

# ENVIRONMENTAL IMPACT ASSESSMENT

## NON-TECHNICAL SUMMARY

### SINES REFINERY COGENERATION PLANT



*These reports are an English translation of the original ones, filed at the competent authority and available in Galp Energia's site.*

*The Portuguese official version should also be read in order to confirm and evidence these data*

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December 2004

## 1. What is a non-technical summary?

This non-technical summary is an independent section of the Environmental Impact Assessment for the Sines refinery cogeneration plant. As its name indicates, it is intended to be a document for general distribution, written in a language accessible to all. For this reason, if you wish to obtain more in-depth information about the effects that the project will have on the environment, you should consult the environmental impact assessment, which is available at Sines Municipal Council and the Environment Institute in Lisbon.

## 2. What is the Sines Refinery Cogeneration Plant?

The double purpose of the cogeneration plant to be installed at Galp Energia Sines refinery is to produce steam to supply the refinery and to generate electricity by burning natural gas. The electricity generated (apart from the electricity consumed in the course of operating the cogeneration plant) will be supplied to the national network.

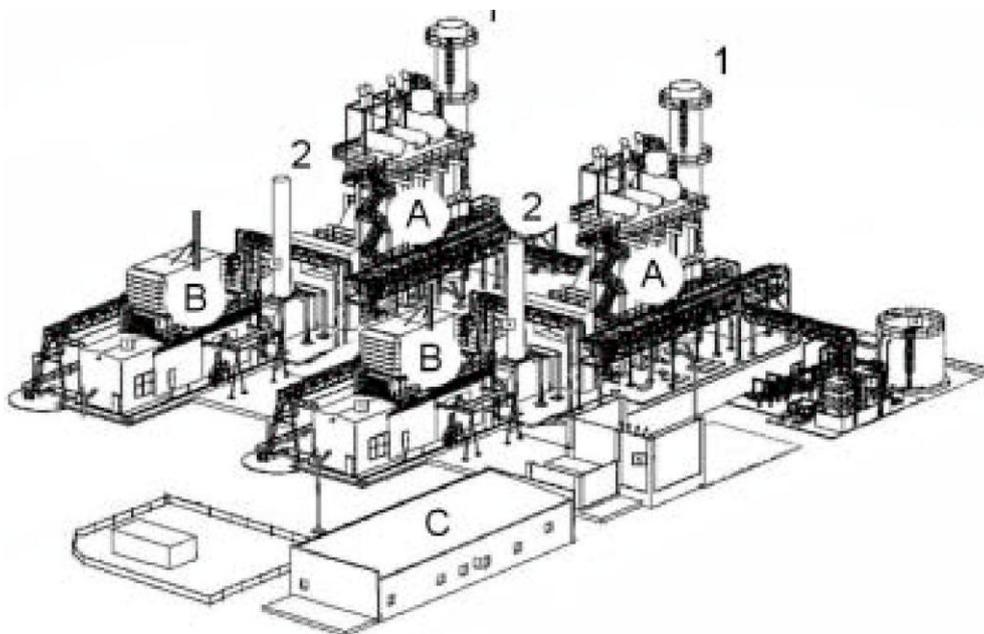
The cogeneration plant, which is currently at the preliminary stage design, will be made up of the following functional elements, as identified in Figure 1:

- Two generator sets, comprising the association of two natural gas-fired turbines with their alternators;
- Two gas turbine-waste heat boilers, equipped with an additional firing system using natural gas to produce up to 125 tonnes of superheated steam per hour each.

The following auxiliary systems are also present:

- High-voltage electrical system and transformers;
- Medium-voltage electrical system;
- Low-voltage electrical system;
- Fuel system;
- Compressed air system;
- Pipes, ducts and mechanical connection system;

- Instrumentation, supervisory control and data acquisition system;
- Fire protection system.



- 1 — Main chimney
- 2 — By-pass chimney
- A — Recovery boiler
- B — Turbo-generator set
- C — Building

**Figure 1** – Layout of the cogeneration plant.

The substation will connect to the national network by way of a dedicated line (at 150 kV), which will connect the cogeneration plant to the Sines national network substation.

