocated capacity reflects the public service obligations related to procurement security and the need to arbitrate between the different gas supply sources. These needs are evolving continuously with expected growth in imports and a sustained rise in gas consumption in Europe due to electricity generation.

Liquefied natural gas, notably from Qatar, continues to play a major role in Europe's future gas balance in a climate riddled with uncertainty regarding the production of unconventional gas. The marketplaces in Northwest Europe are increasingly active and, although short-term prices have already converged to a large extent, better market integration could require additional interconnection capacity.

Short- or long-term differences in gas prices, compared to the average transmission cost in France, confirm it is attractive to invest in new gas infrastructure to boost competition between the various sources of gas supply and thereby lower the risk of a costly commodity.

The development of the North-South (…) are renewing interest in research to merge the North and South Zones.

Therefore, several major works have been commissioned in Europe, between 2010 and 2011, notably the Fos-Cavaou terminal in France.

Similarly, significant decisions were taken in 2011 with the creation of a future LNG terminal in Dunkirk and the looping of the Rhône pipeline. The latter project received decisive financial support from the European Commission which, in the framework of priority energy infrastructure in Europe, wishes to develop a gas route to connect Southern Europe to the markets in the northwest.

France's geographic location largely explains the many development projects by GRTgaz, as they relate to interconnections with LNG terminals in neighbouring countries. The projects presented in this document are the result of ongoing discussions and exchanges with users of the transmission network as well as operators of adjacent infrastructure. They express the requests for increased capacity in the two large zones – North and South – of GRTgaz. Among the projects today identified, we should highlight the following developments:

- the commissioning of a terminal in Dunkirk (late 2015) requires that we strengthen our core network by looping the Hauts de France pipeline and creating the Arc de Dierrey. In conjunction the terminal's delivery, GRTgaz is planning to enhance France's transmission delivery to Belgium (2015-2016), thanks to the Flandres pipeline that will link Pitgam to Veurne;

- expanding the core network in the North Zone is an essential step in reinforcing the Montoir terminal planned for 2017 or in developing a terminal in Antifer for 2020. It will also enable the development of a new interconnection with Luxembourg (2016), as well as the creation of a reverse flow from Switzerland at Oltingue (2018). Finally, it opens the possibility for firm reverse capacity to Germany at Obergailbach (2017) and makes it possible to meet the expressed needs to increase the storage capacity planned for the North Zone, over this same period;

- changes in the South Zone are basically the complete commissioning of the Fos-Cavaou terminal (2010) and the decision to loop the Rhône pipeline (commissioning in 2016). The enlargement of this South-North link could be complemented in a second phase by the looping of the Est Lyonnais pipeline (2017-2018), or by the partial then total looping of the Bourgogne pipeline (2018-2020). These successive projects would provide a response to the developments planned for the terminals at Fos-sur-Mer (Fos Tonkin in 2014-2015, Fos Faster in 2017, Fos-Cavaou around 2020) and for storage at Manosque (2018). They would also support expansion of the capacity for interconnection with TIGF, in conjunction with the Midcat project planned at the conclusion of this plan.

Significant decisions were taken in 2011 with the creation of a future LNG terminal in Dunkirk and the looping of the Rhône pipeline.

The development of the North-South link, which will be helped by the completion of the Arc de Dierrey and the looping of the Rhône pipeline is renewing interest to study the North and South Zones merger and to identify the needed tools to achieve this merger after the commissioning of these works.

The implementation of a single zone for the GRTgaz network would enhance the attractiveness of the French market and the competition between the different procurement sources, thereby helping to secure a resource at a better cost.

Document Overview

The GRTgaz Ten-Year Development Plan is based on existing supply and demand, as well as on reasonable medium-term projections for growth in gas infrastructure, gas consumption and international trades.

This plan describes the primary infrastructure elements to build or reinforce, lists the corresponding investments that have been decided upon or must be made within three years and presents the projected schedule of completion for all of the planned investments.

The GRTgaz Ten-Year Development Plan consists of four parts:

1. An analysis of existing supply and demand for gas transportation.

2. An analysis of medium-term changes in:
   - natural gas consumption,
   - international gas trade,
   - development of adjacent gas infrastructure,
   - the organisation of the gas market.

3. Network developments in order to respond to growing demand, with a distinction between projects that have been greenlit and those that have not.

4. The projected schedule of completion for the corresponding investment plans, with specific indications as to the projects scheduled for commissioning within the next three years of the plan.

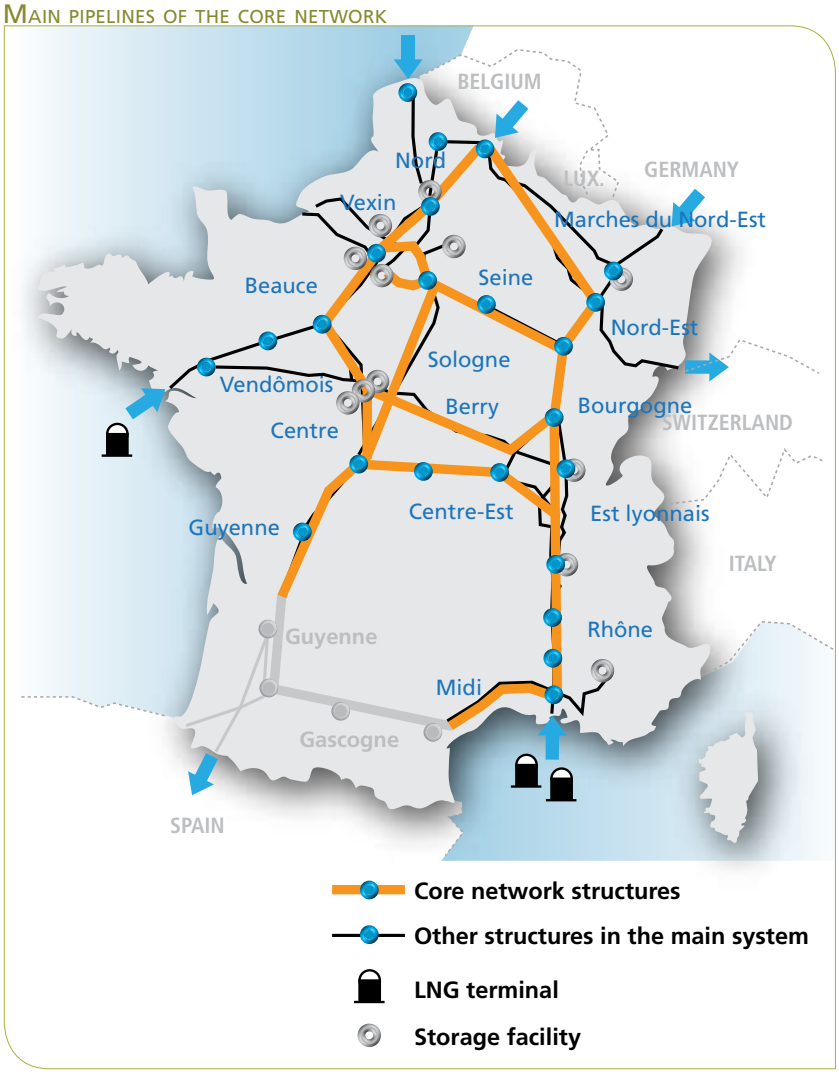
The GRTgaz Ten-Year Development Plan begins with a summary that reviews in particular the primary changes made since the 2010 version.

This document contains additional information in the form of four appendices which describe:

- the assumptions used by GRTgaz regarding gas consumption in France;

- the methodology used by GRTgaz to determine the network's commercial capacity;

MAIN PIPELINES OF THE CORE NETWORK



- the adequacy of financial resources to the financing needs of the primary infrastructure elements to build or reinforce and which are scheduled for commissioning within the first three years of the plan;

- the primary stages of completion for a pipework project and a compressor station project.

The GRTgaz Ten-Year Development Plan is a forward-looking document based on assumptions regarding French European markets' evolutions. The list of primary infrastructure elements to build or reinforce includes in large part the works related to projects outside GRTgaz area, for which a funding decision has not yet been taken. Given the market and project uncertainties, GRTgaz cannot be held liable, notably with regard to the execution of all the foreseen developments.

However, in a constantly changing energy sector, GRTgaz intends through this document to inform all actors of its market vision and the impact of the investment projects today identified on the entry and exit capacities of the French network over the 10 coming years. GRTgaz seeks therefore to provide information that will improve future gas flows through France and Europe.

The GRTgaz network

With more than 32,260 km of high pressure pipelines, the GRTgaz network enabled in 2010 the flow of nearly 688 TWh of natural gas and final consumption of about 489 TWh, covering more than 80% of French demand.

The GRTgaz network is interconnected:

- at the borders with the Belgian, German and Swiss transmission networks;
- in South-Western France with the TIGF network, which is itself cross-connected with the Spanish network;
- along the coast with the Fos and Montoir LNG terminals, as well as with the Norwegian network Gassco;
- with underground storage facilities spread across each of the two GRTgaz zones;
- with downstream distribution networks that deliver the gas to end consumers.

Almost all natural gas consumed in France is imported: the natural gas enters the network at cross-border interconnection points or at interconnection points with LNG terminals and exits downstream toward the distribution networks or directly to major industrial customers. Part of the transmitted volumes is channelled to neighbouring countries. The volumes injected into storages and then withdrawn primarily cover needs related to the climatic modulation of consumption, but also allow price spreads over time (economic arbitration) to be taken advantage of.

A distinction is made between the primary transmission network and the regional network.

The primary network consists of the network components which link the interconnection points with adjacent transmission networks, LNG terminals and storage points. This network is composed of large diameter pipelines, almost always greater than or equal to 600 mm. A significant portion of this network is meshed and forms the "the core network". In this part of the primary network, gas can flow in both directions, depending on the configuration of forward and reverse flows at interconnection points; flow direction can vary from day-to-day or even within a given day. Thus, it is not possible to specifically assign a core network structure to the delivery of gas from an entry point or to an exit.

> Monitoring centre in Paris (75) for the Val de Seine region

The regional network consists in the network components which enable the delivery of gas from the primary network directly to the biggest consumers or to local distribution networks. Except in special cases, the regional network is operated as an "antenna" because gas flows through it in a single direction from the primary network to the consumer. Pipeline diameters of this network are usually less than 600 mm.

The projects described and the analysis presented in this document mainly relate to the primary network.

> European natural gas network *(source: ENTSOG)*

Analysis of transmission supply and demand

GRTgaz transmission supply

The French natural gas market relies on an entry-exit system.

This network access model facilitates the nomination of transmission capacity, which is no longer linked to the physical routes taken by the gas. Within the limits of the capacity booked at the different entry and exit points of a market zone, a shipper can request its gas to be transmitted from any entry point to any exit point with the sole requirement that the entry quantities balance out the exit quantities for a given gas day. Therefore this model enables flexibility in market operations and promotes the development of competition.

The existence of several entry-exit zones reflects the physical constraints of the network and the impossibility, in certain scenarios, to ensure the gas transmission from one zone's entry point to another zone's exit point.

Since its creation in 2005, GRTgaz has made significant changes to its network's structure to reduce the number of balancing zones to respond to demands from most of the market players. The merger of three zones in northern France was possible thanks to the investments made by GRTgaz in its core network over the 2007-2010 period.

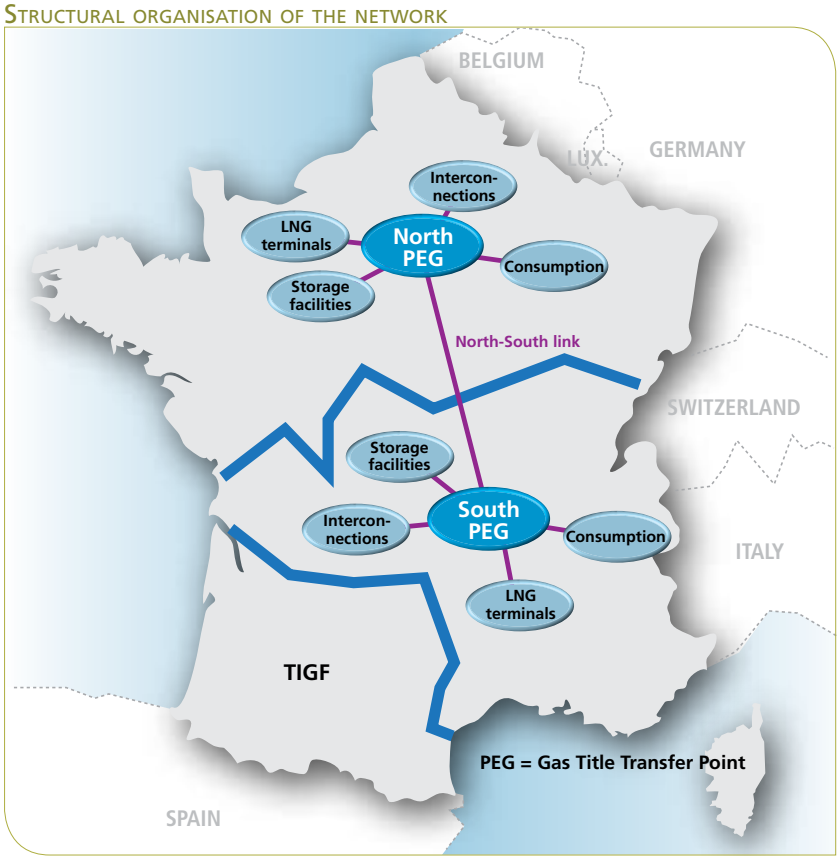
Consequently, since 1st January 2009, the GRTgaz network consists in two balancing zones, the North Zone and the South Zone, which are interconnected by a link, the North-South link. The South Zone is connected to the TIGF zone by a single contractual interconnection and marketed jointly by the two operators. This simplification trend could go on with the implementation of a single zone based on a joint cost-benefit analysis with the different market actors.

The available capacity at the various network entry and exit points is designed for several different durations of use (one day, one month or one or several years). GRTgaz offers "firm" capacity, which is guaranteed continuously, and "interruptible" capacity, which can be reduced in certain cases (the capacity calculation methodology as well as the normal terms of network use are described in appendix II).

Moreover, in each region, shippers have access to:

- bundled access to terminals/transmission;
- access to storage capacity marketed by the relevant actors;

STRUCTURAL ORGANISATION OF THE NETWORK



- access to the PEGs (gas title transfer points), North PEG and South PEG, which have been linked to a gas exchange since November 2008 [1], allowing gas sale/purchase transactions;

- services to convert H-gas (high calorific value) into B-gas (low calorific value), and vice versa;

- a mechanism to manage imbalances (i.e. differences between entry and exit flows) based on market mechanisms;

- the ability to sell, buy or trade transmission capacity on secondary market thanks to the "**cap**square" electronic platform, which is shared with the Belgian gas transmission operator.

In addition, since July 2011 GRTgaz and Powernext have been experimenting with a coupling of the North and South marketplaces, which should smooth exchanges between the North and South zones, develop liquidity between the North and South PEGs and promote price convergence.

Adaptating supply to demand

MEET OVERALL MARKET DEMAND

As part of its public service obligations, the role of the transmission operator is, as before, to help to secure the supply to the French market by properly scaling its infrastructure design.

1. The gas exchange is operated by Powernext SA, an enterprise created in 2001 which has the status of a Multilateral Trading System; it manages organised, transparent and anonymous markets in the fields of electricity and gas. GRTgaz acquired a 5% share in Powernext in May 2008.

Therefore, GRTgaz constantly ensures that the available capacity within its network meets the specific needs of shippers. Where necessary, it must plan investments which enable it to:

- deal with the increase in consumption, notably due to the rise in electricity generation from natural gas sources;

- create additional capacity at the interconnections with adjacent gas infrastructures;

- improve the market zone structure with the long-term possibility of creating a single zone covering the GRTgaz network.

GRTgaz continuously analyses changes in consumption and the adequacy of existing capacity vis-à-vis market demand.

In addition to these analyses, the ongoing dialogue with the different market players is supporting the optimised definition of the needed investments.

STAKEHOLDER CONSULTATION, A KEY FACTOR TO DEVELOPMENT

To facilitate exchanges with its various interlocutors, GRTgaz relies on several mechanisms:

- the consultation bodies set up in the French market since autumn 2008;

- the North-West and South regional gas initiatives overseen by European regulators;

- the work conducted with ENTSOG support in the framework of defining the European Ten Year Network Development Plans and Gas Regional Investment Plans (GRIPs);

- bilateral meetings with the gas adjacent operators.

Along with the analyses of the booking level of existing capacity, these mechanisms help to identify emerging projects or new needs. The new needs are then confirmed through a specific market consultation ("open season" procedure) which leads to long-term booking commitments by interested shippers.

GRTgaz then starts the decision-making process with regard to making the investment. This process assumes prior approval of the investment budget by the shareholders and the regulator, as well as confirmation of the project's terms of remuneration. If necessary, the decision to proceed is taken simultaneously by GRTgaz and the adjacent operators, particularly in the framework of the coordinated development of gas infrastructure.

Current demand for capacity

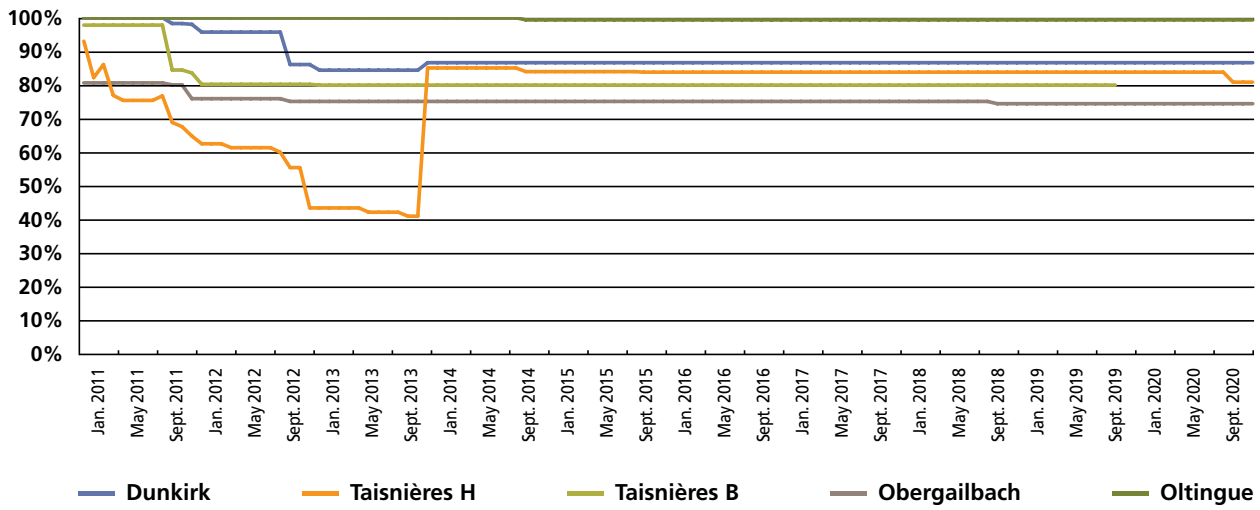
As indicated in the preceding paragraph, the analysis of the contractual booked capacity at different points is factored in by GRTgaz to determine the needs for capacity development.

Over the period 2011-2020, it appears that the booked level of capacity at the entry and exit points of the GRTgaz primary transmission network will remain stable overall and at a high level. At the time of writing this *Ten-Year plan,* an average of nearly 80% of the firm capacity offered to the market at interconnection points with foreign networks at Dunkirk, Taisnières and Obergailbach had been booked through the end of 2020.

Nevertheless, there is still capacity available for the long term, providing additional arbitrage opportunities and promoting the network to new market players.

