TEN YEAR DEVELOPMENT PLAN
FOR THE GRTgaz NETWORK
2013-2022 PERIOD
32,246 km
of high-pressure pipelines

637 TWh transmitted
i.e. 56 billion m³
- 463 TWh in consumption
- 81 TWh in storage
- 93 TWh in transit

514 TWh
traded

98 customer-shippers

808 customers connected
- 16 distribution system operators;
- 792 industrial customers;
  including 12 electricity power plants.

3,075 employees

€1.65 billion
turnover

€666 million
in investments
# TABLE OF CONTENTS

Profile ........................................................................................................................................................................ 1
Framework for the Ten Year Development Plan for the GRTgaz Transmission Network ........................................ 2
Foreword by the Director ........................................................................................................................................... 4

**SUMMARY** .......................................................................................................................................................... 5

**1. TRENDS AND PROSPECTS FOR THE GAS MARKET IN EUROPE** ................................................................. 10
   11. Slowdown in 2012 consumption due to the crisis and competition with coal .................................................. 11
   12. Rising price differences between regions, and the short and long term .......................................................... 12
   13. Long-term demand forecasts reflecting uncertainty in Europe ........................................................................ 13
   14. European gas production on a decline ........................................................................................................... 15
   15. A target model for the European gas market .................................................................................................. 16
   16. The development of gas infrastructures in Europe: a “no regrets” option ......................................................... 17
   17. Ten Year European gas infrastructure Development Plan .............................................................................. 18

**2. TRENDS AND PROSPECTS FOR THE GAS MARKET IN FRANCE** ................................................................. 20
   21. Consumption levels supported by the cold period in February 2012 ................................................................. 21
   22. A stable outlook for demand by 2022 .................................................................................................................. 22
   23. Public services obligations in the gas sector during exceptional cold spells .................................................... 24
   24. France's natural gas supply sources ................................................................................................................ 25
   25. Biomethane: a new source of renewable gas .................................................................................................... 26
   26. GRTgaz's transmission offer ............................................................................................................................... 27
   27. Demand for transmission capacity on the GRTgaz network .......................................................................... 29
   28. Evaluation by ENTSOG of the French network's performance ........................................................................ 36

**3. DEVELOPMENT OF THE GRTgaz TRANSMISSION NETWORK** ................................................................. 38
   31. Developing the transmission network: processes and timelines .................................................................... 39
   32. Principal changes since the 2012-2021 plan ....................................................................................................... 40
   33. Development projects in the North Zone ........................................................................................................ 41
   34. Development projects in the South Zone .......................................................................................................... 46
   35. The creation of a single market zone .................................................................................................................. 51
   36. Infrastructures commissioned in the next three years (2013-2014-2015) ......................................................... 51
   37. Infrastructures commissioned after 2015 ........................................................................................................ 53

**APPENDICES**

   A1. Interconnections: utilisation and subscription rates ........................................................................................ 54
   A2. Determination of the network’s commercial capacity ........................................................................................ 56
   A3. Execution of major projects .................................................................................................................................. 59

**GLOSSARY** ................................................................................................................................................................. 62

Leaf 1 : 2012 GRTgaz network map
Leaf 2 : 2022 GRTgaz network map
GRTgaz operates France’s high-pressure natural gas transmission network, which covers most of the country. It contributes to the proper operation of the gas system, on which depends the supply of natural gas customers, i.e.:

- industrial sites and gas-fired power plants that use the natural gas for electricity production and are directly connected to the transmission network;
- households, communities and companies supplied by the public distribution networks, which in turn receive their supply via the gas transmission network.

GRTgaz’s network is the longest in Europe and one of the most interconnected. Connected to the transmission networks of Norway, Belgium, Germany, Italy via Switzerland and Spain via TIGF, and to the LNG terminals on the Atlantic and Mediterranean coasts that receive liquefied natural gas (LNG) from the entire world, GRTgaz’s network allows for access to diverse gas sources and facilitates gas trading throughout Europe. It thus contributes to securing France as well as Europe’s supply and the construction of an integrated, efficient and competitive natural gas market.

France and Europe have initiated their energy transition aiming to allow for combined security of supply, competitiveness and sustainability. On a European level, a 2030 framework for EU climate change and energy policies will be adopted by the end of 2013. In France as well, the national debate on energy transition has already started. Whatever the outcome, the gas infrastructures and in particular the transmission network, will undoubtedly play a pivotal role in the face of such a challenge and in order to ensure a successful transition.

Our goal at GRTgaz is to make sure that natural gas, our network and our skills are serving the objective of maintaining competitive and secure gas supply as well as energy solutions for the future.
The French Energy Code has transposed the European directive and regulations that define access conditions for gas infrastructures and the common rules applicable to the internal EU natural gas market into French law. In this context, every year, GRTgaz issues a ten year development plan for its gas transmission network in France \(^1\), which it files with the CRE (French energy regulating commission) for examination.

GRTgaz’s ten year development plan is now defined in the framework of both the European and the French energy policies. This reflects the obligations of transmission operators in terms of the security of supply. GRTgaz’s ten year plan takes into account the requirements and projects of stakeholders, whether national, supranational or European. It is based on the offer and demand for existing gas and reasonable gas infrastructure development forecasts for the medium term, as well as consumption and international trade.

- It identifies the principal gas transmission infrastructures to be built or further developed over the next ten years.
- It lists the investments that have been decided or are to be made within a three-year period.
- It presents a projected schedule for all investments planned, with a breakdown by decided and non-decided projects.

The analysis and projects presented in this document essentially relate to the primary network. The transmission network is functionally broken down into two sections:

- **The primary network** links the interconnection points to the adjacent transmission networks, LNG terminals and storage facilities. Composed of 600 mm to 1,200 mm diameter pipelines, it includes a meshed portion in which the gas may flow in both directions: the core network. Core network investments potentially benefit all entry and exit points in the relevant balancing zone \(^2\).

- **The regional network** transmits the gas from the primary network to the distribution networks and major consumers, industry and power plants that use natural gas to produce electricity. It is composed of pipelines with a diameter that is generally less than 600 mm and, except in certain cases, the gas flows in one direction only.
An extensive consultation structure allows for the identification of new projects or requirements: the “Concertation Gaz” at the national level (France), the North-West and South Gas Regional Initiatives (GRI (3)) at a supranational level and as part of ENTSOG (4) for the setting up of gas regional investment plans (GRIP), as well as the European Ten Year Network Development Plan (TYNDP - the third edition of which was released on 21 February 2013 for consultation). Finally, bilateral meetings are arranged with the operators of adjacent gas infrastructures.

The CRE surveys market opinion, ensures that investment requirements are covered and verifies the consistency of this plan with the European Ten Year Network Development Plan (TYNDP). It also makes sure that the investments for the first three years, which are binding, are effectively made.

Within GRTgaz, the compliance manager (5) makes sure this plan is implemented properly. Subject to the competencies that are specifically attributed to the CRE, its mission, which is set out in the French Energy Code, consists in overseeing GRTgaz’s compliance with its obligations as an independent transmission operator (ITO).

The development plan for the 2013-2022 period takes into account the results of the public consultation conducted by the French Energy Regulatory Commission (“Commission de régulation de l’énergie” - CRE) in November 2012 and the “deliberation” of the CRE of 20 December 2012 (6). It reflects the contents of the European Ten Year Network Development Plan (TYNDP) issued by ENTSOG as well as input from adjacent network operators.

It is to be noted that a large part of the facilities to be built or expanded depends, however, on the projects of other operators who have not made their investment decisions. For projects pending a decision to proceed, the financial data are based on estimates. In this regard, financial data are only provided for information.

In light of market and project uncertainties in a constantly changing energy environment, GRTgaz cannot be held responsible on the basis of this document for the completion of all development projects planned.

(2) In France, a shipper may request transmission of its gas from any entry point to any exit point in the same market zone within the limits of the capacity subscribed at these different points. Its only obligation is to balance entries and exits over the gas day. GRTgaz has two balancing zones: the North Zone and the South Zone.
(3) Set up in 2006, Gas Regional Initiative was designed as an interim measure in the process of pooling all national markets into a single domestic energy (electricity and gas) market for the EU. France takes part in two of the three gas regions.
(5) Claude Doerflinger: claude.doerflinger@grtgaz.com.
The eighth edition of the Ten Year Development Plan for the GRTgaz Network is being published against the backdrop of an adverse and uncertain economic situation and gas market in Europe. The persistent economic crisis, combined with the relative loss of competitiveness of gas as a source of electricity, is having an impact on consumption. LNG deliveries are shifting to Asia and thus deserting Europe because of more attractive prices. This factor has important consequences in terms of flows and supply costs for the south.

Under such circumstances, in 2012, our transmission network proved its robustness, its reliability and its flexibility by allowing fluctuations in supply solutions whilst coping on 8 February 2012 with record-breaking consumption levels of 3.4 TWh.

In 2012, the linking capacity between the North and the South zones was extensively used due to the price differentials between LNG and pipeline imports. Higher gas exports towards the Iberian peninsula have contributed significantly to the increase in north-south flows. The debate on a potential coupling of the French zones must now incorporate these new parameters in light of the uncertainties and costs at stake.

The development of our network supports the integration of the energy markets sought by the European Union and is potentially instrumental to the energy transition. However, the economic situation, the lack of visibility on the role of gas in tomorrow’s energy mix and the uncertainties as to French and European regulatory changes, tend to make market operators reticent to engage in the expansion of the network. The postponing of adjacent gas network infrastructure consolidation works and the little interest shown during the last Open Seasons conducted by GRTgaz testify to this adverse situation.

Natural gas can undeniably contribute to securing supply in France and Europe and boost the competitiveness of our industries. It can and must play a pivotal role in the energy transition. In this regard, GRTgaz has mobilised to facilitate the emergence of biogas and “power to gas”, and, with other European transmission operators, has committed to support the development of carbon neutral gas supply by 2050.

However, some of the projects listed in this ten year development plan may not be implemented in the next ten years. To support the development of natural gas infrastructures, the role of natural gas must at the very least be affirmed in the energy policies currently being drafted in France and in Europe. Returns on investment must also be attractive and stable over time.

Due to strong uncertainties regarding gas transmission requirements over the long term, it is essential to make sure that existing infrastructures are being used optimally and efficiently and to precisely evaluate the economic value of network development that will be incumbent on the community for many years to come. This eighth edition of the Ten Year Development Plan aims to contribute to reaching this goal by shedding new light for market operators on the transmission infrastructures necessary to fulfil potential requirements.

I trust you will enjoy reading this report.

Thierry Trouvé
Managing Director
Summary

GRTgaz invested more than €1.2 billion in 2011 and 2012 to expand its infrastructures and develop its trading capacity with adjacent networks, and to simplify access to the market.

The existing network has proved the most robust option for the transmission of gas during extreme cold periods as well as its flexibility in the event of significant changes in the organisation of gas procurement in France, especially due to a drop in LNG deliveries and an upturn in gaseous gas.

France, with its extensive coasts and located at the heart of trading between the North-South and the West, occupies a key position in the creation of a fluid, interconnected market that can secure supply and favour competition at a European level. To this effect, 25% additional capacity should be created by 2017.

And beyond the capacity already mentioned, other potential requirements are identified in this Plan. If all such requirements were confirmed, the entry and exit capacity of the network would increase by nearly 50% compared to 2012. This would require long-term commitments by market operators and a long-term commitment to cover the corresponding costs with appropriate transmission pricing.

A decline in natural gas consumption in Europe

The combination of the current economic crisis in Europe, the more competitive pricing of American coal, the collapse of CO₂ prices and initiatives towards a more informed use of energy all result in a significant decline in natural gas consumption in 2012.

This situation has led market operators to considerably downgrade their forecasts for natural gas consumption in Europe. Compared with 2012, GRTgaz has revised down by 0.7% its assumptions on gas demand trends for its own network. This would result in a 230 GWh/day reduction in peak consumption on its network by 2022.

Nevertheless, regardless of the gas demand assumptions, the needs for new gas imports in Europe remain high for the 2020-2030 period owing to the drop in domestic production.

LNG is therefore an essential resource to achieve a balance in terms of European requirements over the long term. Drawing on the strengths of its particularly favourable geographic position, France may become a preferred transmission route for these new volumes.

Today, however, the strong demand for gas occurring as a consequence of the Fukushima nuclear disaster in Japan, on the one hand, and economic growth in China, on the other hand, are shifting the market for liquefied natural gas towards Asia, thus causing significant price spreads between the different international marketplaces. This has led to a reduction of LNG deliveries by around 25% in Europe and 35% in France.

Against this backdrop, no firm investment decisions have been made to undertake new terminal or storage facility projects. On the contrary, some storage sites or consumption points (combined cycle power plants) have been shut down temporarily or long-term. As a consequence, the short term prevails over the long term because market players are not keen to commit for lack of visibility over future market trends.

All such factors have created a climate of uncertainty, which does not favour investment decisions.
The drafting of French and European energy policies is ongoing

The energy transition towards a sustainable model is a major social issue in the regions of France and throughout Europe. The main issues at stake for 2020 and 2050 have been defined in the light of the key components of European energy policy, i.e. security of supply, competitiveness and the fight against global warming.

The year 2013 will be a critical year during which the European and French roadmaps for 2030 should be drawn - a structuring deadline for industrial stakeholders:

- by the end of 2013, the European Commission will propose “a 2030 framework for climate and energy policies”.
- France has started a national debate, which should result in a national legislative bill by the autumn 2013.

The gas transmission network, an essential infrastructure for the energy transition

Beyond its crucial role in the diversification and security of supply, the transmission network, and natural gas itself, will be one of the most important factors in the success of the energy transition.

Natural gas has many advantages. It is abundant, has a high level of energy efficiency across the entire gas supply chain, and is storable, competitive and has low CO₂ (carbon dioxide) emissions. Natural gas could thus contribute favourably towards energy efficiency and greenhouse gas emission reduction objectives by replacing fuel oil and coal as well as by supporting the emergence of solar and wind energy, which are intermittent by nature.

The biomethane, hydrogen and renewable methane sectors now enjoy promising prospects in the long run as a domestic energy resource located near consumption sites, renewable and storable, and which may be used for transporting surplus solar and wind power.

The natural gas transmission network is a key factor in the optimal use of gas-based energy.

GRTgaz’s ten year development plan: adapting the network to market trends

Having benefited from investments over several years, notably in the North zone, GRTgaz’s network can now demonstrate its reliability and its capacity to adjust to constantly changing gas flow models. However, despite a sharp rise in utilisation rates on the North-South link, natural gas prices in the South zone, and more broadly in the Iberian peninsula, have remained higher than those in the North zone, owing to the North’s high reliance on LNG.

New interconnection capacity between Belgium and France and with the TIGF network will be commissioned in 2013.

In 2012, GRTgaz undertook a significant investment programme for the connection of a new LNG terminal at Dunkirk and the creation of a new interconnection point with Belgium so as to reinforce the capacity south of the South zone.

Once these investments have been made, GRTgaz’s network will be one of the best performing networks according to the criteria used by ENTSOG in its European development plan both for resilience and access to diversified sources.

The intent to more extensively integrate European markets and position France as a preferential route for LNG access in Europe may constitute the driving force for the potential development of GRTgaz’s network in the future.

