

# **PROJECT DESIGN DOCUMENT**

## **Camargo Power Plant**

### **Bolivia**

**November - 2007**

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**PROJECT DESIGN DOCUMENT**  
**(CDM-SSC-PDD)**

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## PROJECT DESIGN DOCUMENT (CDM-SSC-PDD)

### Camargo Power Plant – Bolivia<sup>1</sup>

#### Section A. General Description of the small scale Project Activity

##### A.1 Title of the small scale Project Activity:

Camargo Power Plant. Version 3, November 28th, 2007

##### A.2 Description of the small scale Project Activity

The purpose of the Project Activity is to substitute diesel power generation in Pampa Colorada Power Plant in Camargo, Bolivia by natural gas fired power generation to meet the demand of electricity of the Camargo off grid distribution system.

Prior to April 2004, electric energy production in Camargo took place with diesel power units. As of April 2004 the effective generation capacity of the power plant Pampa Colorada in Camargo in diesel units was 600 kW, equipped with old English Electric and Caterpillar machines (see Annex A).

The proposed project activity reduces the greenhouse gas (GHG) emissions by changing the diesel generation equipment by four new natural gas fired GUASCOR units model FGLD 180, with 900 kW effective capacity on site, devoting 50 kW to auxiliary services in the power plant (see Annex B).

Diesel power generation is among the most polluting form of electricity generation in off grid distribution systems of Bolivia, wherever there are no economically feasible renewable energy resources. A cleaner alternative source is natural gas, provided that the demand is located within an economically affordable distance from existing gas pipeline transportation system.

The contribution of Gas & Electricidad S.A., with this experience can be replicated in similar conditions in different parts of the country.

Electricity supply is of paramount importance for education, social communication, healthcare and replacement of low quality energy sources and for the sustainable development for the population of the area of influence of the project (83% with unsatisfied basic needs)<sup>2</sup>.

<sup>1</sup> This document has been prepared following the “Indicative Simplified Baseline and Monitoring Methodologies for selected small scale CDM Project Activity Categories” of Annex 6, Appendix B, of Annex II to decision 21/CP.8, Cfr. document FCCC/CP/2002/7/Add.3, as well as taking into account “Project Design Document” form (CDM-SSC-PDD) Version 03 CDM-Executive Board, in effect as of 22 December 2006. Whenever applicable also has been followed the document “Approved Consolidated Baseline Methodology for fuel switching from coal and/or petroleum fuels to natural gas in existing Power Plant for electricity generation”, Approved Consolidated Baseline and Monitoring Methodology ACM0011/Version 01, Sectoral scope: 01; EB02.

<sup>2</sup> Cfr. Anuario Estadístico 2005, INE, Instituto Nacional de Estadística, Bolivia, ASDI, Swedish Cooperation Agency, April 2006, La Paz, Bolivia

E+Co, as energy service institution that promotes and finances clean and renewable energy, energy efficiency, supports this project activity because it fits in the triple bottom objectives of the institution: financially sustainable, with favorable social and environmental impacts.

### **A.3. Project Participants**

<b>Name of Party involved</b>	<b>Private or public entity</b>	<b>Party involved wishes to be considered as project participant (yes/no)</b>
Bolivia (host)	--	--
Gas & Electricidad S.A.	Private, project owner	Yes
E&Co	Private, project promoter	Yes

### **A.4 Technical Description of the small scale Project**

#### **A.4.1 Location of the small scale Project Activity**

##### **A.4.1.1 Host Party**

The Republic of Bolivia

##### **A.4.1.2 Region/state/province**

Department of Chuquisaca, Province of Nor Cinti.

##### **A.4.1.3 City/Town/Community**

Town: Camargo; Power Plant Site: Pampa Colorada

##### **A.4.1.4 Details of physical location, including information allowing the unique identification of this small scale Project Activity.**

The town of Camargo is located in the first section of the Province Nor Cinti of the Department of Chuquisaca, at a distance of 325 km by road, south from the city of Sucre, capital of the Department and of the country and at a distance of 187 km, north from the city of Tarija.

The geographical coordinates are 20°38' latitude South and 65°13' longitude West at an altitude around 2406 m.a.s.l. The power plant is located 4 km south of the town on the east side of the road to Tarija. (See Annex C).

##### **A.4.2 Type, category and technology of the small scale Project Activity**

According to “Appendix B of the simplified modalities and procedures for small-scale CDM project activities”<sup>3</sup>, the Camargo Power Plant for off grid power generation belongs to Type III – Other Project Activities, where the project activity category is III.B “Switching Fossil Fuels” that includes fossil fuel switching in existing electricity generation applications. The natural gas fired generation takes place with four generation set units, Brand Mark Guascor Model FGLD 180, from Spain.

The project personnel are experienced and were properly trained by the supplier in specific aspects of the operation, mostly related with monitoring, protection, control and measurement equipment.

#### **A.4.3 Estimated amount of emission reductions over the chosen crediting period.**

The chosen crediting period is 10 years from January 2005 to December 2014.

<b>Year</b>	<b>Estimation of Overall Emission Reductions (tCO<sub>2</sub>)</b>
2005	227
2006	374
2007	271
2008	320
2009	336
2010	353
2011	559
2012	795
2013	1063
2014	1368
<b>Total tonnes of CO<sub>2</sub> e</b>	<b>5667</b>

Total estimated Reductions (tCO<sub>2</sub>): 2005-2014: 5667 tCO<sub>2</sub>

Total number of crediting Years: 10

Annual average of the estimated Reductions over the crediting Period: 566.7 tCO<sub>2</sub>.

#### **A.4.4 Public funding of the small scale Project Activity**

No public funding for the generation project, except for the temporary assignment to Gas & Electricidad S.A. of the land where the power plant is located.

<sup>3</sup> Appendix B to document FCCC/CP/2002/7/Add.3, contained in annex II to Decision 21/CP.8

**A.4.5 Confirmation that the small scale project is not a debundled component of a large scale project activity.**

The Pampa Colorada Power Plant as off grid power generation for the supply of energy to the distribution System of COSERCA (Cooperativa de Servicios Eléctricos Camargo), has been executed independently and separated from any other project of its type and within the area of influence of the pertinent distribution grid.

**SECTION B: Application of a baseline and monitoring methodology**

**B.1 Title and reference of the approved baseline and monitoring methodology applied to the project activity.**

The methodology used corresponds to Type III, Other Project Activities, Category III.B Switching Fossil Fuels, Version 11, Sectoral Scope 01, EB 33, related with existing applications of electricity generation.

**B.2 Justification of the choice of the project category**

The estimated production of electricity in the off grid Camargo system, i.e. in the Pampa Colorada Power Plant, where diesel has been substituted by natural gas as mentioned in par. A.2 above in this document does not exceed 3.9 GWh per year between 2004 and 2006 and it is foreseen that in 2014 it will reach 6.78 GWh. This figure being the highest of the proposed crediting period represent emission reductions in the order of 1367 tCO<sub>2</sub> in the corresponding year. During the proposed crediting period 2005-2014 the average carbon emissions reduction is 566.7 tonnes CO<sub>2</sub> per year.

These values are far below the limit of 60 ktCO<sub>2e</sub> of emission reductions to qualify as a small scale project.

**B.3 Description of the project boundary**

According to the methodology, the project boundary is the physical, geographical site where the fuel combustion affected by the fuel-switching measure occurs. In this particular case it is the Pampa Colorada Power Plant site in Camargo, where the old and the new power plants are installed.

In Annex C the Pampa Colorada Power Plant site and its physical boundaries are presented.

**B.4 Details of the baseline and its development.**

The emissions baseline is the business as usual emissions of the Power Plant of Pampa Colorada in Camargo, without the implementation of the gas fired power generation units.

Baseline Emissions are calculated as:

$$BE_{elec,y} = EL_{BL,y} * EF_{elec,BL}$$

**BE<sub>elec,y</sub>** Baseline emissions due to generation of electricity supplied to the captive electricity grid of COSERCA system in year y of the crediting period in tCO<sub>2</sub>

**EL<sub>BL,y</sub>** Electricity supplied to the captive isolated rural grid of COSERCA system plus the energy for the internal use of the plant for auxiliary services, in year y not exceeding the supply in absence of the project activity (MWh).

**EF<sub>elec,BL</sub>** Emission factor for the baseline source of electricity supplied to the captive electricity grid of COSERCA system (tCO<sub>2</sub>/MWh)

$$EF_{elec,BL} = \frac{EF_{Diesel,BL}}{NCV_{Diesel,BL}} = tCO_2/MWh$$

**EF<sub>Diesel,BL</sub>** CO<sub>2</sub> emission factor for diesel fuel used in the power plant prior to the implementation of the project activity (tCO<sub>2</sub>/TJ), is the default emission factor for the upper limit of 95% confidence interval 74.80 tCO<sub>2</sub>/TJ<sup>4</sup>.

**NCV<sub>Diesel,BL</sub>** Net calorific value (NCV) of diesel oil used in the power plant prior to the implementation of the project activity. It is the value of NCV for diesel according to Bolivian regulation, Supreme Decree Nr. 26276, Regulation of Quality of Hydrocarbons and Lubricants, Specifications, Annex C, Table Nr.21, Diesel Oil, i.e. 20,000 Btu/lb, or 11.376 MMBtu/MWh.<sup>5</sup> According to 2006 IPCC Guidelines, Volume 2, Energy, Table 1.2, Default NCVs (95%), for 43.3 TJ/Gg, the corresponding specific consumption is 10588 MMBtu/MWh. This figure being more prudent, has been applied for the calculation of baseline emissions with diesel.<sup>6</sup>

The corresponding figures based in the power generation statistics for the period 2001-2006, and the IPCC default values for emission coefficients for diesel generation<sup>7</sup> are the following:

Year	2001	2002	2003	2004	2005	2006
Energy Production MWh (gross generation)	2044	2051	2147	2571	3522	3816
Default Coefficient Diesel (tCO <sub>2</sub> /MWh)	0.836	0.836	0.836	0.836	0.836	0.836
Baseline Emissions (tCO <sub>2</sub> )	1708.0	1713.9	1794.1	2148.4	2943.1	3188.7

<sup>4</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Table 1-4, Default CO<sub>2</sub> Emission Factors for combustion.

<sup>5</sup> Conversion factors: 947.817120313 MMBtu/TJ; specific weight of diesel: 0.835kg/liter; average specific consumption of diesel: 0.3 liter/kWh, at the site of Pampa Colorada. See Annex 3.

<sup>6</sup> See Appendix I of Annex 3 and Annex 3 of this document.

<sup>7</sup> The default values were applied due to the fact that the specific fuel consumption in the Pampa Colorada Power Plant is affected by the old English Electric machines and the insufficient fuel consumption records. The IPCC default values for emission coefficients were obtained from "IPCC Good Practice and Guidance and Uncertainty Management in Greenhouse Gas Inventories"

The Baseline projected data for the period 2007 – 2014 with the same IPCC default values for emission coefficients for diesel generation are the following:

Year	2007	2008	2009	2010	2011	2012	2013	2014
Energy Production MWh (gross generation)	4015	4190	4404	4629	5092	5601	6161	6778
Default Coefficient Diesel (tCO <sub>2</sub> /MWh)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Baseline Emissions (tCO <sub>2</sub> )	3355.0	3501.3	3680.1	3868.2	4255.0	4680.5	5148.6	5663.5

The historic registers of the period before October 2007 are presented in Annex 3, par. 4, as reported to and certified by the Superintendence of Electricity.

### **B.5 Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the small Project Activity<sup>8</sup>**

The alternatives to the project activity of power generation with natural gas to meet the demand in the rural distribution system of COSERCA are the following:

- To increase the installed capacity in diesel power generation in Pampa Colorada Power Plant
- To interconnect the rural distribution system to the national interconnected system.

These alternatives are consistent with legal provisions for the power sector in Bolivia.

Investment Barrier: From the investment point of view for the operator the least cost alternative was to continue with the diesel generation with subsidized diesel oil (Bs 1.10 per liter, equivalent to US\$ 0.1408 per liter as of September 2007)<sup>9</sup>. The addition of diesel generation sets for the increase of demand would have required less investment than the replacement of the total installed capacity with natural gas fired Gen Sets. The interconnection to the grid currently is still a being a long term solution due to the long distances, the small scale of the power market of COSERCA and its high investment cost, that will not be justifiable for the sole purpose of the connection of the rural grid of Camargo.

Barrier due to prevailing practice: The prevailing practice with off grid diesel based generation and diesel oil price subsidy, would have led to the diesel generation continuity and extension of the installed capacity.

Other Barriers: No private company before Gas & Electricidad S.A. took the responsibility of the power generation in Camargo, due to market risks, organization, lack of technical personnel, financing capability and managerial skills. If Gas & Electricidad S.A. should have not probably, business as usual should have continued.

<sup>8</sup> According to Attachment A to Appendix B of simplified modalities for small scale CDM Project Activities

<sup>9</sup> Ratified recently by Ministerial Resolution of the Ministry of Hydrocarbons Nr. 099/07, dated September 27, 2007. Reference made to earlier Administrative resolution of the Superintendence of Hydrocarbons, Nr. 583/2001 dated November 16, 2001.

The Project Activity as it takes place in Camargo Power Plant is consistent with the National Development Plan. The current national policies set forth in the National Development Plan of the Government of Bolivia, issued in June 2006 by the Ministry of Planning and Development<sup>10</sup>, makes reference to the increase of the electricity service coverage in the urban and rural area, to “Environmental resources”<sup>11</sup>, to the program of Certification of Emission Reduction, carbon sequestration and carbon conservation for the promotion of clean development for the international trading of emissions, oriented to generate additional incomes for the country and the local communities with an equitable distribution of the benefits.

Policy 2 of the Power Sector, par. 3.3.3 of the Plan, states: *“To promote the universalization of the electricity service, both in urban and rural areas, developing the rural electrification as national priority, in the context of integral social and productive development, for the attention, with priority, to the population strata with the least resources.”*

The above mentioned plan also mentions the intention of the government *“to dispose the change of the energy matrix by means of the research and application of renewable and non-renewable energy resources, promoting diesel substitution projects for electricity generation in the framework of sustainability, complying with environmental regulations and the international agreements within the framework of the Kyoto Protocol”*<sup>12</sup>

## **B.6 Emission reductions**

### **B.6.1 Explanation of methodological choices**

**Emission reductions:**  $ER_y = BE_{elec, y} - PE_y$

Where  $PE_y$  is the project emission in Pampa Colorada in year  $y$  expressed in  $tCO_2$

Project Emissions emissions are calculated as follows:

$$PE_y = PE_{n.g., y} + PE_{emergency, y}$$

$PE_{n.g., y}$  Emissions due to combustion of natural gas for production of Electricity in year  $y$  of the crediting period ( $tCO_2$ ) as follows.

$$PE_{n.g., y} = EL_{n.g., y} \times EF_{ELn.g., y}$$

Where  $EL_{n.g., y}$  is the electricity produced in the Power Plant of Pampa Colorada with Natural gas Fired Gen Set measured in MWh, for the year  $y$

<sup>10</sup> Plan Nacional de Desarrollo, Lineamientos Estratégicos 2006-2011, approved by Supreme Decree 29272, d.d. September 12, 2007.

<sup>11</sup> Plan Nacional de Desarrollo, Ministerio de Planificación del Desarrollo, La Paz, Bolivia, June 2006, par. 5.34 page 123.

<sup>12</sup> Ibidem par 3.3.3. page 57.

<b>EF<sub>ELn.g.,y</sub></b>	Is the emission factor for electricity generation obtained from the IPCC 2006, Guidelines <sup>13</sup> as the upper limit for an interval of 95% confidence, i.e. 58.30 tCO <sub>2</sub> /TJ, converted into tCO <sub>2</sub> /MWh with conversion factors <sup>14</sup> i.e. 0.7682, 0.7699, 0.7353, 0.7670 tCO <sub>2</sub> /MWh, respectively for 2004, 2005, 2006, 2007 and 0.7576 tCO <sub>2</sub> /MWh for 2008 through 2014.
<b>PE<sub>emergency,y</sub></b>	Emissions due to partial use of diesel fired reserve capacity in Pampa Colorada Power Plant
<b>PE<sub>emergency,y</sub> = EL<sub>diesel,y</sub> X EF<sub>elec,BL</sub></b>	
Where <b>EL<sub>diesel,y</sub></b> is the electricity produced in the Power Plant of Pampa Colorada with diesel reserve units in MWh.	
<b>EF<sub>ELdiesel,y</sub></b>	This value is the same of the Baseline for diesel generation, i.e 0.836 tCO <sub>2</sub> /MWh, in case of emergency, fixed over the crediting period.

### B.6.2 Data and parameters that are available for validation.

The following data and parameter are available for validation:

<b>Data/ Parameter</b>	<b>EL<sub>BL,y</sub></b>
Data unit:	MWh (or kWh)
Description:	Energy production in Pampa Colorada Power Plant for 2001 through September to 2007.
Source of data used:	For diesel generation: Historic annual reports data of COSERCA. For natural gas generation: automatic register of the power plant at the generation level, measurement before the step up substation of the power plant, monthly energy bills to COSERCA, declaration to the Superintendence of Electricity and official certification of the Superintendence. For diesel generation: measurements and registers of COSERCA
Value applied:	

<sup>13</sup> 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy, Table 1.4 “Default CO<sub>2</sub> Emissions Factors for Combustion”.

<sup>14</sup> See footnote Nr. 4 and Annex 3 specific consumption of natural gas obtained from the registered data of the Power Plant of Pampa Colorada: 12,489, 12,516, 11,954, 12,469 and 12,316 Btu/kWh respectively for 2004, 2005, 2006, 2007 and 2008 through 2014

<b>Year</b>	<b>Gross Energy production with Diesel (MWh)</b>
2001	2044
2002	2051
2003	2147
2004	725
2005	68
2006	92
2007	72

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Value applied:	2003 – 2007: 0.30 l/kWh.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The historical data have been used as reference only. In fact, the historical values are systematically higher than 0.3 l/kWh due to losses and poor performance of old diesel machines and spinning reserve. A conservative value of 0.3 l/kWh has been applied.
Any comment:	The load factor of the diesel fired machines is low in addition to previous explanation of the high specific consumption.

<b>Data / Parameter</b>	<b>SFC<sub>n.g.</sub> - Average specific consumption of natural gas</b>
Data unit:	Btu/kWh
Description:	Simultaneous registers of electricity generation and natural gas consumption in the power plant of Pampa Colorada (at the plant gate), minimally at monthly level. Total production of electricity and total consumption of natural gas per month leads to specific consumption of fuel.
Source of data used:	Measurement station of Pampa Colorada at the gate of the plant of gas consumption. Periodical analysis of the natural gas delivered at the plant including net calorific value (NCV) of it in Btu/cft. The corresponding natural gas meter with corrector is available at the gate of Pampa Colorada power plant since May 2007. Prior to this date and since 2005 only mechanical measurement without correction was available. Between May 2004 and May 2005 only one meter was available in El Puente for the measurement of natural gas supply to El Puente and Pampa Colorada power plants. The fuel consumption in Pampa Colorada was obtained as the difference of the total supply and the fuel consumption in El Puente power plant. Monthly natural gas bills paid by Gas & Electricidad S.A. to the supplier for El Puente and Pampa Colorada and measurement of the consumption in El Puente between May 2004 and May 2005.

	Register of Gas & Electricidad S.A. of natural gas quantities received, cross checked for official register of the supplier of quantities delivered and certified by the Superintendence of Hydrocarbons at point of delivery in El Puente. The period of data covered is May 2004 to September 2007.
Value applied:	12,489, 12,516, 11,954 and 12,469 Btu/kWh for 2004, 2005, 2006 and 2007 respectively and 12,316 Btu/kWh for 2008 through 2014.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The use of natural gas is the main source of CO <sub>2</sub> emissions in the crediting period. The accuracy of its measurement provides important quantitative support for the actual project emissions that took place in the past and will take place in the future.
Any comment:	None

### B.6.3 Ex-ante calculation of emission reductions:

<p>Based on the baseline emissions presented above in paragraph B.4 and the formulae presented in paragraph B.6.1, the calculation of the emission reduction for the period from 2004 to 2014 has been carried out with the following basic parameters as explained before: <b>BE<sub>elec, y</sub></b> results of baseline calculations</p>	
<b>EL<sub>n.g.,y</sub></b>	Same values used in Baseline
<b>EF<sub>ELn.g., y</sub></b>	58.30 tCO <sub>2</sub> /TJ, converted into tCO <sub>2</sub> /MWh with conversion factors i.e. in tCO <sub>2</sub> /MWh: 0.7682 for 2004, 0.7699 for 2005, 0.7353 for 2006, 0.7670 for 2007 and an average of 0.7576 for 2008 through 2014
<b>EL<sub>diesel, y</sub></b>	Electricity produced in the Power Plant of Pampa Colorada with diesel reserve units in MWh.
<b>EF<sub>diesel, y</sub></b>	0.836 tCO <sub>2</sub> /MWh, in case of emergency diesel generation, fixed over the crediting period, the same as for the baseline.
<p>The results of the calculations are presented in Annex 3 and the corresponding spread sheets in Appendix I of Annex 3.</p>	

### B.6.4 Summary of the ex-ante calculation of emission reductions:

The following is the summary of the ex-ante emissions reduction<sup>16</sup>:

Year	Estimation of Project Activity Emissions (tCO <sub>2</sub> )	Estimation of Baseline Emissions (tCO <sub>2</sub> )	Estimation of Overall Emission Reductions (tCO <sub>2</sub> )
2005	2716	2943	227
2006	2815	3189	374
2007	3084	3355	271
2008	3181	3501	320
2009	3344	3680	336
2010	3515	3868	353
2011	3696	4255	559
2012	3885	4681	795
2013	4085	5149	1063
2014	4296	5663	1368
<b>Total tonnes of CO<sub>2</sub> e</b>	34617	40284	5667

## B.7 Application of a monitoring methodology and description of the monitoring plan:

### B.7.1 Data and Parameters monitored

The monitoring procedures are explained below in the respective tables of each parameter:

Data / Parameter	Installed capacity and Electricity generation
Data Unit:	kW and MWh (or kWh)
Description:	Installed capacity and electricity generation of the Project Power Plant.
Source of data:	Project site, Pampa Colorada, Camargo – Bolivia.
Measurement Procedures:	The installed capacity and actual generation of the power plant before and after the fuel switch activity shall be certified by the superintendence of Electricity of Bolivia (Regulatory Body). The report will be available during the validation to be checked.
Monitoring frequency:	Yearly (registers hourly and daily)
QA/QC procedures:	Updated pertinent control, calibration and certification of measurement instruments available in file of the Power Plant.

<sup>16</sup> According to Annex 6, of the Report of the Seventh Meeting of the Executive Board, Appendix B of the Simplified modalities and procedures for Small –Scale CDM Project Activities, on Type III, Category III-B, Switching Fossil Fuels, par. 75, no leakage calculation is required.

Any comment:	All relevant documents on the quality and reliability of the information and parameters of the performance and activity of the power plant are reported to the Superintendence of Electricity, in charge of regulation and oversight of the power public service.
Data / Parameter	<b>EL</b> <sub>n,g.,y</sub>
Data Unit:	MWh
Description:	Electricity produced with natural gas in the Power Plant to serve the auxiliary equipment needs of the Power Plant and to serve the off grid market of COSERCA.
Source of data:	Electricity meters at the Power Plant.
Measurement Procedures:	Read the meters and cross check the information accumulated both digitally and printed, as well as officially reported to the Superintendence of Electricity and billed to COSERCA.
Monitoring frequency:	Yearly
QA/QC procedures:	As per electricity meter equipment maintenance and calibration manual, according to requirements of the client and the Superintendence of Electricity.
Any comment:	None

Data / Parameter	<b>FF</b> <sub>diesel,y</sub>
Data Unit:	Liters
Description:	Total amount of diesel used for emergency power generation in the Pampa Colorada Power Plant to meet demands above the generation capacity of the gas fired Gen Sets in year y of the crediting period.
Source of data:	Data logs in the power plant; cross checking of invoices, register of fuel delivered, stocked, used and losses with monthly data.
Measurement Procedures:	Manual volumetric procedures.
Monitoring frequency:	Yearly
QA/QC procedures:	As per flow meter's manuals or procedures and requirements of Superintendence of Electricity.
Any comment:	----

Data / Parameter	<b>FF</b> <sub>n,g.,y</sub>
Data Unit:	MMcft
Description:	Total quantity of natural gas used in the Power Plant for the generation of electricity

	to serve all the needs of the plant auxiliary systems and the supply to COSERCA in a year y of the crediting period.
Source of data:	Gas & Electricidad S.A.
Measurement Procedures:	Data from the meters of the regulation and measurement station located at the gate of the Power Plant, cross checked with monthly natural gas bills of YPFB (the supplier) and registers of the Superintendence of Hydrocarbons and registers of Gas & Electricidad S.A. and YPFB for natural gas delivered at point of delivery in El Puente.
Monitoring frequency:	Yearly
QA/QC procedures:	As per maintenance and calibration manual of the metering equipment and according to requests of calibration from natural gas buyer (Gas & Electricidad S.A.).
Any comment:	None

Emission factor for diesel as per Baseline will remain valid for the entire period of crediting as per 2006 IPCC Guidelines mentioned in note N° 10 and 11.

Data / Parameter	$EF_{elec,y}$ (with natural gas)
Data Unit:	tCO <sub>2</sub> /MWh
Description:	Emission factor
Source of data:	$FF_{n.g.}$ mentioned above and $EL_{n.g.,y}$ to calculate and natural gas analysis of supplier in Btu/Cft to calculate specific fuel consumption of natural gas to generate electricity ( $SFC_{n.g.}$ in MMBtu/MWh) and based on default emission factor for natural gas combustion 58.3 tCO <sub>2</sub> /TJ (see Annex 3 for conversion factors)
Measurement Procedures:	None
Monitoring frequency:	Yearly
QA/QC procedures:	As per metering of basic parameter
Any comment:	None

### B.7.2 Description of the monitoring plan:

The existing structure of the management organization of the Project owner Gas & Electricidad S.A. includes an administrative office in Sucre, headed by the Executive President, with administrative and technical staff. In the specific case of the Power Plant of Pampa Colorada in Camargo, the Power Plant is daily operated and managed by a Power Plant manager, two mechanic technicians, two electricians, and support personnel.

The responsible person for the monitoring measurements and documentation originated in the site will be the Power Plant manager, currently Omar Torricos Herboso. The filing and custody of all third party generated back up documentation is under the responsibility of the administrative manager, in the head office of Gas & Electricidad S.A. in Sucre, currently Mr. Freddy Chumacero.

Among the responsibilities of the plant manager and his technical staff in Pampa Colorada, are the safety and prevention activities, regarding the pipe connections, valves and fittings pressure regulation and measurement equipment. The technical personnel of the Power Plant carries out permanent control and monitoring of the performance of the gas distribution system for generation inside the Power Plant to prevent natural gas leakages.

Each generation unit Guascor FGLD 155/80 has incorporated a performance and malfunction protection, control, monitoring and register system including a screen and selected alarm systems. See Annex 5.

The CO<sub>2</sub> emission reduction monitoring system proposed is based on the fixed values provided in B.4 above, for the Baseline Emissions. The emission reduction will be assessed yearly by the auditing of the following data to recalculate the actual Project emissions in each year:

**EL<sub>n.g.,y</sub>** Total energy produced by the Power Plant with natural gas. This magnitude is expressed in MWh (or kWh) and is constantly displayed and monitored in the electro mechanic register system in the power plant before self demand loads and in an automatic digital register system before the transfer point as per invoicing means. The registers are accumulated daily, monthly and yearly and are the basis for the electricity bill. The amount of energy considered will be the gross generated being it directly proportional for the actual CO<sub>2</sub> emissions and metered in the electro mechanic meter transcribed to paper support in hourly spreadsheets.

**EF<sub>n.g.,y</sub>** This value being the emission factor of electricity generated with natural gas, will be corrected based on actual data; registered of **EL<sub>n.g.,y</sub>** and actual total consumption of natural gas **FF<sub>n.g.,y</sub>** in the Power Plant for the total generation and the Default emission factor **EF<sub>ELn.g., y</sub>** obtained from the IPCC 2006, Guidelines, i.e. 58.30 tCO<sub>2</sub>/TJ, converted into tCO<sub>2</sub>/MWh with conversion factors.

The value shall be assessed at monthly and yearly average level.

This information will be documented with the above mentioned registers of metering in the Power Plant for electricity and with the registers of YPFB for the natural gas consumption per month, cross audited with the natural gas monthly invoices. Since the electronic corrector unit to the gas meter was only implemented by may 2007, all previous data will be obtained by adjusting caloric and meter factors and/or comparison to the electronic corrector unit over the gas meter at El Puente.

Annex 4 presents the forms to be filled in for the monitoring and certification and the

reference to documents to be verified in the files of the company and eventually, in case of doubt, the certifications of both, the Superintendence of Hydrocarbons for the natural gas measured, delivered, sold and used at the Power Plant gate of Pampa Colorada and for electricity generation from the Superintendence of Electricity.

**B.8 Date of completion of the application of the baseline and monitoring methodology and the name of responsible person (s)/entity (ies):**

Date of completion: November 29th, 2007

Responsible person for application of the baseline and monitoring methodology: Gonzalo Rico Calderón.

Entity: E+Co, sponsor see Annex 1.

**SECTION C. Duration of the project activity / Crediting period:**

**C.1. Duration of the project activity:**

**C.1.1. Starting date of the project activity:**

The starting date of the project activity is May 2004

**C.1.2. Expected operational lifetime of the project activity:**

The expected operational lifetime of the project is 20 years from May 2004

**C.2. Choice of crediting period and related information:**

The project will use a fixed crediting period.

**C.2.1. Renewable crediting period:**

n.a.

**C.2.1.1. Starting date of the first crediting period:**

n.a.

**C.2.1.2. Length of the first crediting period:**

n.a

**C.2.2. Fixed crediting period:**

Crediting period : Ten years

**C.2.2.1. Starting date:**

01/01/2005

**C.2.2.1. Length:**

Ten (10) years.. 01/01/2005 to 31/12/2014

**SECTION D. Environmental impacts:**

**D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:**

The project has an updated certificate of compliance of national environmental regulations of Bolivia, issued by the Vice-Ministry of Natural Resources and Environment, MPD-VRMA-DGMA-01701-05-CD3 N° 2703/06.

**SECTION E. Stakeholders' comments:**

**E.1. Brief description of how comments by local stakeholders have been invited and compiled:**

This document has been sent with a letter to Gas & Electricidad S.A. on October 11, 2007 and a meeting scheduled for October 12, 2007 to cross check information and receive comments, amendments and complementation. Comments received in writing on October 12<sup>th</sup>, 2007 were incorporated in this document and sent to Gas & Electricidad S.A. on October 19<sup>th</sup>, 2007 for its completion with historical information and documentation. Last information on available historical data was received from the project owner on November 24, 2007. The Company has been also requested to ask directly comments to other local stakeholders and to document their response.

**E.2. Summary of the comments received:**

October 12<sup>th</sup>, 2007 from Gas & Electricidad S.A.: Detailed description of existing measurement systems for diesel, natural gas and electricity generation. Correction of net calorific value of natural gas and description of historical data and documentation available for verification and monitoring.

Historical information on diesel generation under the responsibility of COSERCA has been received on November 24, 2007 for the period before 2004. Environmental permits from responsible national Environmental Authority for the Pampa Colorada Power Plant were made available by the owner of the project.

**E.3. Report on how due account was taken of any comments received:**

The information received from October 12<sup>th</sup> through November 24<sup>th</sup>, 2007 from Gas & Electricidad S.A. has been introduced in the PDD with an improvement of precision and accuracy of the emission calculations and documentation and the obtention of significantly conservative results.

## ANNEX I

### CONTACT INFORMATION ON PARTICIPANTS IN PROJECT ACTIVITY

Organization:	Gas & Electricidad S.A.
Street/P.O.Box:	Avenida del Maestro N° 372
Building:	---
City:	Sucre
State/Region:	Chuquisaca
Postfix/ZIP:	n.a.
Country:	Bolivia
Telephone:	591-4-64-60006
FAX:	591-4-64-60005
E-Mail:	info@emdigas.com
URL:	<a href="http://www.emdigas.com">www.emdigas.com</a>
Represented by:	Jorge Calderón Zuleta
Title:	Executive President
Salutation:	Mr. President
Last Name:	Calderón Zuleta
Middle Name:	--
First Name:	Jorge
Department:	Presidency
Mobile:	591-728-79100
Direct FAX:	591-4-6460005
Direct tel:	591-4-64-60006
Personal E-Mail:	jorge@emdigas.com

Organization:	E&Co
Street/P.O.Box:	383 Franklin Street
Building:	Energy House
City:	Bloomfield
State/Region:	New Jersey
Postfix/ZIP:	NJ 07003
Country:	U.S.A.
Telephone:	1-973-680-9100
FAX:	1-973-680-8066
E-Mail:	<a href="mailto:philip.larocco@eandco.net">philip.larocco@eandco.net</a>
URL:	<a href="http://www.EandCo.net">www.EandCo.net</a>
Represented by:	Philip LaRocco
Title:	Executive Director
Salutation:	Mr. Director
Last Name:	LaRocco
Middle Name:	--

First Name:	Philip
Department:	--
Mobile:	--
Direct FAX:	1-973-680-8066
Direct tel:	1-973-680-9100
Personal E-Mail:	<a href="mailto:philip.larocco@eandco.net">philip.larocco@eandco.net</a>

**ANNEX 2**

**INFORMATION REGARDING PUBLIC FUNDING**

N.A. (no public funding)
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## ANNEX 3

### BASELINE INFORMATION

#### 1. CONVERSION AND EMISSION FACTORS

##### Conversion and Emission Factors

<b>EF<sub>Diesel,BL</sub></b>	<b>74.8</b>	<b>tCO<sub>2</sub>/TJ</b>
<b>NCV<sub>Diesel,BL</sub> (*)</b>	<b>20000</b>	<b>Btu/lb</b>
<b>NCV Diesel (2006 IPCC Guidelines)</b>	<b>43.3</b>	<b>TJ/Gg</b>
<b>Conversion Factor</b>	<b>947.8171203</b>	<b>MMBtu/TJ</b>
<b>EF<sub>Diesel,BL</sub></b>	<b>0.078918</b>	<b>tCO<sub>2</sub>/MMBtu</b>
<b>Specific Consumption of Diesel (Bolivian Standard, NVC)</b>	<b>11376</b>	<b>Btu/kWh</b>
<b>Specific Consumption of Diesel (2006 IPCC Guidelines, NCV)</b>	<b>10588</b>	<b>Btu/kWh</b>
<b>Specific Consumption of Diesel</b>	<b>0.30</b>	<b>liter/kWh</b>
<b>Upper Diesel specific density</b>	<b>0.860</b>	<b>kg/liter</b>
<b>EF<sub>Diesel,BL</sub> (Bolivian Standard, NCV)</b>	<b>0.898</b>	<b>tCO<sub>2</sub>/MWh</b>
<b>EF<sub>Diesel,BL</sub> (2006 IPCC Guidelines, NCV)</b>	<b>0.836</b>	<b>tCO<sub>2</sub>/MWh</b>
<b>EF<sub>n.g.,BL</sub></b>	<b>58.3</b>	<b>tCO<sub>2</sub>/TJ</b>
<b>NCV<sub>n.g.</sub> (**)</b>	<b>Btu/Cft</b>	
	<b>Maximum</b>	<b>1132</b>
	<b>Minimum</b>	<b>1071</b>
<b>Specific Consumption of Natural Gas</b>	<b>Year</b>	<b>MMBtu/MWh</b>
	<b>2004</b>	<b>12489</b>
	<b>2005</b>	<b>12516</b>
	<b>2006</b>	<b>11954</b>
	<b>2007</b>	<b>12469</b>
	<b>2008-2014</b>	<b>12316</b>
<b>EF<sub>n.g.,y</sub></b>	<b>0.06151</b>	<b>tCO<sub>2</sub>/MMBtu</b>
<b>EF<sub>n.g.,y</sub></b>	<b>Year</b>	<b>tCO<sub>2</sub>/MWh</b>
	<b>2004</b>	<b>0.7682</b>
	<b>2005</b>	<b>0.7699</b>
	<b>2006</b>	<b>0.7353</b>
	<b>2007</b>	<b>0.7670</b>
	<b>2008-2014</b>	<b>0.7576</b>

(\*) Supreme Decree Nr. 26276, Regulation of quality of hydrocarbons and lubricants, Specifications Table Nr. "1, Diesel Oil.

(\*\*) NCV analysis of natural gas in Pampa Colorada Power Plant  
See Annex 3, Paragraph 4.5

## 2. BASELINE CALCULATIONS

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Energy Production (MWh)	2044	2051	2147	2571	3522	3816	4015	4190	4404	4629	5092	5601	6161	6778
Baseline Emissions (tCO <sub>2</sub> )	1708.0	1713.9	1794.1	2148.4	2943.1	3188.7	3355.0	3501.3	3680.1	3868.2	4255.0	4680.5	5148.6	5663.5

## 3. EMISSION REDUCTION CALCULATIONS

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Energy Production (MWh)	2147	2571	3522	3816	4015	4190	4404	4629	5092	5601	6161	6778
Baseline Emissions (tCO <sub>2</sub> )	1794.1	2148.4	2943.1	3188.7	3355.0	3501.3	3680.1	3868.2	4255.0	4680.5	5148.6	5663.5
Energy Generation with Diesel (MWh)		725	68	92	72	90	99	109	120	132	145	159
Default Coefficient Diesel (tCO <sub>2</sub> /MWh)	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836	0.836
Diesel Generation Emissions (tCO <sub>2</sub> )	1794.1	605.8	56.8	76.9	60.2	75.2	82.7	91.0	100.1	110.1	121.1	133.2
Energy Generation with Natural Gas (MWh)		1846	3454	3724	3942	4100	4305	4520	4746	4984	5233	5494
Default Coef. Natural Gas (tCO <sub>2</sub> /MWh)	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766	0.6766
Natural Gas Emissions (tCO <sub>2</sub> )		1249	2337	2520	2667	2774	2913	3058	3211	3372	3541	3718
Total Emissions with Project Activity (tCO <sub>2</sub> )		1854.8	2393.8	2596.6	2727.4	2849.3	2995.5	3149.4	3311.5	3482.0	3661.6	3850.8
Emission reductions (tCO <sub>2</sub> )		293.5	549.2	592.2	627.7	652.0	684.6	718.8	943.6	1198.5	1487.0	1812.7

The calculations presented above are to be found in Appendix I to this Annex 3, in worksheets.

## 4. PRODUCTION STATISTICS AND DOCUMENTATION

### Registers of Electricity Generation with Diesel

**HISTORIC DATA ACCORDING TO COSERCA'S 2004 YEARBOOK**

YEAR	TOTAL DIESEL GENERATION IN MWH	DIESEL CONSUMED IN GENERATION IN LITERS	AVERAGE DIESEL CONSUMPTION L/KWH
2001	2044760	742912	0.36
2002	2154210	803480	0.37
2003	2146810	818920	0.38

## Registers of Electricity Generation with Natural Gas in Pampa Colorado

### STATISTICAL INFORMATION - PAMPA COLORADA POWER PLANT - CAMARGO

<b>COMPANY</b>	GESA
<b>Power Plant</b>	Pampa Colorado

Date	Firm Available Capacity (MW)	Maximum Demand (MW)	Gross Energy Generation (MWh)	Net Energy Generation (MWh)	Natural Gas Consumption (Mcft)
May-2004	0.60	0.60	236.78	215.18	2,521.91
Jun-2004	0.60	0.60	231.84	216.74	2,544.53
Jul-2004	0.60	0.60	241.25	224.45	2,635.04
Ago-2004	0.60	0.59	221.85	204.75	2,403.80
Sep-2004	0.60	0.59	222.82	206.92	2,429.18
Oct-2004	0.60	0.60	239.00	211.80	2,746.00
Nov-2004	0.60	0.60	213.34	190.02	2,673.00
Dic-2004	0.60	0.56	239.14	213.05	2,828.00
Ene-2005	0.60	0.58	242.21	216.76	3,143.00
Feb-2005	0.60	0.58	255.20	228.78	3,139.00
Mar-2005	0.60	0.58	288.14	257.06	3,545.00
Abr-2005	0.60	0.59	280.68	250.44	3,580.00
May-2005	0.60	0.59	270.98	241.39	2,796.00
Jun-2005	0.85	0.73	270.33	248.14	2,873.00
Jul-2005	0.85	0.75	298.64	268.60	3,417.00
Ago-2005	0.85	0.81	310.09	280.13	3,294.00
Sep-2005	0.85	0.83	301.75	271.92	3,238.00
Oct-2005	0.85	0.80	318.76	288.21	3,438.00
Nov-2005	0.85	0.82	306.88	277.33	3,308.60
Dic-2005	0.85	0.79	310.06	279.38	3,396.24
Ene-2006	0.85	0.80	318.25	286.90	3,446.00
Feb-2006	0.85	0.82	288.36	260.87	3,134.00
Mar-2006	0.85	0.83	330.10	299.84	4,076.00
Abr-2006	0.85	0.81	233.34	211.54	2,569.00
May-2006	0.85	0.84	332.28	301.82	3,561.00
Jun-2006	0.85	0.84	313.36	283.09	3,767.00
Jul-2006	0.60	0.60	317.05	285.31	3,800.00
Ago-2006	0.60	0.57	319.41	286.58	3,106.00
Sep-2006	0.85	0.81	307.59	275.81	3,245.00
Oct-2006	0.85	0.81	330.56	301.92	3,503.00
Nov-2006	0.85	0.84	314.60	289.79	3,293.00
Dic-2006	0.85	0.84	319.10	295.16	3,388.00
Ene-2007	0.85	0.85	330.65	305.08	3,533.00
Feb-2007	0.85	0.84	300.54	278.12	3,481.00
Mar-2007	0.85	0.83	328.43	304.60	3,540.00
Abr-2007	0.85	0.82	306.51	283.72	3,577.00
May-2007	0.85	0.81	328.34	303.36	3,770.00
Jun-2007	0.85	0.81	334.22	308.50	3,864.00
Jul-2007	0.85	0.82	350.41	323.21	4,176.00
Ago-2007	0.85	0.81	347.44	317.08	4,111.00
Sep-2007	0.85	0.82	323.71	295.90	3,863.00
Oct-2007	0.85	0.81	332.08	299.10	3,845.00

Source: ISE 110 Forms, Superintendence of Electricity

## Registers of Diesel Consumption in Pampa Colorado Power Plant

HISTORIC DIESEL DEMAND FOR POWER GENERATION IN CAMARGO												
SOURCE: COSERCA (POWER DISTRIBUTION UTILITY)												
Date	English G-2			Caterpillar G-3			Caterpillar G-4			Tot. Gen.	Tot. diesel	liters/kWh
	Diesel (liters)	kWh	Hrs Tot.	Diesel (liters)	kWh	Hrs Tot.	Diesel (liters)	kWh	Hrs Tot.			
May-04	0	0	00:00:00	214	536	14:30:00	0	0	00:00:00	536	214	0.40
Jun-04	0	0	00:00:00	718	1303.2	45:55:00	0	0	00:00:00	1303.2	718	0.55
Jul-04	740	1420	12:30:00	1055	1552	58:22:00	642	1216.8	33:43:00	4188.8	2437	0.58
Ago-04	0	0	00:00:00	525	792	31:15:00	814	1538.4	47:30:00	2330.4	1339	0.57
Sep-04	0	160	00:45:00	324	454.4	21:46:00	887	1783.2	66:20:00	2397.6	1211	0.51
Oct-04	0	0	00:00:00	251	370.4	18:19:00	1001	2274.4	67:59:00	2644.8	1252	0.47
Nov-04	270	580	03:40:00	793	1396	53:00:00	1040	2582.4	65:31:00	4558.4	2103	0.46
Dic-04	660	1390	09:04:00	750	1150.4	52:45:00	1261	3244.8	71:10:00	5785.2	2671	0.46
<b>Total 2004</b>	<b>1670</b>	<b>3550</b>		<b>4630</b>	<b>7554.4</b>		<b>5645</b>	<b>12640</b>		<b>23744.4</b>	<b>11945</b>	<b>0.50</b>
Ene-05	1230	2290	18:57:00	795	1236	53:50:00	1175	3081.6	69:29:00	6607.6	3200	0.48
Feb-05	2010	4060	31:10:00	905	1649.6	50:10:00	1022	2539.2	57:12:00	8248.8	3937	0.48
Mar-05	2960	6290	49:25:00	1006	1745.6	59:11:00	1149	2752.8	67:13:00	10788.4	5115	0.47
Abr-05	3460	8130	58:10:00	960	1658.4	58:36:00	1110	2824	67:57:00	12612.4	5530	0.44
May-05	3970	9430	67:57:00	966	1696	58:39:00	1290	3113.6	74:43:00	14239.6	6226	0.44
Jun-05	3730	8480	54:20:00	677	1186.4	33:40:00	1229	2869.6	61:00:00	12536	5636	0.45
Jul-05	690	1600	10:25:00	93	156.8	05:45:00	238	606.4	13:20:00	2363.2	1021	0.43
Ago-05	350	840	05:15:00	53	94.4	03:15:00	127	331.2	06:25:00	1265.6	530	0.42
Sep-05	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Oct-05	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Nov-05	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Dic-05	25	0	00:30:00	30	76	02:05:00	45	122.4	03:00:00	198.4	100	0.5
<b>Total 2005</b>	<b>8765</b>	<b>20350</b>		<b>5485</b>	<b>9499.2</b>		<b>7385</b>	<b>18240.8</b>		<b>68660</b>	<b>31295</b>	<b>0.45</b>
Ene-06	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Feb-06	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Mar-06	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Abr-06	4040	9300	60:45:00	1110	2076	72:20:00	1260	3017.6	62:25:00	14393.6	6410	0.45
May-06	0	0	00:00:00	0	0	00:00:00	0	0	00:00:00	0	0	
Jun-06	5340	12860	86:10:00	1500	2753.6	88:15:00	1790	4417.6	96:45:00	20031.2	8630	0.43
Jul-06	4995	11520	83:40:00	1513	2739.2	99:20:00	1692	4444.8	105:25:00	18704	8200	0.44
Ago-06	5900	13350	93:20:00	1785	3160	109:00:00	1905	5084.8	112:25:00	21594.8	9590	0.44
Sep-06	4515	9960	73:00:00	1350	2392	84:25:00	1413	3728	89:45:00	16080	7278	0.45
Oct-06	300	620	05:00:00	80	132	04:05:00	75	176	04:00:00	928	455	0.49
Nov-06	0	0	00:00:00	25	47.2	00:45:00	63	145.6	03:20:00	192.8	88	0.46
Dic-06	0	0	00:00:00	25	40	01:30:00	53	104	03:20:00	144	78	0.54
<b>Total 2006</b>	<b>25090</b>	<b>57610</b>		<b>7388</b>	<b>13340</b>		<b>8251</b>	<b>21118.4</b>		<b>92068.4</b>	<b>40729</b>	<b>0.44</b>
Ene-07	0	0	00:00:00	15	22.4	00:23:00	75	148	05:05:00	170.4	90	0.53
Feb-07	0	0	00:00:00	24	32.8	01:50:00	137	218.4	10:20:00	251.2	161	0.64
Mar-07	0	0	00:00:00	164	244.5	09:15:00	478	846.4	23:25:00	1090.9	642	0.59
Abr-07	0	0	00:00:00	251	451.2	16:40:00	327	817.6	19:50:00	1268.8	578	0.46
May-07	130	270	00:00:00	190	360.8	10:35:00	277	992	18:26:00	1622.8	597	0.37
Jun-07	1500	2700	26:45:00	0	0	00:00:00	1365	2988	61:32:00	5688	2865	0.5
<b>Total 2007</b>	<b>1630</b>	<b>2970</b>		<b>1182</b>	<b>2119.7</b>		<b>3681</b>	<b>8442.4</b>		<b>13532.1</b>	<b>6493</b>	<b>0.48</b>
<b>Total</b>	<b>46815</b>	<b>105250</b>	<b>750:48:00</b>	<b>18685</b>	<b>32513</b>	<b>1149:13:00</b>	<b>24962</b>	<b>60442</b>	<b>1432:27:00</b>	<b>198204.9</b>	<b>90462</b>	<b>0.46</b>

## Specific Fuel Consumption in Pampa Colorado Power Plant

Date	Gross Energy Generation (MWh)	Natural Gas Consumption (Mcft)	Specific Natural Gas Consumption (Cft/kWh)	Average Specific Natural Gas Consumption (Cft/kWh)
May-2004	236.78	2,521.91	10.651	11.257
Jun-2004	231.84	2,544.53	10.975	
Jul-2004	241.25	2,635.04	10.922	
Ago-2004	221.85	2,403.80	10.835	
Sep-2004	222.82	2,429.18	10.902	
Oct-2004	239.00	2,746.00	11.490	
Nov-2004	213.34	2,673.00	12.530	
Dic-2004	239.14	2,828.00	11.826	
Ene-2005	242.21	3,143.00	12.976	11.341
Feb-2005	255.20	3,139.00	12.300	
Mar-2005	288.14	3,545.00	12.303	
Abr-2005	280.68	3,580.00	12.755	
May-2005	270.98	2,796.00	10.318	
Jun-2005	270.33	2,873.00	10.628	
Jul-2005	298.64	3,417.00	11.442	
Ago-2005	310.09	3,294.00	10.623	
Sep-2005	301.75	3,238.00	10.731	
Oct-2005	318.76	3,438.00	10.785	
Nov-2005	306.88	3,308.60	10.782	
Dic-2005	310.06	3,396.24	10.953	
Ene-2006	318.25	3,446.00	10.828	10.980
Feb-2006	288.36	3,134.00	10.868	
Mar-2006	330.10	4,076.00	12.348	
Abr-2006	233.34	2,569.00	11.010	
May-2006	332.28	3,561.00	10.717	
Jun-2006	313.36	3,767.00	12.021	
Jul-2006	317.05	3,800.00	11.985	
Ago-2006	319.41	3,106.00	9.724	
Sep-2006	307.59	3,245.00	10.550	
Oct-2006	330.56	3,503.00	10.597	
Nov-2006	314.60	3,293.00	10.467	
Dic-2006	319.10	3,388.00	10.617	
Ene-2007	330.65	3,533.00	10.685	11.504
Feb-2007	300.54	3,481.00	11.583	
Mar-2007	328.43	3,540.00	10.779	
Abr-2007	306.51	3,577.00	11.670	
May-2007	328.34	3,770.00	11.482	
Jun-2007	334.22	3,864.00	11.561	
Jul-2007	350.41	4,176.00	11.918	
Ago-2007	347.44	4,111.00	11.832	
Sep-2007	323.71	3,863.00	11.933	
Oct-2007	332.08	3,845.00	11.579	

Source: ISE 110 Forms, Superintendence of Electricity

## Reports on Natural Gas Chromatographic Analysis in Pampa Colorado Power Plant

**Volumes and Chromatographic Analysis of Natural Gas Delivered to Gas & Electricida S.A. in El Puente Measuremet Station for El Puente and Camargo Power Plants: Years 2004 - 2007**

2004	Volume	Chemical Composition												
	Scft	N2	CO2	C1	C2	C3	IC4	NC4	IC5	NC5	C6+	Total	Specific Gravity	Btu/cft
Ene	7,595,000	1.94	0.49	86.26	6.78	3.07	0.21	0.90	0.15	0.12	0.08	100.00	0.654	1,104
Feb	6,862,000	1.89	0.51	86.01	6.81	3.11	0.50	0.83	0.15	0.11	0.08	100.00	0.658	1,109
Mar	6,294,000	2.26	-	85.63	7.00	3.30	0.52	0.93	0.15	0.13	0.08	100.00	0.659	1,119
Abr	8,003,000													
May	9,306,000	2.19	0.03	85.71	6.89	3.22	0.55	0.98	0.17	0.15	0.11	100.00	0.661	1,122
Jun	9,894,000	1.92	0.10	87.38	6.15	2.73	0.43	0.81	0.18	0.16	0.14	100.00	0.649	1,104
Jul	9,840,000	1.96	0.08	87.34	6.25	2.72	0.44	0.80	0.16	0.14	0.11	100.00	0.648	1,104
Ago	10,396,000													1,118
Sep	9,862,000	2.52	0.07	85.11	6.40	2.94	1.48	1.05	0.17	0.15	0.11	100.00	0.672	1,132
Oct	9,811,000													1,110
Nov	9,724,000	1.23	0.90	88.20	5.89	2.37	0.39	0.64	0.16	0.12	0.10	100.00	0.644	1,088
Dic	10,751,000													1,095

2005	Volume	Chemical Composition												
	Scft	N2	CO2	C1	C2	C3	IC4	NC4	IC5	NC5	C6+	Total	Specific Gravity	Btu/cft
Ene	10,475,000													
Feb	10,369,000	2.00	0.09	87.32	6.37	2.76	0.37	0.74	0.14	0.12	0.09	100.00	0.646	1,101
Mar	12,289,000	1.78	0.46	87.23	6.27	2.71	0.42	0.75	0.16	0.12	0.10	100.00	0.649	1,098
Abr	11,384,000	0.59	1.98	89.03	5.38	1.86	0.35	0.44	0.15	0.10	0.12	100.00	0.640	1,068
May	10,739,000	2.22	0.17	86.41	6.58	2.96	0.52	0.76	0.16	0.13	0.09	100.00	0.653	1,105
Jun	11,120,000	2.11	0.03	85.84	6.96	3.27	0.49	0.92	0.16	0.13	0.09	100.00	0.658	1,118
Jul	11,688,000	2.24	0.04	85.59	6.91	3.22	0.56	1.03	0.18	0.14	0.09	100.00	0.662	1,120
Ago	11,203,000	1.82	0.54	86.03	6.82	3.03	0.52	0.83	0.18	0.14	0.09	100.00	0.659	1,112
Sep	11,074,000	2.14	0.04	85.88	6.81	3.18	0.56	0.99	0.18	0.14	0.08	100.00	0.659	1,119
Oct	12,904,000	1.32	1.20	87.28	6.48	2.43	0.39	0.56	0.15	0.10	0.09	100.00	0.648	1,086
Nov	12,673,000	0.96	1.54	86.89	6.68	2.59	0.42	0.59	0.15	0.10	0.08	100.00	0.653	1,091
Dic	13,128,000	0.55	1.92	87.16	6.63	2.42	0.43	0.54	0.16	0.10	0.09	100.00	0.653	1,088

2,006	Volumen	Chemical Composition												
	Scft	N2	CO2	C1	C2	C3	IC4	NC4	IC5	NC5	C6+	Total	Specific Gravity	Btu/cft
Ene	12,679,000	0.50	2.24	87.02	6.58	2.41	0.41	0.52	0.15	0.09	0.08	100.00	0.654	1,085
Feb	11,607,000	0.51	2.16	87.31	6.42	2.33	0.41	0.52	0.16	0.09	0.09	100.00	0.653	1,083
Mar	12,779,000	0.59	1.99	87.14	6.57	2.43	0.42	0.54	0.15	0.09	0.08	100.00	0.653	1,086
Abr	8,995,000	0.46	1.60	88.05	6.30	2.44	0.35	0.48	0.14	0.09	0.09	100.00	0.646	1,087
May	12,717,000	0.94	1.40	87.35	6.49	2.56	0.37	0.56	0.14	0.10	0.09	100.00	0.650	1,090
Jun	12,121,000	2.40	0.03	86.05	6.76	3.13	0.44	0.82	0.15	0.13	0.09	100.00	0.655	1,107
Jul	13,057,000	0.70	1.68	87.22	6.52	2.56	0.40	0.59	0.14	0.10	0.09	100.00	0.652	1,091
Ago	13,691,000	0.56	1.92	87.78	6.27	2.28	0.37	0.49	0.14	0.09	0.10	100.00	0.648	1,082
Sep	13,779,000	0.52	1.95	87.85	6.15	2.21	0.41	0.54	0.16	0.10	0.11	100.00	0.649	1,082
Oct	11,991,000	0.80	1.88	87.21	6.54	2.41	0.37	0.48	0.13	0.09	0.09	100.00	0.651	1,082
Nov	14,136,000	0.98	1.46	87.26	6.47	2.51	0.40	0.59	0.14	0.10	0.09	100.00	0.651	1,090
Dic	14,638,000	1.39	0.99	86.65	6.64	2.79	0.44	0.72	0.16	0.12	0.10	100.00	0.655	1,100

2007	Volume	Chemical Composition												
	Scft	N2	CO2	C1	C2	C3	IC4	NC4	IC5	NC5	C6+	Total	Specific Gravity	Btu/cft
Ene	14,626,000	0.49	1.92	87.50	6.51	2.38	0.37	0.50	0.14	0.09	0.10	100.00	0.650	1,086
Feb	12,649,000	0.52	1.93	87.54	6.45	2.34	0.38	0.51	0.15	0.10	0.08	100.00	0.650	1,084
Mar	15,547,000	0.62	1.92	87.45	6.45	2.34	0.38	0.52	0.15	0.09	0.08	100.00	0.650	1,084
Abr	14,019,000	0.99	1.44	86.85	6.73	2.65	0.41	0.62	0.14	0.10	0.07	100.00	0.653	1,094
May	15,028,000	1.99	0.49	85.76	6.94	3.12	0.47	0.88	0.15	0.12	0.08	100.00	0.659	1,110
Jun	14,876,000	1.06	1.36	86.60	6.82	2.75	0.41	0.66	0.15	0.11	0.08	100.00	0.655	1,097
Jul	15,253,000	0.55	2.00	88.74	5.56	1.93	0.35	0.48	0.17	0.10	0.12	100.00	0.643	1,071
Ago	15,279,000	0.51	1.99	88.73	5.60	1.96	0.34	0.48	0.17	0.10	0.12	100.00	0.643	1,072
Sep	17,279,000	0.51	1.98	88.72	5.60	1.96	0.34	0.47	0.17	0.11	0.14	100.00	0.643	1,073

## ANNEX 4

### MONITORING AND VERIFICATION INFORMATION

**Monitoring and certification data for CO<sub>2</sub> emission reduction  
in Pampa Colorada Power Plant – Camargo – Bolivia  
Natural Gas Fired Generation  
Year: 2004**

Date of Measurement	Parameters				
	EL <sub>n,g,y</sub> (MWh)		Natural Gas Consumption	Net calorific value Nat. Gas	SCF <sub>n,g,y</sub>
	Gross Generated	Net sold	MCft	Btu/Cft	Specific Fuel Consumption (MMBtu/MWh)
January 31					
February 28					
March 31					
April 30					
May 431	236.78	215.18	2521.9096	1122	11950.26
June 30	231.84	216.74	2544.5276	1104	12116.80
July 31	241.25	224.45	2635.043	1104	12058.39
August 31	221.853	204.753	2403.80022	1118	12113.65
September 30	222.815	206.915	2429.1821	1132	12341.33
October 31	239	211.802	2746	1110	12753.39
November 30	213.335	190.024	2673	1088	13632.19
December 31	239.14	213.052	2828	1095	12949.15
<b>Total</b>	<b>1846.013</b>	<b>1682.916</b>	<b>20781.46252</b>		<b>12489.40</b>

N.B. Data in yellow boxes were interpolated, because the gas transport company did not perform the chromatographic gas analysis

**Monitoring and certification data for CO<sub>2</sub> emission reduction  
in Pampa Colorada Power Plant – Camargo – Bolivia  
Natural Gas Fired Generation  
Year: 2005**

Date of Measurement	Parameters				
	EL <sub>n,g,y</sub> (MWh)		Natural Gas Consumption	Net calorific value Nat. Gas	SCF <sub>n,g,y</sub>
	Gross Generated	Net sold	MCft	Btu/Cft	Specific Fuel Consumption (MMBtu/MWh)
January 31	242.21	216.756	3143	1095	14209.10
February 28	255.2	228.78	3139	1101	13542.47
March 31	288.14	257.064	3545	1098	13508.75
April 30	280.68	250.436	3580	1068	13622.06
May 431	270.98	241.392	2796	1105	11401.51
June 30	270.33	248.136	2873	1118	11881.83
July 31	298.638	268.598	3417	1120	12814.98
August 31	310.0897	280.132	3294	1112	11812.48
September 30	301.7518	271.919	3238	1119	12007.62
October 31	318.762	288.208	3438	1086	11713.03
November 30	306.876	277.32912	3308.6	1091	11762.67
December 31	310.062	279.375	3396.24	1088	11917.32
<b>Total</b>	<b>3453.7195</b>	<b>3108.12512</b>	<b>39167.84</b>		<b>12516.15</b>

N.B. Data in yellow boxes were interpolated, because the gas transport company did not perform the chromatographic gas analysis

**Monitoring and certification data for CO<sub>2</sub> emission reduction  
in Pampa Colorado Power Plant – Camargo – Bolivia  
Natural Gas Fired Generation  
Year: 2006**

Date of Measurement	Parameters				
	EL <sub>n,g,y</sub> (MWh)		Natural Gas Consumption	Net calorific value Nat. Gas	SCF <sub>n,g,y</sub>
	Gross Generated	Net sold	MCft	Btu/Cft	Specific Fuel Consumption (MMBtu/MWh)
January 31	318.252	286.9	3446	1085	11748.27
February 28	288.359	260.869	3134	1083	11770.47
March 31	330.1	299.844	4076	1086	13409.68
April 30	233.338	211.538	2569	1087	11967.63
May 431	332.277	301.822	3561	1090	11681.49
June 30	313.361	283.086	3767	1107	13307.56
July 31	317.05	285.308	3800	1091	13076.17
August 31	319.405	286.58	3106	1082	10521.73
September 30	307.589	275.812	3245	1082	11414.88
October 31	330.559	301.92	3503	1082	11466.17
November 30	314.597	289.792	3293	1090	11409.42
December 31	319.1	295.16	3388	1100	11679.10
<b>Total</b>	<b>3723.987</b>	<b>3378.631</b>	<b>40888</b>		<b>11954.38</b>

**Monitoring and certification data for CO<sub>2</sub> emission reduction  
in Pampa Colorado Power Plant – Camargo – Bolivia  
Natural Gas Fired Generation  
Year: 2007**

Date of Measurement	Parameters				
	EL <sub>n,g,y</sub> (MWh)		Natural Gas Consumption	Net calorific value Nat. Gas	SCF <sub>n,g,y</sub>
	Gross Generated	Net sold	MCft	Btu/Cft	Specific Fuel Consumption (MMBtu/MWh)
January 31	330.652	305.075	3533	1086	11603.86
February 28	300.536	278.124	3481	1084	12555.58
March 31	328.431	304.595	3540	1084	11683.92
April 30	306.508	283.723	3577	1094	12767.16
May 431	328.341	303.363	3770	1110	12744.98
June 30	334.22	308.5	3864	1097	12682.69
July 31	350.407	323.208	4176	1071.1	12764.91
August 31	347.443	317.08	4111	1072.2	12686.44
September 30	323.714	295.896	3863	1073.2	12806.90
October 31	332.079	299.096	3845	1071.2	12402.96
November 30					
December 31					
<b>Total</b>	<b>3282.331</b>	<b>3018.66</b>	<b>37760</b>		<b>12469.94</b>

**SpecificCO<sub>2</sub> Emissions for Electricity Production in Pampa Colorado Power Plant**

$$PE_{n,g,y} = EL_{n,g,y} \times EF_{n,g,y}$$

$$EF_{n,g,y} = 0,06151 \times SFC_{n,g,y}$$

Year	Btu/kWh	tCO <sub>2</sub> /MWh
2004	12489	0.7682
2005	12516	0.7699
2006	11954	0.7353
2007	12469	0.7670
2008 - 20014	12316	0.7576

Default Emission Factor for Natural Gas: 50.30 tCO<sub>2</sub>/TJ

Conversion Factor: 947.817120313 MMBtu/TJ

### Emergency Diesel Generation

#### Pampa Colorada Power Plant – Camargo, Bolivia

Year: 2004

Date of Measurement	EL <sub>diesel,y</sub> (MWh)	Diesel consumed (liters)	CO <sub>2</sub> Emissions Tonnes
January 31			
February 28			
March 31			
April 30			
May 431	0.536	214	0.481
June 30	1.3032	718	1.170
July 31	4.1888	2437	3.761
August 31	2.3304	1339	2.092
September 30	2.3976	1211	2.153
October 31	2.6448	1252	2.374
November 30	4.5584	2103	4.092
December 31	5.7852	2671	5.194
<b>Total</b>	<b>23.7444</b>		<b>21.317</b>
		= PE <sub>emergency,y</sub>	<b>21.317</b>

### Emergency Diesel Generation

#### Pampa Colorada Power Plant – Camargo, Bolivia

Year: 2005

Date of Measurement	EL <sub>diesel,y</sub> (MWh)	Diesel consumed (liters)	CO <sub>2</sub> Emissions Tonnes
January 31	6.6076	3200	5.932
February 28	8.2488	3937	7.406
March 31	10.7884	5115	9.686
April 30	12.6124	5530	11.323
May 431	14.2396	6226	12.784
June 30	12.536	5636	11.254
July 31	2.3632	1021	2.122
August 31	1.2656	530	1.136
September 30	0	0	0.000
October 31	0	0	0.000
November 30	0	0	0.000
December 31	0.1984	100	0.178
<b>Total</b>	<b>68.86</b>		<b>61.821</b>
		= PE <sub>emergency,y</sub>	<b>61.821</b>

**Emergency Diesel Generation**  
**Pampa Colorada Power Plant – Camargo, Bolivia**  
**Year: 2006**

Date of Measurement	EL <sub>diesel,y</sub> (MWh)	Diesel consumed (liters)	CO <sub>2</sub> Emissions Tonnes
January 31	0	0	0
February 28	0	0	0
March 31	0	0	0
April 30	14.3936	6410	12.922
May 431	0	0	0.000
June 30	20.0312	8630	17.983
July 31	18.704	8200	16.792
August 31	21.5948	9590	19.387
September 30	16.08	7278	14.436
October 31	0.928	455	0.833
November 30	0.1928	88	0.173
December 31	0.144	78	0.129
<b>Total</b>	<b>92.0684</b>		<b>82.657</b>
		= PE <sub>emergency,y</sub>	<b>82.657</b>

**Emergency Diesel Generation**  
**Pampa Colorada Power Plant – Camargo, Bolivia**  
**Year: 2007**

Date of Measurement	EL <sub>diesel,y</sub> (MWh)	Diesel consumed (liters)	CO <sub>2</sub> Emissions Tonnes
January 31	0.1704	90	0.153
February 28	0.2512	161	0.226
March 31	1.0909	642	0.979
April 30	1.2688	578	1.139
May 431	1.6228	597	1.457
June 30	3.44	1560	3.088
July 31	5.688	2865	5.107
August 31	6.188	3009	5.555
September 30	5.816	2513	5.221
October 31	7.902	3350	7.094
November 30			
December 31			
<b>Total</b>	<b>33.4381</b>		<b>30.020</b>
		= PE <sub>emergency,y</sub>	<b>30.020</b>

$$ER = BE_{elec,y} - PE_y$$

$$PE_y = PE_{n.g,y} + PE_{emergency,y}$$

## ANNEX 5

### DESCRIPTION OF MEASUREMENT, REGISTER AND MONITORING SYSTEM OF POWER PLANT EQUIPMENT IN PAMPA COLORADA

#### Background

The Pampa Colorado Power plant was implemented in 2004 in order to minimize and eventually stop existing diesel power generation, consisting in two 500 kW English Electric diesel gensets and two 50 kW CAT D33 gensets arranged in parallel, sending all generation to electro-mechanic metering and then to a single 10000:24900 V, 1 MVA, step-up voltage transformer which feeds the distribution grid operated by COSERCA.

The new gas fired plant consists in a separate array of three 260 kW Guascor FLGD 180 gensets (original setting since 2004) plus one 320 kW Guascor FGLD 240 genset (first power up-grade made in 2006). Because altitude and temperature de-rating total available power is 900 kW, however, plant self demand including refrigeration pumps, forced ventilation, illumination and special power charges add up a total of 50 kW, leaving 850 kW available for exporting to the grid.

This gas fired power plant is synchronized and set in parallel in 380 V in a single power cabinet where gross power generation is monitored in a fully automatic PLC programmed system and metered in an electro-mechanic, class 1, energy meter. This power cabinet feeds all internal energy demand of the power plant and then sends the rest of the generation to a electronic class 0.5 power meter meant for invoicing and fiscal reports. Then, immediately, the available generation goes through a 380:24900, 1 MVA, step-up transformer connected to COSERCA grid and capable to work in parallel to the separate diesel generation stream.

Gas & