Galsi Project Factsheet

The Galsi Project

The Galsi (acronym of “Gasdotto Algeria - Sardegna Italia” Algeria Sardinia Italy Gas Pipeline) is a new gas pipeline to import natural gas from Algeria to Italy, crossing Sardinia and ending in Piombino (Tuscany).

The Galsi Company

Galsi Spa is the company established in 2003 to develop the project, build and manage this new energy infrastructure. Galsi Spa shareholders are major international and domestic companies active in the energy market:

- **Sonatrach**, the Algerian government-owned company for the exploration, extraction, transport, transformation and marketing of hydrocarbon resources, which has a stake of 41.6% of all shares;
- **Edison**, the second Italian company for the supply, production and sale of electricity and gas (20.8%);
- **Enel**, the largest Italian electric company (15.6%);
- the **Hera Group**, the third Italian multiutility company in the gas business (10.4%).
Among Galsi shareholders, a primary role is played by the Autonomous Regional Administration of Sardinia, which owns 11.6% of the company through SFIRS, its investment finance company.

Snam Rete Gas also collaborates in the project. It has signed an agreement with Galsi under which terms during the development stage, Galsi will manage the design and authorization stage for the whole project.

With respect to the construction stage:
- Snam Rete Gas shall build (material procurement, selection of suppliers for each construction stage, construction, restoration works, etc.) and shall manage the segment of domestic network of the pipeline from the landing area in Sardinia through to Piombino.
- Galsi shall build and manage the international part, from Algeria to the landing in Sardinia.

**Strategic benefits**

The GALSI has already been included by the European Union in the list of priority projects for the development of the Trans-European Energy Network and – more recently – in the European Recovery Plan (with an allocation of funds of up to €120m for the project). It is a strategically significant project for the energy future – and for the industrial future in general – of Italy. The objective of this infrastructure is to make Italy no longer just a gas importer, rather an “energy hub” between the Mediterranean and Europe.

The strategic value of the Galsi project was also confirmed by an Intergovernmental Agreement signed in Alghero on 14 November 2007 by the Prime Ministers of Italy and Algeria. By means of this formal document, the two governments have confirmed their commitment to support the activity of the companies involved in the construction of this important infrastructure in order to speed up its construction times.

We can summarize below the main strategic aspects of the new infrastructure:

- The GALSI will improve the safety of energy supply ensuring the transportation of a further 8 billion cubic meters of Algerian natural gas towards the Italian and European markets;
- It will meet the growing demand of natural gas in the European Union;
- It will establish an alternative route to the routes from Eastern Europe at competitive costs, reaching the centre of Italian demand;
- It will take methane to the whole of Sardinia with consequent environmental and economic benefits for households and companies.
- It will assign Italy, and particularly Sardinia, a main role in future European scenarios of energy policy;
It will contribute to the achievement of the Kyoto Protocol objectives for the protection of the environment, by making a clean energy source available.

Environmental and economic benefits for Sardinia

The construction of the Galsi gas pipeline and the consequent taking of methane to Sardinia will be a great opportunity for environment protection and for the whole economic system of the island.

**Methanization of Sardinia.** The arrival of Galsi in Sardinia, requested by the Regional authority, will be the last and only great chance for the island to achieve the objective of methanization, an aim pursued over the years by means of various unsuccessful projects. For this reason, the project has been strongly and unreservedly supported by the Sardinia Regional authority which, at the same time as the Galsi, is working on a plan for the island’s methanization to distribute gas arriving as of 2014 to all Sardinian citizens and companies. A first stage of this plan already began in 2000, with the construction of gas distribution networks in all user areas for which the Regional authority has allocated over the years the necessary resources to cover all costs, for an overall amount of € 474 million. 31 basins out of a total of 33 have received the funds and are already working, in some cases building sites have already been opened. In the second stage, resulting from the first one, connection networks will be built from the Galsi gas pipeline to the basin networks. This stage has not been started yet because the Regional authority has logically chosen to first finish the networks within the basins in order to provide Sardinian citizens with a service and a useful investment regardless of the construction of the Galsi pipeline. The construction of the connection networks to the Galsi, is instead subject to the construction of the pipeline. Now this is certain and the Regional authority, as Regional Minister La Spisa maintained at the Cagliari Conference in November 2009, undertakes to start working immediately, also through the support of Sfirs, to conclude also the second stage of the plan by 2014 and finally take methane to all Sardinian households and companies.