Nevertheless, upstream consultations with stakeholders before this document was drafted did not confirm all the potential requirements identified in the previous edition of the GRTgaz Ten Year Development Plan (see Open Seasons 2012 and 2013).
The projects in the framework of the development plan for 2013-2022

In the North zone

The main projects decided or planned are as follows:

- the commissioning of an LNG terminal in Dunkirk (end of 2015) that will consolidate the core network by looping the Hauts de France pipeline (2015) over 174 km between the Pitgam (North of France) and Cuvilly (Oise) stations, and by creating the Arc de Dierrey (2015 and 2016) over 308 km between Cuvilly and Voisines (Yonne);
- increasing Belgium’s capacity towards France at Taisnières H (end of 2013) warrants the partial looping of the Hauts de France pipeline over 50 km and the adaptation of the Cuvilly station;
- the creation of a new France-to-Belgium interconnection point (end of 2015) requires a new pipeline - the Flandres pipeline - allowing for transmission of non-odourised gas.

The potential requirements identified in the previous edition of the Ten Year Development Plan have not all been confirmed.

The consultation conducted jointly in 2012 and 2013 by GRTgaz and CREOS Luxembourg in order to increase France’s interconnection capacity towards Luxembourg failed to confirm the interest of market operators in the capacity proposed. However, the project could go ahead if Luxembourg confirmed its interest with a view to securing its supply.

The consultation conducted jointly by GRTgaz and FluxSwiss in 2012 to increase capacity out of Switzerland towards France by 2016-2018 has not been successful. GRTgaz and FluxSwiss now envisage proposing a product that would require less investment and better reflect current demand. Corresponding capacity could be commissioned by 2017, provided this requirement is confirmed before the end of 2013.

Having been requested by several shippers in the past, the increase in exit capacity out of France into Italy via Switzerland is subject to the feasibility of increasing capacity in Switzerland. In light of the uncertainties concerning the latter point and the period from contract to delivery of such works, the date of commissioning of such capacity is planned for the end of this ten year plan.

Lastly, the absence of expressions of interest and the very low likelihood of the situation changing half-way through the plan leads us to postponing by two years the requirement for physical flows from France towards Germany.

All in all, the potential requirements taken into account are as follows:

- the creation of entry capacity from Switzerland and Italy (2017);
- the expansion of exit capacity towards Switzerland (2022);
- making operational support available with a view to increasing the regasification capacity from the Montoir-de-Bretagne LNG terminal (in 2018, then in 2021);
- the development of the exit capacity out of Germany at Obergailbach, first ensuring that non-odourised gas can be transmitted (2020).

To allow for these needs to be fulfilled before the closing of the plan, the looping of the Beauce pipeline, and the pipeline connecting Morelmaison at Voisines, as well as the creation of a new pipeline between Chémery and Dierrey would be required, and several compressor stations would need to be expanded.

In the South zone

The main projects that have been decided are as follows:

- the increasing of interconnection capacity with Spain via TIGF from 155 to 255 GWh/d from Spain to France and from 100 to 165 GWh/d from France to Spain in 2013 and in 2015, with the commissioning in 2013 of a new compressor and interconnection station at Chazelles (Charentes);
- the Eridan project, which will allow for expansion of the southernmost part of the South-North link by looping the Rhône pipeline over 220 km between Saint-Martin-de-Crau (Bouches-du-Rhône) and Saint-Avit (Drôme), is also a prerequisite to the future merging of the North and South Zones.
It is important to note that because of the technical problems encountered in the field, the commissioning of the Eridan project will most probably be postponed by a few months (to 2017) and the total cost of the completed project will be in the upper end of the bracket of estimates made when the project was defined (+30%).

The various players operating in this market have expressed additional potential requirements by 2018-2020, namely the development of storage capacity at Etrez and Manosque, and increased reception capacity for LNG at Fos and of trading capacity with TIGF, consistent with the Midcat interconnection project east of the Pyrenees.

To satisfy such potential needs for increased entry capacity south of the South zone beyond the extra 120 GWh/d created through Eridan, the looping of the pipeline between Saint-Avit and Etrez (Arc lyonnais) is necessary. To this effect, GRTgaz has initiated a consultation process with the various stakeholders, with the prior agreement of the regulators. Taking into account the characteristics of the facility, the National Commission for Public Debate (“Commission nationale du débat public”) has been consulted and has decided in favour of a public debate.

At the request of the French Ministry and further to an agreement with EDF, GRTgaz has also studied the feasibility of supplying Corsica in natural gas, either via the GALSI (Algeria - Sardinia - Italy pipeline) offshore pipeline, the approval of which has been postponed a number of times, or using one or two LNG regasification barges.

**The creation of a single market zone**

In phase with the target model for the gas market in Europe and in order to reduce the reliance on LNG of the South zone, the French CRE in its meeting of 19 July 2012 adopted the general approach of merging GRTgaz’s North and South zones at the latest in 2018. This merger presupposes considerable investments, such as the looping the Burgundy pipeline between Etrez and Voisines - Val de Saône project - and the use of contractual tools (e.g. flow commitments, etc.)

Pursuant to its decision, the CRE has initiated a cost-benefit study to define the optimal levels of investments to be made for the creation of a single North-South PEG.

The results of this study should be available in the autumn of 2013.

In parallel, GRTgaz and TIGF are studying the terms of a merger of their PEG in the south of France on 1 April 2015, in conformity with the regulator’s decision. This contractual decision does not require the expansion of the network.

**The harmonisation of odourisation practices**

Differences in odourisation practices on the primary network have become an obstacle to the development of firm capacity from France to Germany and Belgium. Transmission network operators are working on the standardisation of these practices with a view to drawing up a network code on interoperability.

GRTgaz wishes to evaluate the impact of a change in the regulatory framework and launched studies on the decentralisation of gas odourisation on its transmission network in 2012. The initial work showed the need for a wide-ranging consultation, leading GRTgaz to envisage the construction of pilot facilities, prior to engaging in a binding phase, with the assistance of a distribution network operator.

**Variation of entry and exit capacity**

A 16% increase in entry capacity by 2017 (+ 475 GWh/d). The consolidation work decided on 30 June 2013 will expand the entry capacity to 3,340 GWh/d by 2017 (H gas + L gas(7)). The entry capacity in the North zone will remain high, i.e. at 81%. The entry capacity in the form of LNG will change from 28% to 36%. The network's intraday flexibility will increase significantly to better fulfil the modulation requirements of the site highly modulated, including CCPPs.

---

(7) H-gas: high heating value gas, usually with over 90% methane content.
L-gas: low heating value gas from the Netherlands and distributed in the north of France. It is characterised by its higher nitrogen content.
A 60% increase in entry capacity by 2016 (+ 340 GWh/d). The consolidation work decided on 30 June 2013 will expand the exit capacity to 888 GWh/d by 2016. The creation of an exit point in Veurne supplied by a pipeline transmitting non-odourised gas from Dunkirk will allow GRTgaz, for the first time, to deliver gas intended for Belgium and markets in northern Europe that do not accept pre-odourised gas on their large scale transmission pipelines.

**Variations in entry capacity**

<table>
<thead>
<tr>
<th>Year</th>
<th>Belgium</th>
<th>Germany</th>
<th>TIGF (Spain)</th>
<th>LNG terminals in the North zone</th>
<th>LNG terminals in the South zone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>570 H**</td>
<td>620</td>
<td>80</td>
<td>370</td>
<td>410</td>
<td>2,865 GWh/d</td>
</tr>
<tr>
<td>2014</td>
<td>570 H**</td>
<td>230 B</td>
<td>175</td>
<td>250</td>
<td>-</td>
<td>2,865 GWh/d + 475 GWh/d</td>
</tr>
<tr>
<td>2015</td>
<td>570 H</td>
<td>50 H</td>
<td>230</td>
<td>55-450</td>
<td>370-830</td>
<td>2,865 GWh/d + 475 GWh/d + 655-1,510 GWh/d</td>
</tr>
<tr>
<td>2016</td>
<td>640 H</td>
<td>-</td>
<td>-</td>
<td>675-1,070</td>
<td>780-1,240</td>
<td>2,865 GWh/d + 475 GWh/d + 655-1,510 GWh/d + 4,000-4,855 GWh/d</td>
</tr>
</tbody>
</table>

**Variations in exit capacity**

<table>
<thead>
<tr>
<th>Year</th>
<th>Belgium</th>
<th>Switzerland/Italy</th>
<th>Spain/TIGF</th>
<th>Germany</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>0</td>
<td>223</td>
<td>325</td>
<td>-</td>
<td>548 GWh/d</td>
</tr>
<tr>
<td>2014</td>
<td>-</td>
<td>-</td>
<td>70</td>
<td>-</td>
<td>548 GWh/d + 340 GWh/d</td>
</tr>
<tr>
<td>2015</td>
<td>270</td>
<td>37-97</td>
<td>80</td>
<td>100</td>
<td>548 GWh/d + 340 GWh/d + 217-277 GWh/d</td>
</tr>
<tr>
<td>2016</td>
<td>-</td>
<td>-</td>
<td>475</td>
<td>-</td>
<td>548 GWh/d + 340 GWh/d + 217-277 GWh/d + 1,105-1,165 GWh/d</td>
</tr>
</tbody>
</table>

* Excluding storage facilities.
** See decision of the CRE dated 31 March 2011: until December 2013, GRTgaz will market 15 additional GWh/d in Dunkirk, in parallel with a reduction of 20 GWh/d in firm capacity at Taisnières H.
1. Trends and prospects for the gas market in Europe

Due to the combined impact of the economic crisis Europe is currently facing and the loss of competitiveness of gas because more coal is exported from the United States, gas consumption in Europe is declining. The implementation of the decisions adopted on energy efficiency and the development of renewable energies may limit the use of natural gas despite its undeniable advantages. In this environment, many highly distinct scenarios may be envisaged. However, regardless of the assumptions adopted, consumption forecasts are in general lower than last year’s.

In Europe, due to the drop in domestic production, demand for gas imports will remain high looking toward 2030. Furthermore, the major price spreads seen on global markets confirm the importance of diversifying supply sources and increasing the fluidity of exchanges within the European Union. The implementation of the market integration plan by the European Commission continues, with the finalisation of two network codes (capacity allocation and congestion – bottleneck - management) and the adoption of a regulation on guidelines for trans-European energy infrastructures.

Aware of the major financial constraints and significant economic stakes energy issues present, the European Commission is encouraging market participants to perform cost-benefit analyses to determine which projects are the most promising in particular in the framework of the subsidy process for “common interest projects”.

11. Slowdown in 2012 consumption due to the crisis and competition with coal
12. Rising price differences between regions, and the short and long term
13. Long-term demand forecasts reflecting uncertainty in Europe
14. European gas production on a decline
15. A target model for the European gas market
16. The development of gas infrastructures in Europe: a “no regrets” option
17. Ten Year European gas infrastructure Development Plan
11. Slowdown in 2012 consumption due to the crisis and competition with coal

Natural gas represents approximately one quarter of Europe’s consumption of primary energy. In 2012, the consumption of the 27 Member States of the European Union totalled 466 Gm³, not corrected for weather factors - a 2.2% drop over 2011, according to Eurogas.

This change is essentially due to the economic crisis and its impact on demand from industry, as well as the strong drop in gas consumption for the production of electricity caused by a rise in the use of coal. In the United States, shale gas is in fact used as a substitute for coal, the exports of which to Europe have increased significantly, pushing prices downwards: $130 per tonne in March 2011, less than $85 in March 2012, according to the IEA. The collapse of CO₂ prices - from €11.20/tonne in 2011 to €6.40/tonne at the end of 2012 and less than €5 since that time - has favoured competition with coal for the production of electricity to the detriment of natural gas and the reduction of CO₂ emissions.

Energy demand for heating from residential and service sectors, boosted by the cold spell in February 2012, partially compensated these trends.

The consumption of natural gas is increasing in Germany and France, which constitute the number one and number four markets, respectively, in Europe in terms of volume. It is decreasing in the United Kingdom and Italy, the Union’s number two and three markets, where the production of natural gas-fuelled electricity is greater.

### GAS DEMAND IN 2012*

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>83.0</td>
<td>84.2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>83.8</td>
<td>79.2</td>
</tr>
<tr>
<td>Italy</td>
<td>76.3</td>
<td>73.4</td>
</tr>
<tr>
<td>France</td>
<td>43.9</td>
<td>45.6</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>39.2</td>
<td>38.2</td>
</tr>
<tr>
<td>Spain</td>
<td>34.5</td>
<td>33.6</td>
</tr>
<tr>
<td><strong>Total EU-27</strong></td>
<td><strong>477</strong></td>
<td><strong>466</strong></td>
</tr>
</tbody>
</table>

* Before adjusting for climate conditions  
Source: Eurogas 2013

### EVOLUTION OF THE PRICES OF NATURAL GAS AND COAL

Source: SOeS
12. Rising price differences between regions, and the short and long term

The growth of shale gas in the United States, now the leading global producer of natural gas, along with the drop in consumption in Europe and strong demand from Asia have led to very significant price differences on the various worldwide markets. Spot prices dropped in early 2012 to $2/MMBtu in the United States, before climbing to $4/MMBtu, which remains three times lower than in Europe and four times lower than LNG imported into Japan at $16/MMBtu.

Furthermore, in Europe, in 2012, these trends resulted in variances between spot prices and long-term contract prices, for the most part indexed on oil, that reached up to €6/MWh.
13. Long-term demand forecasts reflecting uncertainty in Europe

The economic crisis and the growth of renewable energies in Europe, as well as the market globalisation - illustrated, for example, by the impact of the Fukushima nuclear disaster on the demand for LNG and that of unconventional energies in North America on LNG, coal and oil products - have made forecasts about long-term natural gas consumption more difficult than in the past. The variations in the IEA’s reference forecasts since 2010 reflect these difficulties.

Europe’s 2020 and 2050 targets

Europe has endorsed three objectives for 2020: to cut greenhouse gas emissions (GHG) by 20% in relation to 1990 levels, to increase the share of renewable energies in final energy consumption to 20% and to increase energy efficiency by 20%. The European Commission aims for a reduction of GHG emissions by a factor of four (4) by 2050, while protecting competitiveness and security of supply.

The Energy Roadmap 2050 examines various scenarios to achieve these goals. They all rely on major efforts to save energy and the massive development of renewable energies (RE), which would make up at least 55% of the final energy consumption in 2050, as against 10% in 2011. As a consequence, the share of electricity in final energy demand should almost double to reach 36% to 39% in 2050.

The European Commission also plans on proposing by the end of 2013 a 2030 framework for climate and energy policies for Europe (9).

“Gas will be critical for the transformation of the energy system.” (10)

While highlighting the many uncertainties that may affect the demand for energy by 2050 (11), the European Commission states that, “Gas will be critical for the transformation of the energy system”(12).

Indeed, natural gas offers great flexibility combined with a high energy efficiency ratio to generate electricity, provide heating and as fuel.

---

(10) Energy Infrastructure - Priorities for 2020 and beyond – 17/10/2012
(11) Rate of economic growth, energy prices, the future of shale gas in Europe, technological and behavioural trends, the nuclear policies of Member States, the scope of efforts undertaken to lessen climate change, etc.
(12) Energy Infrastructure - Priorities for 2020 and beyond – 17/10/2012
By 2030-2035, flexible gas resources will become essential to support the increasing contribution of intermittent wind and solar energies to the production of electricity. As long as competitive large-scale storage solutions are not available for electricity, gas-fired power plants are the best option as a supplement to wind and solar energy. They provide maximum flexibility and energy efficiency with the lowest possible emissions.

Gas plants have CO₂ and NOx emissions that are twice and three times inferior to those of coal-fired power plants respectively, and combined cycle power plants offer an energy efficiency ratio of about 55% against 35% for a coal-fired power plant.

This implies however that the standards applicable to fuel oil and coal-fired plants be aligned with the targets of the European Union and that sufficient penalties are incurred in the event of CO₂ emissions so as to reinforce the competitiveness of natural gas relatively to coal.