### 3. Where is the cogeneration plant located?

The Sines refinery cogeneration plant is located within the boundaries of the refinery. Figure 2 shows its location on a 1:25 000 ordnance survey map. In administrative terms, the cogeneration plant is located in the parish of Sines, municipality of Sines. Figure 3 shows a possible way to be followed by the power line that will connect the cogeneration plant's substation (near the plant) to the Sines substation of the national network.

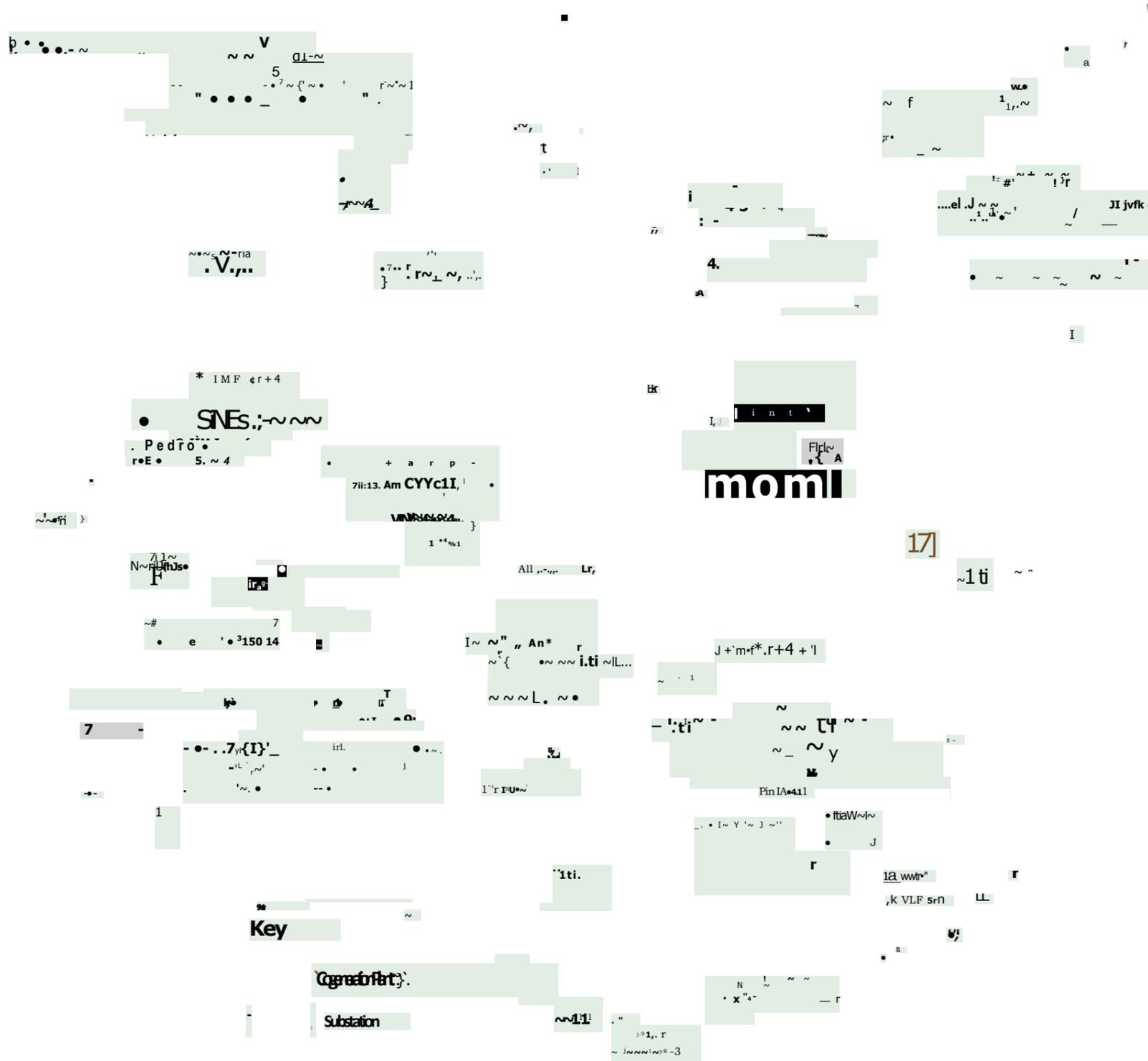


Figure 2 — Location of the Sines Refinery Cogeneration Plant.