**Benefits for the environment.** When burning, natural gas generates fewer pollutants. Its use as an alternative to oil or coal, the most polluting fossil fuels and currently the most widely used in Sardinia, will help reduce the level of polluting emissions in the air and contribute to the improvement of air and environmental quality. According to an AIEE survey on the arrival of natural gas in the Sardinian economy, the use of methane in the electricity industry, for industrial and civil thermal uses and transportation, is estimated to bring down current CO2 emissions by 14% in Sardinia, thus helping get near to the 20% target defined by the Kyoto protocol.

**Energy cost reduction.** In Sardinia, the cost of energy, also due to the lack of natural gas, is higher with respect to the average of the other Italian regions. The availability of a natural gas distribution network for domestic and manufacturing use, replacing current, more expensive systems (LPG networks, propane air, diesel, electric water boilers, etc.) shall mean a reduction in the energy bill, with savings of 30-40% for Sardinian households and companies. AIEE estimated that the average annual cost for a Sardinian household in energy bills is around €600, so they can therefore save € 270 a year by replacing, for instance, propane air and electric water boilers for domestic use with natural gas. For a school with 500 children or a hospital with
100 beds, replacing a traditional diesel or fuel oil boiler with a methane condensing boiler will generate annual savings of €17,000 and €35,000, respectively.

**Development of Sardinian industry and business community.** Savings in energy costs will give a significant positive stimulus to Sardinian economy. The currently high energy consuming Sardinian companies will be helped, since they will use more efficient and less expensive energy, with respect to other fossil sources currently available (oil and coal). As was the case of Southern Italy with methanization, the setting up of new industrial operations will be fostered, linked to the presence and greater availability of energy, such as in the ceramics, paper, wood industries, food and agriculture industries and the building material industry. According to AIEE estimates, with the arrival of methane an economic benefit for the industrial sector of approximately €200 million per year can be estimated, with an additional €150 million when considering the use of methane also for electric generation.

### Savings on energy costs for Sardinia with the use of methane

<table>
<thead>
<tr>
<th></th>
<th>Average annual saving</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOMESTIC</strong></td>
<td></td>
</tr>
<tr>
<td>Sardinian household</td>
<td>€ 270</td>
</tr>
<tr>
<td><strong>SERVICES</strong></td>
<td></td>
</tr>
<tr>
<td>School with 500 children</td>
<td>€ 17,000</td>
</tr>
<tr>
<td>Hospital with 100 beds</td>
<td>€ 35,000</td>
</tr>
<tr>
<td><strong>INDUSTRIAL SECTOR</strong></td>
<td></td>
</tr>
<tr>
<td>Industries</td>
<td>€ 200,000</td>
</tr>
<tr>
<td>Thermo-electric industries</td>
<td>€ 150,000</td>
</tr>
</tbody>
</table>

**Jobs increase.** According to our forecasts, jobs will increase during the gas pipeline construction stage with respect to contracts and subcontracts within the framework of engineering works and transport (excavations and building site preparation, walls, material transportation, etc.) which alone represent around 30% of an overall investment of €700 million just for the construction of the pipeline (with the exclusion of the Olbia compressor station). According to Snam Rete Gas figures, it is estimated that, during the stage of the building site for the construction of the pipeline, at first 500 and then up to 2000 workers might be hired for a period of 18 months. Of them, around 50% will be skilled workers and labourers.