Also, the transmission of natural gas via underground pipelines is a secure, economical and landscape-friendly means of transmitting and storing large quantities of energy while respecting the life of the local residents, farming, landscapes and biodiversity. Its energy efficiency ratio is particularly high: its exploitation only uses 0.3% of the transmitted energy.

**Electricity stored in the form of hydrogen**

Wind and solar energy produce electricity during periods in which consumers do not necessarily need this energy. In the absence of a storage solution, production is stopped or the excess electricity is lost to avoid saturating the electricity grid, which raises the production cost, already high, of these types of energy. By 2050, assuming strong penetration of intermittent capacity, this excess production could total close to 75 TWh\(^{(13)}\). A promising solution may be the use of excess electricity to produce hydrogen from the electrolysis of water to be injected into the gas transmission networks. The networks could accommodate 6% to 10% of hydrogen with no particular modification required. The production of hydrogen via electrolysis could ensure the management of close to 25 TWh/year of excess production from the French electricity system that cannot be managed through other forms of shorter-term storage (load-shedding, consumption modulation, exports, etc.), leading to the injection of close to 20 TWh/year of hydrogen into the natural gas transmission network.

Also, hydrogen coupled with CO₂ can produce renewable methane, which has the same energy qualities as natural gas.

These solutions are all the more interesting, as gas infrastructures have very large storage capacity. This would allow for the maximisation of the share of renewable energy in consumption, as well as an improvement in the profitability of existing gas production facilities and infrastructures.

\(^{(13)}\) Study conducted by E-cube Strategy Consultants on behalf of GRTgaz
14. European gas production on a decline

In 2012, a 5% drop in production

The European Union’s production (14) remained the leading source of natural gas, accounting for just over 30% of supply. However, it continues to drop due to a decline in more mature fields.

The year 2012 was marked by a drop of close to 25% in LNG deliveries, caused by strong demand and higher prices in Asia. The share of LNG decreased from 15% to 13%, with Qatar being the primary supplier.

The principal sources of pipeline imports were Russia, representing 23% of supply, Norway representing 21%, and Algeria representing 9%.

### EVOLUTION OF THE GAS SUPPLY IN EUROPE IN 2012

<table>
<thead>
<tr>
<th>In billion m³</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU production</td>
<td>149</td>
<td>150</td>
</tr>
<tr>
<td>Russia</td>
<td>115</td>
<td>106</td>
</tr>
<tr>
<td>Norway</td>
<td>95</td>
<td>110</td>
</tr>
<tr>
<td>Algeria</td>
<td>46</td>
<td>43</td>
</tr>
<tr>
<td>Qatar</td>
<td>43</td>
<td>30</td>
</tr>
<tr>
<td>Nigeria</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>478</strong></td>
<td><strong>462</strong></td>
</tr>
</tbody>
</table>

(14) Eurogas 2012
Medium and long-term outlook for imports: will imports make up 85% of supply in 2035?

The erosion of the European Union’s conventional natural gas production should continue in the near future to reach close to 130 billion m$^3$ by 2020 and drop below the 100 billion m$^3$ threshold in 2035. Imports, representing close to two-thirds of supply in 2012, could total 85% in 2035, according to the IEA.

Uncertainties exist in terms of the level of LNG imports. Europe currently plays the role of the residual balance market, but this situation could change with the exporting of liquefied shale gas from the United States. This could be a competitive source of supply for Europe, preferable to coal from an environmental perspective.

Furthermore, the development of biogas production and especially the exploitation of shale gas in Europe could reduce this dependency. Great Britain and Poland have decided to launch pilot projects. The European Commission should publish results of a public consultation on unconventional gasses by the end of 2013.

**EUROPE’S NATURAL GAS CONSUMPTION AND PRODUCTION BY 2035**

15. A target model for the European gas market

In the present situation, the security and competitiveness of supply are priorities for the European Union, notably to provide access to diversified sources of natural gas supply, facilitate arbitrage and increase its safety margins through the development of import, storage and transmission infrastructures and the further development of trading capacity between countries and market integration.

The definition of a Gas Target Model for the European gas market and the adoption by 2014 of network codes that harmonise rules governing access to transmission networks and market operations support this objective.

The European target model favours the creation of “entry-exit” zones with virtual exchange points (hubs) and sufficient scope to secure the liquidity of wholesale natural gas markets:

- annual consumption in excess of 20 billion m$^3$, i.e. about 230 TWh;
- at least three different supply sources;
- a number of active market suppliers sufficient to avoid concentration;
- hub liquidity that is equivalent to that of the National Balancing Point (NBP) in the UK.

Interconnection capacity between these zones is sold by auction in “bundled” form (exit from one zone + entry into the adjacent zone) and by period.
16. The development of gas infrastructures in Europe

The main objectives of the European energy policy are security of supply, competitiveness and sustainability. To achieve these goals, the European Council highlighted the need to create “an internal energy market that is integrated, interconnected and fully operational” by 2014 in order to “benefit from more reliable and competitive prices, as well as more sustainable energy”. The challenge consists in diversifying sources and supply channels, facilitating arbitrage between the most competitive sources of natural gas supply, ensuring the circulation of gas is more fluid between the various markets, and increasing the flexibility of the network.

A “no regrets option”

The European Commission notes that the development of new, flexible infrastructures is a “no regrets option” likely to support a number of orientations and estimates the investment requirement for 2020 at €70 billion for gas infrastructures(15).

To support this development, on 12 March 2013, the European Parliament adopted a regulation on “guidelines for trans-European energy infrastructure”.

In the field of natural gas, four priority gas corridors have been defined, considered to be strategic for Europe. The North-South corridor in western Europe is of direct interest to France and aims to better interconnect the Iberian peninsula and Italy with the markets of north-western Europe. GRTgaz’s major projects, notably the Arc de Dierrey, the project to loop the Rhône pipeline and that of Val de Saône as well as the creation of new trading capacity with adjacent countries will contribute directly to the development of these trans-European corridors.

Supporting projects of common interest to facilitate implementation

The projects planned for these corridors are described in detail in the regional investment plans (GRIP), which are then discussed with the various stakeholders within regional initiative groups (GRI). GRTgaz is participating in the drafting of three of the six regional investment plans with the relevant transmission operators:

- the North-West GRIP (interconnections with Belgium, Germany and Luxembourg),
- the South Grip (interconnection with Spain),
- the South-North GRIP (interconnections with Germany and Italy via Switzerland).

The second edition of these regional investment plans is to be published in 2013. These investment plans identify the development projects, which would allow transmission networks - historically oriented in the north-south direction (to transmit gas from the North Sea) and in the east-west direction (to transmit Russian gas) - to manage the south-north and west-east flows from the LNG terminals.

They also allow for the trading of interconnection capacity of networks in both directions and for the reinforcement of the security of supply (16).

On 12 March 2013, the European Parliament adopted a regulation on “trans-European energy infrastructure” with specific procedures to accelerate the granting of authorisations, greater incentives for investors and EU financing for projects referred to as “projects of common interest” (PCI).

The regulation sets out the criteria to be fulfilled for eligibility as a PCI.

A list of PCIs should be proposed by the Commission in September 2013.

17. Ten Year European gas infrastructure Development Plan

The European Network of Transmission System Operators for Gas, ENTSOG, issues a European Ten Year Network Development Plan (TYNDP) every two years. Its third edition was published in February 2013.

This document constitutes the most complete listing of gas infrastructure development projects in Europe and their status. Almost 280 projects are identified, one quarter of which have been approved.

Major pipeline projects

Most pipeline projects to Europe are still relevant, some of them awaiting a decision.

- With a capacity of 55 Gm³/year, North Stream links Russia to northern Germany via the Baltic Sea with two pipes commissioned in November 2011 and October 2012. Its capacity may be doubled with the installing of two new piping facilities.
- South Stream would create a new channel for imports of Russian gas to Europe (Austria and Slovenia) via Bulgaria, with a pipeline capacity of 63 Gm³/year (2,370 kilometres long, of which 923 km offshore) by the end of 2015.
- GALSI, with 8 to 10 Gm³/year in capacity, could connect Algeria and Italy via Sardinia. The decision to proceed has been postponed to 2014.
- Trans Adriatic Pipeline (TAP), with its capacity of 10 Gm³/an, would link Greece and Italy via Albania along a 800 km pipeline.

(16) EU Regulation No. 994/2010 concerning measures to safeguard security of gas supply, which took effect on 3 December 2010, provides for the development of bidirectional flows at cross-border interconnection points by the end of 2014. It sets minimum standards for transmission infrastructures at times of peak cold and in the event of a disruption to the largest entry point, and defines the methods to increase coordination, cooperation and solidarity among Member States in the event of a crisis.
Projects involving LNG terminals

- OLT LNG is an offshore LNG terminal between Livorno and Pisa of a capacity of 3.75 Gm³/year and should be operational in the third quarter of 2013.
- With a capacity of 13 Gm³/year, the Dunkirk LNG terminal on the English Channel should be operational in late 2015.
- Other projects to create or expand LNG terminals are under study for the western and southern coasts of Europe, in France in particular (Fos Faster LNG project with a capacity of 8 to 16 Gm³/year by 2019), Belgium and Italy.

MAJOR NATURAL GAS IMPORT PROJECTS IN EUROPE

REGASIFICATION AND STORAGE INFRASTRUCTURES IN THE EUROPEAN UNION
2. Trends and prospects for the gas market in France

France is the 4th largest gas market in Europe, with consumption of around 45 Gm³. However, it is not exempt from the sluggish trend, with consumption in 2012 close to that of 2009, despite cold peaks in February. GRTgaz has revised downwards its forecasts for 2022 compared with last year and anticipates that gas consumption will remain unchanged due to a 1% reduction in annual industrial and residential consumption, offset by the growth in the consumption for electricity generation. To a large extent, this will depend on the energy policy choices that are currently being discussed.

Almost all natural gas consumed in France is imported. As far as supply is concerned, Asian competition caused a drop in LNG deliveries starting at the beginning of the year with a sharper decline since then. This situation underlines the advantage in implementing new infrastructures so that arbitrages can be made in favour of the most competitive supply sources. GRTgaz’s network has demonstrated its reliability and its capacity to adjust to constantly-changing gas flow models. Long-term capacity is amply reserved and often used in excess of 90%. Once the development already decided have been made, GRTgaz’s will be one of the best performing networks according to the criteria used by ENTSOG for resilience and access to diversified sources.

The limited transmission capacity between the North and the South zones may however lead to major price discrepancies to the detriment of the South zone. The coupling of the two zones would eliminate such discrepancies, but requires a significant level of investments. In parallel to this, GRTgaz is committed to using the existing facilities to the full while generating synergies with the adjacent networks.

Thanks to its geographic position, France benefits from the most diverse sources of supply in Europe and constitutes a preferential zone for arbitrage on both the West-East and the North-South links. By optimising both its capacity and flexibility, GRTgaz has assets that can serve France’s and Europe’s energy policies and reflect their priorities.
21. Consumption levels supported by the cold period in February 2012

In 2012, the consumption of natural gas on GRTgaz’s transmission network, which accounts for 92% of total consumption in France, was 461 TWh\(^{(17)}\), up 3.1% on 2011. Corrected for weather factors for weather factors, it declined by 3.6% at 461.5 TWh.

The consumption levels fulfilled by public distribution systems, representing 65% of the total (300 TWh), increased by 11.5% due to the cold snap in February, one of the coldest months in the last fifty years. For 12 consecutive days, the average temperature was -5°C in the areas served by GRTgaz and total consumption exceeded 3,000 GWh/d daily, a level only been reached once in the past, with a peak at 3,405 GWh/d on 8 February 2012. Corrected for weather factors, the consumption by public distribution systems is stable compared to 2011.

The consumption by industrial customers connected to the network decreased by 9.5%, with a 38% decline for gas-powered plants, strongly affected by the competition of coal prices and \(\text{CO}_2\), and a 3.8% drop in other industrial sectors, as a direct consequence of the slowdown in the economy.

---

\(^{(17)}\) Excluding own consumption and losses
22. A stable outlook for demand by 2022

In order to anticipate the demand for gas, GRTgaz uses a sector-based approach to estimate consumption trends for the next 10 years for residential, services, industry, centralised electricity generation and cogeneration (CHP).

Taking into account the drop in consumption and the adverse economic prospects, gas demand forecasts in GRTgaz’s zones have been revised downwards significantly by around 10% against previous estimates.

**FORECAST CHANGE IN GAS DEMAND IN GRTgaz’S ZONES**
(assumptions as of March 2013)

<table>
<thead>
<tr>
<th>TWh</th>
<th>2012 (1)</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2020</th>
<th>2022</th>
<th>AAGR (2) 2013-2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential and services sector (3)</td>
<td>243</td>
<td>241</td>
<td>239</td>
<td>237</td>
<td>223</td>
<td>218</td>
<td>-1.1%</td>
</tr>
<tr>
<td>Industrial sector (3)</td>
<td>167</td>
<td>164</td>
<td>164</td>
<td>162</td>
<td>154</td>
<td>152</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Centralised electricity generation and cogeneration</td>
<td>50</td>
<td>50</td>
<td>53</td>
<td>58</td>
<td>85</td>
<td>93</td>
<td>7.0%</td>
</tr>
<tr>
<td>Transmission system operators’ own consumption</td>
<td>4.1</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.8</td>
<td>3.8</td>
<td>-0.4%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>464</td>
<td>460</td>
<td>460</td>
<td>461</td>
<td>466</td>
<td>466</td>
<td><strong>0.2%</strong></td>
</tr>
</tbody>
</table>

(1) Actual consumption (2) AAGR: average annual growth rate (3) Excluding cogeneration

**COMPARISON OF CONSUMPTION HYPOTHESIS PREPARED IN 2012 AND 2013**

Our key assumptions for the 2013-2022 period are as follows:

- **Residential and services sector: -1.1% per year**
  The introduction of environmental regulations resulting from the Climate and Energy Package and the Grenelle Environment Roundtable should be reflected in a decrease in unit consumption, albeit partly offset by an upturn in the housing sector.

- **Industry: -0.9% per year**
  This assumption takes into account the structural development of the main sectors (18), and the more negative impact of the recession for some of them. This assumption takes into account energy savings, substitution energy and the development of new ways to use natural gas, notably through process heat and hydrogen production.

(18) Automobiles and tyres, chemical-petroleum industry, glass and materials, metal industry, paper manufacturing, food-processing industry.
• Electricity generation: 7% per year

For 2013-2017, our consumption hypothesis concerning combined cycle power plants (CCPPs) is based on projects GRTgaz is aware of and the likelihood of their completion. In total, 13 CCPPs, that is the whole of the French system or installed capacity of 6,165MW, were connected to GRTgaz’s network at end 2012. A power plant with capacity of 514 MW should be commissioned in Bouchain (North of France) in 2015 and another one with capacity of 422 MW in Landivisiau near Brest in the last quarter of 2016. The connection of the latter will require the consolidation of the regional network for Brittany.

However, since late 2011, gas-fired power plants have hardly operated in periods which are off peak due to the market prices of gas, electricity, coal and CO₂: less than 2,000 hours on average in 2012. In 2013, its operator announced the mothballing of the Cycofos plant at Fos-sur-Mer (Bouches-du-Rhône) and the seasonal operation of the Combigolfe plant at Fos sur Mer and the SPEM of Montoir-de-Bretagne (Loire-Atlantique). GRTgaz has taken into account these developments and planned for a progressive return to normal operations on the basis of 4,000 operating hours by 2018.

By the end of 2016, such limitations on the periods in operation of oil-fired and coal-fired power plants, together with the expanding share of intermittent renewable energies in the production of electricity, should create a greater need for gas plants.

GRTgaz anticipates the installation of a new unit of 500 MWe per year from 2020 to 2022, due to the progressive phasing out of the former oil-fired and coal power plants.