**Figure 3 — Route of the electricity power line.**

Sines refinery is situated approximately three kilometres east of the town of Sines and is bounded on the west and north by the rapid-access roads to Sines. The railway line also runs on the north of the refinery zone.

In the surroundings of the refinery, also within Sines area, there are a number of other industrial facilities, including EDP thermoelectric power station, the petrochemical complex operated by Borealis, Carbogal carbon black factory, Metalsines engineering unit, the oil terminal and the coal terminal, along with various industrial support structures, most notably Ribeira de Moinhos waste water treatment plant and Sines waste processing plant.

#### **4. Who is promoting the project? What body will be licensing it?**

The company Galp Power is the entity that is promoting Sines refinery cogeneration plant project. For this reason it is referred to as the project promoter.

The project licensing body is the Portuguese Directorate-General of Geology and Energy (DGGE).

#### **5. What are the advantages of building the cogeneration plant?**

The purpose of installing a cogeneration plant at Sines refinery is to supply high pressure steam to the refinery, thus benefiting from the advantages of combined production of electricity and steam through the burning of natural gas. This technology offers greater energy efficiency. The steam to be produced in the new cogeneration plant will replace most of what is currently produced in the boilers, which burn a fuel called “combustible process waste”. All the electricity generated will be exported to the national network.

When the cogeneration plant enters into operation, the refinery will shut down two of the existing boilers. The other two existing boilers will continue to operate at a reduced load.

As regards atmospheric emissions, there will be significant reductions in emissions of compounds such as oxides of sulphur (SO<sub>x</sub>), compared with the current situation.

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## **6. Why an environmental impact assessment? What is it for?**

An environmental impact assessment (EIA) has been carried out to review the direct and indirect effects (impacts) of the Sines refinery cogeneration plant on the environment, to identify and assess the positive and negative effects resulting from construction and operation of the plant, in line with the applicable environmental legislation. An understanding of these effects helps to implement the project, so that it takes account important local environmental assets. It also offers a means of understanding and demonstrating the environmental benefits that the plant brings.

The study was carried out in the period between December 2003 and June 2004, with particular emphasis on the months of January to March. It analysed the project from various standpoints:

- Climate,
- Geology, geomorphology and hydrology,
- Surface water resources,
- Air,
- Soils,
- Land use and spatial planning,
- Landscape,
- Acoustic environment,
- Socio-economic aspects.

Of these, air quality, acoustic environment, landscape, land use and planning were the object of more particular analysis, given the nature of the project and the general characteristics of the site.

To analyse the implications for landscape, land use and the acoustic environment, site visits for fieldwork were conducted in January.

## **7. What effects (impacts) could this project have on the environment?**

As regards geology and geomorphology, bearing in mind that the work to construct the infrastructure necessary for the cogeneration plant and the substation does not involve earthworks or excavations that cause changes to the site, major impacts are not expected.

When the cogeneration plant and the substation are in operation, the presence of those facilities will be the only impact. As they are incorporated in the industrial facilities of the refinery, their presence is not considered a very large negative impact.

It was also noted that any accidental spillage of pollutants will not lead to contamination of groundwater, as the refinery is equipped with a drainage system (sewer network) that allows the different types of waste water produced at the facility to be separated and sent for treatment. This drainage system will also serve the future cogeneration plant.

As for surface water resources, the study area is a flat zone made up of sandy soils, with no well-defined watercourses. The only watercourse of any significance in the surrounding area is Ribeira de Moinhos to the north of the refinery facility. Given that the cogeneration plant will be served by the drainage networks in place at Sines refinery and the waste water (sewage) produced will be treated at the Ribeira de Moinhos waste water treatment station, no significant negative effects are foreseen.

From the standpoint of land use, the area considered by the study was the footprint of the cogeneration plant and the substation (inside the refinery perimeter) plus a strip 500 metres wide around it. In this area the predominant land use is industrial, followed by scrub, uncultivated land and agricultural use. The whole of the surroundings of the proposed site of the cogeneration plant, to the north and east of the plant, corresponds to the current area of Sines refinery. Part of the area assigned for the plant building is currently occupied by support buildings (of prefabricated construction) and warehouses, dismantling of which is foreseen. Given that the site where the cogeneration plant is to be built is located in an industrial area, there are no significant impacts on land use.

The area in question is not an area of interest for nature conservation, as it does not include, totally or partially, any special protection zones, protected landscape areas, national park or nature park or site on the national list of sites belonging to the Natura 2000 network. The future cogeneration plant is located south of the Comporta/Galé site and north of the Southwest Coast site and the Sudoeste Alentejano and Costa Vicentina Nature Park.

As far as restrictions are concerned, the study does not include any area within the National Ecological Reserve or the National Agricultural Reserve.

As regards planning, the Sines municipal master plan categorizes the intended site of the Sines refinery cogeneration plant and its substation as '*Industrial areas outside built-up areas*'. The structures of the cogeneration plant and its electrical substation are perfectly

appropriated to locations thus designated; accordingly, there is no incompatibility with the municipal master plan.

As far as the electricity power line is concerned, it was found that installing this line will not substantially alter the current use of the land through which it passes, but will involve only removal of the larger tree species. Only the areas where the line supports (pylons) are positioned will be altered, and this only locally. This is a minor negative impact, since for approximately half its length the route of the line runs alongside other power lines already present on the site, which is considered an industrial zone. All the lines are connected to the Sines substation of the national network.

For the air quality analysis, a pollutant dispersion model was used. Sines refinery, Borealis, Carbogal and Sines thermoelectric power station were considered points of emissions sources.

To assess the current situation in terms of air quality of the study area, an analysis was conducted of data from measurements taken between 1995 and 1998 on the air quality monitoring (measurement and vigilance) network associated with the Sines Air Management Commission. The air quality data measured were compared with the legislation in force.

In the results of modelling the reference situation characterization with regard to air quality, the values recorded are much lower than the limits required by the legislation, with the exception of the limit on exceedances (the number of times that levels are exceeded) defined for sulphur dioxide (SO<sub>2</sub>). The area of 0.3 km<sup>2</sup> (equivalent to approximately 30 football pitches) where the number of exceedances is higher than permitted is located in the zone southeast of Sines thermoelectric power station.

Based upon the estimates made, no air pollution phenomena affecting human health are anticipated.

During the construction phase of the cogeneration plant, the various activities involved, the circulation of machinery and the handling of materials could lead to an increase in particles (dust) in the air. These effects are negative, temporary and of medium importance.

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The results of the simulations carried out indicate that there will be no degradation of air quality when the cogeneration plant is in operation. The sulphur dioxide concentrations obtained are lower than current values, meaning a slight improvement in air quality in the region. On the other hand there is a slight increase in concentrations of oxides of nitrogen. The maximum values in the simulations do not exceed the limits set by the legislation currently in force.

For purposes of characterizing the reference situation for the acoustic environment, noise measurements were taken at four points around the refinery, near homes that could potentially be affected. It was found that presently the main sources of noise are the refinery, road traffic on the EN 261-3 and EN 120-1, the Borealis factory, and pipeline valves. The study area was classified as an area of “medium disturbance” in terms of noise.

At the construction stage, given the considerable distances between the site of the cogeneration plant and the nearest homes studied, along with the low level of traffic accessing the site, when compared with current traffic into the refinery, negative effects of only slight importance are expected as far as noise is concerned.

When the cogeneration plant is in operation, it will comply with the noise levels laid down in the relevant legislation for mixed zones (zones with housing, shops and services), both during the day and at night, according to the simulations conducted. Thus the environmental impact on the nearest homes will be very small.

Additionally, as some of the refinery’s existing facilities will be less active once the cogeneration plant comes into operation, the impact identified could even be positive, if noise levels fall from current levels.

As regards landscape, a circular area around the project (cogeneration plant and substation) was studied, up to a distance of 4.5 kilometres, bearing in mind that beyond that distance the human eye’s capacity to discern objects/structures is much reduced. The following landscape elements were identified: agricultural land and woodlands; industrial areas; scrubland and uncultivated land; and urban areas. A map of the visual quality of the landscape was also produced and this showed that 46% of the study area is classified as being of medium landscape quality and 31% as being of low landscape quality. These areas correspond to zones without any features of natural or cultural value. The remaining 23% of the landscape of the study area is classified as being of high visual quality; it corresponds to zones with a greater slope and coastal areas occupied by natural vegetation.

It is anticipated that construction and operation of the future Sines refinery cogeneration plant will have a slight local impact on elements of the landscape. As regards the aesthetic quality of

the landscape, a minor local negative impact is again anticipated. Figure 4 provides a simulated view of the site of the Sines refinery cogeneration plant, and shows how the plant will be entirely integrated in the refinery and will not have a significant impact on the landscape.



**Figure 4** – Possible insertion of a cogeneration unit at the planned plant construction site.

Installation of the electricity power line will have a negative impact as a consequence of the work to be done and the presence of the necessary machinery. A small change is expected at the level of landscape features, as only those areas where the line supports are erected will be affected. If necessary, larger trees will also be removed in the strip along which the line passes. The visual impact of these structures will also be low, as they are not very conspicuous, and they are common features in this location (an industrial zone that has several electricity power lines already). This is a minor local negative impact.

In socio-economic terms, generation of electricity from natural gas will help improve the efficiency of electricity production and reduce the production of energy from traditional fossil fuels (coal, oil). The refinery will use the steam generated by the plant for its operations, thus reducing production of steam by burning combustible process waste. There is thus a positive impact, on a national scale, given that imports of fossil fuels with low energy-efficiency will be reduced.

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All in all, the socio-economic impacts of the project are very positive. It is not anticipated that the local population will be disturbed either during the construction phase or the operational phase. At the same time, the project will also contribute to national environment policy, as a less polluting and more energy-efficient fuel will be used.

## **8. What measures are foreseen to safeguard the project's environmental performance?**

A number of measures have been provided for to safeguard the project's environmental performance. Firstly, steps and actions have been considered that could help to reduce the negative effects identified. These are referred to as "mitigating measures".

The main mitigation measures identified in the Environmental Impact Assessment are as follows:

- Construction yards will be set up in a dedicated area that the refinery already uses for setting up its own yards for the maintenance operations it has to carry out. This means that setting up yards to support this project will not cause major negative effects at the level of land use or indeed landscape. The same will happen with temporary storage of waste and equipment maintenance, which will also take place in dedicated areas of the refinery itself. Nevertheless, the yards must be dismantled after work is complete and provisional support structures must be removed;

- All soil sealing/waterproofing materials deposited on the ground and all debris must be removed, leaving the site clean;
- Special care must be taken with regard to the handling of oils and fuels, and legislation on waste oils must be complied with during the construction and operation of the cogeneration plant;
- Waste produced during construction and operation of the cogeneration plant must be handed over to operators authorized by the Institute of Waste and sent to an appropriate final destination;
- Cleaning wheels whenever temporary roads are used that lead to an increase in suspended particles (dust) in the atmosphere;
- Spraying of the ground where increased dust emission is expected as a result of the various activities associated with the work;
- Noisy activities during the construction phase may only take place between 7 a.m. and 6 p.m.;
- Measurements will be taken during the operational phase to check noise levels at the nearest homes and determine whether or not there is a need to take any steps to reduce them.

At the same time, the development of a series of measurement campaigns, observations and studies to analyse the effects of the cogeneration plant in terms of emissions of atmospheric pollutants has been planned, as provided for by law. A specific programme to measure the effects of cogeneration on air quality was not considered necessary, in as much as this project is part of the Sines refinery and the Sines industrial complex and is not a decisive factor in the region's air quality levels.

In terms of noise, a campaign to measure noise levels has been proposed, in accordance with the applicable legislation: its duration and need will be monitored on the basis of the values that are recorded.

These measurement campaigns, which will be carried out on the basis of the characterization of defined parameters, analysed in samples taken at identified sites, with a specific frequency, are known as "monitoring". The results obtained, duly recorded and processed, will subsequently

be assessed by the Environment Institute. This follow-up by the Environment Institute is known as the “post-assessment phase”, as provided in the applicable environmental legislation, and is a way of ensuring that the cogeneration plant will be properly supervised in environmental terms.