At the same time, significant and lasting benefits on employment are already emerging from the concomitant construction of local (secondary and urban) gas distribution networks for which AIEE estimates 3,500 people working on the whole in the construction. Further support to employment will be given in a third stage by new industrial and commercial operations that the arrival of gas will promote in the industrial and economic situation of Sardinia. It has been calculated that just the companies dealing with the maintenance of networks and domestic
systems alone will hire no less than **2000 new workers**. Overall, there will be **10,000 new local jobs**.

**Table local job increase in Sardinia with the arrival of methane**

<table>
<thead>
<tr>
<th></th>
<th>Seasonal jobs</th>
<th>Permanent jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction stage</td>
<td>no. 2,000</td>
<td>no. 1,500</td>
</tr>
<tr>
<td>Operation stage</td>
<td>no. 1,000</td>
<td>no. 500</td>
</tr>
<tr>
<td>Total</td>
<td>no. 6,000</td>
<td>no. 4,000</td>
</tr>
</tbody>
</table>

**The route**

The route amounts to a total of **837 kilometres**: **285 kilometres** in the Algeria-Sardinia international stretch, with a 26 inch (**66 cm** diameter) pipe laid in the sea at a maximum **depth** of **2824 metres**; **272 kilometres** across land in Sardinia from Porto Botte to Olbia, with a 48 inch (**120 cm** diameter) pipe; **280 kilometres**, finally, in the stretch in the Tirrenian sea between Olbia and Piombino, with a 32 inch (**81 cm** diameter) pipe at a maximum sea depth of **878 metres**.

Starting from the south, the pipeline will pass through the following Sardinian municipalities: San Giovanni Suergiu, Carbonia, Iglesias, Villamassargia, Domusnovas, Musei, Siligua, Vallermossa, Villasor, Serramanna, Villacidro, San Gavino Monreale, Sardara, Pabillonis, Mogoro, Uras, Marrubiu, Santa Giusta, Palmas Arborea, Oristano, Simaxis, Ollastra Simaxis, Zerfaliu, Villanova Truschodu, Paulilatino, Abbasanta, Norbello, Borore, Macomer, Sindia, Bonorva, Torralba, Mores, Ozieri, Oschiri, Berchidda, Monti, Loiri and Olbia: cities from all Sardinian provinces, with the exception of Ogliastra. The journey of Galsi will end in Tuscany, in the last town affected at Piombino (Livorno), where the pipeline will plug into the gas domestic network.

All the Italian stretch of the pipeline has already been included in the **National Gas Pipeline Network** by a decree of the Ministry for Economic Development dated **1st August 2008**.

According to the construction schedule, **authorization procedures will be completed by 2010, construction will start in 2011** and works will be completed in two years. **Commissioning** is forecast for **2014**.

**Criteria for choosing the route**

The criteria for choosing the Galsi route, defined after **various years of analysis** (since 2003) have considered many aspects, such as:
• Crossing Sardinia from the south to the north to make the methanization of the region possible. The decision was taken by the Sardinian regional authority that strongly wanted the project, so much that it is also a shareholder in it.
• Define the route based on the possibility to restore the areas crossed bringing them back to their original conditions, minimizing environmental impact;
• avoid any interference with Natura 2000 ecological network;
• avoid any interference with the most prominent archaeological areas;
• pass through agricultural land as much as possible, carefully assessing local urban development plans and avoiding areas subject to specific constraints as well as areas for future construction projects;
• avoid areas subject to landslides or hydro geological instability;
• avoid, where possible, buffer areas around wells and wells used for drinking water;
• limit the number of river, road and railway crossings;
• affect wood areas and/or precious cultivations as little as possible;
• use, as much as possible, corridors of passage already set up by other existing infrastructures (canals, roads, etc.);
• ensure accessibility of safety systems;

The final route, presented in December 2009, also considered observations and requests to change the route received (sent by administrations and offices concerned), most of which have been accepted by Galsi.

The gas pipeline

In the open sea, the gas pipeline will be simply laid on the floor, by using pipe laying ships, without any need of excavations or trenches.

In coastal areas, starting from 40m of depth (approx. 400 metres from the shore) the pipe will be buried with variable 1-3 meters cover to avoid any interference with human activities (e.g. fishing and navigation)

Inland, the gas pipeline will be completely buried at a depth of approx. 1.5 metres and shall require a buffer area of approx. 40 metres (20 metres on each side of the pipe) which can be normally used for agricultural purposes, but on which no buildings can be constructed.

For the ground laying, a trench of 3 metres in depth and 2.5 metres in width, that will be filled with rubble. The environmental recovery of the area will then be performed, restoring its original conditions.
During operation, the pipe will not be visible and will have no environmental impact. Building site works will take a limited amount of time since construction sites will work on various segments in parallel and, on average, 500 metres of pipes will be laid every day. As to the most delicate areas (wetlands, meadows of posidonia sea grass etc.) highly advanced laying procedures will be utilized to minimize impact at the construction stage.

Connection points

Along the land route of Galsi in Sardinia, 38 connection points are planned, to which ancillary pipes will be linked to take gas to all the areas. Each connection point is provided with a small supporting building, the size of a 16 square metres hut (5.5 metres x 3 metres, h. 3 metres) surrounded by approximately 300 square metres of grass.
Metering and gas reduction stations

The metering and gas reduction stations in Porto Botte and Piombino precisely measure gas flow rate and adjust its pressure before it enters the transport network. The buildings that house the instrument have the size of three 200 sq m houses, in plan, with a maximum height of 5 metres) surrounded by 4 hectares of meadows.

The compressor station

The compressor station, to be built in Olbia and necessary for giving gas enough pressure to reach the coast of Tuscany, will comprise two compressor units (400 square metres each and a height of 15 metres, equal to a small 5 storey building) with installed mechanical power of 26 MW each. Just one unit will operate, while the other will be used as reserve. The remaining buildings will be used for offices, control room and workshop. The surrounding area (17 hectares) will remain green, with service road to connect the various buildings.
Compressor units are provided with sound insulation system to keep compressor noise inside. The result will be an increase of just two decibels in background noise, from 38 to 41 decibels, an increase that cannot be perceived outside the station area.

As to the impact on air quality, this is limited to the very low fallout of nitrogen oxide (annual average of approx. 3 micrograms) and well below legal thresholds (annual average of 40 micrograms per cubic metre) and they remain limited in space to the areas around the Station (up to 1 km distance). In addition, the actual impact of the station on the air quality in Olbia will be constantly monitored by means of the installation of new environmental monitoring stations, whose data can be shared also with the Town Administration. The location of the measuring instruments will be agreed with the competent authorities, among which ARPAS (Environmental Regional Agency Sardinia).

The following stations, built by Snam Rete Gas, - Masera (Verbania), Malborghetto (Udine), Istrana (Treviso), Poggio Renatico (Ferrara), Enna (Enna), Faro Superiore (Messina), Tarsia (Cosenza), Montesano sulla Marcellana (Salerno), Melizzano (Benevanto), Gallese (Viterbo); Terranuova Bracciolini (Arezzo)- have been present in Italy for around 40 years without ever causing problems or nuisance to the population.
Olbia compressor station layout
Compressor unit: 31 x 14 metres h. 15 metres

Minimum environmental impact

Of particular concern to Galsi has been to reduce the environmental and landscape impact of the gas pipeline to a minimum.

Since 2004 Galsi has collaborated with research institutes, companies and qualified professionals in the fields of engineering, geology and the environment to assess the environmental impact of this infrastructure in order to optimize technical decisions, minimize interferences, find the best environmental mitigation and restoration measures. Part of the studies carried out are included in the Environmental Impact Study (SIA – EIS) that Galsi has already presented to the competent Italian government authorities to vouch for the compliance of the whole project with environmental protection constraints. The Ministry for the Environment and the Protection of Land and Sea together with the Ministry of Cultural Heritage and Activities by means of a procedure called “Environmental Impact Assessment” ensure the compliance of the project with existing regulations with respect to the environment, as well as the environmental compatibility of the project.

According to the outcomes of the EIS, the impacts of the Galsi project on each of the environments examined (air, water and sea environment, soil and subsoil, vegetation, landscape, human ecosystems) will be minimal, will only regard the building site stage will be nearly totally reversible, therefore limited to a period of time and localized to the areas affected by the construction.

During its operation, the pipeline will have no interactions with the surrounding environment – it will be buried and therefore not visible – and it will not generate any impact in the area. There will be no constraints or limitations for the operations along the route of the pipe in the
sea, while inland the only existing constraint is represented by an unbuildable right of way of 20 m on each side of the pipe’s route, although agricultural and sheep farming activities can continue.

In the open sea the pipe will be laid on the sea bed without any need to make excavations, avoiding interactions with the sea environment. To lay the pipe inland and in the sea near the coast, thanks to the inspections performed and the information gathered on the environmental features of the area to be crossed, Galsi has defined the most appropriate techniques for the excavation and pipe laying, making use of the most advanced technologies able to minimize impacts on the environment, such as “trenchless” technologies, where no trenches are required to be dug (for example, an underground microtunnel is bored, through which the pipe is pulled).

Once construction and burying works have been completed, natural habitats will be restored to their original condition.

Work procedures to lay the pipe in the landing areas where Posidonia is present (a type of seaweed native to the Mediterranean Sea), will be defined with the adoption of significant mitigation actions of environmental impacts, which will include the adoption of a narrow working track by using special laying machines; works will be performed during clement weather and sea conditions to reduce the transportation of deposits and there will be Posidonia reimplantation projects.

As to compressor stations, the only existing impacts regard emissions and noise which will be – as pointed out above – limited and localized to the areas near the station and at any rate at much lower levels than the thresholds allowed by law. To contain to a minimum the emissions generated by the gas turbines utilized in the compressor stations, the best available technologies will be utilized i.e. high performance units with low emission burning systems. As to noise, the turbocharger is inside a sound insulated structure and the turbine that activates it is equipped with a silencer. This reduces noise to very low values within the borders of the station area. As to the visible effects, environmental mitigation and inclusion measures have been studied to hide the station in the natural landscape.

With respect to the Porto Botte and Piombino metering stations, these systems will simply be utilized to precisely measure the quantity of incoming gas and to reduce its pressure. They will cover a small area and will have no impact on the environment since they will not generate noise or harmful emissions into the atmosphere.

During 2008, to acquire further detailed information on the features of some more sensitive areas in environmental terms, Galsi started a series of additional surveys partly also required by the Technical Commission for Environmental Impact Assessment of the Ministry, which in June 2009 made an inspection with Galsi managers along the whole route of the pipeline. The documents will be sent to the Ministry for the Environment by December 2009. (annex 1)
Safety

As evidence of the safety of these infrastructures, it is worth recalling that, in Italy, there is a network of more than 30,000 km of gas pipelines that run under our feet without us noticing and various gas compressor stations located not far from urban settlements.

To ensure maximum safety, the pipe underground is covered with insulating material (polyethylene) and buried at a depth of one and a half metres. In the sea, near the coast, the pipe is protected and covered by polypropylene and reinforced concrete and is buried at variable depths with 1-3 metres cover to ensure further protection.

Compressor stations are provided with detection and alarm systems which record any possible system malfunctioning which may represent a near risk. In such circumstances, the security system automatically stops the gas flow thus preventing the risk from occurring.

To ensure maximum gas pipeline safety, its operation will be continuously monitored by means of a control and automatic intervention system called SCADA (Supervisory Control and Data Acquisition). This system keeps under control the operating data of the gas pipeline (e.g. flow rate, pressure, temperature, gas compression) and finds any deviations from the standards and automatically intervenes and makes the system safe. As is usually the case for all the existing network, the gas pipeline and the systems will also be controlled by means of periodical inspections which ensure effective maintenance and safe operation, in line with maximum safety standards.