As for cogeneration plants, there is a high degree of uncertainty as most electricity purchase obligation contracts will expire between 2008 and 2013. The assumption is that one third of the capacity installed in 2008 will be marketed on the electricity market, one third will be reconditioned and kept under contract and one third will be shut down. As a result, the decrease in installed capacity would be in the range of 7 to 10% in 2013. In 2022, consumption needs fulfilled by cogeneration would represent 28 TWh as opposed to 32 TWh in 2012.

These assumptions do not incorporate the expected consequences of the amendment to the French energy code that is currently being drafted, with a view to setting up a transitory support system for cogeneration plants until the establishment of an electrical energy capacity market in 2016.

**NATURAL GAS-FIRED POWER PLANTS**
## 23. Public services obligations in the gas sector during exceptional cold peaks

GRTgaz, responsible for strategic infrastructures related to the security of energy supply, must face an increase in the volumes of gas transmitted during cold weather peaks, or when temperatures are very low for three successive days, as has statistically occurred every 50 years on average.\(^{(19)}\)

GRTgaz must design its network and its regional network in particular, so as to ensure that its delivery and exit capacity is available and sufficient to meet these obligations.

Daily gas consumption at peak cold times is known as "1-in-50 peak-day demand" or P2 and is estimated for the past year by extrapolating winter consumption levels at times of extreme temperatures according to a method called "winter analysis".

The three-year trend is established by consulting the distribution system operators and consumers directly connected to the transmission network. Long-term trends (beyond three years) are assumed to follow changes in annual volume consumption.

### Forecasted change in peak gas demand on the GRTgaz network (assumptions as of March 2013)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas year (TWh)</td>
<td>0.1%</td>
<td>460</td>
<td>460</td>
<td>462</td>
<td>466</td>
<td>466</td>
</tr>
<tr>
<td>Total P2 (GWh/d)</td>
<td>-0.5%</td>
<td>4,079</td>
<td>4,050</td>
<td>4,001</td>
<td>3,902</td>
<td>3,891</td>
</tr>
<tr>
<td>Firm P2 (GWh/d)</td>
<td>-0.5%</td>
<td>4,017</td>
<td>3,988</td>
<td>3,939</td>
<td>3,840</td>
<td>3,829</td>
</tr>
<tr>
<td><strong>Public distribution systems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas year (TWh)</td>
<td>-1.1%</td>
<td>298</td>
<td>295</td>
<td>289</td>
<td>273</td>
<td>271</td>
</tr>
<tr>
<td>Total P2 (GWh/d)</td>
<td>-1.1%</td>
<td>3,087</td>
<td>3,062</td>
<td>3,001</td>
<td>2,834</td>
<td>2,807</td>
</tr>
<tr>
<td>Firm P2 (GWh/d)</td>
<td>-1.1%</td>
<td>3,087</td>
<td>3,062</td>
<td>3,001</td>
<td>2,834</td>
<td>2,807</td>
</tr>
<tr>
<td><strong>Direct customers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas year (TWh)</td>
<td>2.1%</td>
<td>161</td>
<td>163</td>
<td>171</td>
<td>191</td>
<td>194</td>
</tr>
<tr>
<td>Total P2 (GWh/d)</td>
<td>1.0%</td>
<td>975</td>
<td>971</td>
<td>983</td>
<td>1,051</td>
<td>1,067</td>
</tr>
<tr>
<td>Firm P2 (GWh/d)</td>
<td>1.1%</td>
<td>913</td>
<td>909</td>
<td>921</td>
<td>989</td>
<td>1,005</td>
</tr>
<tr>
<td><strong>GRTgaz’s own consumption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas year (TWh)</td>
<td>0.0%</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total P2 (GWh/d)</td>
<td>-</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Firm P2 (GWh/d)</td>
<td>-</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

(1) From 1 November to 31 October of the following year.  
(2) P2: 1-in-50 peak-day gas demand, or 2% risk.  
(3) Firm P2: 1-in-50 peak-day gas demand, or 2% risk for non-interruptible customers.

---

24. Supplying France with Natural Gas

France imports more than 98% of the natural gas it consumes. To ensure the security of supply, France has developed a proactive policy aiming at diversifying its sources (Europe, Russia, North Africa, the North Sea and the Middle East) as well as its supply channels, drawing on its key geographical position.

France benefits from several sources of gaseous gas, as it is connected through pipelines to Norway, Belgium, Luxembourg, Germany, Italy via Switzerland and Spain via the TIGF network. With LNG terminals on the coasts of the Atlantic, the Mediterranean and shortly the English Channel, France imports LNG from the entire world. It is the only European country with direct availability of such diversified gas resources.

This advantageous location is enhanced by powerful and well-situated gas infrastructures serving more than 11 million customers and making up the first European network by length (37,000 km), the first distribution network in Europe covering more than 200,000 km, the third regasification capacity with 24 Gm³/year and the third storage capacity with more than 12 Gm³ in effective volume. The storage capacity can increase its safety margins, fulfill seasonal variation needs and allow for arbitrages.

At the junction between northern Europe, southern Europe and the entry points for LNG from the Atlantic and Mediterranean Basins and Gulf countries, France has a key position in ensuring the security of supply to the European Union’s Member States and offers arbitrage opportunities on both the West-East and the North-South links.
25. Biomethane: a new source of renewable gas

Biogas is a gas that results from the process of natural decomposition of animal or plant-base organic matter. When this process is integrated into controlled production free of oxygen, it is referred to as methanisation. Pre-sorted organic waste is mixed and heated for approximately three weeks in a digester, which is an oxygen-free tank. The digestion of the organic matter produces biogas and a residue called “digester’s sludge”. Once cleaned, the biogas turns into biomethane, whose quality is similar to that of natural gas.

The injection of biomethane into the networks reduces greenhouse gas emissions, improves air quality, saves non-renewable resources and increases the decentralised production of renewable energy. Potential production by 2020 is estimated at 3 to 9 TWh.

As an incentive for the development of biomethane, the Energy Code provides for a purchase obligation. The price has been determined for a period of 15 years in a Ministerial Order dated 23 November 2011, which authorises the injection of biomethane into the transmission network. Thanks to its technical and regulatory expertise, GRTgaz can support project owners. Standard connection and injection contracts were finalised in 2012 and the company is designing an injection station offer adapted to meet the requirements of different facilities.

A new service, Réso’vert, available on GRTgaz’s website, allows producers to locate potential biomethane injection zones on the transmission network on an interactive map. This service helps users identify the closest pipeline, calculate distances, identify the injection potential and make initial contact.

In early 2013, 65 projects were being examined; 10 study agreements were signed, and the first injections onto GRTgaz’s network are expected in 2014.
26. GRTgaz’s transmission offer

The newly opened natural gas market in Europe has offered consumers the freedom of choice of gas suppliers, and allowed authorised operators to access the natural gas transmission network.

GRTgaz’s mission is to transmit its customers’ natural gas in optimal cost, reliability and service conditions. It facilitates market access and favours a balance between the offer and demand for gas.

The “Concertation Gaz”
For this purpose, in 2008, GRTgaz and TIGF implemented a permanent consultation system with all market operators under the aegis of the CRE. An orientation committee organises the work programme and 11 working groups led by GRTgaz endeavour to reach a consensus on shared issues. All operators can access this work, which is published on the www.concertationgaz.com website.

An entry/exit model with two market zones
GRTgaz markets its transmission services in the form of access to capacity in two entry/exit zones or balancing zones: the North zone and the South zone, interconnected by the North-South link. Within the scope of each zone, the shippers may:
• subscribe capacity at entry/exit points and request transmission of their gas from any entry point to any exit point in the zone;
• exchange gas, with no need to indicate its source or destination, using transfer points called “PEG” (title transfer points).

Their only obligation is to balance entries and exits over the gas day.
This model guarantees flexible market operations and favours increased competition.

The existence of multiple entry/exit zones reflects the physical limits of the network and, in some cases, the impossibility of delivering gas between an entry point in one zone and an exit point in another. Thanks to its investments, GRTgaz has reduced its number of balancing zones from four in 2005 to two in 2009: GRTgaz has also contractually simplified access to its network in the North zone: since 1st April 2013, the shipper may supply its customers in L-gas from H-gas without having to purchase or pay for the conversion service.

This simplification is to continue with the launch of a common PEG for GRTgaz South-TIGF on 1st April 2015. If the CRE's orientation, defined its discussions of 19 July 2012, is confirmed, it could lead to a merger of the North and South zones by 2018 at the latest (see p. 54).

In the interim, since 11 July, GRTgaz, with Powernext, is proposing a coupling service for the North and South markets to improve fluidity in the market and reconcile the wholesale natural gas prices in the two zones.

A capacity offer and services adapted to our customers’ requirements
For each North and South zone, GRTgaz offers shippers:
• subscriptions for capacity at the network’s entry/exit points and on the North-South link with different maturity dates, which allows them to then make deliveries to their customers,
• access to a Title Transfer Point (PEG) where each shipper can buy or sell natural gas. The PEGs allow access to bilateral transfers between shippers and to an exchange managed by Powernext.

Furthermore, shippers can trade capacity, notably on the secondary market, in particular on the Capsquare platform.

Recognised service quality
• 89% of GRTgaz’s customers are satisfied with the transmission and delivery services
• 92% of customers are satisfied with commercial relations
2012 satisfaction survey
Smart GRTgaz’s online information service offers reference data on the gas market

Launched in 2011 and accessible to the public, Smart GRTgaz’s online information service offers more than 1,000 pieces of data in quasi real-time. It covers all interconnection points, i.e. borders, LNG terminals, storage facilities, interfaces between GRTgaz’s balancing zones and consumption points. Complete information is made available to customers and prospects so they can optimise their reservations of capacity, anticipate market changes and ensure their gas portfolio is balanced. Bloomberg and Reuters agencies have chosen Smart GRTgaz to inform their subscribers.

Joint offers with adjacent transmission system operators

GRTgaz works in close collaboration with adjacent operators to facilitate gas trading.

In France, GRTgaz’s South Zone is linked to the TIGF zone by a single contractual interconnection whose capacity is marketed jointly by the two transmission system operators. At the points of interconnection to the adjacent LNG terminals and storage facilities, a system of automatic allocation of transmission capacity on GRTgaz’s network is in place, based on the capacity subscribed with the adjacent network operators.

The Prisma platform allows for the joint marketing of capacities between marketplaces.

The wholesale market: renewed momentum in 2012

With 514 TWh traded at GRTgaz’ PEGs, showing a growth of 14.5% compared with 2011 and of more than 63% over two years.

PRISMA: the first European capacity reservation platform

Nineteen Transmission System Operators (TSOs) have launched a partnership for the creation of the new PRISMA European Capacity Platform. Since the 1st April 2013, PRISMA has offered shippers the possibility to auction joint cross-border transport capacity or “bundled” capacity between the various European marketplaces, i.e. France, Germany, Austria, Belgium, Denmark, Italy and the Netherlands.

PRISMA manages harmonised capacity products and will act as a secondary market in 2014.

More than 250 European shippers have already registered on the platform, which has achieved the implementation of the CAM (capacity allocation mechanism) network code two years ahead of schedule. The PRISMA platform is a major step towards creating the internal gas market.
27. Demand for transmission capacity on GRTgaz’s network

The trends observed in 2011 did confirm in 2012, precisely the sharp drop in LNG, the strong increase in traffic on the North-South link and a low rate of utilisation of storage sites. Gas flows reflected the impact of the price spreads between the European and international marketplaces. However, despite these strong constraints, the network has shown the flexibility necessary to adjust flows to the market conditions.

<table>
<thead>
<tr>
<th>Gas flows</th>
<th>2012 (TWh)</th>
<th>2011 (TWh)</th>
<th>Variation 2012/2011 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry of gaseous gas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dunkirk</td>
<td>183</td>
<td>164</td>
<td>+12%</td>
</tr>
<tr>
<td>Taisnières H</td>
<td>101</td>
<td>118</td>
<td>-15%</td>
</tr>
<tr>
<td>Taisnières L</td>
<td>52</td>
<td>48</td>
<td>+7%</td>
</tr>
<tr>
<td>Obergailbach</td>
<td>104</td>
<td>77</td>
<td>+36%</td>
</tr>
<tr>
<td>LNG entry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montoir</td>
<td>23</td>
<td>59</td>
<td>-60%</td>
</tr>
<tr>
<td>Fos</td>
<td>81</td>
<td>100</td>
<td>-19%</td>
</tr>
<tr>
<td>North-South link</td>
<td>110</td>
<td>79</td>
<td>-34%</td>
</tr>
<tr>
<td>Exit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oltingue</td>
<td>28</td>
<td>43</td>
<td>-34%</td>
</tr>
<tr>
<td>Midi</td>
<td>58</td>
<td>49</td>
<td>+18%</td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injection</td>
<td>85</td>
<td>85</td>
<td>0%</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>93</td>
<td>68</td>
<td>+38%</td>
</tr>
</tbody>
</table>
Utilisation of capacity subscribed in 2012

The capacity utilisation rates are higher than 80% in Dunkirk and Taisnières, rising significantly at Obergailbach and on the North-South links and Midi interconnection point, but declining sharply at the interconnection points with the LNG terminals and the exit point at Oltingue. This utilisation reflects the decisions shippers have made to supply the French market at the lowest cost.

LNG: a declining utilisation of the entry points

LNG deliveries fell by 50% in Montoir and by 19% in Fos because cargoes were diverted to the Asian markets, offering better prices.

As a result, the Montoir terminal had a capacity utilisation rate of 19% in 2012 and the situation has worsened since, with no gas injection in March 2013.

The Fos terminals, which are essential to the supplying of the South zone, operated on the basis of less than 60% of their capacity for half the year. The downturn in LNG was offset, however, by an increase by over 40% in flows on the North-South link, part of which were directed to Spain, resulting in a 18% rise in the flows exiting the Midi PIR point.
Gaseous gas entry flows: a strong increase at Obergailbach and a drop at Taisnières to the benefit of Dunkirk

Entries expanded by 36% at Obergailbach and 12% in Dunkirk, as the cold period of February 2012 reflected in an increase in flows.

They were 15% lower in Taisnières due to arbitrage decisions taken by shippers in favour of other entry points.

The end of year rise in entries at Obergailbach reflects the sustained increase in prices at the North PEG, compared with those of the German NCG, as shown on the opposite graph.

At the majority of the entry and exit points, the shippers optimised the volume and the utilisation of their subscribed capacities, notably in Dunkirk, Taisnières and Obergailbach, where they cut down on subscriptions and increasing utilisation.
Exit flows of gaseous gas: a sharp drop in Oltingue, an increase at the Midi PIR

Gas export flows towards Switzerland and Italy dropped by 34% at Oltingue, while exit flows increased by 18% towards TIGF and Spain.

OLTINGUE
Gas flows at the Midi interconnection point were boosted by high prices in Spain, attributable to the Iberian peninsula’s reliance on LNG. At Oltingue, the utilisation rates were high at the beginning of the year due to the cold weather period and virtually collapsed in the second term, compared to 2011, at -63%. Such a drop is attributable notably to the drop in price spreads between PSV and the North PEG experienced in 2012, from 9 €/MWh at the beginning of the year to less than 0.5 €/MWh at year-end.

**North-South link: utilisation on the increase in the North-South direction**

The utilisation of the North-South link rose by 41% and was particularly acute in the summer of 2012. The drop in LNG deliveries, exports to Spain and the need for injections into salt cavern storage sites were all factors in favour of a higher rate of utilisation in the South zone. With a utilisation rate of more than 95% during 60% of the time (93% on average), the North-South link has become the most used link. As a result, the price spread between the North and South PEGs reached almost 7 €/MWh in July 2012.
The price spreads between the North and the South PEGs are closely linked to the daily availabilities of capacities.
If available capacity (in dark) is abundant, the price spread is low.