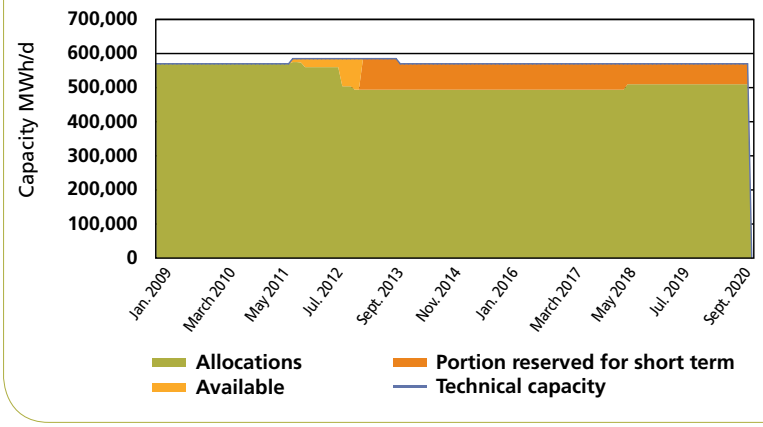
GRTgaz has also analysed the use of booked capacity. As shown in the diagrams below, shippers make extensive use of the subscribed capacity during the various quarters.

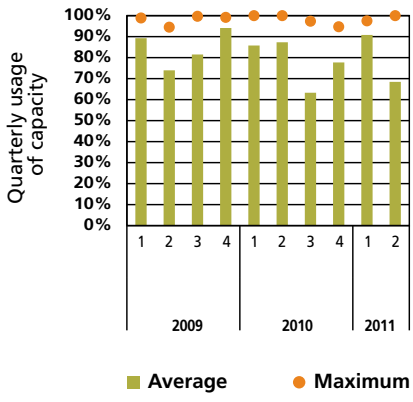
Capacity nomination rates at interconnections with adjacent foreign networks



Interconnection with the Norwegian network at Dunkirk

The interconnection with the Gassco network at Dunkirk has the highest booking rate (an average of 88% over the period). The strong demand at this point led GRTgaz to study the possibility of adding capacity. Following discussions held at the end of 2010 with Gassco and as part of the "Concertation Gaz" process, GRTgaz sells an additional 15 GWh/day starting on 1st October 2011 for a period of two years[2].



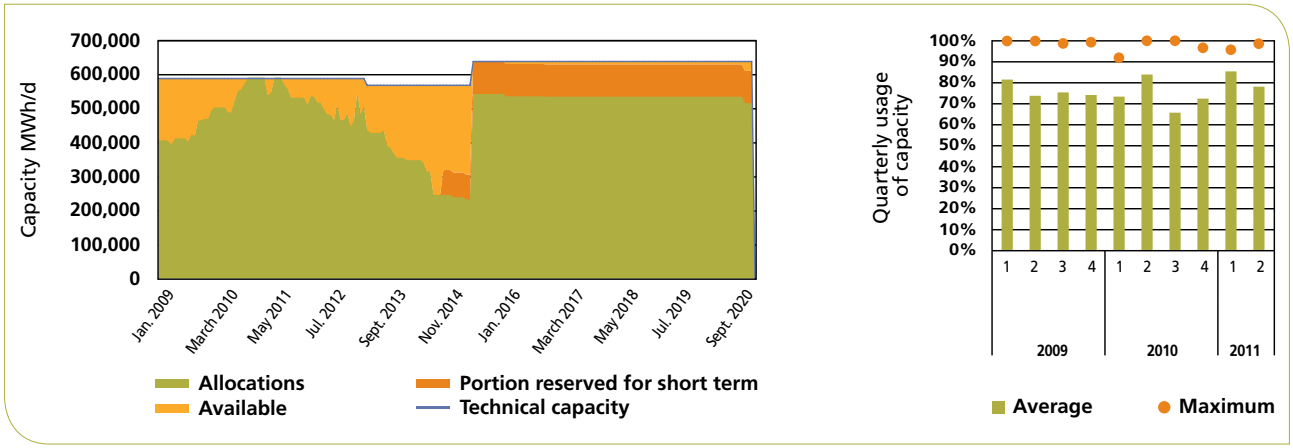


2. Because the primary network infrastructure located downstream of the entry points at Dunkirk and Taisnières H is partially shared, it was possible to sell some of the firm capacity available at Taisnières in Dunkirk, provided that this capacity was converted into interruptible capacity at Taisnières.

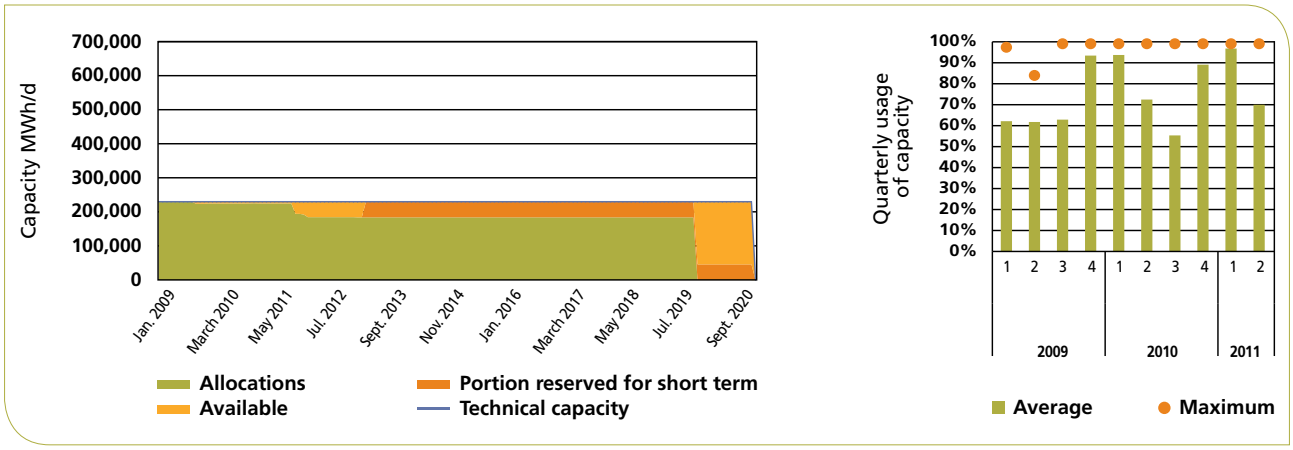
Interconnection with the Belgian network at Taisnières

With regard to the H-gas entry, behaviours based on a short-term market approach are being studied for the period 2009-2013. Thus, there has been some slack in booked capacity since winter 2009 and a portion of capacity available in the short term.

There is a major interest in this point over the long term: after the market consultation in 2009, commitments were made, resulting in the creation of 50 GWh/d of additional capacity starting in 2013 to cover all of the expressed demand.

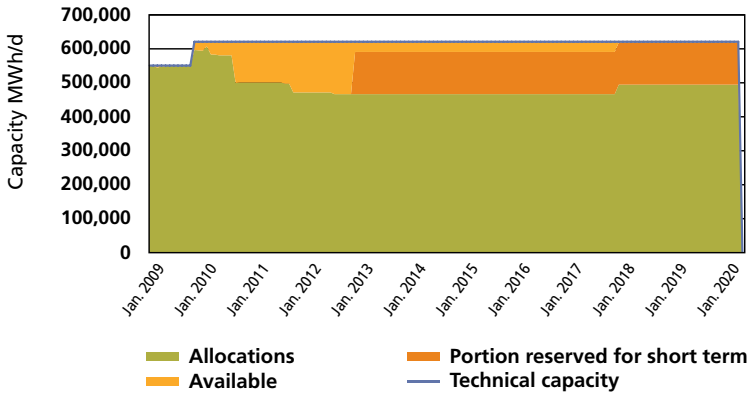


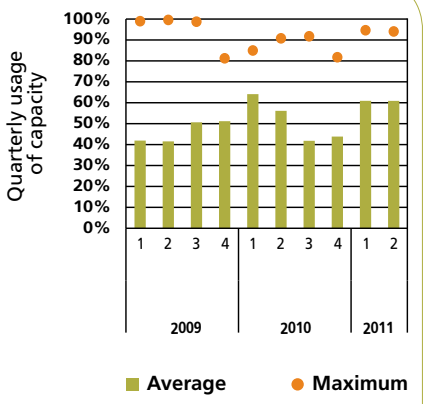
With regard to the interconnection with the Belgian network for B-gas, intended to supply customers in northern France, its operation has proven to be strongly correlated with consumption in that zone.



Interconnection with Germany at Obergailbach

Regarding the entry point to the GRTgaz network at Obergailbach, the increase in capacity from 430 GWh/d to 620 GWh/d between 2008 and 2010 has relieved the previous bottleneck and enabled to satisfy all the demand identified during the open season. This interconnection now seems to be properly scaled relative to the market need, while leaving some capacity available for both the short term and long term.

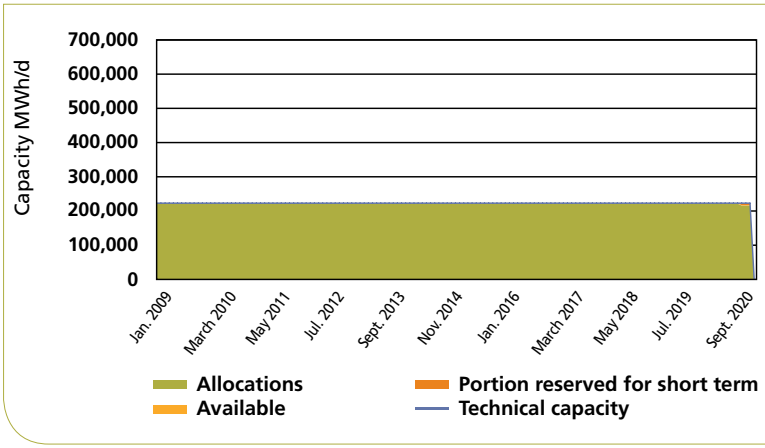


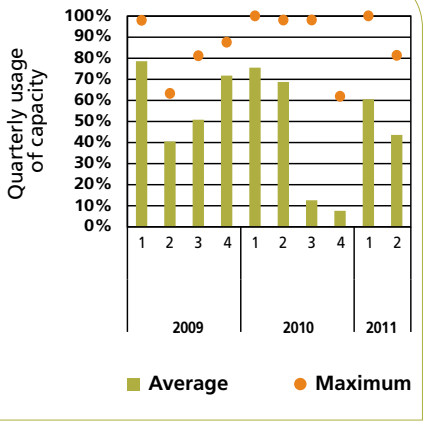


Interconnection with Switzerland at Oltingue

The exit capacity of the GRTgaz network at Oltingue is fully booked over the long term. Because it is the exit point for gas transmitted from France to Switzerland and Italy, the utilisation rate at this point is high. An interruption in transmission over the Swiss network explains the drop in flows in the third and fourth quarters of 2010.

A number of shippers have expressed interest in seeing an increase in the available capacity at this point. Studies are being conducted with the adjacent operator to meet this need for expansion by 2016 (see page 28).





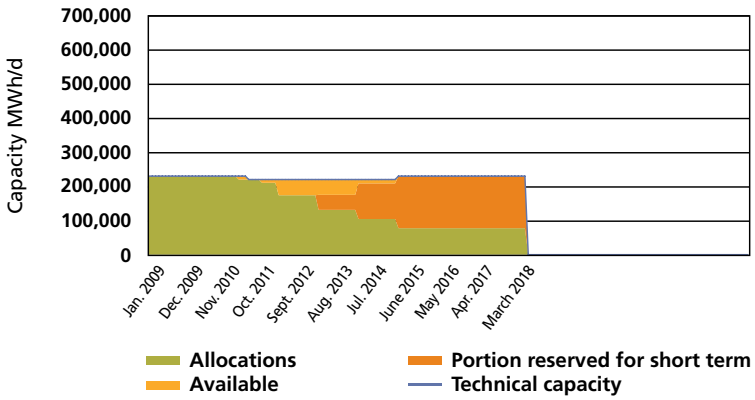
Connection between the North and South balancing zones

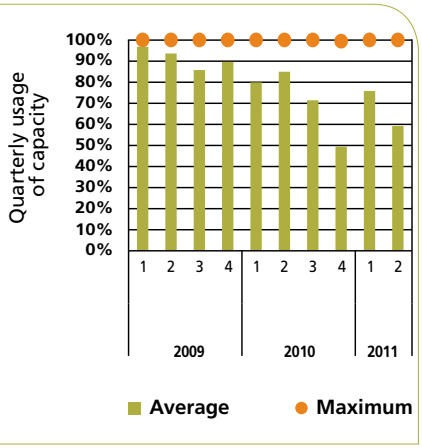
Created in 2009 after the merger of the former North, East and West zones, the North-South connection has a high rate of booking. As a consequence of the limited amount of physical capacity between the North and South zones and within the South zone, the market is limited to 230 GWh/d and presents contractual bottlenecks.

The consultation undertaken as part of the France-Spain open season confirmed the need to develop interconnection capacity between the North and South Zones. The need expressed in the first half of 2010 probably shifted due to the full commissioning of the Fos-Cavaou terminal, which has led to lower utilization of this connection in historical flow terms. However, flows from South to North are growing in favour of actors in the North who are thus enjoying enhanced access to LNG sources.

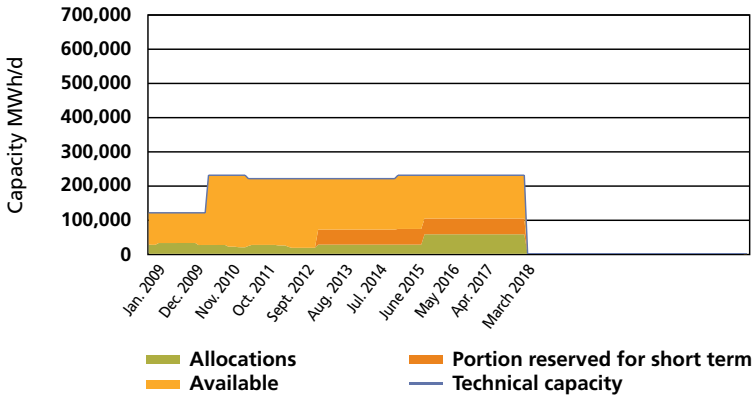
Finally, the "Concertation Gaz" process has brought about changes in marketing rules to allow a better capacity allocation among stakeholders and to promote access to the South Zone for actors whose procurement needs are modest.

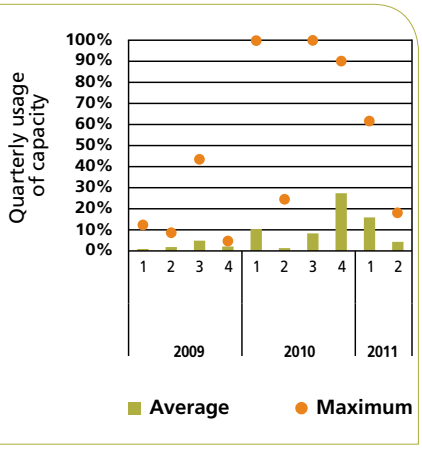
North to South





South to North

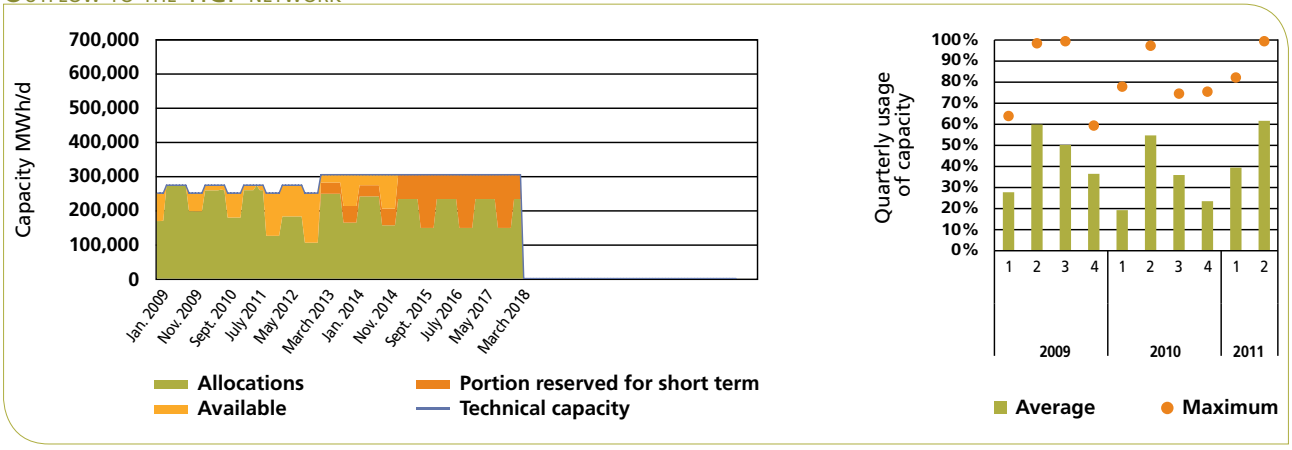




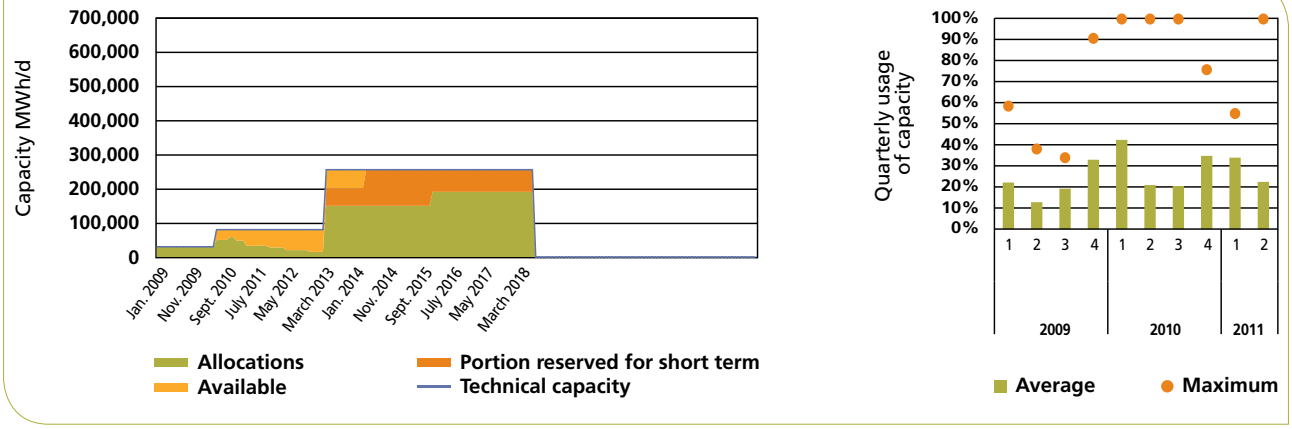
Interconnection with the TIGF network

The use of the TIGF interconnection is highly seasonal. Following the consultations carried out in 2009 and 2010 for the interconnection between France and Spain, market demand resulted in the development of interconnections at Larrau and Biriatou for 2013 and 2015. It was not high enough to justify the development of the Midcat project. The interconnection capacities of the GRTgaz and TIGF networks will be adjusted accordingly.

Outflow to the TIGF network



Inflow from the TIGF network



A changing gas market

Consumption projections on a growth trend

2010: AN EXCEPTIONAL YEAR

The year 2010 proved exceptional for natural gas, with world consumption registering an annual growth rate of 7%. This significant rebound largely offsets the historic decline recorded in 2009 and thus enabled worldwide consumption to reach a higher level than before the economic crisis.

Gas consumption in the European Union grew at the same pace in 2010 to reach about 510 bcm and returned to a level close to that reached before the crisis.

The rise in European consumption is explained by both structural and cyclical factors that can be distinguished by analysing the different uses of natural gas.

The biggest increase in demand is related to a cyclical factor: climate conditions in 2010, with two consecutive extremely harsh winters in Europe, triggered very high consumption levels in residential and tertiary sectors.