Storage: a drop in subscriptions, a rise in withdrawals

At the beginning of the winter 2012-2013, the cumulative stocks in Storengy and TIGF were inferior to the previous year's. This is associated with the fact that bookings showed a lower trend that was confirmed in April 2013, and that the temperatures were lower than average in the first half of 2012. As a result, shippers operated more and longer withdrawals, thus delaying the injection process. Driven by the rise in consumption of the residential sectors and of the combined cycle power plants during the cold weather peak, the quantities withdrawn increased by 38%, in part to offset the drop in LNG deliveries.

Analysis of subscriptions by entry/exit points by 2020 (20)

GRTgaz also uses the subscription rate analysis for entry and exit points to determine capacity development requirements.
Over the period 2013-2011, these rates are high and stable overall: on average, more than 90% of the long-term firm capacity offered is already booked for the period 2015-2020. Additional firm capacity is offered short-term to offer supplementary market arbitrage possibilities and to ease the market entry of new players.

Firm capacity subscriptions for LNG entry points

For 2015/2020, capacity has been fully subscribed in Dunkirk and Taisnières L, which is normal in light of the capacity of the pipeline that imports Norwegian gas and consumption in Zone L.
Capacity at Taisnières H has been fully subscribed since 2013 further to the market consultation conducted in 2009.
Subscription rates at Obergailbach and at Midi interconnection point from TIGF to GRTgaz are slightly inferior to 80%, 20% being reserved for the short-term. As there is some spare capacity, the amount made available seems in line with requirements. Capacity requirements at the Midi interconnection point had been estimated in the framework of the “France-Spain” Open Season in 2010.

(20) More detailed analyses by entry/exit point are set out in the appendix.
Firm capacity subscriptions for LNG entry points

At the Montoir and Fos entry points, the long-term subscription rates reach close to 90% on average (21).

At the new Dunkirk LNG entry point, reserved capacity at the end of December 2012 totalled 250 GWh/d.

Firm capacity subscriptions for exit points

At Oltingue, capacity has been fully subscribed.

At Veurne, the subscription rate approximates 80% for the long term.

At the Midi interconnection from GRTgaz to TIGF, the strong seasonal nature of the link is reflected in subscription rates of close to 80% in the winter and 50% in the summer.

Capacity subscriptions for the North-South link

Firm capacity for the North-South linked is restricted to 230 GWh/d. Such a physical constraint accounts for the existence of two balancing zones. The current conditions lead to a high rate of subscription to the South link. Subscriptions are restricted to one year by the CRE. As a consequence, long-term subscriptions are not possible. The terms and conditions for subscriptions from April 2014 are currently being discussed. This situation is a prime example of why capacity requirements to be built between the North and the South zones. The subscription rate in the south-north direction is, however, very low.

Injection/withdrawal capacity subscriptions for underground storage facilities

All storage capacity is marketed every year by the Storengy storage operator. The corresponding injection and withdrawal capacity on the transmission network is allocated automatically on the basis of the result of the allocation of storage capacity.

Further to a sharp downturn in 2012, GRTgaz has recorded a new drop in subscriptions. They only reached 45% in May 2013 as opposed to 83% in May 2011, as operators seem to have chosen other modulation sources, such as spot markets: winter/summer spreads dropped and therefore competed with storage facilities.

A potential deficit in gas to cover any peaks in cold temperatures during the next winter

In its winter analysis extrapolating winter consumption levels at times of extreme temperatures, GRTgaz observed that the available resources at the transmission network entry points would not suffice to cover extreme temperatures, as occurs statistically once every 50 years, during the winter 2013-2014 (22). This consideration largely rests on the analysis of capacity subscribed as at 29th April 2013 with underground storage sites, showing a sharp drop compared to the previous years, and on the maximum utilisation of most cross-border and LNG terminal entry points.

If capacity subscriptions at the transmission network entry points remained at such levels, a deficit of more than 500 GWh/d would remain, in parallel to peak consumption levels estimated at between 4,000 and 4,137 GWh/d (23).

To ensure sufficient supply in the event of extreme cold temperatures, additional capacity requirements to be subscribed with storage sites and LNG deliveries need to be sufficient to guarantee maximum transmission levels from the LNG terminals during such periods.

(21) Normative averages calculated based on regasification capacity subscribed with Elegy and Fosmax LNG.
(22) In accordance with the public services obligations in the gas sector.
(23) Peak value 2013/2014 as calculated in 2012. The lowest end of the value bracket is adjusted in light of the initial analyses of consumption as observed in the winter 2012-13.
28. Evaluation of the network’s performance by ENTSOG

For the publication of the TYNDP 2013-2022, the ENTSOG estimated the performance of the European natural gas system as well as the contribution of various new infrastructure projects.

A model European network was drawn up on the basis of the balancing zones, the links between each zone, the entry and storage capacity in 2012, in 2017 and in 2022 and assuming different hypotheses with a breakdown by decided and non-decided projects. Over 200 different scenarios were simulated, incorporating peaks in demand, disruption in supply, forecast changes over ten years, etc. The performance was then assessed in view of the dependence of the network on different sources of supply and its estimated resilience levels. The results give an indication as to the degree of European market integration, and the investments required in each zone.

In light of this evaluation, GRTgaz’s network shows its capability to meet the demand where tests have been run and the improvements brought about by the developments already decided. This is the case for the South zone in particular.

- **Resilience capacity:** this test measures the network’s capability to transmit large quantities of gas to meet peak demand and in the event of a disruption in a supply source (Russia, Algeria, Norway or LNG terminals). This evaluation highlighted the greater vulnerability of the South zone due to insufficient interconnection capacity with the North zone. The consolidation of the core network on the South link (Eridan project) and on the North link (Arc de Dierrey) will address the issue by 2017.

**INFRASTRUCTURE RESILIENCE UNDER DESIGN-CASE SITUATION**

![Map showing infrastructure resilience](source: ENTSOG, TYNDP 2013-2022)

(22) Conformément aux obligations de service public du secteur du gaz
(23) Valeur de pointe 2013/2014 telle que calculée en 2012. La valeur inférieure e la fourchette correspond à un ajustement tenant compte des premières analyses des consommations de l’hiver 2012-13
• **Dependence on one supply source:** this test measures the minimum levels indispensable to the annual balancing in the analysed zone. In the south of France and in Spain, LNG has to make up at least 40% of annual supply.

**SUPPLY SOURCE DEPENDENCE**

<table>
<thead>
<tr>
<th>Zone connected to a LNG terminal</th>
<th>Minimum share in total supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LNG</td>
</tr>
<tr>
<td></td>
<td>RU</td>
</tr>
<tr>
<td>&lt; 20 %</td>
<td>20-40 %</td>
</tr>
<tr>
<td>20-40 %</td>
<td>40-60 %</td>
</tr>
<tr>
<td>&gt; 60 %</td>
<td></td>
</tr>
</tbody>
</table>

Source: ENTSOG, TYNDP 2013-2022

• **Diversification of supply sources:** this test measures the number of supply sources contributing to at least 5% of total supply that each zone can rely on. One of the most diversified countries, its principal sources of imports coming from four different directions, i.e. Norway, the Netherlands, Russia and Algeria and LNG constituting a fifth source, LNG is diversified by nature.

**NUMBER OF ACCESSIBLE SOURCES**

<table>
<thead>
<tr>
<th>Number of sources a Zone may have access alternatively (5 % share threshold)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

including LNG

Source: ENTSOG, TYNDP 2013-2022
3. The development of GRTgaz’s transmission network

Subscription rate analysis for entry and exit points helps determine variations in flow configurations according to the resources available and the market prices. The strong variability of gas flows highlights the need for a solid transmission network designed with enough flexibility to ensure the proper functioning of the market. The shippers must be able to make arbitrage decisions between the most reliable and competitive supply sources without this process being hampered by the network’s own limitations.

Increased entry capacity in Dunkirk, extra exit capacity at Veurne towards Belgium and in both direction at the Midi interconnection between TIGF and Spain commissioned for 2016 should improve both functioning and fluidity of this market.

The flow configurations for 2012 have confirmed the congestion of the network on the North-South link, thus restricting supply possibilities for the South zone and creating large price spreads between the two balancing zones. The development of the North-South link, which will be supported by the looping of the Rhône pipeline, constitutes a decisive step towards the elimination of this congestion. However, the creation of a single market zone will require other significant investments that will need to be assessed as part of the cost-benefit study to be conducted by the CRE in 2013.

Beyond these developments and as this document is published at an early prospective stage, the operators have decided to reinstate most of the potential requirements identified in the ten year development plan established last year for the period 2012-2021.

However, in the absence of long-term subscription expressions during market consultations or if visibility is lacking in the medium-term as to the conditions to justify them, the assessment of certain needs was postponed (for example the interconnection capacity with Switzerland and Germany) or cancelled (interconnection capacity with Luxembourg).
31. Developing the transmission network: processes and timelines

The analysis of demand and changes in demand has allowed GRTgaz to identify additional facilities required to:

- contribute to the development of new exchange capacity with adjacent transmission system operators, receiving or storage capacity for LNG;
- allow for the adjustment of the network to variations in flow configurations;
- respond to changes sought for the organisation of the market, with the eventual creation of a single balancing zone;
- respond to changes in consumption, notably those related to the use of combined cycle power plants (24) that require significant levels of intraday flexibility.

The development of the regional network mainly targets coverage of transmission requirements when consumption peaks. The method used to determine these requirements is presented on page 56.

The development of the primary network depends on changes in capacity requirements at zone entry or exit points. The creation of new capacity flowing into or out of a market zone requires more than the building of connection facilities to connect to the adjacent infrastructure - the core network must also be strengthened so it can transmit the additional delivered volumes to all the exit points from the zone.

In most cases, consolidating a core network facility means satisfying the needs of several capacity development projects. The decision to expand then hinges on the first project that triggers this decision. In some circumstances, reinforcing the core network can be progressive, e.g. the development plans for the North-South link.

In such cases, discussions with shippers and adjacent operators allow GRTgaz to measure these requirements and plan towards core network investment schemes. A change in their schedule can also cause GRTgaz to adjust its programme accordingly. In addition, changes in these projects can occur due to regulatory and global energy market developments or constraints, with consequences on the shippers, the industrial consumers and the investors.

### MACRO PLANNING FOR THE EXECUTION OF MAJOR PROJECTS

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>N+1</th>
<th>N+2</th>
<th>N+3</th>
<th>N+4</th>
<th>N+5</th>
<th>N+6...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Studies / Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultations and public and administrative procedures prior to authorization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(24) A CCPP uses around 20 GWh/d (20 million kWh), i.e. the equivalent of the winter consumption of a city with 200,000 inhabitants.
32. Changes in the portfolio of projects

GRTgaz invested 666 million euros in 2012 to provide better security of supply on its network, upgrade and expand its transmission network, optimise its robustness and flexibility, and increase its trading capacity with adjacent networks.

Facilities launched in 2012 and 2013

In 2012, two combined-cycle gas turbine power plants were connected to GRTgaz’s network, i.e.:
- 413 MW near Toul (Meurthe-et-Moselle)
- 465 MW in Martigues (Bouches-du-Rhône).

In 2013, the commissioning of the completed or scheduled projects is unchanged in relation to development plan for the period 2012-2021. The projects are presented in detail in the following section, notably the:
- partial looping of the Hauts de France pipeline (51 km, DN 1,200);
- adaptation of the Taisnières interconnection (North of France);
- adaptation of the Laneuvilloitte interconnection point (Meurthe-et-Moselle);
- adaptation of the compressor station at Cuvilly (Oise);
- new compressor station and interconnection point at Chazelles (Charente);
- new compressor station at St Avit (Drôme);
- adaptation of the compressor station at Etrez (Ain);
- connection of the new storage site at Hauterives (Drôme).

Ongoing projects

GRTgaz continues the implementation of scheduled projects, notably the connection of the Dunkirk terminal and the reinforcing of the core network in the South zone.

However, to spread the burden of installation companies, GRTgaz has postponed by a few months (to 2017) the commissioning of the Dierrey – Voisines section. However, this has no impact on the commissioning of the Dunkirk terminal.

As for the Eridan project, the detail studies have evidenced more technical constraints than expected and will probably cause a delay of a few months in the commissioning and result in costs reaching the higher end of the estimation bracket (+30%).

Studies underway and projects pending a decision

Further to a consultation with the stakeholders, potential requirements identified in the previous edition of the development plan have been confirmed by the various project owners and the operators of adjacent infrastructures.

Nevertheless, the open seasons held to make capacity available from France to Luxembourg and from Switzerland to France have not at this stage confirmed such needs. GRTgaz and the various stakeholders are debating the follow-up.
33. Development projects in the North Zone

Connected to the major markets of northern Europe, the North Zone is both active and attractive. In 2012, 410 TWh were traded at the North PEG (+ 9%). GRTgaz has identified the following requirements to 2022:

- The connection to the future LNG terminal in Dunkirk (2015) and the consolidation of the core network by looping the Hauts de France pipeline (2015) and creating the Arc de Dierrey (2015 -2016);
- The development of entry capacity from Belgium (2013) and Switzerland (2017), as well as exit capacity towards Belgium (2015), Germany (2020) and Switzerland (2022);
- Increasing entry capacity at the Montoir de Bretagne terminal and adjusting the network accordingly (2018-2021).

As several of these requirements have not been confirmed by the market, the development has been rescheduled (for example the interconnection capacity with Switzerland and Germany) or cancelled (interconnection capacity with Luxembourg).

Regional network consolidation works related to interconnections

Increase entry capacity from the north-western section of the North zone leads to the saturation of the network on the West-East link: the eastern part of the network may, as a consequence, not be fully supplied in the event of a cold spell if the exit capacity are brought to maximum levels.

The creation of the Arc de Dierrey, a new pipeline (diameter 1,200 mm; length 300 km), and the adaptation of the Cuvilly (Oise) and Voisines (Yonne) interconnection stations via Dierrey (Aube) is one step towards durably relieving bottleneck situations on the North-West to East link. Decided in 2011 with a view to connecting the Dunkirk terminal in 2015, the Arc de Dierrey will be commissioned in two phases. The 120 km section between Dierrey and Voisines has been postponed to late 2016 together with the preparation work for the Voisines interconnection station. This delay will have no impact on the emission capacity of the new terminal and on the availability of capacity subscribed at the terminal entry point and at the Veurne interconnection point. Despite being rescheduled, the project will still be eligible for European subsidies for the purchase of tubes.
The development of new regasification capacity on the Atlantic coast may also warrant strengthening the network’s west-east link with the full looping of the Beauce and of the Maine pipeline, that of Nozay (Loire Atlantique) and that of Saint-Arnoult-des-Bois (Eure-et-Loir), as well as the looping of the North-East pipeline between the Laneuvelotte (Meurthe-et-Moselle) and the Morelmaison stations (Vosges), and the installation of another pipeline between Chémery (Loir-et-Cher) and Dierrey.

**Forthcoming development projects**

**Connecting the new Dunkirk terminal (2015)**

With a capacity of 13 Gm³/year, this terminal should be operational by the end of 2015. Its connection to the network necessitates the creation by the end of 2015 of the following:

- a 900 mm linking pipeline on 17 km between the terminal and the Pitgam (North of France) compressor station; this pipeline will deliver non-odourised gas;
- the looping of the Hauts de France pipeline between Nedon (Pas-de-Calais) and Cuvilly (123 km length, 1,200 mm diameter) and adapting the interconnection stations accordingly at Pitgam, Cuvilly, Ourcq et Dierrey (Aube);
- the creation of the first section of the Arc de Dierrey over 180 km between Cuvilly and Dierrey.

The second section of the arc de Dierrey connecting Dierrey and Voisines will be commissioned by the end of 2016. The planned infrastructures will take the Dunkirk terminal’s entry capacity to 520 GWh/d towards the North PEG.

The decision in favour of the connection works was taken on 30 December 2011. This investment was approved by the CRE and amounts to €1,185 million. The development of the core network associated with this project (Arc de Dierrey) and the increase in entry capacity at Taisnières H benefit from a European Union subsidy of €108 million.

**Belgium**

**Increasing entry capacity at Taisnières H (2013)**

A joint market consultation was launched by Fluxys and GRTgaz in 2007 to evaluate transmission capacity development requirements from Belgium to France. A supplementary requirement for 50 GWh/d was evidenced during the binding phase, potentially bringing total entry capacity to 640 GWh/d in 2013. This supplement led to the restructuring of the Taisnières (North) interconnection station and of the Cuvilly compressor station as well as the partial looping of the Hauts de France pipeline over approximately 50 km.

The final decision in respect of the Hauts de France II and Cuvilly pipelines was taken by GRTgaz in 2010. The investment was approved by CRE for a total of €191 million.

**Creating exit capacity close to Veurne (2015)**

In Belgium, natural gas is not odourised on the primary transmission network and the Belgian transmission network does not accept transmission of pre-odourised gas. As a result, GRTgaz does not sell firm exit capacity towards this country. Only interruptible reverse capacity is offered at Taisnières.

The new Dunkirk LNG terminal will provide large quantities of non-odourised gas in the vicinity of the Belgian border. The sale of firm capacity from France to Belgium will become possible by creating a new interconnection point dedicated to non-odourised gas close to Veurne. This development will consolidate the integration of the French, Belgian and North European markets.
GRTgaz and Fluxys therefore launched a joint market consultation in May 2012 to estimate requirements. The outcome of the non-binding phase led GRTgaz and Fluxys to offer the following for the binding phase of the consultation:

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

The consultation phase ended in 2012 with a decision to allocate 100 GWh/d in firm capacity from the North PEG towards Belgium and 170 to 219 GWh/d in firm capacity towards Belgium depending on the year considered.

On the French side, the completion of this new interconnection requires the following:

- a modification to the Pitgam interconnection;
- the creation of a new pipeline - the Flandres pipeline - approximately 25 km long to transmit non-odourised gas between the Pitgam station and the Veurne interconnection point.

The investment was approved by CRE for a total of €86 million.

**Development projects planned to meet requirements**

**Supporting the development of the Montoir terminal (2018 and 2021)**

The Montoir-de-Bretagne LNG terminal operator envisages to increase the terminal’s annual capacity from 10 to 12.5 Gm$^3$ in 2018, and to 16.5 Gm$^3$ in 2021. A market consultation (non-binding phase) is in progress for these extension works.

To allow for an extra capacity of 2.5 Gm$^3$ on the network by 2018, the Auvers-le-Hamon (Sarthe) compressor station will require an additional 10 MW and the looping of the Beauce pipeline will be necessary between Cherré (Sarthe) and Saint-Arnoult (Yvelines).

In order to accommodate 16.5 Gm$^3$ in 2021 on completion of the the Arc de Dierrey, the Maine pipeline will have to be looped with a line of 1,050 mm in diameter between Nozay (Loire-Atlantique) and Cherré, and a new pipeline will need to be installed linking Chémery (Loir-et-Cher) and Dierrey so as to reinforce compression at Dierrey.

**Switzerland/Italy**

**Creating entry capacity at Oltingue (2017)**

FluxSwiss launched a market consultation in 2010 to evaluate demand for transmission capacity from Italy to France, which led to capacity bookings. At its end, the Italian transmission system operator SNAM RETE GAS decided to invest in its network in order to export more than 400 GWh/d towards Switzerland to supply France and Germany.

A joint market consultation by GRTgaz and FluxSwiss took place from June to September 2012 regarding the marketing of of 100 GWh/d of interruptible (2016) or firm -depending on conditions of pressure- (2018) capacity. This consultation did not lead to a favourable decision on the project but has confirmed the demand albeit. GRTgaz and FluxSwiss are working on a solution to propose a product that would require less investments (adapting the Oltingue and Morelmaison interconnections for an amount estimated at around ten million euros) and better reflect current demand. Corresponding capacity may be commissioned by 2017, provided this need is confirmed before the end of 2013.
Increasing exit capacity at Oltingue (2022)

The principal network exit point to Switzerland and Italy is Oltingue. Oltingue is running at near full-capacity to supply Italy with gas out of the Netherlands and Norway in particular. Several shippers have shown interest in gaining access to additional exit capacity. This project is subjected to the feasibility of increasing capacity towards Italy in Switzerland itself. Taking into consideration the uncertainties concerning the latter point and the period from contract to delivery of such works, the commissioning date of such capacity is likely to coincide with the end of this ten year plan.

For GRTgaz’s network, this could lead to the partial looping of the North-East pipeline between the Morelmaison (Vosges) and Laneuvelotte (Meurthe-et-Moselle) stations and that of the Beauce pipeline as well as the increasing of compression at Dierrey.

Luxembourg

Increasing exit capacity (2018)

In order to meet the anticipated evolution of consumption in Luxembourg, CREOS Luxembourg asked GRTgaz to study the feasibility of increasing the interconnection capacity from France, currently restricted to 0.3 GW/h/d. The expansion work due for completion by 2018 consisted in the installation of a new pipeline linking the Lorraine and Luxembourg. The investment has been estimated at €72 million and the exit capacity available for marketing at 40 GW/h/d.

The two operators launched a joint market consultation which was completed in May 2013. The market operators have not yet confirmed their interest for the capacity on offer.

However, the project could go ahead if Luxembourg confirmed its interest with a view to securing its supply.

Germany

Creating exit capacity at Obergailbach

In order to reinforce the North-South corridor in Western Europe, GRTgaz has envisaged the possibility of creating 100 GW/h/d extra firm exit capacity at Obergailbach towards Germany (up to 2020).

The following expansion work has been planned to create such capacity:
- the looping of the North-East pipeline between Morelmaison (Vosges) and Voisines;
- the installation of a compressor station at Cheppy (Meuse);
- the increasing of compression on the Voisines and Evry stations and the restructuring of interconnection points at Voisines and Morelmaison.

However, such projects rely on changes in odourisation practices on GRTgaz’s primary network, as German transmission system operators do not currently accept pre-odourised gas, except in case of force majeure.

Despite discussions with the various stakeholders, market interest for this project has not been confirmed. The models set up by ENTSOG have demonstrated the network’s capacity to meet the different supply scenarios. Exporting gas towards Germany would require the building up of regasification capacity and higher LNG deliveries to France and Spain, according to a scenario, which seems unlikely to materialise in the short-term.
At their end, German transmission operators have incorporated certain supply scenarios into their development plans, with additional potential quantities delivered from the north-west of Europe, but have no particular bias towards a particular interconnection point (in Belgium, France or Switzerland).

In view of these factors, GRTgaz retains this project with a two-year delay. However, its presence in the next ten year development plan will be reviewed in light of the interest expressed by stakeholders in the coming months.

**Development projects related to storage facilities**

GRTgaz consulted with Storengy regarding the storage capacity requirements. Storengy confirmed its position of 2012 and indicates there are no significant developments in the North Zone.

---

**Transmission and odourisation of natural gas**

Natural gas is odour-free, but in order to identify any leaks on the distribution network and on internal facilities, odourised gas is distributed. The distribution of odourised gas is compulsory in all European countries. On all French and Spanish networks, the odourisation process is centralised by transmission systems operators upon entry onto the system. In most European countries, the odourisation takes place just upstream of the distribution networks. Further to contacts made in 2011, a difference in gas odourisation practices was evidenced between France on the one side and Germany and Belgium on the other side, which means that increasing flows via Switzerland is currently impossible.

This topic is the subject of a particular point in the network code on interoperability. This code being drafted in ENTSOG will be given to the ACER no later than September 2013. Then follow the process of formal validation by ACER, the EC, the Member-States, the Council and the Parliament. It will rely on the guidelines issued by the ACER July the 26th 2012 which provide that in the case where differences in odourisation practices represent barriers to trade cross-border gas, operators will seek an agreement within six months.

GRTgaz wishes to evaluate the impact of a change in the regulatory framework and launched studies on the decentralisation of gas odourisation on its network in 2012. The first exchanges with the national stakeholders showed the need for a wide-ranging consultation in order to weigh up the impacts of the harmonisation process. To this effect, GRTgaz envisages the construction of pilot facilities with the assistance of a distribution network operator.

In parallel to this, with regards to the creation of firm capacity in the France-Belgium direction, the installation of a new pipeline and an interconnection will allow in 2015 for non-odourised gas to be transmitted between Dunkirk and Belgium. It has to be noted that no French customers will be connected to these works, directly or indirectly.

The harmonisation of gas odourisation practices will be made at a high cost assuming the decentralisation of odourisation to fulfil a strong demand in exit capacity towards Germany. This also implies the increasing of LNG reception capacity in France.
34. Development projects in the South Zone

The South Zone enjoys a strategic position to receive LNG from North Africa and the Middle East. As such, the South Zone may need the capability of delivering this gas to markets in northern Europe. Furthermore, it must be capable of receiving gas transmitted via the North zone for the supply of the South zone itself, Spain (TIGF) when LNG flows are lower. Facilitating gas trading is the objective of the development of the North-South corridor in western Europe. In 2012, 104 TWh were traded on the South PEG. The main projects are as follows:

- The development of trading capacity with TIGF and Spain with the creation of a new compressor station at Chazelles (2013);
- The consolidation of the core network by looping the Rhône pipeline (Eridan project), the Arc Lyonnais pipework and the Burgundy pipeline;
- The increasing of entry capacity from the storage facilities (2018) at the LNG terminals in Fos (2019-2021).

Since 2010, progress has been made to expand access to the South Zone

- Marketing is now organised into several successive rounds of allocation on a pro rata basis, giving greater visibility to shippers as they express their requirements. A guaranteed allocation mechanism allows shippers with limited requirements to access the capacity that they need.
- Since the second half of 2011, GRTgaz and Powernext have been offering a service coupling of the North and South marketplaces. This innovative service should help maximise utilisation of the link capacity between the two zones and facilitate access to the South Zone (see p50).

Beyond the issue of the zone’s supply sources, the large projects in the South Zone fall within the wider framework of the integration of the Iberian peninsula and support for Europe’s energy transition, by substituting natural gas for fuel oil and coal, in addition to the REs.
Forthcoming development projects

TIGF and Spain

Increasing trading capacity (2013 and 2015)

Reinforcing trading capacities between France and Spain is a priority for the European Union and the South Gas Regional Initiative. The market consultations initiated in 2009 and 2010 have confirmed the need for further interconnection capacity between Spain and France in both directions. The new routes will go through:

- Port de Larrau for a capacity of 110 GWh/d to 165 GWh/d in the Spain to France direction and for a capacity of 100 GWh/d to 165 GWh/d in the France to Spain direction (2013);
- Briatou for a capacity of 5 GWh/d to 60 GWh/d in the Spain to France direction (2015).

The creation of a new compressor station at Chazelles (2013) falls under this scheme. It will be equipped with three 12.5 MW electric compressors, which will allow for increased trading with TIGF and use the full capacity of the Guyenne pipeline.

The investment was approved by CRE for a total of €99 million. It benefits from financing in the amount of €48 million from the European Union.

Reinforcing the North-South corridor

Projet Eridan: looping of the Rhône pipeline

The Eridan project will loop the Rhône pipeline with 220 km long pipework, linking up the interconnection stations of Saint-Martin-de-Crau and Saint-Avit (Drôme) in the vicinity of the Tersanne storage facility.

This facility was decided in 2011 and its commissioning is scheduled for 2016, with a view to reinforcing entry transmission capacity south of the South zone and to prepare for the merger of GRTgaz’s North and South zones.

The investment was approved by CRE for a total of €484 million. It benefits from financing in the amount of €74 million as part of the EEPR (European Energy Programme for Recovery).

The detail studies conducted for the appraisal of applications, once declared complete and eligible by the government on 18 December 2012, have evidenced more technical constraints than expected. This will most probably result in a delay in the commissioning (in 2017) and result in costs reaching the higher end of the estimation bracket as established during the feasibility study stage in 2010 (+30%).

Further development projects

The expansion of the South-North link may be complemented with the looping of the Burgundy pipeline between Etrez and Voisine (Yonne) as part of the merger of these zones. The looping of the pipeline between Saint-Avit and Etrez (Arc lyonnais) would be done within the framework of an increase in capacity south of the South zone to reach further levels than those generated by the Eridan works linked to the building up of LNG reception capacity at Fos and of storing capacity at Hauterives, Etrez and Manosque or by the Midcat project.
Development projects planned to meet requirements

Creating an interconnection point to the east of the Pyrenees (2020)

A new interconnection to the east of the Pyrenees called the Midcat project should be launched for completion by 2020. It would help integrate the Iberian Peninsula. This project is listed in the TYNDP and in the gas regional investment plans (GRIP) that are regional investment plans covering Portugal, Spain and France. However, other than the expansion of the South-North link as described below, this project may entail the following:

- increase compression pressure and adapting the interconnection at Saint-Martin de Crau (Bouches-du-Rhône);
- install a compressor station at Montpellier (Hérault) and expanding the stations located between Saint-Martin de Crau and Voisines.

Development projects related to LNG terminals

Three projects for the creation of new regasification capacity around the basin of Fos-sur-Mer by 2019 are under consideration.

Connecting a new LNG terminal at Fos-sur-Mer

Fos Faster LNG Terminal SAS is planning the construction of an LNG terminal with regasification capacity of 8 to 16 Gm³ per year, to be commissioned in 2019. The final investment decision should take place in 2015.

Connecting this terminal for a capacity of 8 Gm³ per year may require the following adjustments:

- a pipeline between the terminal and the Crau pipeline;
- the looping of the Arc Lyonnais pipeline between Saint Avit (Drôme) and Etrez (Ain) in addition to that of the Rhône pipeline once completed;
- the expansion of certain compressor stations in the Rhône valley, notably St Avit and Etrez;
- the looping of the Beauce pipeline between Saint-Arnoult-des-Bois and Cherré.

Supporting the development of the Fos Tonkin terminal

Elengy initiated a market consultation in 2011 in order to ascertain the potential for renovation and expansion of the Fos Tonkin terminal by 2020 so as to increase its capacity from 3 to 5.5 Gm³ per year. In parallel, GRTgaz launched the technical and economic studies necessary to evaluate the impact of this development on the network.

The consultation approved the extension of existing capacity until 2019, when a further increase in capacity of 80 GWh/d is planned. No investment will be necessary for the primary network other than for the consolidation work already approved (Eridan) and planned (Arc Lyonnais pipeline scheduled for 2019 as part of Fos Faster project).

Supporting the development of the Fos Cavaou terminal

Fosmax LNG is planning to extend the Fos Cavaou terminal up to 16.5 Gm³ by 2021. A public consultation is in progress. Insofar as the expansion work due for completion by 2020 takes place, the development of Fos Cavaou terminal’s capacity may lead to the following:

- the adaptation of the Saint-Martin-de-Crau interconnection;
- increase compression on the Saint-Martin-de-Crau–Voisines link.
Development projects related to storage facilities

**Supporting the development of the Manosque storage facilities (2016 and 2018)**

Géométhane will renovate the storage facilities at Manosque (Alpes-de-Haute Provence) and is planning on increasing its injection capacity in 2016 and its withdrawal capacity in 2018.

**Supporting the development of the Etrez storage facilities (2017 and 2021)**

Over the same period, Storengy has decided to continue developing its storage facility at Etrez by increasing its injection and withdrawal capacity.

In addition to the consolidation of the core network as detailed above, developing the withdrawal capacity of these two storage facilities may require:

- the adapting of the interconnection stations at Saint-Martin-de-Crau, Saint-Avit and Etrez;
- the strengthening of compression at Saint-Martin-de-Crau.

**Supplying natural gas to Corsica**

Connecting Corsica to the natural gas network would allow for the phasing out of fuel oil as the main resource used by both thermal power stations on the island. Two options can be considered by the public authorities:

- the Cyrénée project for the connection to the future GALSI offshore pipeline linking Algeria to Italy through Sardinia: the feasibility studies have sketched out a draft route. However, the construction of this gas pipeline was postponed for the third time on 30 May 2013.
- Corsica could be supplied from one or two LNG barges off the coast of Bastia and Ajaccio, or from one barge off the coast of Bastia connected to Ajaccio via a land pipeline between Porto-Vecchio and Bastia (400 mm in diameter, 200 km in length).

As this is a zone that has no interconnection point with the continental network, the public authorities would set the legal and regulatory framework, provided they gave the go-ahead for the conversion of Corsica’s power plants to natural gas. GRTgaz could then take up a position on the implementation of the project and its participation.

**Merging the North and South market zones**

**Consistent with the target model for the European gas market, the CRE intends to improve the organisation of the transmission market in France. It has asked GRTgaz and TIGF to create a single South PEG as of 1 April 2015 and has adopted an objective seeking to merge the North and South zones by 2018. This merger is based in particular on the looping of the Burgundy pipeline between Etrez and Voisine (the Val de Saône project).**

**Creation of a single South GRTgaz-TIGF marketplace**

The creation of a single GRTgaz South-TIGF PEG does not involve the physical development of the network. Its implementation has been approved and now requires the determination of the methods to create and operate this shared PEG.

**Merger of GRTgaz’s North and South market zones**

In 2012, GRTgaz studied an approach to combine investments and contractual mechanisms once the Arc de Dierrey and Eridan had been completed. The looping of the Burgundy pipeline between Voisines and Etrez (Val de Saône project) was identified as being the most effective to reduce bottlenecks and limit the use of contractual tools. Based on the assumptions adopted in the study entrusted to KEMA in 2011(25), the investment was

---

(25) www.grtgaz.com/fr/accueil/grands-projets/etude-fusion-nord-sud/
evaluated at close to €600 million, and the cost of contractual tools at less than €10 million per year. The CRE relied on this information when it made its decision to adopt the strategy on a future merger of the North and South zones in the future.

In accordance with its 19 July 2012 discussions, the CRE intends to conduct a cost-benefit analysis in the summer of 2013 that should confirm the soundness of this strategy.

Until this potential merger is completed, GRTgaz will continue to optimise to the greatest extent possible the use of existing infrastructures in cooperation with adjacent operators, and will adapt the link’s capacity access rules if required.

**Market coupling between the North and South PEGs: a liquidity instrument for the South PEG**

On the 1st July 2011, GRTgaz initiated a joint experimental market coupling service with Powernext between the North and South PEGs, a first in the gas industry in Europe. The principles of this service were developed with all market players, trade associations and the CRE, with a view to offering shippers a new way to access capacity on the North-South link through an indirect transmission service between the North and South PEGs (or vice versa) for the next day and on weekends.

Since 1st April 2013, the capacity made available by GRTgaz can reach up to 30 GWh/d from the North to the South. The offer, proposed by Powernext, is based on a PEG South/PEG North spread product launched in 2011. It is marketed in the form of an implicit auction, the price of which reflects the status of the market.

This service has increased the liquidity of the PEG South on the spot market, in particular in bottleneck situations. But the coupling does not create capacity, and when physical flows saturate the North-South link, which happens when emissions from the Fos terminals are low and the flows towards Spain are high, the price spreads between PEG North and South rise significantly.

**JTS service**

Since June 2013, GRTgaz has offered shippers a new service called “Joint Transport Storage Service”, which will make new capacity on the North-South link available on the market. Designed in close collaboration with Storengy, it consists in offering daily firm capacity on the North-South link of up to 15 GWh/d, sold by auction. This service is being marketed on an experimental basis until October 2013.
35. Infrastructures commissioned in the next three years

All infrastructures to be commissioned in the next three years (between 2013 and 2015) were approved and scheduled in the framework of GRTgaz’s financing plan. The Board of Directors in fact approved the global financial budget for the implementation of the three-year investment plan, which includes the infrastructures listed below:

<table>
<thead>
<tr>
<th>Infrastructures to adapt or build</th>
<th>Commissioning</th>
<th>Capacity demand spurring reinforcement</th>
<th>Decision status</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Adapt the Laneuvelotte interconnection point</td>
<td>2013</td>
<td>Increase the entry capacity from Germany at Obergailbach</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Create a compressor station at Chazelles</td>
<td>2013</td>
<td>Increase GRTgaz–TIGF interconnection capacity</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Partial looping of the Hauts de France pipeline (51km, DN 1,200)</td>
<td>2013</td>
<td>Increase entry capacity from Belgium to Taisnières H</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Adapt the Taisnières interconnection point</td>
<td>2013</td>
<td>Reinforce North-South corridor in western Europe</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Adapt compression at Cuvilly</td>
<td>2013</td>
<td>Connect Dunkirk terminal</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Adapt compression at Etretz (18MW, of which 9MW spare capacity)</td>
<td>2013</td>
<td>Create exit capacity to Belgium</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Clipon pipeline (19km, DN 900)</td>
<td>2015</td>
<td>Connect Dunkirk terminal</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Looping of the Hauts de France pipeline from Nedon to Cuvilly (123km, DN 1,200)</td>
<td>2015</td>
<td>Connect Dunkirk terminal</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Arc de Dieffy between Cuvilly and Dieffy (180km, DN 1,200)</td>
<td>2015</td>
<td>Connect Dunkirk terminal</td>
<td>Decision to proceed with the project</td>
</tr>
<tr>
<td>• Adapt the Pitgam, Cuvilly and Dieffy interconnections, and create the Ourcq interconnection.</td>
<td>2015</td>
<td>Connect Dunkirk terminal</td>
<td>Decision to proceed with the project</td>
</tr>
</tbody>
</table>

36. Infrastructures commissioned after 2015

Projects commissioned after 2015, which were the subject of a decision to proceed, are the completion of the Arc de Dieffy and the looping of the Rhône pipeline (Eridan).

• the decision to proceed with the other projects will be taken when:
  • market interest has been confirmed
  • the decision on the completion of the adjacent infrastructure has been taken, if applicable
  • financing is secured
  • the investment has been approved by the CRE.

To establish the schedule of works to be completed, GRTgaz has taken into account the information provided by the operators of adjacent infrastructures in terms of capacity to be developed and the commissioning dates sought. The infrastructures to be built or adapted, in particular for the core network, depend, however, on order of arrival and the scope of the requirements for an increase in entry or exit capacity in the relevant market zone. The facilities indicated below will be reviewed if the demand for capacity schedule were to be modified.
Given this uncertainty, only preliminary design studies have been conducted for the most distant deadlines. More in-depth analyses will complete the initial studies once requirements have been clarified, at which time a need to adapt other facilities may be identified.

<table>
<thead>
<tr>
<th>Infrastructures to adapt or build</th>
<th>Commissioning</th>
<th>Capacity demand spurring reinforcement</th>
<th>Decision status</th>
</tr>
</thead>
</table>
| • Arc de Dierrey between Dierrey and Voisines (120 km, DN 1,200)  
• Adapt the Voisines interconnection | 2016 | Reinforce fluidity in the North Zone further to the increase in capacity at Dunkirk and Taisnières | Decision to proceed with the project |
| • ERIDAN: looping of the Rhône pipeline, (220 km, DN 1,200) and changes to the Saint-Avit and Saint-Martin de Crau interconnections | 2016 - 2017 | Reinforce North-South corridor in western Europe | Decision to proceed with the project |
| • Adapt the Oltingue and Morelmaison interconnections | 2017 | Increase entry capacity from Switzerland | In progress |
| • Looping of the Burgundy pipeline | 2018 | Reinforce fluidity in the North Zone further to the increase in capacity at Dunkirk and Taisnières | In progress |
| • Adapt the compressor station at Auvers-le-Hamon  
• Looping of the Beauce pipeline | 2018 | Increase entry capacity from the Montoir terminal (+2.5 Gm³/year) | In progress |
| • Partial looping of the Burgundy pipeline, if applicable  
• Adapt the interconnections at Saint-Martin-de-Crau, Saint-Avit and Etrez  
• if applicable, reinforce compression at Saint-Martin-de-Crau | 2018 | Increase entry capacity from the storage facilities at Manosque and Etrez | In progress |
| • Linking pipeline between the terminal and Saint-Martin-de-Crau.  
• Arc Lyonnais pipeline  
• Adapt the interconnections at Etrez and Saint-Avit  
• If applicable, complete the looping of the Beauce pipeline  
• If applicable, adapt the compressor stations at St Avit and Etrez | 2019 | Connect a new LNG terminal at Fos | In progress |
| • Create a compressor station at Montpellier  
• Reinforce the compressor station at Saint Martin de Crau  
• Reinforce the Saint Martin de Crau - Voisines line in accordance with prior development projects (limited to compressor stations if the Arc Lyonnais and Burgundy pipelines have been completed) | 2020 | Increase interconnection capacity between France and Spain | In progress |
| • Reinforce all or part of the Morelmaison - Voisines pipeline  
• Adapt the interconnections at Morelmaison and Voisines  
• New compressor station at Cheppy  
• Depending on capacity developed, reinforce compression at Evry and Voisines | 2020 | Create exit capacity towards Germany | In progress |
| • Reinforce the Saint Martin de Crau - Voisines line in accordance with prior development projects (limited to compressor stations if the Arc Lyonnais and Burgundy pipelines have been completed) | 2020/2021 | Extend the terminal at Fos Cavaou. | In progress |
| • Looping of the Maine pipeline  
• Create a pipeline between Chémery and Dierrey  
• Enhancing compression at Dierrey | 2021 | Increase entry capacity from the Montoir terminal (+4 Gm³/year) | In progress |
| • Create a compressor station at Champney,  
• Reinforce compression at Dierrey and adapt the station at Morelmaison  
• Reinforce the north-east pipelines between Morelmaison and Laneuvelotte and the Beauce pipeline if not completed earlier | 2022 | Increase exit capacity to Switzerland | In progress |
37. Forecast capacity development for 2013-2022

The projects presented would lead to an increase in entry capacity of 17% in 2016 and 64% by 2022.
Exit capacity would increase by 60% in 2015 and would double by 2022.

<table>
<thead>
<tr>
<th>As on 1st of January in GWh/d</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>Beyond</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NORTH ZONE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Entry capacity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway - Dunkirk PIR</td>
<td>2,605</td>
<td>2,660</td>
<td>2,660</td>
<td>2,910</td>
<td></td>
</tr>
<tr>
<td>Belgium – Tainières H PIR</td>
<td>570</td>
<td>640</td>
<td>640</td>
<td>640</td>
<td></td>
</tr>
<tr>
<td>Belgium – Tainières L PIR</td>
<td>230</td>
<td>230</td>
<td>230</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Germany - Obergailbach PIR</td>
<td>620</td>
<td>620</td>
<td>620</td>
<td>620</td>
<td></td>
</tr>
<tr>
<td>LNG – Dunkirk PITM</td>
<td>370</td>
<td>370</td>
<td>370</td>
<td>370</td>
<td>425(2)-550</td>
</tr>
<tr>
<td>LNG – Montoir PITM</td>
<td>250</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Zone to North Zone</td>
<td>230</td>
<td>230</td>
<td>230</td>
<td>230</td>
<td>Merger</td>
</tr>
<tr>
<td><strong>Exit capacity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland/Italy – Oltingue PIR</td>
<td>223</td>
<td>223</td>
<td>223</td>
<td>223</td>
<td>260-320</td>
</tr>
<tr>
<td>Belgium – Veurne PIR</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>270</td>
<td>270</td>
</tr>
<tr>
<td>Germany - Obergailbach PIR</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td><strong>SOUTH ZONE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Entry capacity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNG – Fos PITM</td>
<td>720</td>
<td>895</td>
<td>895</td>
<td>895</td>
<td></td>
</tr>
<tr>
<td>TIGF/Spain-PIR towards the South Zone</td>
<td>410</td>
<td>410</td>
<td>410</td>
<td>410</td>
<td>780-1240</td>
</tr>
<tr>
<td>North Zone to South Zone</td>
<td>80</td>
<td>255</td>
<td>255</td>
<td>255</td>
<td>485</td>
</tr>
<tr>
<td><strong>Exit capacity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Zone-PIR towards TIGF/Spain</td>
<td>325</td>
<td>395</td>
<td>395</td>
<td>395</td>
<td>475</td>
</tr>
</tbody>
</table>

(1) With maximum technical capacity developed
(2) Study on the basis of 425 (+55 GWh/d)
(3) Excluding any core network capacity increase (+120 GWh/d with Eridan)
APPENDIX 1
Interconnections: utilisation and subscription rates

MIDI PIR/SPAIN

FROM TIGF

TO TIGF

TAISNIÈRES H AND L FROM BELGIUM

TAISNIÈRES H

TAISNIÈRES B

DUNKIRK FROM NORWAY

OBERGAILBACH FROM GERMANY

---

Subscriptions  Reserved for Short Term  Available  Technical Capacity
APPENDIX 2

Determination of the network’s commercial capacity

GRTgaz markets gas transmission in the form of:

• firm capacity whose utilisation is guaranteed by contract to the shipper under normal conditions of network use for the period of the subscription;

• interruptible capacity, the utilisation of which is not guaranteed.

If all the firm and interruptible capacity GRTgaz offers is used, the system becomes saturated. Any increase in the transmission capacity of GRTgaz’s network 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 can be determined by analysing scenarios likely to create network bottlenecks. The firm capacity adopted is the maximum capacity that does not produce bottlenecks under standard conditions of system use. The same approach is used to determine what works are required to increase 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 network’s infrastructures, the operating constraints and the distribution of gas flows within the network.

Technical characteristics of the infrastructures

The transmission network primarily consists of pipelines and compressor or interconnection stations. The technical characteristics of these infrastructures are already known for existing and approved facilities, or are provisional for new infrastructure projects.

• 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. As a result, the capacity of a transmission network is directly linked to the load losses generated in the pipes.

• the compressor stations raise the pressure of the natural gas in the pipes. The technical characteristics of the compressor stations are primarily their power, the maximum and minimum flows they can compress, and their compression rate limits (the ratio between downstream and upstream pressure).

• the characteristics of other network structures, such as the regulation valves that generate specific load losses, also affect capacity.
Operating constraints

The operating constraints result from the minimum pressure levels required at different points of the transmission system to enable transmission and delivery of the gas. They are determined to allow GRTgaz to meet the following obligations:

- its public service obligations in terms of supplying the distribution systems;
- its contractual obligations under the connection agreements signed with each of its industrial customers.

The heating value of natural gas

The physical capacity of a transmission system is expressed in volume flow rate (m³), whereas trading between shippers and/or consumers is conducted in terms of energy (Wh). In order to market capacity that is consistent with the requirements of its customers, GRTgaz makes assumptions about the calorific value of the gas entering the network based on the flows observed at each entry point.

Breakdown of flows inside the network

The gas flows on the network depend on the utilisation of capacity subscribed at entry and exit points, the level of consumption and the use of storage capacity.

Certain entry points are used in preference to others depending on the market situation and the arbitrage decisions made between the different supply sources. GRTgaz takes many supply scenarios into account with different weather conditions to evaluate gas flows and design its network accordingly.

Operating conditions

Capacity is determined under normal operating conditions, based on gas flow breakdown assumptions considered realistic and acceptable. Such assumptions are made using data on past flows and forecast trends. They cover a wide array of weather conditions, from harsh cold intervals (26) to the minimum consumption levels typically observed in August, as well as the utilisation of underground storage facilities according to temperatures and the demand for natural gas.

The validity framework for the firm capacity GRTgaz offers allows each shipper to fulfil its public service obligations (27), notably through underground storage withdrawals in winter and injections in summer.

Special situations

The examination of various potential supply strategies led GRTgaz to identify the boundaries of network operations in relation to temperatures and supply solutions for which minimum flows are required to guarantee optimal operations of the network. The major conditions relate to the minimum level of withdrawal from storage and the minimum entry flow at Fos, Dunkirk and Obergailbach.

---

(26) i.e. a period of extremely low temperatures during a maximum of three consecutive days, as occurs statistically once every 50 years: decree No. 2004-251 dated 19 March 2004 related to public service obligations in the gas sector.
For example, conditions at Obergailbach are presented below.

**The “Obergailbach minimum”**

Above a level of consumption corresponding to a cold temperature, the increase in gas flows from the network’s other entry points (with the exception of Fos), combined with maximum use of the North-South link, causes a system bottleneck in the west-east direction. In such a case, Obergailbach must be topped up to supply the eastern part of the network.
APPENDIX 3

Execution of major projects

GRTgaz is committed to building relations of trust with all local stakeholders so as to succeed with the integration of the transmission network over the territory by favouring the emergence of solutions that are shared and adapted to each case.

Determining the route with the least impact

Pipeline projects are subject to detailed studies in order to identify the best possible solutions. The impact study is conducted by a third party expert in consultation with local governing authorities, associations and interested parties to identify all potential impacts on the environment and define the best ways to limit and compensate these effects.

An active coordination policy

All stakeholders are informed in the upstream notification phase during public meetings and exchanges. This dialogue has taken on a new dimension with the public debates organised by the National Commission for Public Debate concerning the Arc de Dierrey, Eridan and Cyrénée projects. The debates allow GRTgaz’s teams in charge of the projects to hear other perspectives, which contribute to useful adjustments being made to the projects. At the end of these discussions and once the studies have been completed, the adopted project route is the subject of a public inquiry aiming at further adjusting the project to the specifics of the territory it runs through. GRTgaz endeavours to satisfy to the greatest extent possible expectations expressed and to provide guarantees in terms of the ecological, agricultural and socio-economic impact on territories it runs through. A Charter sets out the company’s territorial commitments as part of a proactive approach specific to each project.

Ensuring safety

The regulatory obligations related to safety and the environment account for a significant portion of the investments GRTgaz makes as it applies rigorous management to ensure industrial safety and that of the transmission network.

Each project is the subject of a safety study, leading to enhanced protection measures if necessary, e.g. thicker pipes, protective slabs and specific monitoring procedures. The pipes are in steel and the melting is tested by radiography or ultrasound. An insulating coating and cathodic protection system protect pipes from corrosion.

On the building sites, a Safety Passport is dispatched to all participating contractors. Safety Trophies are also awarded in partnership with the “construction and public works organisation for prevention” (OPPBTP) in recognition of high performance.
Identifying and enhancing archaeological heritage

GRTgaz has entered into a partnership with the national institute for preventive archaeological research (Inrap) for two purposes: to prepare archaeological interventions upstream of construction site work to allow enough time for research without delaying the major projects and to favour potential archaeological findings.

Protecting agriculture

Ninety per cent of the pipeline routes are located in rural areas. GRTgaz has signed a national protocol with FNSEA (Federation of Farmers’ Trade Unions) and agricultural associations, detailing its commitments and its subsidy and compensation scheme.

The objective is to minimise the impact of the works on farmland, preserve the quality of the soil and guarantee the restoration of the land used: pre-sorted soil layers are put back in place; ditches and slopes are re-graded; fences and drainage are restored.

Respecting the environment and favouring biodiversity

Promoting biodiversity is a major component of GRTgaz’s sustainable development policy. Ecologists are involved in the early stages of routing to establish inventories, then throughout the projects and restoration works.

As a Founding Member of the Club infrastructures linéaires et biodiversité (“linear infrastructures and biodiversity club”), GRTgaz partners with the Fédération des parcs naturels régionaux, the National Museum of Natural History and Natureparif to ensure best practices are implemented when laying pipes and for the maintenance of easement perimeters. The ecological management of sensitive and forest areas allows rare species to thrive.

GRTgaz is also dedicated to the promotion of our natural heritage. It has joined the biodiversity funds (FDB) to support the completion of a biodiversity atlas. It contributes to the creation, planning and maintenance of hiking paths in the framework of a partnership with the French federation of hikers.

Integrating above-ground facilities

Above-ground facilities are integrated into their environment as best as possible. The technical choices that release the least CO₂ emissions are favoured.

GRTgaz replaces old compressors in its stations with high efficiency electro-compressors or turbocompressors. This programme has allowed for a ten-fold reduction in nitrogen dioxide NOX) emissions since 1999, while carbon dioxide (CO₂) emissions dropped by 4 % between 2005 and 2011.

Optimising the economic impact

The impact of projects on the regional economy and job market is significant for many sectors: materials, clearing, earth-moving, civil engineering, transport, construction, landscaping, hotels, restaurants and convenience stores, etc.

GRTgaz works with the Chambers of Commerce and Industry and the French job centres to foster collaboration with local businesses and jobseekers with regard to its building sites.
The Pavillon Vert® approach: an illustration of GRTgaz’s commitment towards its sensitive sites

The Pavillon Vert® approach illustrates GRTgaz’s commitment to operate according to sustainable development principles in managing its sensitive sites:

- safety on the site and in the immediate perimeter, actions promoting employment and local economic impact, high-quality communications and relationships with partners and residents;
- economical use of water and energy, anti-pollution measures, limitations on site machine traffic;
- compliance with the project’s timeline, optimised guarantees so as to limit the impact on gas consumers, customer satisfaction.

Installed on the building site, the green flag (Pavillon Vert®) is raised or lowered on the flagpole according to the results of internal and external audits performed by specialised firms at the beginning, middle and end of the work on the site.
Glossary

**Backhaul capacity:** capacity on the principal network that allows the shipper to make nominations in the direction opposite the dominant direction of the flows when the gas flows can only move in one direction.

**Balancing zone:** a set that includes entry points, delivery points and a title transfer point within which the shipper must provide a balance. There are two balancing zones: the North and the South balancing zones. The North balancing zone is the subject of a separation between the H-gas and L-gas balancing sections.

**Connection:** transmission infrastructure that creates a link between the transmission network and one or more delivery stations, and exclusively or mainly intended to supply a customer or a distribution network. The connection is part of the network.

**Connection contract:** contract between GRTgaz and a customer that defines the conditions for the completion, operations and maintenance of connection infrastructures and delivery conditions.

**Connection infrastructures:** connections and delivery stations that constitute the connection of a consumption site or a distribution network to the transmission network.

**Consumer delivery point:** delivery point for a consumer connected to the transmission network. A Consumer Delivery Point is associated with a single exit zone.

**Conversion capacity:** maximum quantity of energy, expressed in MWh (HCV) per day, that GRTgaz undertakes to deliver in the form of L-gas or H-gas and simultaneously take off in the form of H-gas or L-gas.

**Cumulative imbalance:** it is equal to the sum of the shipper’s daily residual imbalances after taking into account purchases and sales of quantities in excess of the daily imbalance tolerance and in excess of the cumulative imbalance mid-range.

**Customer:** end consumer of natural gas.

**Daily capacity:** maximum quantity of energy that GRTgaz undertakes to take off, transmit or deliver every day.

**Daily imbalance:** it is equal to the difference between the sum of the shipper’s entry and exit quantities each day for each balancing zone and for each gas type in the North zone.

**Delivery conditions:** GRTgaz’s obligations related to the physical specifications of the natural gas it delivers (pressure, temperature, etc.).

**Delivery point:** point at which GRTGaz delivers to a receiving party all or part of the gas under a transmission contract. A delivery point is associated with a single balancing zone.

**Delivery station:** facility located at the downstream extremity of a transmission network and that manages the release, pressure adjustment and readings for gas delivered to a consumer or a distribution network.

**Distribution capacity:** maximum quantity of energy, expressed in MWh (HCV) per day, that GRTgaz undertakes to deliver at a consumer delivery point, a transport distribution interface point or a regional network interconnection point.

**Distribution network:** medium to low-pressure pipelines that transmit gas to consumers who are not directly connected to the principal network or a regional network.

**Entry capacity:** maximum quantity of energy, expressed in MWh (HCV) per day, that GRTgaz undertakes to take off each day at a given entry point.

**Entry point:** point at which the shipper makes available all or part of the gas under a transmission contract available to GRTgaz. An entry point is attached to a single balancing zone.

**Exit capacity:** maximum quantity of energy, expressed in MWh (HCV) per day, that GRTgaz undertakes to deliver every day to all delivery points attached to a given exit zone, at a given network interconnection point or at a given transmission storage interface point.

**Exit zone:** series of consumer delivery points, interconnection points on the regional network and transport distribution interface points on which is defined an exit capacity from the principal network. An exit zone is associated with a single balancing zone.
**Firm capacity:** capacity for which the transmission system operator can guarantee utilisation at any time throughout the subscription period under normal operating conditions.

**H-gas:** natural gas with high calorific value.

**H-gas balancing section:** subsection in the North balancing zone in which the shipper must ensure a balance of gas that complies with the specifications of H-gas.

**Hourly delivery capacity:** maximum quantity of energy, expressed in MWh (HCV) per day, that the operator undertakes to deliver each hour at a consumer delivery point.

**Interruptible capacity:** capacity for which the transmission system operator can guarantee utilisation at any time throughout the subscription period under normal operating conditions.

**L-gas:** natural gas with low calorific value.

**L-gas balancing section:** subsection in the North balancing zone in which the shipper must ensure a balance of gas that complies with the specifications of L-gas.

**Link capacity:** oriented duo of balancing zones for which a link capacity is defined.

**Link capacity:** maximum quantity of energy, expressed in MWh/d (HCV) per day, that GRTgaz undertakes to transmit every day on a link between two balancing zones.

**LNG terminal:** facility used for the receipt, storage and regasification of liquefied natural gas (LNG), as well as its emission to the principal regasified LNG network.

**Network interconnection point (PIR):** a physical or notional interconnection point for the transmission networks of two operators.

**Principal network:** large-size high-pressure transmission facilities that connect interconnection points to neighbouring transmission networks, storage and LNG terminals, and with which regional networks and certain industrial consumers and the distribution networks are associated.

**Regional network:** high-pressure transmission facilities for the transmission of gas from the principal network to consumers or the distribution networks that are not connected directly to the principal network.

**Regional network interconnection point (PIRR):** a physical or notional interconnection point on GRTgaz's regional network with the transmission network of the adjacent operator.

**Regional transmission capacity:** maximum quantity of energy, expressed in MWh (HCV) per day, that GRTgaz undertakes to transmit on the regional network to a consumer delivery point, a transport distribution interface point or a regional network interconnection point, as applicable.

**Releasable capacity:** firm capacity that the shipper undertakes to release to GRTgaz at any time at its request.

**Shipper:** party that enters into a transmission contract with GRTgaz. Depending on the situation, the shipper is the eligible customer, the supplier or their agent, as defined in Article 2 of the Law dated 3 January 2003.

**Storage site:** facility used for the storage of natural gas, in particular in the summer when consumption is low, and its release in the winter when consumption is higher.

**Title transfer point (PEG):** virtual point attached to a balancing zone where a shipper may transfer gas to another shipper.

**Transmission contract:** contract between GRTgaz and a shipper that defines the conditions pursuant to which GRTgaz undertakes to take off quantities of gas made available to it by the shipper at one or more entry points or title transfer points and to deliver quantities of gas with the same energy content at one or more delivery points or title transfer points.

**Transmission Distribution Interface Point (PITD):** a physical or notional interface point between the transmission network and a distribution network.

**Transmission network:** high-pressure transmission facilities for the transmission of gas to industrial consumers directly connected and distribution networks; the transmission network is composed of the principal network and regional networks.

**Transmission storage interface point (PITS):** a physical or notional interface point between the transmission network and a storage entity.
### Conversion of Gas Units

<table>
<thead>
<tr>
<th></th>
<th>1 Kwh</th>
<th>1 GJ</th>
<th>1 Therm</th>
<th>1 MBTU</th>
<th>1 m³ of natural gas</th>
<th>1 boe</th>
<th>1 toe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Kwh</strong></td>
<td>1</td>
<td>0.0036</td>
<td>0.0341</td>
<td>0.0034</td>
<td>0.0949</td>
<td>0.00059</td>
<td>0.000086</td>
</tr>
<tr>
<td><strong>1 GJ</strong></td>
<td>277.8</td>
<td>1</td>
<td>9.48</td>
<td>0.948</td>
<td>26.35</td>
<td>0.1634</td>
<td>0.0239</td>
</tr>
<tr>
<td><strong>1 Therm</strong></td>
<td>29.3</td>
<td>0.10551</td>
<td>1</td>
<td>0.1</td>
<td>2.78</td>
<td>0.0172</td>
<td>0.0025</td>
</tr>
<tr>
<td><strong>1 MBTU</strong></td>
<td>293.1</td>
<td>1.06</td>
<td>10</td>
<td>1</td>
<td>27.81</td>
<td>0.1724</td>
<td>0.0252</td>
</tr>
<tr>
<td><strong>1 m³ of natural gas</strong></td>
<td>10.54</td>
<td>0.038</td>
<td>0.36</td>
<td>0.036</td>
<td>1</td>
<td>0.0062</td>
<td>0.0009</td>
</tr>
<tr>
<td><strong>1 barrel of oil equivalent (boe)</strong></td>
<td>1,700</td>
<td>6.12</td>
<td>58.01</td>
<td>5.8</td>
<td>161.29</td>
<td>1</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>1 tonne of oil equivalent (toe)</strong></td>
<td>11,630</td>
<td>41.87</td>
<td>397</td>
<td>39.7</td>
<td>1,103</td>
<td>6.8</td>
<td>1</td>
</tr>
</tbody>
</table>

### Liens Utiles

- [www.grtgaz.com](http://www.grtgaz.com)
- [www.gasinfofocus.com](http://www.gasinfofocus.com)
- [www.cre.fr](http://www.cre.fr)
- [www.entsog.eu](http://www.entsog.eu)
- [www.acer.europa.eu](http://www.acer.europa.eu)
- [www.gie.eu.com](http://www.gie.eu.com)
- [www.aie.org](http://www.aie.org)
- [www.ec.europa.eu](http://www.ec.europa.eu)
- [www.eurogas.org](http://www.eurogas.org)
- [www.developpement-durable.gouv.fr](http://www.developpement-durable.gouv.fr)
GRTgaz operates France’s high-pressure natural gas transmission network, which covers most of the country. With more than 32,000 km of pipelines and 25 compressor stations, GRTgaz’s network is the longest in Europe and one of the most interconnected. In 2012 GRTgaz invested €666 million to ensure the transmission of natural gas in the best possible conditions of safety and fluidity, as well as to reinforce the security of supply in France and in Europe, whilst providing access to diversified sources of supply. GRTgaz employs over 3,000 men and women, all committed to building tomorrow’s gas transmission system.