The faster-than-expected economic recovery strongly supported gas demand, notably through industrial activity and related growth in the first half of 2010.

Finally, the competitiveness of gas prices promoted gas as a source of energy in industry and power generation.

Ultimately, gas consumption rose sharply for all categories of use: residential and commercial heating, industrial processes and power generation.

A LASTING, PREPONDERANT ROLE FOR GAS IN THE ENERGY MIX

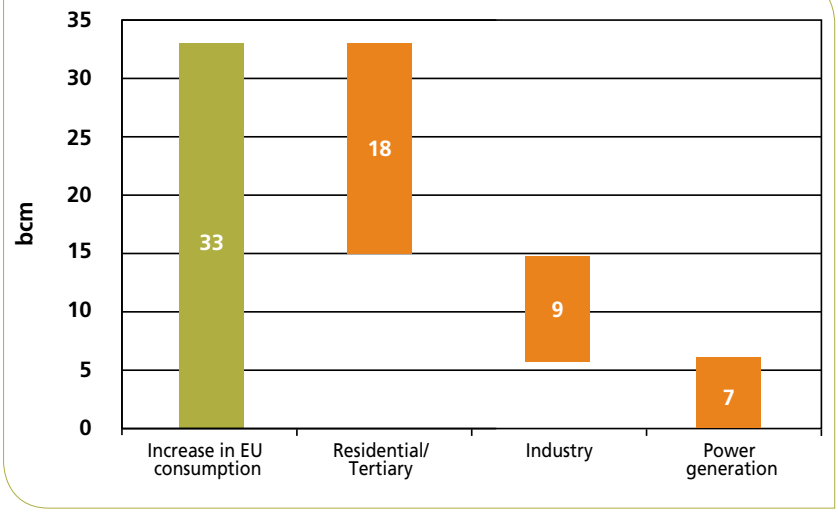
According to the annual report by the International Energy Agency (IEA) published in June 2011, natural gas is entering a "golden age" thanks to significant assets: abundant and geographically diverse proven reserves, competitive prices compared to other sources of energy and the lowest greenhouse gas emissions among fossil fuels.

This report presents a new scenario that notably includes a slower growth in nuclear energy, a new energy policy in China and a bigger role played by unconventional gas production. Accordingly, the international demand for natural gas is expected to grow by 2% per year, against 1.4% in the 2010 estimates. Gas could account for more than one quarter of world energy consumption in 2035, versus 21% currently. By 2030, this energy source could thus exceed coal's share in the energy mix.

Nearly 80% of the expected increase in gas demand between 2010 and 2035 is expected to come from countries outside the OECD, with China playing a leading role.

In Europe, by 2035 gas demand could top 630 bcm according to the new IEA scenario. This increased momentum in demand comes mainly from a re-estimate of the needs for power generation.

CHANGES IN GAS CONSUMPTION IN EU: 2010 VS 2009



Source GRTgaz d'après IHS CERA

Recomposition of European supply

LNG IMPORTS INCREASED SHARPLY IN 2010

In 2010, the European Union's production level remained stable, in particular thanks to a large rise in Dutch production, to cover 35% of demand.

Thus imports had to grow to meet rising demand, with a 25% jump in annual imports of LNG in Europe; at the same time imports of pipeline gas recorded a more moderate annual increase of about 2%.

Impact of the Fukushima disaster

The tragedy suffered by Japan on 11 March 2011, an earthquake followed by a tsunami triggering the worst nuclear accident since Chernobyl, had strong implications for the global energy market.

In Japan, about 15 GW of nuclear capacity are out of service as of mid-2011. Thermal generation capacity (mostly coal) was also damaged.

Combined cycle gas plants and LNG terminals were spared by the disaster; LNG has, by its nature, become the energy alternative to meet Japan's electricity needs. Japan is the world's largest importer of LNG, with purchases of about 100 bcm/year. The additional LNG requirements have been estimated by analysts to be in the broad range of 6 to 12 bcm/year.

In Europe, the German government decided on 15 March 2011 to immediately stop its oldest nuclear reactors (7 GW capacity). In June 2011, Germany decided to stop all nuclear production by 2022 with a timetable of plant closures starting in 2015.

In addition, the European Commission has asked all electricity producers to conduct "stress tests" on European nuclear power plants, the results of which will be made public in late 2011.

The disaster at Fukushima revived the debate on the safety of nuclear power plants and the diversification of the energy supply. Whatever the energy mix in the different Member States, natural gas is already positioned among the major energies of tomorrow's world.

In the medium and long term, this new context is likely to increase demand for gas in Europe, which should lead to a need for new gas infrastructure.

Qatar is proving to be the main origin of the increase in LNG supply: additional Qatari volumes of around 16 bcm in 2010, were mainly imported by the United Kingdom, Italy and France.

LNG imports now cover 15% of the demand for gas in Europe.

Finally, it should be noted that market participants have made very large withdrawals from gas stocks to balance supply and demand in 2010.

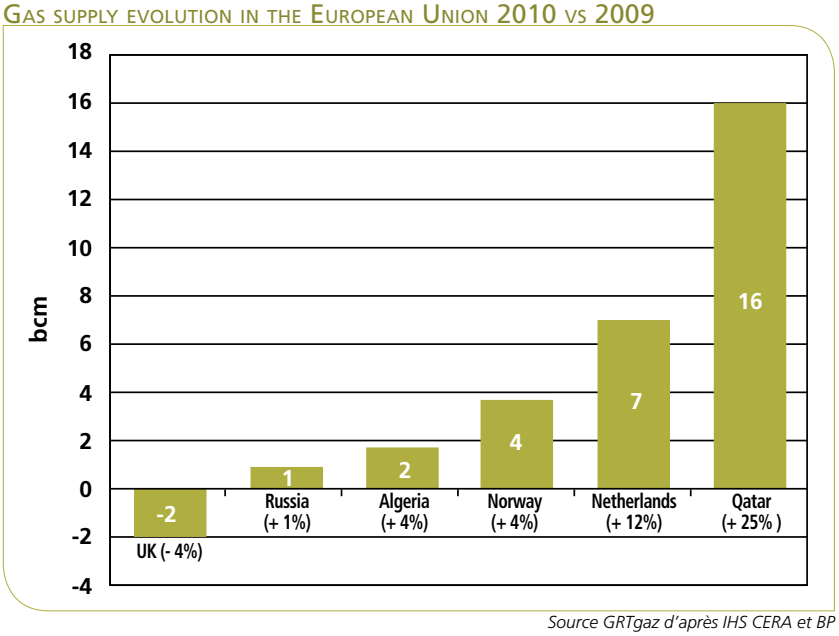
CHANGES IN GAS PRICES IN EUROPE

In 2009 the gas market experienced the birth of a gas bubble, a combination of the commissioning of new LNG export capacity, the decline in global demand for gas and the rise of unconventional gas production in the U.S. This situation of oversupply had a significant impact on the gas market prices in the United States and Europe.

In 2010, the prices of long-term contracts in Europe, reflected by the average import price in Germany, climbed steadily, mechanically affected by the upward trend in oil prices.

The day-ahead spot prices in Europe, governed by the short-term supply-demand balance, also sharply increased

GAS SUPPLY EVOLUTION IN THE EUROPEAN UNION 2010 VS 2009



Source GRTgaz d'après IHS CERA et BP

in 2010 primarily due to the upturn in demand.

While remaining generally below the prices of long-term contracts, spot prices were subject to high volatility, with the difference between these two references sometimes reaching € 10/MWh during the period.

The comparison between the average cost of transmission in France and gas prices in the short term or long term, confirms the value of investing in new infrastructure to meet the need for arbitration between gas flows revealed by this situation.

Moreover, market prices in north-western Europe are already converging significantly. The continued integration of European marketplaces could also require additional interconnection capacity.

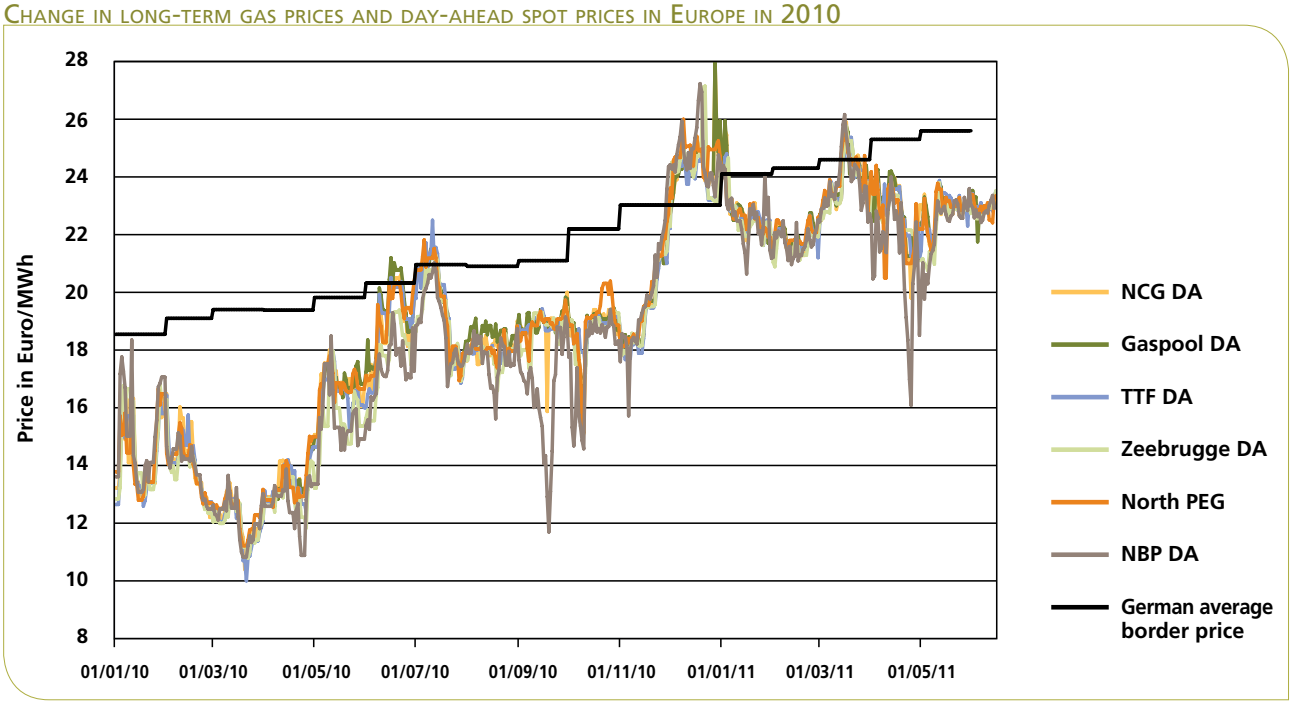
DYNAMIC MARKETPLACES

The prevailing market conditions in 2010 favoured a very big surge in the volumes traded on all marketplaces in Europe. These marketplaces are associated with organised markets (gas exchanges) which centralise buy and sell transactions and serve as a common, public price reference.

The enhanced liquidity of wholesale markets has increased competition: new players are emerging and taking market share both for trading operations and for gas supply to end customers. Furthermore, the latter also have direct access to these marketplaces thanks to the range of solutions developed by GRTgaz (see sidebar).

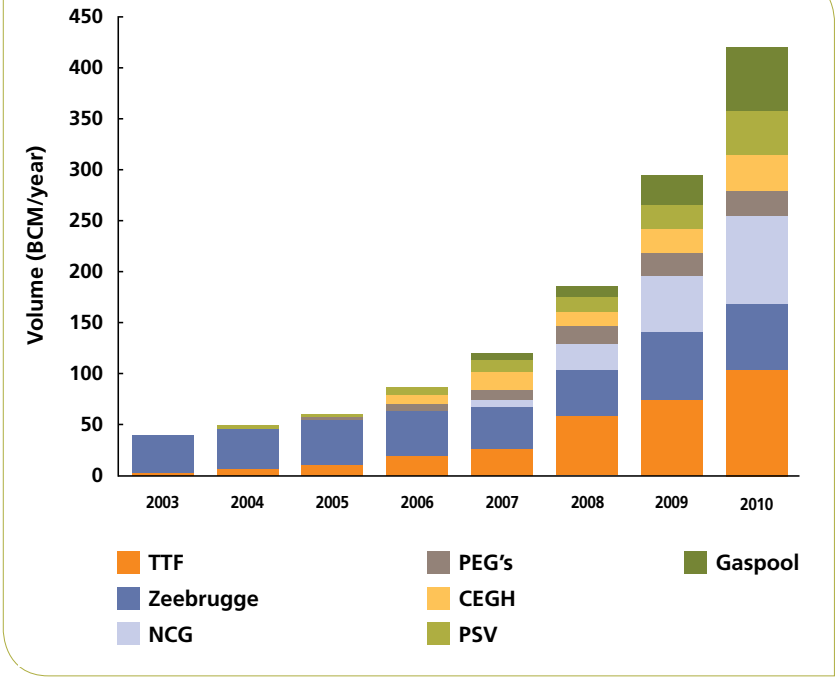
The incorporation of market prices in contracts binding consumers to their suppliers reflects the growing importance of gas hubs in Europe. It appears that conditions are met – supply/demand fundamentals, escalation of LNG imports, game players at the various stages in the chain, regulatory mechanisms etc. – for the role of marketplaces to continue to develop strongly in the near future.

Change in long-term gas prices and day-ahead spot prices in Europe in 2010



Source GRTgaz d'après BAFA et bourses électroniques

Change in volumes traded in Continental European marketplaces



Source AIE

Marketplaces energised by industrial enterprises' access to the wholesale market

To ensure optimal access to the market for industrial consumers, GRTgaz has developed a range of solutions enabling them to source directly from the wholesale market and optimise their supply as needed, including combining purchases from several sources:

- "Modulo": The customer is not a shipper, but rather buys from several suppliers and adjusts its purchases as needed. It delegates the daily balancing to a balancing shipper which integrates the deliveries from different suppliers.
- "Active": The customer is a shipper and holds a transmission contract with GRTgaz. It buys its gas directly on the wholesale market and manages its supply. It entrusts balancing to a balancing shipper which is responsible for transmitting gas to its sites.
- "Solo": The customer is solely responsible for its gas supply. It directly purchases the natural gas it needs. It balances its consumption and the transmission of gas to its sites.
- "Intégrale": The consumer customer selects a single supplier to oversee its gas procurement; this supplier manages the content of the supply, transmission and daily balancing based on consumption at the various sites.

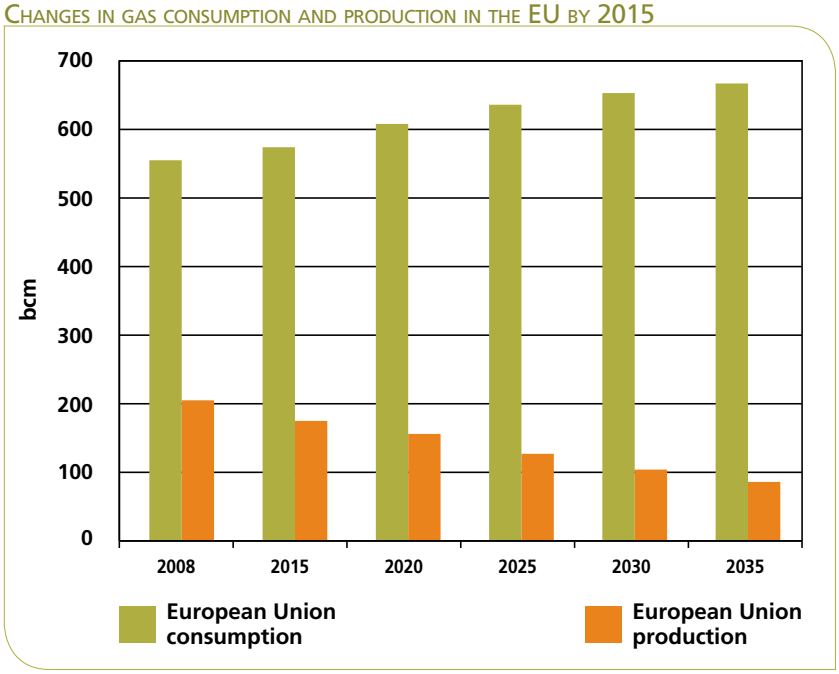
This range of solutions covers a wide spectrum of needs and the innovative solutions are very successful. For example, in June 2011, some 11 industry conglomerates representing 150 sites along the 811 delivery points of the GRTgaz network adopted the "Active" option and are thus contributing to the dynamics of the natural gas wholesale market.

TRENDS THAT ARE EXPECTED TO CONTINUE AND SUPPORT THE EMERGENCE OF NEW GAS INFRASTRUCTURES

European domestic production should continue its decline, falling to less than 100 bcm in 2035 according to the IEA (see the graph opposite). Given the concurrent increase in consumption accompanying this drop in production, a growing share of natural gas will be imported to supply Europe. The IEA estimates that natural gas imports in the European Union in 2035 will swell by 70% over 2008 levels, representing an increase of 220 bcm.

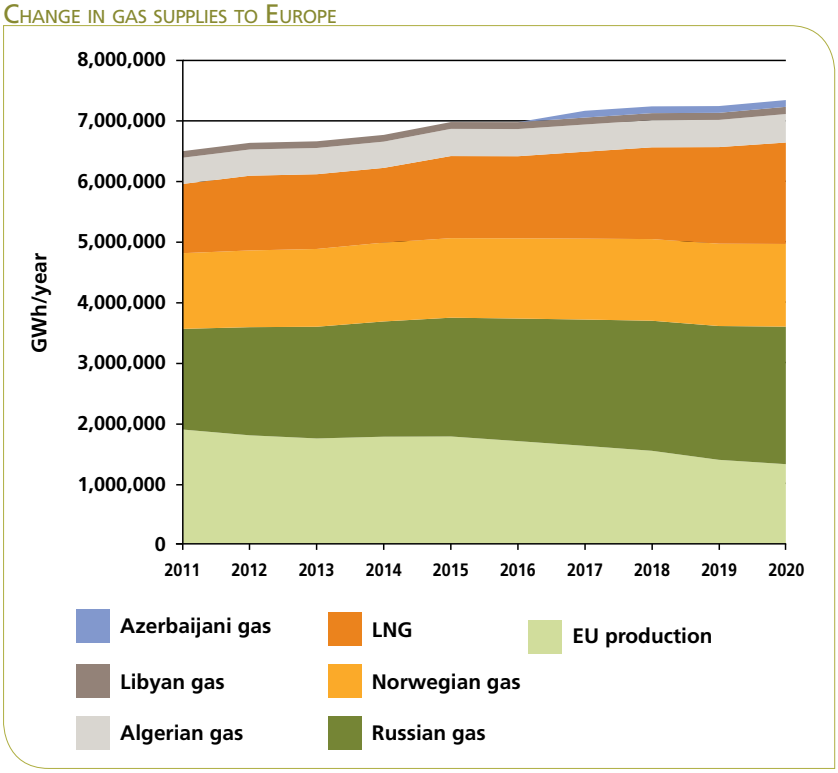
Russia will remain a major source of gas supply to Europe, nevertheless EU imports are expected to diversify heavily in the coming years. LNG will account for a growing share of the European supply portfolio, drawing in particular on the

CHANGES IN GAS CONSUMPTION AND PRODUCTION IN THE EU BY 2015



Source AIE, World Energy Outlook, Section 1: The Golden Age of Gas Scenario

CHANGE IN GAS SUPPLIES TO EUROPE



Source ENTSOG

recent and future developments in gasification capabilities (see page 21).

The current restructuring of the gas supply stemming from the changes in price of various procurement sources can only further the crucial role of gas infrastructure, which are the only guarantee for smooth and sustainable growth in the physical trading of natural gas.

Towards a European harmonisation of market rules

GRTgaz is actively involved in the harmonisation efforts aiming to establish a single market for gas in Europe. A founding member of ENTSOG, GRTgaz is contributing to research on the "Target Model" (target organisation of the European market) and the drafting of Network Codes (codification of rules for network access). GRTgaz's desire to support these developments in the market is actually reflected by several initiatives developed in close collaboration with all the stakeholders:

- in October 2010, GRTgaz and Fluxys launched the marketing of "bundled" primary capacity between two major gas hubs: Zeebrugge and the North PEG. This product, which currently applies to firm monthly capacity, simplifies cross-border trade thanks to a single booking. In the near future it will add the sale of daily capacity and could be expanded to bundled capacity from Germany to France;

- GRTgaz is involved in the development of the "Capacity Allocation Mechanisms" Network Code and is preparing its operational implementation in France. In addition to the physical capacity developed at interconnection points, the addition of new capacity allocation mechanisms (CAMs) seeks to harmonise European practices and to optimise the allocation of interconnection capacity, notably with the organisation of auctions to sell different periods of capacity nomination (intraday, daily, monthly, quarterly, annually). The Network Code also defines the principle of "bundled" capacity at border points. After reviewing its compliance with the ACER guidelines and after a public consultation, the final version of the CAM Network Code will be submitted by ENTSOG to the European Parliament and the European Commission in the second half of 2012;

- planning ahead for the entry into force of European Regulation EC No. 715/2009, in early 2011 GRTgaz launched a new service to publish data on its network to enhance the transparency of its operations. Named "SMART GRTgaz", this web module publishes more than 100 different data in near real-time, including within-day and day-ahead inventory in movement, scheduling imbalances, recovery of the balance of shipper unbalance, or the activity of the secondary capacity market. All relevant points of the network are covered. GRTgaz continues to publish new indicators, such as the recent liquidity index (quantities traded / quantities supplied);

- finally, in accordance with Directive 2009/73/EC, GRTgaz is strengthening the role of market in balancing its network. In parallel with the development of the "Balancing" Network Code, GRTgaz is gradually changing the rules on its network, which will lead the company to expand its action on the Powernext gas exchange. The target organisation will be combined with a network tension indicator to encourage shippers to contribute to the overall balance of the transmission system.

Numerous supply infrastructure projects in Europe

In 2010, LNG terminals were the main import infrastructures commissioned, which contributed to the significant increase in LNG imports in Europe. LNG makes it possible to take advantage of intercontinental trade-offs and boosts the number of gas sources and import routes. As such it represents for Europe a significant tool for securing supplies and a source of optimisation for market players.

A total of about 25 bcm/year of LNG import capacity were commissioned in 2010, including:

- Fos-Cavaou terminal (8.5 bcm/year), France;
- Phase 3 of the Grain LNG terminal (6.6 bcm/year), UK;
- Phase 2 of the South Hook terminal (10.5 bcm/year), UK.

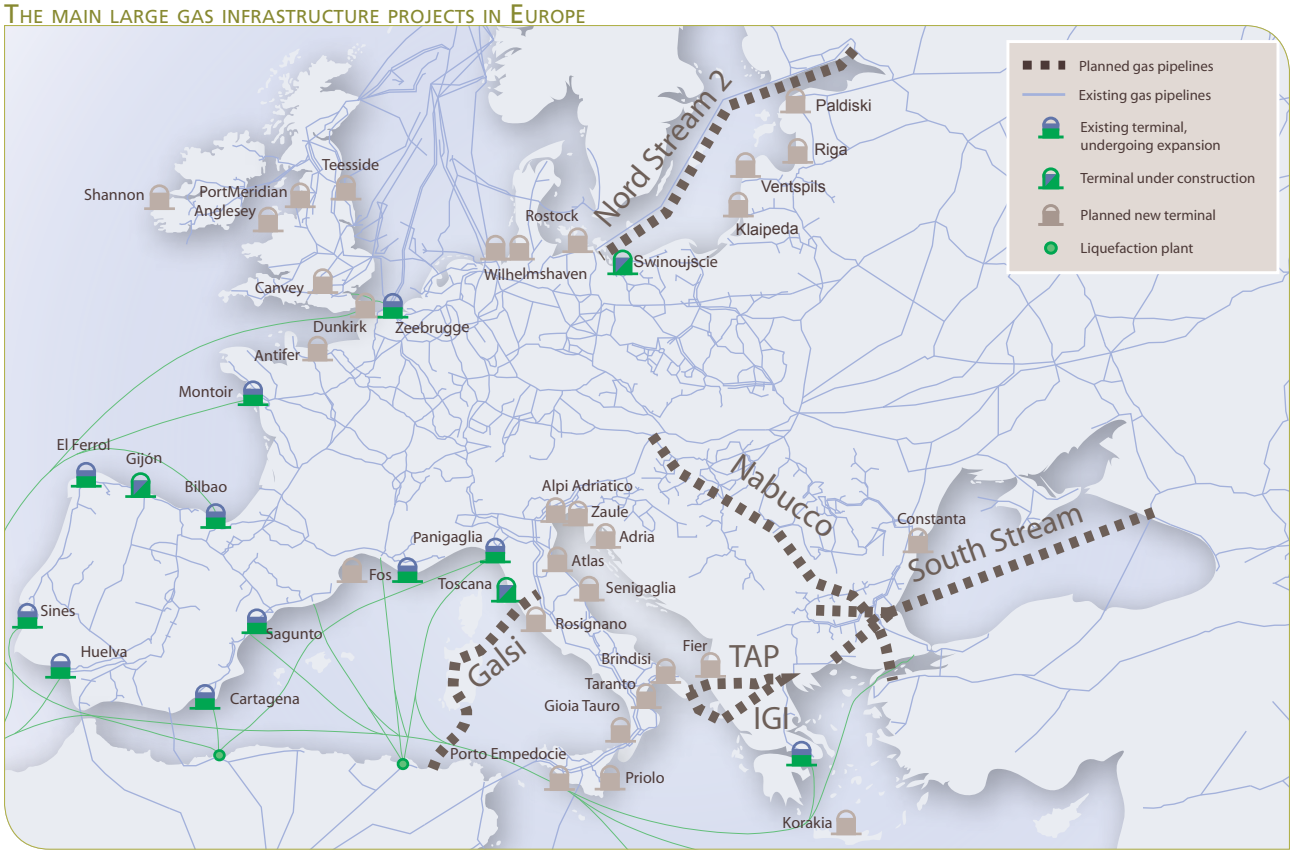
In 2011, major infrastructure projects already have or will come into commercial operation:

- Medgaz: this offshore gas pipeline links Beni Saf in Algeria to Almeria, Spain. Its capacity is 8 bcm/year. It was commissioned in April 2011;
- Nord Stream: this pipeline directly links Russia and Germany via the Baltic Sea. Phase 1 with a capacity of 27.5 bcm/year could be commissioned in late 2011; the second pipeline of identical capacity is under construction and could be commissioned by 2013.
  As the Nord Stream pipeline landing point is in northern Germany, new works are required in the German network: the NEL pipeline (capacity of 20 bcm/year and commissioning in late 2013) and the OPAL pipeline (35 bcm/year capacity and commissioning by end of 2011).
- LNG Gate: the capacity of this onshore terminal based in Rotterdam, Netherlands, is 12 bcm/year. It was to be commissioned in September 2011;
- LNG OLT: the capacity of this offshore terminal based off the coast of Livorno, Italy, is 3.8 bcm/year. It should be commissioned in late 2011 or early 2012.

In addition, new investment projects to develop infrastructure for gas import to Europe are currently being studied:

- Nabucco: this project aims to transmit gas to Europe from the Caspian Sea via a pipeline from Turkey to Austria. The initial capacity of 8 bcm/year announced for 2016 could eventually be increased to 31 bcm/year;
- South Stream: this pipeline is expected to diversify the import routes of Russian gas by linking Russia to Europe (Italy, Greece, Austria) via Bulgaria with a pipeline whose capacity is 63 bcm/year; it is slated for commissioning in late 2015;
- GALSI: the pipeline with a capacity ranging from 8 to 10 bcm/year would link Algeria to Italy via Sardinia with its commissioning in 2015;

THE MAIN LARGE GAS INFRASTRUCTURE PROJECTS IN EUROPE



- Trans Adriatic Pipeline (TAP): with a capacity of 10 bcm/year, this project plans to connect Greece and Italy via Albania;

- Italy Greece Interconnector (IGI): with a capacity of 10 bcm/year, this pipeline is another project to connect Greece and Italy.

Other projects for new LNG terminals or expansions of existing terminals are under consideration. They are located in particular in France, Belgium and Italy along Europe's western and southern seaboards.

In France, a new LNG terminal with regasification capacity of 13 bcm/year will start operating at the end of 2015. Indeed, on 27 June, EDF announced its final decision to invest in the LNG terminal at Dunkirk alongside Fluxys and Total. Construction will start in early 2012.

Priority infrastructures at the European level

The European Union is pursuing an ambitious energy policy to secure gas supply to Europe and to complete the formation of an integrated market providing open access to reliable, competitive and environmentally friendly energy.

These objectives require that energy infrastructures be adapted and integrated on a European scale, which implies significant investments, particularly in the transmission networks and their interconnections.

The challenge is to enable a smoother flow of gas between markets and greater flexibility within the European network in the event of a crisis. On this last point, the security regulations for European supplies adopted in 2010 lay the foundation for assistance between member states in the event of a crisis and establish incentives to develop bi-directional flows at the interconnections between the networks of two member states. Furthermore, to support the development projects identified as essential, the European Commission is implementing financial aid programmes.

Several GRTgaz development projects are receiving cofinancing from the EU due to their contribution toward achieving European policy objectives.

The European Commission awarded grants to GRTgaz in 2010 and 2011 as part of the EEPR (European Energy Programme for Recovery, created in 2009 after the crisis to support the economic recovery) and TEN-E (Trans-European Energy Network).

The affected projects are:
- in the North Zone, the construction of the Arc de Dierrey and Pitgam-Nedon part of the Hauts de France pipeline;
- in the South Zone, the new Chazelles compressor station, reinforcement of the Rhône pipeline (Eridan) and baseline studies for supplying natural gas to Corsica from the pipeline project between Algeria, Sardinia and Italy (GALSI).

> Future compressor plant in Chazelle (Charente)

Security of supply in Europe

The 2009 crisis between Russia and Ukraine highlighted the need to improve supply security in the European system in terms of the preparation of the different member states and coordination between countries. The work undertaken has led to the replacement of the old directive (2004/67/EC) by Regulation 994/2010 on the security of gas supply, which entered into force on 3 December 2010 and whose stated aims are to:

- develop the European Union's ability to manage supply crises by creating a common, minimum level of preparation, the fulfilling of which is the responsibility of each member state;
- improve member states' coordination when faced with crises and establish principles of solidarity;
- encourage the construction of infrastructures necessary to the European market and supply security;
- overcome the limitations of national approaches.

The main provisions of the regulation relate to:

- the definition of a common level of risk;
- the definition of a perimeter of protected customers which consists at a minimum of the residential market;
- the establishment of a minimum standard for transmission infrastructures which must be able to ensure supply to all of their customers on a peak-day in the event of a loss at the biggest point of entry on the network;
- the establishment of a minimum standard for procurement to ensure supply to the protected consumers under certain conditions such as a peak period of 7 days;
- the implementation of physical reverse flow capacity at gas interconnection between states;
- better anticipating action within each state which entails the completion of a risk assessment by 3 December 2011 and the implementation of a preventive action plan within the following year;
- better organisation in the event of a crisis with the establishment of national and European contingency plans (to be prepared by 3 December 2012) and clarification of roles and responsibilities;
- greater transparency and the delivery of additional information for prevention and in the event of a crisis;
- transparent, non-discriminatory measures that do not distort market operations and do not endanger the security of other states or the European Union.

The GRTgaz network already complies with the minimum standard for loss at the largest point of entry. However, GRTgaz is already planning to develop physical counter flow capacity to Belgium and Germany if the market demands it or if one of these states requests it for its supply security.

> Taisnières compressor plant

Published by the Commission in late 2010, the blueprint for an integrated European energy network identifies three priority corridors for energy infrastructure over the next two decades:

- a southern corridor to bring gas from the Caspian Sea directly to Europe to diversify sources of gas supply;
- the integration and connection of the Baltic energy market to central and south-eastern Europe;
- a north-south corridor in Western Europe to better connect the Iberian Peninsula and Italy with the northwest European markets.

The ten-year plans established by the TSOs, which provide a shared vision of development needs to respond to changing market conditions, are a key element in this process.

GRTgaz's decision to proceed with the Eridan project, as well as the expected decisions to invest in its network in order to connect the Dunkirk terminal and to develop capacity toward Belgium are now part of this rationale.

France at the crossroad of European gas transmission

France has several notable features, which enable it to carve out a position as a major gas market in the coming years.

CONSUMPTION IS HIGH AND RISING

France is the 4th largest gas market in Europe, with consumption of around 50 bcm, accounting for 10% of EU demand. This market shows strong momentum, as illustrated by the 11% annual increase in consumption in 2011 due to cyclical (cold winter) and structural (economic growth and strong demand for gas for power generation) factors.

Gas consumption for power generation is on a strongly rising trend for the next few years, which grants the French market a growth outlook higher than the European average.

French consumption could grow by about 1.2% per year on average over the period 2011 to 2020. This increase primarily reflects the continued expansion of gas-fired power generation (see Appendix I).

A MARKET STRUCTURE THAT PROMOTES TRADE

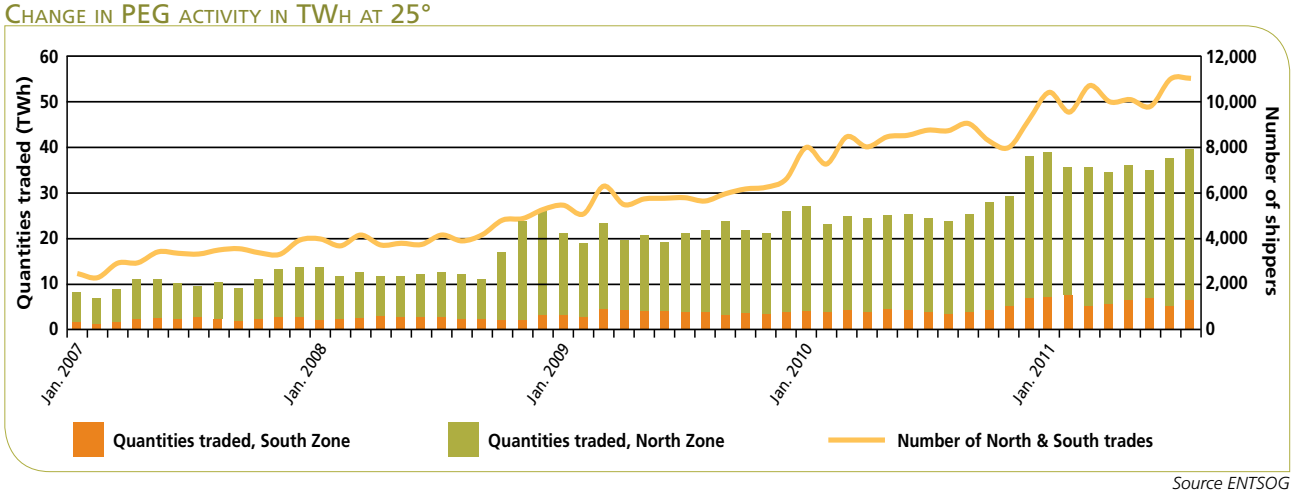
Market participants can rely on two virtual gas exchanges which favour interaction between all the gas market actors (consumers, suppliers, producers, traders, etc.) and are backed by large entry/exit zones.

Since these virtual gas exchange points were made available to the market, GRTgaz has posted robust increases in the number of exchanges and players. Launched in 2008, an organised market rounds out the range of services, stimulating the fluidity and depth of exchanges.

LARGE STORAGE CAPACITY

Underground storage is also a major asset for the French market with over 12 bcm of effective volume, or the third storage capacity in Europe, accounting for 15% of total capacity. Storage mod-

CHANGE IN PEG ACTIVITY IN TWH AT 25°



Source ENTSOG

ulation enables market participants to optimise their gas supply to end customers and to engage in short-term arbitrage transactions.

COASTLINES WHICH FAVOUR THE CREATION OF LNG TERMINALS

The bulk of French gas supply is imported, as domestic production at Lacq is becoming marginal. These imports are delivered by pipeline (70%) and LNG (30%) with a larger proportion of LNG than most European countries. France's regasification capacity ranks third in Europe with 24 bcm/year, or 15% of the European total.

The sources of France's supply are among the most diverse in Europe with contributions from all major suppliers: Norway, Russia, Netherlands, Algeria, Nigeria and Qatar.

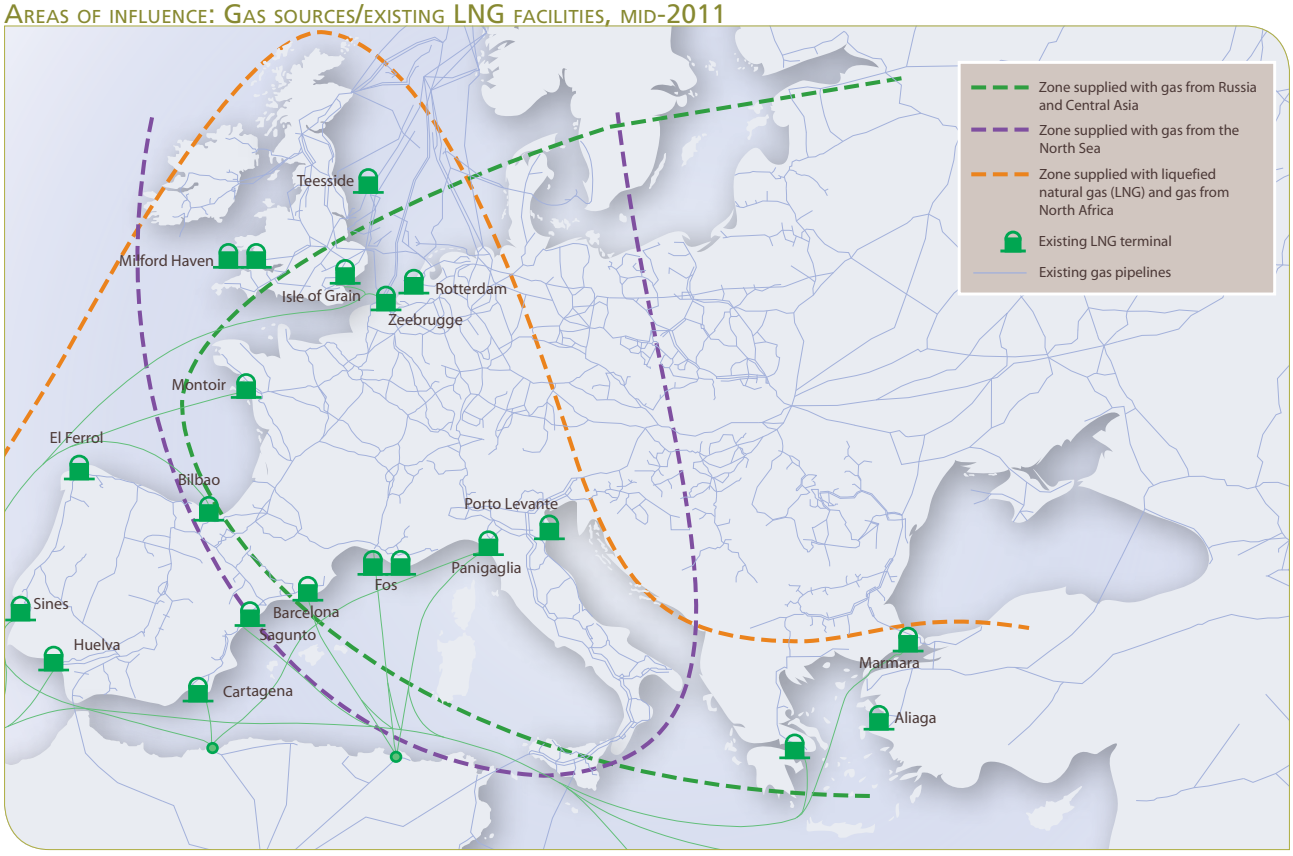
Given the surge in international LNG trading, France enjoys a strategic position due to its regasification capacity (existing and planned) spread across the Atlantic and Mediterranean coasts, which allows for greater flexibility in LNG shipping from both the Atlantic and the Mediterranean, or even the Middle East.

Moreover, as it borders five other European countries in the north and south of Europe, France boasts substantial gas interconnections, including with Italy via Switzerland.

At the junction between the markets of Northern Europe, Southern Europe and the new LNG flows from the Atlantic Basin and Gulf countries, France has a key position in ensuring the solidarity and security of supply to member states, encouraged by European authorities.

Drawing on these strengths, France is a de facto area of arbitrage between the gas flows from the east, west, north and south. This advantageous geography explains the implementation of new infrastructures like the Dunkirk terminal and the market's desire to boost interconnection capacity with adjacent countries. The medium-term need for additional capacity is assessed through the open seasons described in the next chapter.

AREAS OF INFLUENCE: GAS SOURCES/EXISTING LNG FACILITIES, MID-2011



Impact of electricity generation on the French gas system

Sustained growth in centralised power generation from natural gas

As of 1st September 2011, there were 12 power plants connected to the GRTgaz transmission network, of which 8 were operating in commercial mode for an installed capacity of 5.3 GWe. Other projects are currently in the research phase for possible future connection.

Today, these facilities account for one quarter of delivery capacity and consumption of customers directly connected to the GRTgaz network.

Despite a slowdown in planned connections of new facilities, it does not offset a strong trend that is favourable to the use of natural gas for power generation: growth of electricity demand in France, planned exit from nuclear power by several European countries, rise of renewable energy, natural gas advantages over other fossil fuels for power generation, etc. As such, the marketing of new combined cycle gas turbines with high efficiency (greater than 60% GCV) and high power (greater than 500 MWe for a little over 400 MWe previously) announced recently by certain turbine manufacturers is likely to increase the attractiveness of natural gas for electricity production. By 2020, and based on connection projects currently under study, an additional capacity of about 4 GW of CCGT could be installed.

This projection includes the idea of a new plant near Brest (in orange on the map) to ensure the security of electricity supply in western France. Indeed, in accordance with the *Pacte électrique breton* of 14 December 2010, the government launched a call for tenders on 25 June 2011 for the construction of a 450 MW gas combined cycle plant. This project will require substantial changes to the existing network to develop the capacity needed to supply it with natural gas.

In the framework of a daily balancing system, the massive arrival on the GRTgaz network of high power electricity plants has a large impact on the transmission network's management during the day. Since 1st April 2011, and after two years of consultation with market players, all plants in commercial operation are subject to the new intraday flexibility special service as "strongly modulated sites". This service is primarily based on daily operational modes that enable customers to achieve the desired consumption profiles and allow GRTgaz to ensure the safety of the gas system.

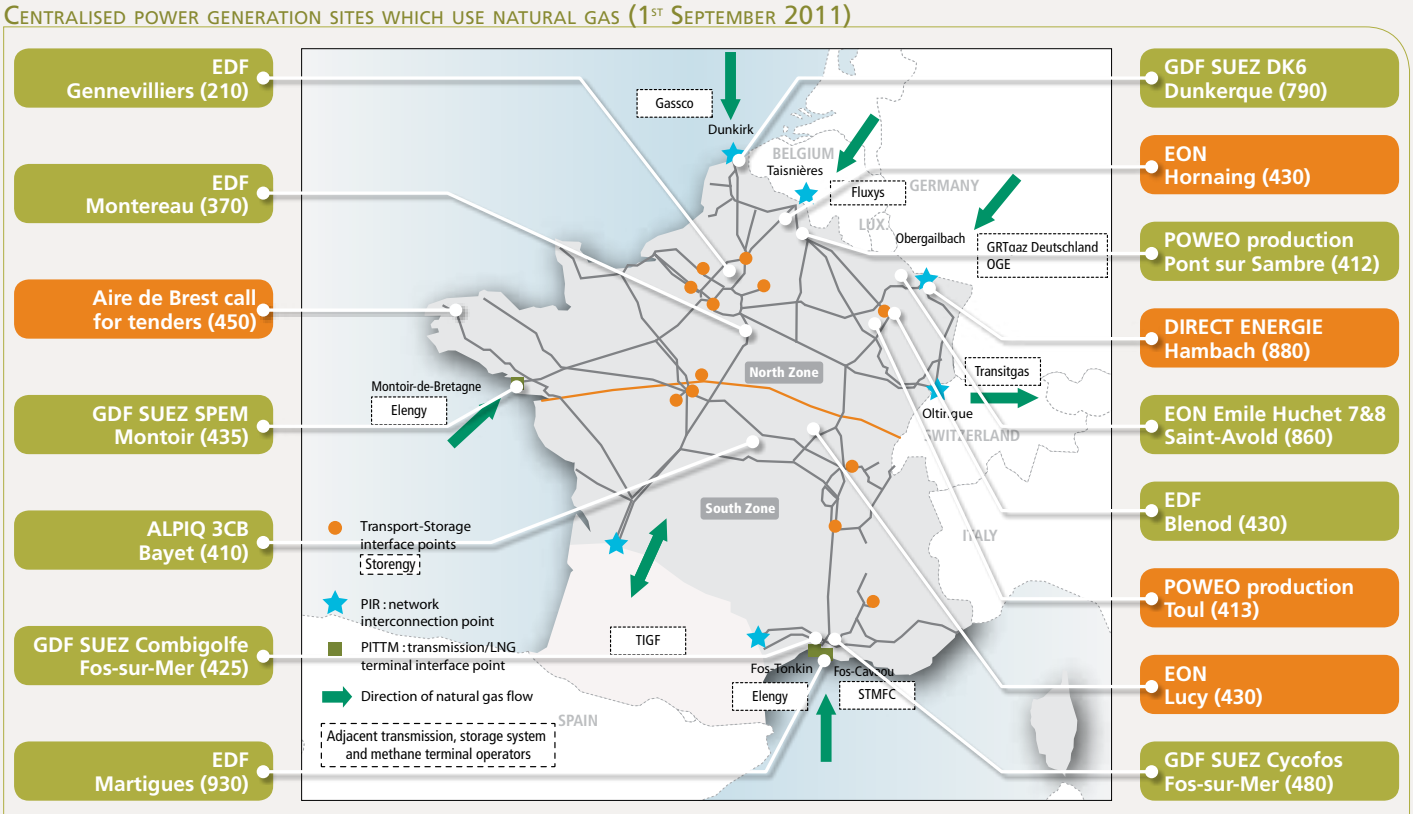
GRTgaz will continue to support its customers by adapting its offer through the Concertation Gaz process to accommodate new power plants.

At the same time, significant uncertainty hangs over decentralised gas-fired power generation

The electricity purchase obligation pricing implemented in the late 1990's enabled cogeneration fuelled by natural gas to experience a boom that is still benefiting France's industry and economy. Most of these contracts, for a maximum, non-renewable term of 12 years, will expire between 2010 and 2013. Often overlooked, these combined means of producing heat and power account for roughly the same amount of installed electrical capacity as the gas plants mentioned above, i.e. about 5 GW.

Several potential scenarios, including one from Association Technique Énergie Environnement, foresee a drop of over 50% in electricity produced by cogeneration when the purchase obligation contracts expire.

CENTRALISED POWER GENERATION SITES WHICH USE NATURAL GAS (1ST SEPTEMBER 2011)



5 other power projects are under assessment for connection to the GRTgaz transmission network.

Legend: (…): electrical power expressed in MW — Power plant that uses or will be able to use natural gas in 2011-10-05 — Planned power plant that will consume natural gas after 2011-10-05

Development of the GRTgaz Transmission Network

An analysis of current demand and its evolution allows GRTgaz to identify additional infrastructure it should build to respond to:

- increases in consumption, notably those linked to combined cycle gas turbines;
- desired changes to the organisation of the French gas market;
- the development of new interconnection, regasification and storage capacity.

The creation of new capacity flowing into or out of a market zone requires more than the reinforcement of infrastructure connecting to the adjacent network; the core network must also be strengthened so it can transmit the additional delivered volumes to all the exit points from the zone (unrestricted entry/exit model retained by GRTgaz).

As a result, strengthening a core network infrastructure component (the Arc de Dierrey, for example) is usually the common denominator for several individual capacity-building projects. The date of commissioning of the reinforcement will then depend on the first project to trigger it. Strengthening the core network can sometimes be accomplished gradually, as in the case of the looping of the South-North link (looping of the Rhône pipeline then Est Lyonnais then the Bourgogne pipeline). In this instance, the improvements are determined according to the timeline of the various projects which vindicate the reinforcement. GRTgaz uses information obtained from the sponsors of projects related to adjacent infrastructure to define the schedule of investments needed for its core network. A change in schedule could therefore cause GRTgaz to adapt its programme accordingly.

The remainder of this chapter describes for each zone both the capacity expansion projects and the corresponding reinforcements to the main network.

Developments in the North Zone

The GRTgaz North Zone is now the most active in terms of market openness and activity at the gas exchange. Because it is naturally connected to the major markets of northern Europe, it is a valuable zone that has attracted many players. In particular, since 2006 and 2007 several LNG terminal projects have emerged in the North Zone. From the outset of these projects, GRTgaz has worked closely with their sponsors to plan the developments to the transmission network they require. A product of this collaboration is the major decision taken in 2011 to create the LNG terminal in Dunkirk. In the North Zone, an east to west constraint occurs as soon as a significant increase in entry or exit capacity is considered for the zone (see Appendix II). To eliminate this potential bottleneck and be able to guarantee all the capacity expansion projects set forth below, reinforcements to the core network are mandatory. Such strengthening is also needed to merge the GRTgaz North and South zones.

Given all the capacity development projects identified to date in the North Zone, the following reinforcements may be needed:

- a pipeline connecting the Cuvilly station (Oise) to the Voisines station (Yonne) via the Dierrey station (Aube), called "Arc de Dierrey";
- full looping of the Beauce pipeline;
- looping of the Nord-est pipeline between the Laneuvelotte and Voisines stations;
- a pipeline connecting Chémery to Dierrey.

Given the time to maturity of the different projects expanding capacity in the North Zone and given the timetable for connection of the Dunkirk LNG terminal, the Arc de Dierrey will be the first stage of this reinforcement.

DEVELOPMENT OF LNG TERMINALS

Connecting the new LNG terminal in Dunkirk

Initiated in 2006, the project to build a new LNG terminal in Dunkirk reached a crucial milestone this year. The shareholders of Dunkerque LNG took the final investment decision for the project on 27 June 2011. The terminal and its capacity of 13 bcm/year will supply natural gas to the French market starting in late 2015.

The need to connect the terminal to the GRTgaz network has triggered the execution of the following works until 2015:

- creation of a 900-mm linking pipeline between the terminal and the Pitgam compressor station; this pipeline will deliver non-odorised gas;
- looping of the Hauts de France pipeline between Nedon and Cuvilly (123 km, 1,200 mm diameter) and the adaptation of interconnection stations accordingly;

- creation of the Arc de Dierrey (about 300 km, ND 1200) and appropriate adaptation of the Cuvilly, Dierrey and Voisines interconnection stations.

These investments were approved by the CRE with its decision of 12 July 2011, on the condition that an audit should be conducted in the second half of 2011. The final investment decision will be taken GRTgaz after this audit.

Adaptation of inflow capacity from the Montoir-de-Bretagne LNG terminal

The operator of the LNG terminal at Montoir-de-Bretagne is considering two possible terminal expansions in the coming years.

The terminal's annual capacity could initially rise from 10 bcm to 12.5 bcm in 2014-2015 then grow to 16.5 bcm in a second phase planned for 2017. A market consultation (non-binding phase) is currently being conducted by the terminal operator to assess these expansions.

To enable the release of an additional 2.5 bcm to the network in 2014-15, the compressor station at Auvers-le-Hamon (Sarthe) must be reinforced (10 MW).

The works necessary to accommodate the release into the GRTgaz network of 16.5 bcm per year from the Montoir-de-Bretagne terminal in 2017 would be the following, assuming the Arc de Dierrey were already up and running:

- loop the Maine pipeline (ND 1050);
- Chémery - Dierrey pipeline;
- Bolster compression at Dierrey.

Connect a new LNG terminal at Antifer

Since 2006-2007, a new LNG terminal has been set as project for Antifer by 2016. Its capacity was to be 9 bcm/year and could possibly be increased to 18 bcm/year. The project was declared to be of a general interest in a prefectural order of 18 June 2009, but was suspended in early 2011. The sponsor maintains, however, that the project could be revived later.

As part of its *Ten-Year Development Plan,* GRTgaz assumes that this terminal will be commissioned in 2020, with a capacity of 9 bcm. To create these new incoming capacities in the North Zone, assuming the previous core network developments are completed, it would be necessary to build a new pipeline of approximately 70 km between the terminal and Elbeuf (Seine-Maritime), called the "Caux-Roumois" pipeline.

DEVELOPMENT OF INTERCONNECTIONS WITH ADJACENT NETWORKS

Increased capacity from Belgium to France at Taisnières H

In 2007, Fluxys and GRTgaz launched a coordinated market consultation to assess needs for additional transmission capacity from Belgium to France. The binding phase of the consultation was completed in the first half of 2010 and helped to identify a total requirement of 640 GWh/day of long-term entry capacity into the GRTgaz North Zone at the Taisnières H point by 2013. This capacity need requires the creation of 50 GWh/day in additional capacity compared to the current marketed capacity. The following projects are needed to accomplish this:

- modification of the Taisnières interconnection station;
- modification of the Cuvilly compressor station;
- partial looping of the Hauts de France pipeline along about 50 km.

The final investment decision was taken by GRTgaz in 2011.

Creation of exit capacity to Belgium near Veurne

Due to a difference in gas odorisation practices between France and Belgium (unlike in France, the gas is not odorised on the transmission network in Belgium), no physical flow is currently possible from France to Belgium and no firm exit capacity to Belgium is therefore sold by GRTgaz. Only interruptible reverse capacity is offered to actors in the Taisnières market.

With the new LNG terminal in Dunkirk, GRTgaz will be assured that each day it will have significant quantities of non-odorised gas near the Belgian border. Under these terms, by the year 2015-2016, it will become possible to market firm capacity from France to Belgium via a new point of interconnection between the GRTgaz and Fluxys networks near Veurne.

In accordance with the decision of the CRE of 29 April 2010, GRTgaz and Fluxys launched on 31 May 2010, a coordinated market consultation (non-binding phase of the open season) to assess the actual market need.

The results of this consultation which ended in late August 2010 confirmed a demand of about 420 GWh/day for 20 years, most of which came from shippers wanting to bring gas from the Dunkirk terminal to Belgium.

To take these results into account, GRTgaz and Fluxys suggested changing the commercial scheme, which was approved by the CRE on 12 July 2011. The binding phase of the coordinated open season should be launched in autumn 2011 and will therefore propose:

- at Veurne, exit capacity from the GRTgaz network to the Fluxys network allocated in a coordinated way and sold respectively by GRTgaz and Fluxys;
- at the Dunkirk terminal, entry capacity to the Fluxys network sold by Fluxys via a transmission service formalised in a Fluxys contract with GRTgaz.

In addition to the investments necessary to connect the Dunkirk terminal to the GRTgaz network, the creation of this new interconnection will require in France:

- a modification to the Pitgam interconnection;
- the creation of a pipeline of roughly 25 km and ND 900 (or ND 1050 depending on open season results) linking the Pitgam interconnection station to Veurne (called the "artère des Flandres"); this pipeline will transmit non-odorised gas.

Increase in outgoing capacity to Switzerland at Oltingue

The main network exit point to Switzerland and Italy is Oltingue. Historically, virtually all the capacity at this exit point was used to supply Italy with gas from Netherlands and Norway.

Several shippers have expressed interest in additional exit capacity at Oltingue. GRTgaz has initiated discussions with ENI GTI in order to provide a favourable response to this demand and studies are underway on both sides of the border. They could lead to a market consultation, subject to confirmation from the Swiss operator, whose shareholder composition will change soon.

Given the initial results of the GRTgaz network study, an expansion adding about 60 GWh/day by 2016 seems relevant.

To do this, assuming the Arc de Dierrey has been completed, a new compressor station would be built at Champey (Meurthe-et-Moselle) and changes would be needed at the Morelmaison station. In addition, some of the following works may be required:

- partial looping of the Nord-est pipeline between the Laneuvelotte and Voisines stations;
- creation of a compressor station in Cheppy (Meuse);
- reinforcement of compression at Voisines.

Creation of inflow capacity from Switzerland at Oltingue

The Swiss transmission operator, ENI GTI, consulted the market in November 2009 and November 2010 to assess the demand for transit capacity from Italy to France. This consultation ended with bookings on this route. SNAM RETE GAS, the Italian operator, has taken investment decisions to enable the exportation of 400 GWh/day from Italy to Switzerland to supply France and Germany.

GRTgaz is currently working with ENI GTI, Swissgas, Transitgas and SNAM RETE GAS to coordinate the work needed to create firm entry capacity at Oltingue in order to offer capacity from Italy to France via Switzerland, in the frame of a future open season.

The Ten-Year Development Plan for the GRTgaz network assumes the creation of 100 GWh/day of entry capacity at Oltingue in 2017.

This development of firm capacity would require reinforcement of the Nord-est pipeline with a looping of the line between Morelmaison and Voisines along about 80 km, assuming the Arc de Dierrey is completed. Depending on the pressure constraints on the Swiss network, additional compression may also be required (currently being studied).

Creation of exit capacity to Luxembourg

The forecasts for consumption growth in Luxembourg have led the operator Creos to ask GRTgaz to study a strengthening of the interconnection capacity from France to Luxembourg. The existing interconnection which accommodates 0.3 GWh/day cannot cope with the expected increase in Luxembourg's consumption. The preliminary studies show a need for additional firm capacity from 9 to 40 Wh/day at the interconnection between the French and Luxembourg networks.

The operators co-launched an open season non-binding phase in November 2010. It confirmed the need to add firm capacity. The two operators plan to continue the open season by launching a binding phase in early 2012 as requested by participants in the non-binding phase.

For this plan, GRTgaz assumes a rise of 40 GWh/day of exit capacity to Luxembourg in 2016. To do so, a new pipeline between the Lorraine and Luxembourg pipelines should be built, assuming the Arc de Dierrey is already completed.

Creation of reverse capacity to Germany at Obergailbach

As part of the integration of European markets, the European Commission stressed the importance of strengthening the south-north corridor in Western Europe to better connect the Iberian Peninsula to the markets in the north-west. Such a development would enable, in particular, gas from French or Spanish LNG terminals to reach the German market which would then benefit from a new supply source. In this context, GRTgaz is conducting pre-studies of emergence to evaluate the possibility of creating firm output capacity to Germany at Obergailbach. Discussions to this end have recently begun with the two German transmission operators active at this interconnection point (Open Grid Europe & GRTgaz Deutschland).

To develop 100 GWh/day of exit capacity at Obergailbach by 2017, GRTgaz must complete the following works in addition to the Arc de Dierrey:

- looping of the Nord-est pipeline between the Laneuvelotte station and Morelmaison;
- creation of a compressor station in Cheppy (Meuse);
- reinforcement of compression at Voisines.

However, as for Belgium, the differences in gas odorisation practices between France and Germany currently prohibit any physical flow of gas from France to Germany. The development of firm capacity from France to Germany is therefore contingent upon the harmonization of European practices in this regard. In light of this, GRTgaz is studying the different possible scenarios to adapt its network and enable the export of non-odorised gas.

DEVELOPMENT OF STORAGE

The core network reinforcements foreseen by GRTgaz incorporate the storage development plan submitted by Storengy and meet the needs expressed by the latter.

Developments in the South Zone

Access to the South Zone has gradually improved since 2009 thanks to two major factors:

- first, the Fos-Cavaou terminal has been running at 100% capacity since September 2010. This contribution of additional volume in the South Zone has resulted in a reduction in the utilization rate of the North-South link, which dropped from about 90% in 2009 to about 70% in 2010;

- moreover, the work carried out in 2010 as part of the "Concertation Gaz" process led to improve capacity marketing rules. Marketing is now organized into several successive rounds of allocation on a pro rata basis, giving greater visibility to shippers as they express their requests. A guaranteed allocation mechanism completes the mechanism and promotes access to capacity for shippers with limited needs.

Launched in July 2011, the coupling service for the North and South marketplaces, which is currently being tested, should help to maximise the capacity use of the link and further facilitate access to the South zone (see sidebar page 30).

However, there are still many projects in the South Zone which no longer involve mere supply to the zone. Taking advantage of the attractiveness of the Mediterranean coast for importing LNG in Europe, they are mostly related to the diversification of supply sources and the medium-term increase in natural gas needs in Europe.

As in the North Zone, the development of entry and exit capacity in the South Zone may require reinforcement of infrastructure of the core network to maintain the existing transmission possibilities. Indeed, bottlenecks emerge, notably between the north and south of this zone as soon as the entry and/or exit capacities are developed in the south.

In light of all the development projects identified in the South Zone, the core network should be strengthened along a south-north axis between Marseilles and Dijon. The main works which will enable this bolstering are:

- looping the Rhône pipeline between the station at Saint-Martin-de-Crau (Bouches-du-Rhône) and the Saint-Avit station (Drôme);

- looping the Est Lyonnais pipeline between Saint-Avit and Etrez;

- looping the Bourgogne pipeline between Etrez and Voisines.

Given the large number of potential projects requiring the reinforcement of this axis in the more or less short term, the importance of this reinforcement to ensure a proper working order and secure supply of European and French markets, and the European Commission's support for this investment via a major subsidy, GRTgaz decided to proceed with strengthening this main line at its southernmost part. The project, called Eridan, consists in looping the Rhône line by mid-2016 and adapting the interconnection stations accordingly. The CRE approved this investment at its proceedings of 19 April 2011.

Moreover, Eridan will help develop the fluidity and flexibility of the South Zone and is an essential step in the process of merging zones. It also facilitates the eventual completion of the North-South corridor in western Europe.

> Laying of the Mâconnais pipeline

Market coupling on the GRTgaz network: a first time for natural gas in Europe

On 1st July 2011, GRTgaz launched its market coupling service between the North and South PEGs with the support of Powernext. This service, which has been operating successfully in the electricity sector since 2006, is a first in the European gas sector. It required an in-depth adjustment of the coupling mechanism to the specificities of natural gas and the terms of continuous trading.

The principles of this service were developed with all market participants, professional associations and the CRE. The CRE approved the proposals with its decision of 19 April 2011.

The coupling of the North and South PEGs enables GRTgaz to broaden the range of services offered to shippers by proposing a new way to access capacity on the North-South link. It indirectly consists in offering shippers a transmission service between the North and South PEGs (or vice versa) for the next day and on the week-end. This service is offered through Powernext gas exchange and is based on the South PEG/North PEG spread product launched by Powernext on 25 May 2011. The service is sold as an implicit auction whose price is indicative of the market situation.

This is a first step in the solutions explored by GRTgaz to merge the North and South Zones and provide a single balancing zone for the GRTgaz network in the medium term. By carrying out a partial merger of the order books for GRTgaz's North and South Zones, this service helps to promote efficiency and fluidity in the French gas market. Indeed, it enables the comparison with the prices of both North and South PEGs and increases the fluidity and attractiveness of the French market, particularly in the South Zone.

The service has begun with an experimental phase. In this first phase, the capacity offered by GRTgaz is a firm capacity of 10 GWh/day in each direction, North-South and South-North (on a daily basis, the capacity made available from the PEG with the lower price to the PEG with the higher price).

A first round of feedback and analysis is planned for October 2011. It will confirm or not the market's interest in this kind of service and will consider future developments from April 2012. The decision of the CRE on 7 July 2011 has already ensured, as necessary, the protraction of the coupling service beyond 1st April 2012, by reserving a capacity of 10 GWh/day for this mechanism starting in April 2012.

DEVELOPMENT OF LNG TERMINALS

Adaptation of entry capacity from the Fos Tonkin LNG terminal

The operator of this terminal launched an open season in early 2011 to validate the market's interest in the renovation and/or expansion of its terminal for 2014-2015 to achieve a capacity of 3 to 7 bcm/year. In parallel, GRTgaz launched the technical and economic studies necessary to evaluate the impact of this development on the network.

To the extent that the goal is essentially to extend existing capacities, this adaptation should not require any investment in the GRTgaz main network beyond Eridan.

Connecting a new LNG terminal at Fos-sur-Mer

The company Fos Faster LNG Terminal SAS has notified GRTgaz of its intention to build a new LNG terminal at Fos-sur-Mer.

The commissioning of this new infrastructure with a regasification capacity of 8 to 16 bcm/year is planned for 2017.

The public debate ran from 6 September to 17 December 2010. The results and minutes of the debate were released on 17 February 2011, by the National Commission for Public Debate (CNDP) and the special commission, respectively. Fos Faster LNG Terminal SAS decided to proceed with project studies and has launched a market consultation. GRTgaz and the sponsor are gradually setting up the contractual scheme which is necessary to ensure smooth project execution.

Connecting this terminal with a capacity of 8 bcm/year may require the following investments:

- a line between the terminal and Saint-Martin-de-Crau;
- looping of the Est Lyonnais line in addition to the looping of the Rhône pipeline, assumed to be completed by 2017;
- the end of the project looping the Beauce pipeline.

Adjustment of entry capacity from the Fos-Cavaou LNG terminal

The operator of this terminal informed GRTgaz of its plan to study the potential expansion of the Fos-Cavaou terminal for 2009. This rise in capacity could require:

- adaptation of the interconnection at Saint-Martin-de-Crau;
- reinforcements north of the Etrez station (completion of the Bourgogne looping project and strengthening of compression on a Saint-Martin - Voisines line) if the works which may be needed for projects before 2020 have been completed.

DEVELOPMENT OF STORAGE

Storengy pursues its policy of boosting storage capacity, notably with the construction of the new Hauterives storage site (Drôme). GRTgaz and Storengy will act in collaboration in order to connect new storage capacity to the transmission network at the Saint-Avit station.

In addition, the company Géométhane conveyed to GRTgaz its decision to renovate and increase its storage capacity at Manosque. Géométhane plans to increase the injection capacity at the Manosque site by approximately 125% starting in 2016 then to bolster the withdrawal capacity of the same site by around 80% in 2018.

Only the 2018 boost of withdrawal capacity could require work (i.e. in addition to the core network developments already identified in the preceding paragraphs), described as follows:

- partial looping of the Bourgogne pipeline;
- compression reinforcement at Saint-Avit, Etrez and Palleau.

DEVELOPMENT OF INTERCONNECTION CAPACITY WITH ADJACENT NETWORKS

Capacity development with the TIGF network and Spain

The Spanish market's demand to strengthen the interconnection with France in both directions was already identified in 2005.

This topic has been at the heart of discussions within the South Gas Regional Initiative led by Spanish, French and Portuguese regulators and with the active involvement of shippers and TSOs, including ENAGAS, GRTgaz, Naturgas Energia Transporte and TIGF.

Following the open seasons held in 2009 and 2010, it was decided to increase interconnection capacity from Spain to France. This capacity will be elevated from 115 GWh/day to 170 GWh/day in 2013 and 225 GWh/day by 2015.

These upgrades in capacity require that GRTgaz develop a new compressor station in Chazelles, planned for 2013. Administrative authorizations related to this project were obtained in late 2010 and construction began in summer 2011.

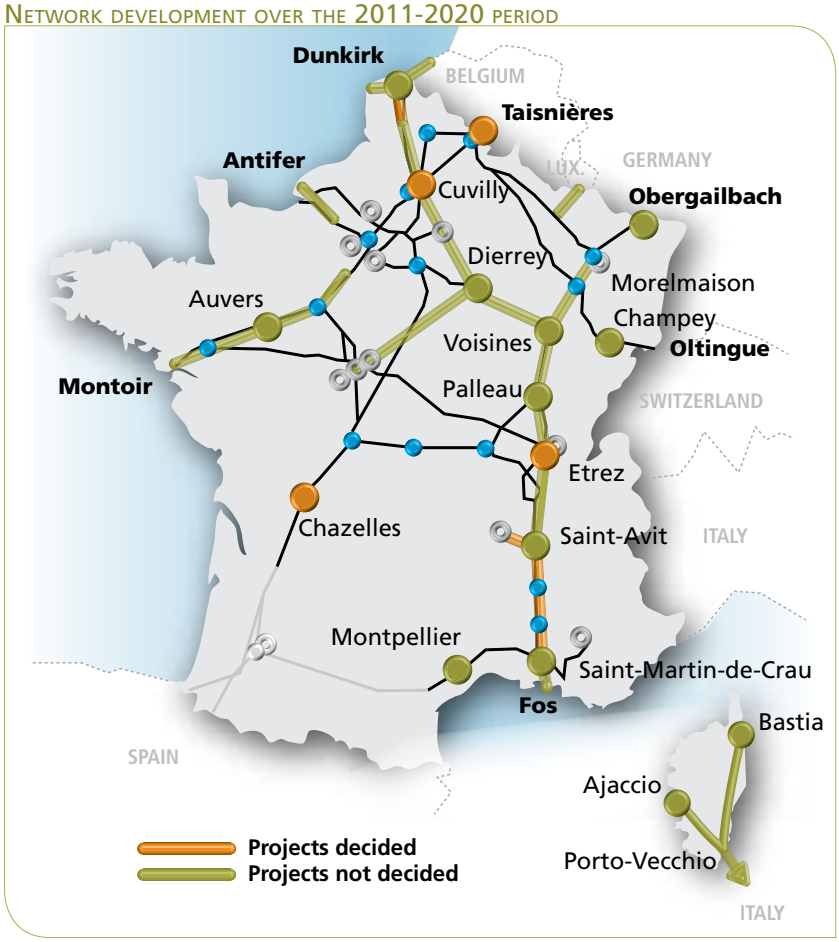
The creation of a new interconnection to the east of the Pyrenees (Midcat project) was not retained after the open seasons mentioned above for lack of sufficient demand. The end of the economic crisis could push up demand related to the creation of a direct link between the Spanish market and GRTgaz's North Zone with the goal of better integrating the Iberian Peninsula with the markets of northern Europe.

2020 is the new proposed deadline for the Midcat project, as indicated by ENTSOG in its network development plan for the entire European Community. Nevertheless, the deadline and the capacity development have to be specified after a new open season organized within the South Gas Regional Initiative. If changes in market demand vindicated Midcat, the following structures in the GRTgaz network could require changes to deliver the gas to the core of the network:

- reinforcement of compression at Saint-Martin-de-Crau;
- creation of a compressor station in Montpellier;
- adaptation of the interconnection at Saint-Martin-de-Crau.

Core network reinforcements specific to this capacity need have not yet been evaluated for this new timeline. To the extent that all the projects described in the preceding paragraphs would have been completed before 2020, it could be necessary to complete the looping of the network north of the Palleau station and to expand the compressor stations located between Saint-Martin-de-Crau and Voisines.

Network development over the 2011-2020 period



Development of the line between GRTgaz's North and South Zones

Since its inception, GRTgaz has been committed to simplifying its offer by reducing the number of entry-exit zones. The number of zones has been lowered from four areas in 2005 to two as of 1st January 2009. The continuation of this simplification approach, if confirmed by the market, would result in the merger of the North and South Zones.

The completion of this step requires the existing physical bottlenecks along the North-South link to be removed. Historically, the southeast of France was largely fuelled by natural gas coming from the Fos terminals with additional gas from the north arriving via the Est, Bourgogne, Est Lyonnais and Rhône pipelines. The link capacities reflect this supply scheme and are limited to 230 GWh/day.

GRTgaz has already studied the complete merger of the zones using two different approaches: the first is based on additional investment and the second relies solely on contractual mechanisms. This second approach was discussed in 2009 with the CRE and the various market players as part of the "Concertation Gaz" process; it revealed its limits because of the deployment of complex contractual tools that would be hard to scale (flow commitments).

The table below reviews the investments identified for the first approach to merge the North and South Zones.

With the completion of two major core network projects – Eridan in the South Zone and Arc de Dierrey in the North Zone – the opportunity assessment of defining a single zone for the GRTgaz network must be refreshed. At the CRE's request, GRTgaz entrusted the preparation of the study to an independent firm. This portfolio, overseen jointly by the Ministry, the CRE and GRTgaz, will be finalised by the end of 2011.

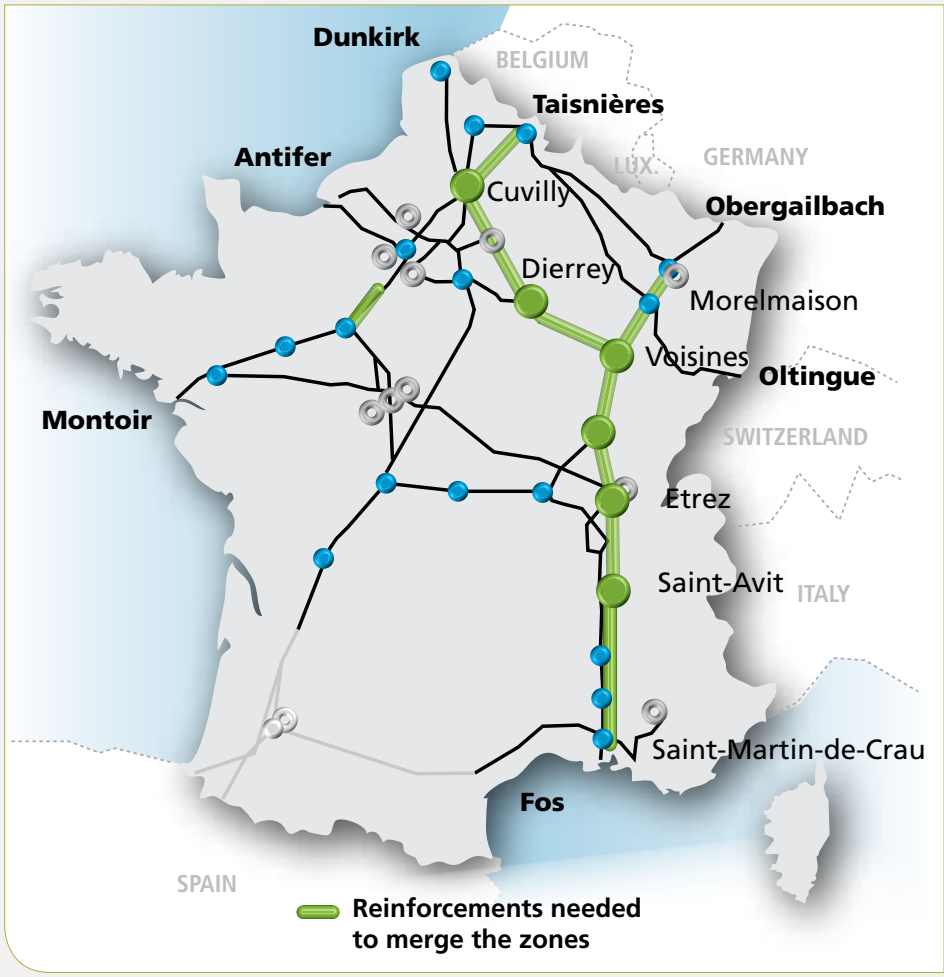
It will then be necessary to evaluate the solutions which can alleviate bottlenecks in terms of feasibility, cost and impact on stakeholders. Three kinds of combinable solutions are being considered at this stage:

- investments;
- restrictions on network terms of use;
- contractualisation of flow commitments in the more or less long term.

2009 study on the development of the North-South link and merger of the North-South zones

To merge the two GRTgaz zones using only network-strengthening solutions, the study conducted in 2009 proved that it was necessary to loop the Lille-Marseille line at an estimated cost of €m 2,500 (2009 euros).

The works to expand would then be:
- tripling of the Taisnières-Cuvilly pipeline;
- looping of the Beauce pipeline;
- new Cuvilly-Dierrey pipeline;
- looping of the Dierrey-Voisines pipeline;
- continued looping of the Nord-est pipeline;
- full looping of the Bourgogne pipeline;
- looping of the Rhône pipeline between Saint-Martin-de-Crau and Saint-Avit;
- strengthening of compressor stations and interconnection at Cuvilly, Dierrey, Voisines and Etrez;
- looping of the Est Lyonnais pipeline;
- strengthening of compressor stations at Dierrey, Voisines, Palleau, Etrez and Saint-Avit.



Connecting Corsica to natural gas

The GALSI consortium (Algeria - Sardinia - Italy pipeline) is planning an offshore pipeline link between Algeria and Italy, which will supply Sardinia en route, from the south to the north of the island.

Connecting Corsica to GALSI is part of the Multi-Year Investment Programme, published in the Journal officiel on 15 December 2009.

The feasibility studies of works to supply natural gas to Corsica, begun in 2008, have sketched out a draft route. This study continues in close collaboration with local actors as part of the Cyrénée project.

Corsica would be connected to GALSI close to its landfall point, at the Olbia compressor station in Sardinia.

An offshore pipeline about 100 km long (ND 600) would then connect Olbia around Porto-Vecchio, Corsica.

An interconnection station would be built at the landing point, where odorisation would occur and would be connected to:

- a land pipeline between Porto-Vecchio and Bastia through the eastern plain (100 km in ND 400);
- a land pipeline between Porto-Vecchio and Ajaccio through the south of Corsica (100 km in ND 400).

As the GALSI project is being considered for a start-up date of 2015, GRTgaz plans to connect the island within the same timeframe.

A voluntary public debate was organised by the National Commission for Public Debate from November 2010 to March 2011. It demonstrated the high level of interest Corsicans have in natural gas.

As an alternative to supplying Corsica through the GALSI pipeline, obtaining supply from one or two LNG barges at Bastia and Ajaccio has been considered. If the supply were to come from a single barge, the land part of the Cyrénée project would be retained.

CORSICA CONNECTION PROJECT

> Serpaize connection - Les Haies (38)

Projected schedule of completion

The numerous infrastructure projects presented in the previous chapter proves the vitality and appeal of the French natural gas market.

Infrastructures to be commissioned in the next 3 years

The structures that will be commissioned in the next three years are related to the programme aiming to reinforce the core network in the North Zone which began in 2007, to the 2010 upsize in entry capacity at Obergailbach, to the additional entry capacity at Taisnières slated for 2013 and to the GRTgaz-TIGF interconnection planned for 2013. The execution of all these works was decided by GRTgaz and included in the company's financing plan.

Infrastructures to adapt or build	Commissioning	Capacity demand spurring reinforcement	Decision status
Etrez interconnection	2011	Fluidify the North Zone	FID taken
Adaptation of Laneuvelotte interconnection	2012	Increase entry at Obergailbach in 2010	FID taken
Partial looping of the Hauts de France pipeline (53 km, DN 1200)	2013	Increase entry from Belgium	FID taken
Adaptation of Taisnières interconnection	2013		
Adaptation of Cuvilly compressor station	2013		
Create a compressor station at Chazelles	2013	Increased capacity at the GRTgaz-TIGF interconnection	FID taken

Infrastructures put in operation after 2013

In the list below, only the Eridan project (looping of the Rhône pipeline) has received a green light from GRTgaz.

The decision to proceed with the other projects will be taken by GRTgaz when:

- market interest has been proven (through capacity reservations, for example);
- the decision of adjacent network operators has been taken, where applicable;
- financing is secured;
- the investment has been approved by the CRE.

To establish the schedule of works to be constructed, GRTgaz took into account the indicative information provided by operators of adjacent infrastructure in terms of capacity to develop and desired dates of service.

One should remember, however, that the works to build or adapt – especially those concerning core network – rely heavily on the order of arrival and the importance of the need for increased entry or exit capacity for the considered market zone. Therefore, the works mentioned below are likely to be revised significantly if the timetable for capacity demand were to be modified.

Furthermore, given this uncertainty, only preliminary design studies have been conducted for the most distant deadlines. More in-depth analyses will complete the initial studies when the needs become clearer, which could reveal the necessity to adapt other works.

Infrastructures to adapt or build	Definitive	Capacity demand spurring reinforcement	Decision status
Adaptation of Auvers-le-Hamon compressor station	2015	Increase in regas capacity from the Montoir terminal (2.5 bcm/year)	In progress
Clipon pipeline (19 km, DN 900) Looping of Hauts de France pipeline from Nedon to Cuvilly (123 km, DN 1200) Arc de Dierrey (308 km, DN 1200) Adaptation of Pitgam, Cuvilly, Dierrey and Voisines interconnections	2015	Connect the Dunkirk terminal	In progress
Flandres pipeline (25 km, DN 900) Adaptation of Pitgam interconnection	2015	Create exit capacity to Belgium	In progress
Porto-Vecchio to Bastia pipeline (100 km, DN 400) Porto-Vecchio to Ajaccio pipeline (100 km, DN 400) Olbia to Porto-Vecchio subsea pipeline (100 km, DN 600)	2015	Corsica connection	In progress
Looping of the Rhône pipeline (220 km, DN 1200) and modifications to Saint-Avit and Saint-Martin-de-Crau interconnections	2016	Reinforcement of South-North corridor in Western Europe	Final investment decision taken
Pipeline connecting Luxembourg (45 km, DN 500) and adaptation of the interconnection	2016	Increase exit capacity to Luxembourg	In progress
New compressor station at Champey and Morelmaison station	2016	Increase exit capacity to Switzerland	In progress
Looping of the Maine pipeline New line between Chémery and Dierrey Reinforce compression at Dierrey	2017	Increase regas capacity from Montoir terminal (+4 bcm/year)	In progress
Looping of the Nord-est pipeline between Voisines and Morelmaison (80 km, DN 1050) and Voisines and Morelmaison interconnections	2017	Increase entry capacity from Switzerland	In progress
Pipeline between the terminal and Saint-Martin-de-Crau Est Lyonnais pipeline Adaptation of the Etrez and Saint-Avit interconnections Completion of project looping the Beauce pipeline	2017	Connect a new terminal at Fos	In progress
Partial looping of the Bourgogne pipeline Reinforce compression at Saint-Avit, Etrez and Palleau	2018	Increase capacity from Manosque storage point	In progress
Completion of project looping the Bourgogne pipeline Reinforce compression along the Saint-Martin-de-Crau - Voisines line Create a compressor station at Montpellier	2019/ 2020	Expand the Fos-Cavaou terminal Increase interconnection capacity between France and Spain	In progress
Caux-Roumois pipeline	2020	Connect the Antifer terminal	In progress

Projected growth in capacity: 2011-2020

Situation on 1st January:	**2011**	**2012**	**2013**	**2014**	**2015**	**Long term** (depending on developments planned by adjacent infrastructure operators)
Entry points in the North zone						
Dunkirk PIR [1]	585	585	585	570	570	570
Dunkirk PITTM [2]					250	250 - 520
Taisnières H PIR	570	570	570	640	640	640
Taisnières B PIR	230	230	230	230	230	230
Obergailbach PIR	620	620	620	620	620	620
Montoir PITTM	370	370	370	370	420	420 - 550
Antifer PITM						315
GRTgaz South → GRTgaz North	230	230	230	230	230	Merger foreseeable according to plan timetable
Oltingue PIR						100
Exit points from the North zone						
Oltingue PIR	223	223	223	223	223	280
France-Belgium PIR					100	100
Luxembourg PIR						40
Entry points in the South Zone						
Fos PITTM	410	410	410	410	410	720 - 1 250 [3]
TIGF PIR → GRTgaz South	80	80	80	255	255	485
GRTgaz North → GRTgaz South	230	230	230	230	230	Merger foreseeable according to plan timetable
Corsica PIR					20	20
Exit points from the South zone						
GRTgaz South → TIGF	325	325	325	395	395	475

(1) PIR: network interconnection point.
(2) PITTM: transmission/LNG terminal interface point.
(3) Total capacity at Fos depending on the final decisions concerning the LNG terminal development projects.

APPENDIX I
Gas demand in France

Public service obligations

Public Service obligations in the gas sector are set out in Decree 2004-251 of 19 March 2004, and apply to everyone involved in the gas supply chain in France. Article 9 of Section II of this decree stipulates the obligations of gas transmission system operators, including that of maintaining continuity of supply, except during maintenance periods or in cases of force majeure, under the following circumstances:

- a cold winter such as occurs statistically once every 50 years;
- a period of extremely low temperature of a maximum of three consecutive days, as occurs statistically once every 50 years.

This obligation applies to shippers for residential customers, non-residential customers who have not signed an interruptible supply contract and customers fulfilling a public interest role to meet the essential needs of the nation, such as the health and public services, and national defence.

In order to meet this obligation, GRTgaz must design and develop a system that is extensive enough for its transmission and exit capacity to be available at all times, and sufficient to meet the needs of consumers. GRTgaz therefore builds its own forecasts of future consumption, in terms of both volume and peak demand, based on its own set of assumptions.

Information on gas demand

GRTgaz regularly releases information about its transmission business and changes in natural gas consumption in the areas supplied by its network in the "Smart GRTgaz" section of its web site www.grtgaz.com.

Normative assumptions on gas demand trends

GRTgaz breaks the market down for analysis and to define its models for changes in gas demand, which it divides into three categories: Residential, Commercial and Industrial.

For the first 3 years, GRTgaz relies on a consultation of distribution network managers and consumers connected directly to the transmission system. This consultation process enables to make an assessment of future consumption, which is then consolidated through a macroeconomic analysis of demand growth based on indicators such as rises in GDP or energy prices.

When considering the longer term, GRTgaz uses a sector-based approach to determine consumption trends over a 10-year period.

Using this approach, the main assumptions taken for the 10-year Development Statement are as follows:

Residential and commercial sector: a 0.6% decrease in consumption each year in this sector over the 2011-2020 period, due to a fall in unit consumption as a result of the gradual introduction of stricter environmental regulations (particularly given the outcomes of the Energy-Climate Package and the Grenelle Environment Round Table), balanced by overall growth, especially in the commercial sector.

Industrial sector: the assumption of growth in demand for natural gas in industry is estimated at 0.7% per year over the period 2011-2020, including the development of new uses for refining (use of natural gas for process heat and hydrogen production). After the sharp downturn in industrial activity linked to the economic crisis of 2008-2009, industrial gas consumption began to recover in the second half of 2009. This recovery continued during 2010 and consumers returned to their pre-crisis consumption levels in early 2011.

Electricity generation by combined-cycle gas turbine power plants: between 2010 and 2016, estimated consumption is based on GRTgaz's knowledge of potential projects and an assessment of the likelihood of their completion as they progress. In particular, GRTgaz maintains direct contact with RTE, the operator of France's electricity transmission system, and companies planning to develop combined-cycle gas turbine (CCGT) power plants. Beyond 2016, GRTgaz foresees an ongoing increase in the demand for gas for power generation.

Cogeneration: the projected natural gas consumption by cogeneration facilities takes into account the renewal of purchase obligation contracts, most of which will come to term between 2008 and 2013. Considerable uncertainty remains about whether managers will renew these contracts. We have assumed that one-third of the capacity installed in 2008 will shift to market-based pricing and that one-third will renew their contracts to remain under a purchase obligation. The decline in installed capacity should be steepest in 2011 and 2012, reaching 10 to 12%. In 2020, cogeneration consumption of natural gas will amount to two-thirds of the 2008 level.

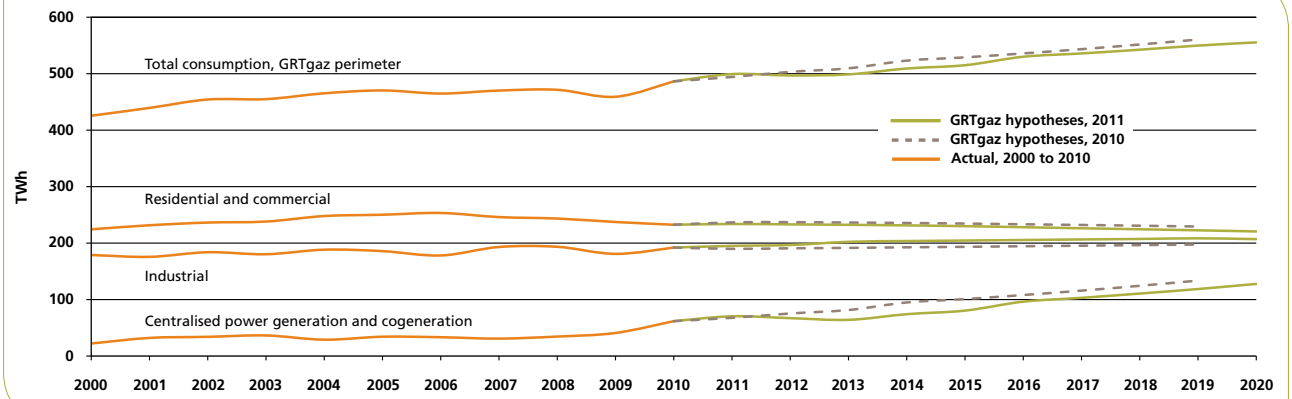
Assumption on future demand for gas in GRTgaz's zones

The table below shows the assumptions for gas demand within GRTgaz's area of activity, divided by sector, established in July 2011 for the 2011-2020 period.

Assumptions in July 2011 Unit: TWh	**2010** [1]	**2011**	**2012**	**2015**	**2020**	**AAGR** [2] **2011-2020**
Commercial and residential sector (excluding cogeneration)	233	234	233	230	221	- 0.6%
Industrial sector (excluding cogeneration)	192	195	197	205	207	0.7%
Centralised electricity production and cogeneration	62	70	67	80	128	6.8%
Transmission system operator consumption	4.1	4.2	4.2	4.2	4.3	0.4%
TOTAL	**491**	**503**	**501**	**519**	**560**	**1.2%**

(1) Actual consumption.
(2) AAGR: average annual growth rate.

Comparison of consumption hypotheses prepared in 2010 and 2011



Assumption on peak gas demand

Daily gas demand at peak cold times, as defined in the Public Service Obligations, is known as "1-in-50 peak-day demand" or P2, corresponding to the extreme temperature T2%.

The value for the previous year is obtained by studying winter consumption, extrapolated to the extreme temperature T2%, using the so-called winter analysis method.

The medium-term (3-year) trend is established by consulting the distribution system operators and consumers directly connected to the transmission system.

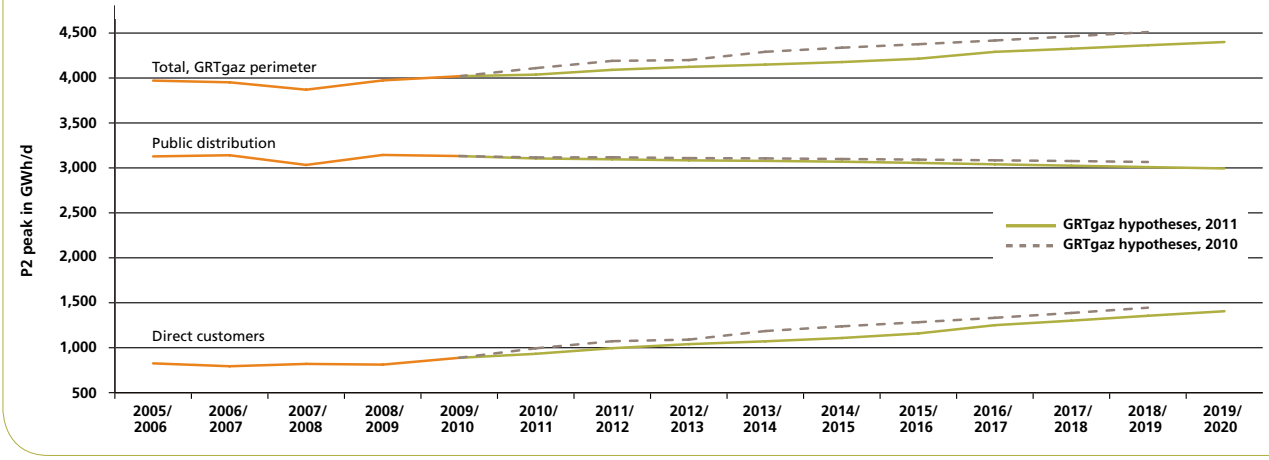
Long-term trends are assumed to follow changes in annual volume consumption.

The table below shows P2 peak consumption at a time of 2-in-50 peak-day demand on GRTgaz's transmission system, established in July 2010 for the 2011-2020 period.

Assumptions in July 2011		AAGR 2010/11 2019/20	2010/ 2011	2011/ 2012	2012/ 2013	2015/ 2016	2019/ 2020
Total	Gas year [1] (TWh)	1.3%	498	501	501	529	557
	Total P2 [2] (GWh/d)	1.0%	4,055	4,108	4,141	4,232	4,417
	Firm P2 (GWh/d)	1.0%	3,970	4,024	4,057	4,147	4,333
Public distribution systems	Gas year (TWh)	- 0.4%	309	308	307	304	298
	Total P2 (GWh/d)	- 0.4%	3,105	3,096	3,084	3,056	2,994
	Firm P2 (GWh/d)	- 0.4%	3,105	3,096	3,084	3,056	2,994
Direct customers	Gas year (TWh)	3.6%	187	191	192	223	257
	Total P2 (GWh/d)	4.7%	932	995	1,040	1,159	1,406
	Firm P2 (GWh/d)	5.0%	851	914	959	1,078	1,325
GRTgaz's	Gas year (TWh)	0.4%	2	2	2	2	2
	Total P2 (GWh/d)	-	17	17	17	17	17
	Firm P2 (GWh/d)	-	17	17	17	17	17

(1) Gas year: from 1st November in year N to 31 October in year N+1.
(2) P2: 1-in-50 peak-day gas demand.

Comparison of peak consumption hypotheses in 2010 and 2011



APPENDIX II
Determining the system's sales capacity

Determination of system capacity at the links and interconnection points

GRTgaz sells transmission services in the form of firm capacity, the use of which is contractually guaranteed to the shipper during the period of subscription in normal operating conditions, and of interruptible capacity, the use of which is not guaranteed.

If all the firm and interruptible capacity offered by GRTgaz were used, the system would become saturated. Any increase in the transmission capacity of GRTgaz's system therefore requires additional investment.

Method used to determine capacity

Due to the network's layout and zone system, the marketable capacities at the different points of the transmission system are interdependent. They are determined by studying possible bottlenecks within the system in a large number of scenarios. The firm capacity adopted is the maximum capacity that does not produce bottlenecks under standard conditions of system use.

The approach is the same when, conversely, the aim is to determine the infrastructures needed to develop a new capacity.

The modelling process used to determine the capacity of a transmission system thus requires a set of assumptions – in particular the technical characteristics of the system's component infrastructures, its operating constraints and the distribution of gas flows within the system.

TECHNICAL CHARACTERISTICS OF GRTgaz'S TRANSMISSION SYSTEM

The transmission system primarily consists of pipelines and compressor or interconnection stations.

The technical characteristics of the pipelines that influence the capacity of the system are the diameter, maximum safe pressure (MSP), length and roughness. These characteristics drive load losses in the pipeline, i.e. the fall in pressure that occurs as the gas is transmitted through the structure. Basically, the capacity of a transmission system is directly linked to the load losses generated in the pipes.

The function of the compressor stations is to boost the gas pressure in the pipes when load losses have reduced the pressure to a level that is too low. The technical characteristics of the compressor stations are primarily their power, the maximum and minimum flows they can compress, and their compression rate limits (ratio between downstream and upstream pressure).

The characteristics of other system structures, such as the regulation valves that generate specific load losses, also affect capacity.

All of these characteristics are known for existing or fully planned structures, but can only be estimated for new infrastructure projects.

OPERATING CONSTRAINTS OF GRTgaz'S TRANSMISSION SYSTEM

The operating constraints define the availability of minimum pressure levels required at different points in the transmission system, to enable the gas to be transmitted and delivered. These conditions are determined by GRTgaz to meet its public service obligations to supply the distribution networks and fulfil its contractual commitments under connection agreements signed with industrial customers.

THE GAS MARKET - THE CALORIFIC VALUE OF IMPORTED GAS

The physical capacity of a transmission system is expressed in volume flow rate, whereas trading between shippers and/or consumers is conducted in terms of energy. In order to offer a commercial capacity that is consistent with the needs of both shippers and customers, GRTgaz needs to make assumptions about the calorific value of imported gas. These are updated regularly and in light of the flows observed at each entry point.

THE GAS MARKET - DISTRIBUTION OF FLOWS IN THE TRANSMISSION SYSTEM

The actual flows depend on the extent to which shippers use their subscribed capacity at the entry/exit points, the level of consumption and the use of storage capacity. Entry points can be used preferentially in certain market situations (see arbitrage between different sources of short- or long-term

supply). This is especially true in summer, with the gas injected into underground storage facilities. Similarly, in winter, withdrawal from underground storage facilities may be preferred over importing gas at border points. Thus GRTgaz must take into account many supply scenarios with different climatic conditions to determine the gas flows scaled to its network.

System operating conditions

Capacity is determined on the basis of the system's normal operating conditions, which rely on realistic and acceptable sets of assumptions about flow distributions.

GRTgaz establishes these assumptions on the basis of its knowledge of past flows and its perception of future trends. These conditions cover a wide range of climatic scenarios, from 1-in-50 peak-day demand (corresponding to an extremely low temperature for a period of three consecutive days, occurring statistically every 50 years, as defined in Decree No. 2004-251 of 19 March, 2004 on public service obligations in the gas sector) to the days in August when consumption is at its lowest.

Assumptions are also based on temperature-related use of underground storage facilities, whereby capacity is injected in summer and withdrawn in winter. In particular, the maximum level of withdrawal assumed when determining transmission capacity depends on consumption levels and therefore on temperature (for example, maximum withdrawal from storage facilities is not considered to represent a normal usage scenario in conditions of moderate cold). This mechanism for the use of storage facilities by shippers is consistent with the provisions of Decree 2004-251 of 19 March, 2004 on public service obligations in the gas sector, and Decree 2006-1034 of 21 August, 2006 on access to underground natural gas storage facilities.

The validity framework for firm capacity proposed by GRTgaz therefore allows shippers to meet their public service obligations, in particular through the use of underground storage facilities to supply customers in winter, and their replenishment during the summer period. In addition, there is a wide range of possible supply strategies from the system's entry points.

Special situations

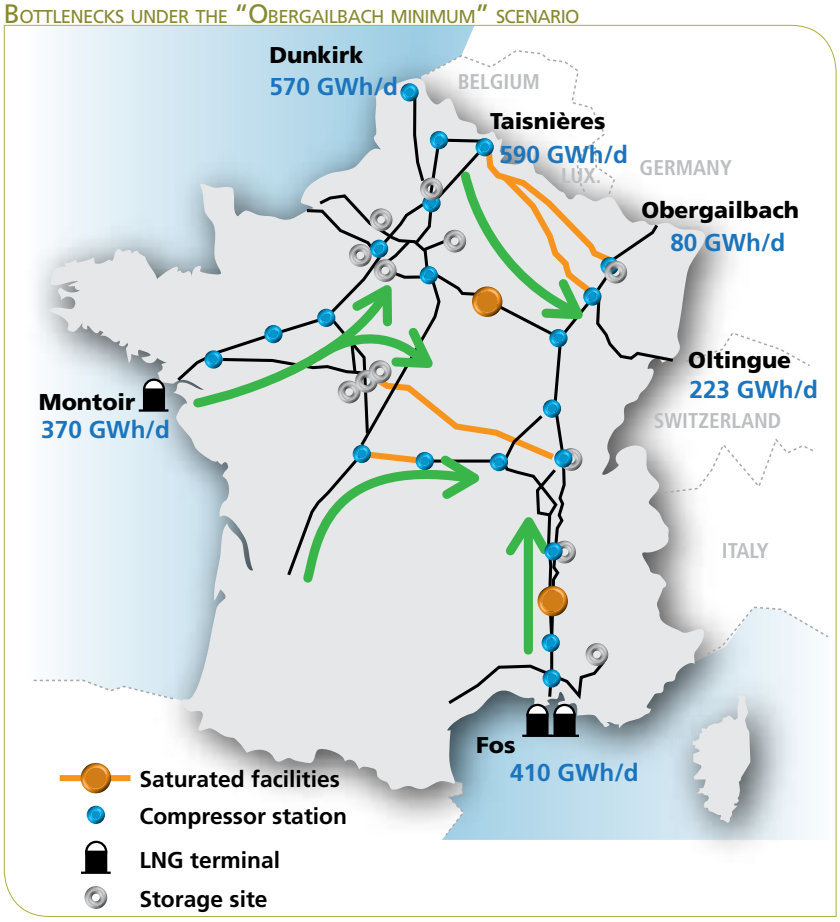
An examination of the different possible supply strategies has led GRTgaz to identify two particular situations in which minimum flows are needed, firstly at Obergailbach and secondly at Montoir, to ensure that the transmission system operates correctly under certain temperature and flow conditions, as described below.

THE "OBERGAILBACH MINIMUM"

Above a level of consumption corresponding to a cold temperature, the increase in gas flows from the system's other entry points (with the exception of Fos), combined with maximum use of the North-South link, causes system saturation in the west to east direction, making it necessary to top up gas at Obergailbach to supply the eastern part of the system.

The most restrictive level occurs in the case of an extreme cold snap (as occurs every 50 years). At this extreme temperature level, a minimum entry flow of gas of some 80 GWh per day may be required at Obergailbach.

BOTTLENECKS UNDER THE "OBERGAILBACH MINIMUM" SCENARIO



THE "MONTOIR MINIMUM"

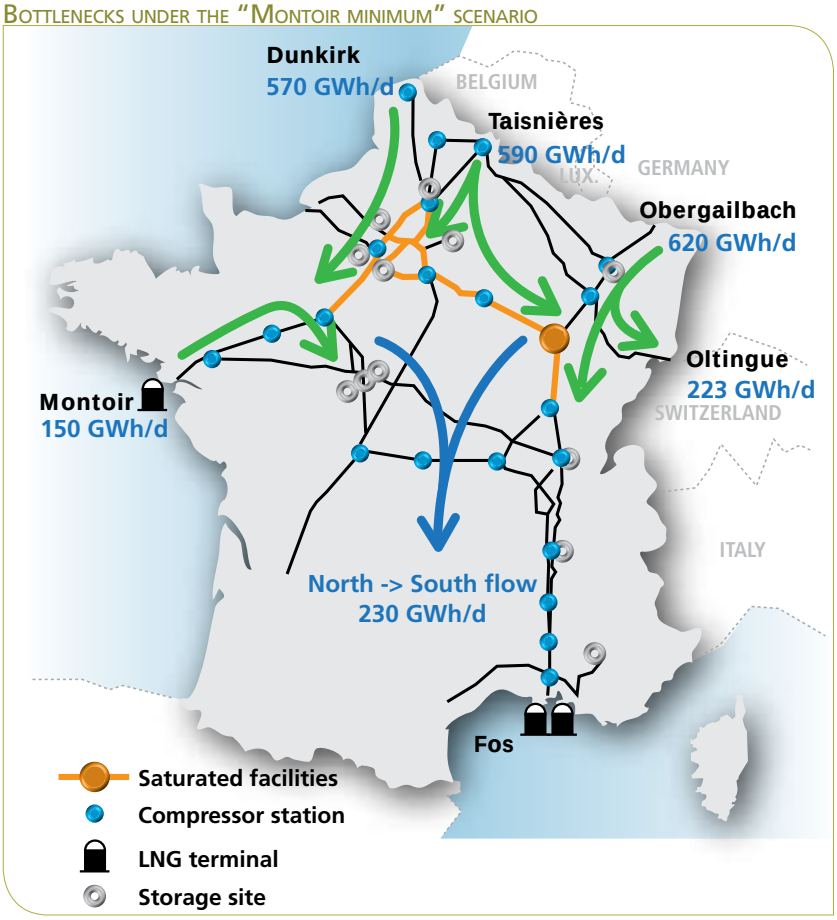
On 1st January 2009, GRTgaz introduced a greater North Zone. This modification to GRTgaz's service was made possible by an investment programme that began in 2007 and will end in 2011.

Until the North de-bottlenecking programme is completed, in particular the commissioning of the Beauce pipeline loop between Fontenay and Saint-Arnoult, and the compressor station at Fontenay, special conditions for the use of firm capacity on the North to South link must be applied for the winter. During this period, when flows from the north and the east of the transmission system to the west and the south are at their maximum levels, many facilities reach saturation point. In order to use the total capacity between the North and South zones, minimum emission may be needed from the Montoir terminal for a level of consumption corresponding to a moderately cold temperature. This emission can reach 150 GWh per day.

At colder temperatures, this condition is fulfilled because of the need for shippers to import enough gas to meet consumer needs in the zone, while still transferring gas to the south.

This restrictive scenario will disappear with the commissioning of the Beauce pipeline loop between Fontenay and Saint-Arnoult and the compressor station at Fontenay.

BOTTLENECKS UNDER THE "MONTOIR MINIMUM" SCENARIO



APPENDIX III
Funding of investments for the 2011-2013 period

In late 2010, the GRTgaz Board of Directors approved the financial package corresponding to the implementation of the three-year investment plan. This package incorporates requirements related to the investments listed in the *GRTgaz Ten-Year Development Plan* and whose commissioning is expected between 2011 and 2013.

A reminder of these investments is shown below:

Work to adapt or build	Commissioning
Etrez interconnection	2011
Adaptation of Laneuvelotte interconnection	2012
Partial looping of the Hauts de France pipeline (53 km, ND 1200)	2013
Adaptation of Taisnières interconnection	2013
Adaptation of Cuvilly compressor station	2013
Create a compressor station at Chazelles	2013

APPENDIX IV
Project completion milestones

The purpose of this appendix is to enhance understanding of the issues and challenges that characterise the major projects undertaken by GRTgaz. It describes, in a simplified way, the main stages in the construction of pipelines and compressor stations.

Executing these large gas infrastructure projects entails the acceptance of the work, especially at the local level, which requires significant, persuasive communication and consultation efforts. This is a challenge with high stakes for GRTgaz because the requirements in this area are becoming increasingly stringent. Moreover, these steps are essential to project completion: the duration of these phases is decisive in the duration of the project and securing authorisations to execute the work is strategic for each project.

To be persuasive, GRTgaz must be able to anticipate needs. Therefore, it must be exemplary in terms of safety and respect for the environment. This is why GRTgaz is striving to lower the impact of its activities at work sites and during the operation of its facilities.

Subsequently, focused studies are conducted to analyse the environmental integration of GRTgaz works and on the normative completion times for these projects.

GRTgaz seeks to optimise the integration of the new works in their surrounding environment and works closely with local stakeholders.

The public debates that took place for the major Eridan and Arc de Dierrey projects in 2009 and 2010, and the local debate organised with the support of the CNDP for the Cyrénée project in Corsica illustrate this desire for dialogue (see sidebar).

GRTgaz relies on the expertise of partner organisations:

- the FNSEA and ACAP, as part of a protocol that made it possible to reconcile the laying and presence of pipework with farming activities;
- the *Fédération des parcs naturels régionaux,* the National Museum of Natural History, Natureparif and ONF for environmental and landscape protection (see sidebar: presentation of ONF guide);
- the *Chambres de commerce et d'industrie* in the territories impacted by projects so that local employees can be used as much as possible;
- OPPBTP in the field of prevention and safety.

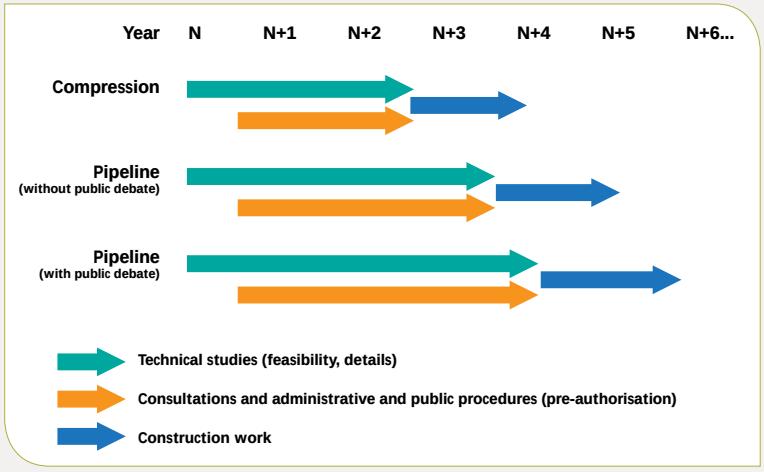
The main stages involved in the construction of pipelines and compressor stations are described later in this appendix.

Normative completion times for major projects

Large gas transmission infrastructure projects require long turnaround times to complete:

- technical studies on feasibility, details, singular points, etc.;
- prior notification and consultation of the public and stakeholders and public debates for works of national concern (over 200 km of pipeline) Legal rights;
- impact studies, risk assesments, specific studies for the preparation of permit applications;
- administrative consultation and public enquiries;
- right-of-way permits involving the signing of amicable agreements and, where necessary, procedures to obtain legal curtailment of ownership;
- supplies of materials;
- calls for tender and selection of works service providers;
- preliminary survey and organisation of the work site;
- execution and inspection of work;
- commissioning, site restoration, acceptance of work

Between the launch of studies and the commissioning of these major projects, schedules for major works span several years (about 4 to 6 years) as follows.



Limiting the impact of projects on the environment

During construction work, GRTgaz is committed to respecting the environment and economy and ensuring the safety of its structures.

Several studies are conducted before the work begins with a single purpose: define a route to ensure the safety of people and property while preserving the environment. The main impacts of the work will be essentially temporary.

During the upstream phases, the project takes into account specific constraints relating to, in particular, local flora and fauna, by conducting an environmental impact study in consultation with local governing authorities, associations and other regional actors. This environmental impact report makes it possible to list all the natural elements that the project will encounter, whether related to wildlife or plant life. This study makes it possible to adjust the route in order to minimise impacts and define which measures can be taken so that the work is carried out in a satisfactory manner from an environmental conservation perspective.

In parallel, each project assesses the safety of facilities, personnel and local inhabitants in a safety study. Specific measures can be implemented after these studies to reduce the likelihood and potential seriousness of an accident with, for example, thicker pipes, protective slabs and specific monitoring measures. These studies, which are part of the administrative portfolio, are made available during the public inquiry.

For safety reasons and to allow servicing where necessary, an easement perimeter that is 10 to 20 metres wide is defined, no construction, changes in profile or large trees may be located in this zone. The owners sign an easement agreement with GRTgaz. They retain full ownership of their land.

The site is fully restored (based on a precise preliminary survey prepared before work began): GRTgaz seeks to guarantee owners and operators that the work is perfectly executed. Thus, GRTgaz commits to restore the grounds: successive soil layers are put back in place, ditches and slopes are re-graded, fences and drainages are restored. The post-work survey is then drawn up with the owner or farmer to confirm the land was properly restored. This enables the restoration to be validated.

Before and after the commissioning of facilities, GRTgaz uses a whole range of controls to ensure the safety of the structure under the administration's surveillance.

Finally, the traces of a gas transmission pipeline disappear, except for the yellow tags which indicate its presence.

The public debate organised for the Arc de Dierrey project resulted in:

- 19 public meetings, three of which with specific themes, were attended by a total of nearly 900 people;
- 5 day-long local meeting held by the members of the Specific Commission for Public Debate (CPDP) who welcomed the public and the press to answer their questions, which drew around 50 people in all;
- 1 press conference.

The Specific Commission for Public Debate estimated that 30,000 were involved in this debate.

The guide for integrating gas pipelines into a wooded landscape is the result of a joint project between the ONF and GRTgaz. It lists the various technical solutions which enable good integration of gas pipelines into a forest landscape during the various project phases.

PIPE LAYING PROJECTS

Public consultation and authorisation procedures

The routes along which underground pipelines are laid are subject to consultations with local governments, public utilities and the public.

Prior to this statutory consultation, GRTgaz undertakes to inform the public and stakeholders about the project's main characteristics. This notification phase is generally pursued through town hall meetings and public meetings, during which GRTgaz explains the reasons for the project, how it will be carried out and the possible route(s).

The purpose of this **consultation phase** is to develop a path of least impact to ensure the safety of people and property while preserving the environment.

Following the consultation phase and studies, the proposed route is subject to review via **administrative consultation and a public inquiry** into all the municipalities concerned. During this phase, the public can ask questions and receive a written response from GRTgaz. The questions and answers will be included in the final technical file submitted to the Prefect.

The results of this dual consultation make it possible, as needed and in accordance with the general consensus, to make adjustments to the route originally planned. It is only after these procedures and IN LIGHT OF their results that the Prefect approves the project and declares the project to be of public utility.

In parallel, GRTgaz invites all affected property owners to sign an amicable easement agreement.

1

Dialogue - Consultation
GRTgaz is compelled to reinforce the network to ensure the security of supply to consumers or to enable the connection of new customers. The route selection is determined after consulting the various stakeholders and organisations to achieve the best compromise between environmental, agricultural and regulatory constraints and financial aspects.

2

Preliminary survey of premises before work
Before starting the project, a survey of the site before work makes it possible to identify the initial condition of the plots concerned and will serve as a baseline for compensation for of any damage at the end of construction.

3

Work road and preparation of pipes
The work road enables the circulation of heavy vehicles and storage of rubble from the trench. Temporary fences are made if necessary. «Stringing» consists in transmitting, unloading and aligning the pipes along the route. «Bending» makes it possible to adapt the pipes to the topography of the route to move along curves and elevation changes.

7 main Stages of a Pipework Laying Project

7

Restoration
The initial profile of the land is restored, fences are rebuilt and ditches and slopes are reshaped. A post-work survey is conducted to confirm the land was properly restored. In addition, this survey enables a comparison with preliminary survey to determine any damage caused and identify the amount of corresponding compensation payments. Only the yellow marking tags remain to indicate the presence of the underground pipeline.

6

Lowering
The conduit, which can measure several hundred metres, is carefully lowered into the bottom of the trench. The pipeline is covered with careful attention to the layering of soils. The nature of the soil is thus reconstituted in accordance with its original configuration.

5

Opening of the trench
The excavation is done by separating the soil at the bottom of the trench from the topsoil that will be replaced after the work to enable the rapid recovery of crops and plants.

4

Welding
The tubes are welded end to end, either by manual welding or by automatic welding. The welds are checked by X-ray or ultrasound to ensure the line is correctly assembled.

COMPRESSOR STATION CONSTRUCTION PROJECTS

Public consultation and authorisation procedures

These projects are subject to a public inquiry or public meetings to allow residents to learn about the project, discover how the works will progress and talk with the GRTgaz project team.

However, GRTgaz does not wait until this phase to **inform the public** and stakeholders about the project's main characteristics. This notification phase is generally pursued through town hall meetings and public meetings, during which GRTgaz explains the reasons for the project, how it will be carried out and the possible location(s).

Following the consultation and study phase, the project is subject to review via **administrative consultation and a public inquiry.** During this phase, the public can ask questions with answers that will appear in the final technical file submitted to the Prefect.

It is only after these procedures and IN LIGHT OF their results **that the Prefect approves the project.**

Dialogue - Consultation
When natural gas moves through the pipes, it is slowed down by friction along the pipe walls. The cumulative effect of this physical phenomenon is a drop in pressure at the end of the network. The compressor stations make it possible to restore pressure to the natural gas so it is transmitted over long distances and retains sufficient pressure to be delivered to transfer points: distribution network and industrial customers. A consultation is carried out to choose the compressor station location so that an appropriate solution can be found in terms of technical requirements and the least possible impact on the population and the environment.

Selection of engineering firm, public inquiry and request for building permit
A technical file is created with a view to launching a call for tenders among engineering firms. The selected engineering company shall complete all studies and installation work for the station to provide a «turnkey» service. The file, which contains, among other things, an impact study and a hazard study, is sent to the administration. At the end of the administrative inquiry, a public inquiry is scheduled and the building permit is issued. After the portfolio has been vetted by the DRIRE, the Prefect issues an authorisation to build and operate.

Selection and installation of compressors
Natural gas compressors are unique because they are custom made to conform to the characteristics of upstream and downstream networks. There are two main types of compressors: motor-driven compressor and turbo-compressors. Each machine is installed in a building of variable size depending on the design of the compressor and its power.

7 main Stages of a Compression Station Construction Project

7

Regular inspections
Teams regularly visit sites to perform the necessary actions and usage checks: pressure level, any gas emissions, etc. and maintenance required for the various equipment items. Tests are conducted to ensure the facility is working normally. When the test results are satisfactory, the various companies involved in construction leave and the facility is commissioned for industrial use.

6

Overview of the station
The entire station has a rather large footprint (several hectares) because its various facilities are geographically isolated for safety reasons, especially in case of fire. The compressor stations are considered classified installations for environmental protection. Thus, apart from the buildings, nothing extends out of the ground except for the valve actuators which make it possible to link the different pipes from the surface (manual or motorised procedure).

5

Remote controlled operations
The vast majority of compressor stations on the GRTgaz network are fully remote controlled and unmanned. Station management is handled by the National Distribution Centre, which manages the stations directly from the dispatching base in Paris or via regional dispatching centres.

Auxiliary buildings
Other buildings are constructed at the site: an electrical building where all the engine control functions are centralised, as well as the station control-monitoring system; a technical building for maintenance and spare parts storage; and an administrative building where offices are located to oversee station operation after connection to the network.

4

GRTgaz, French public limited company with share capital of €500,000,000
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Cover photo: Saint-Martin-de-Crau compressor plant

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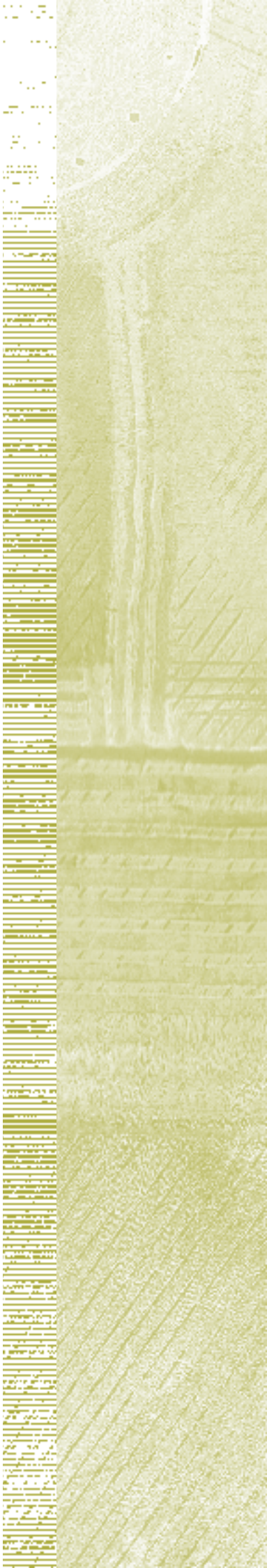

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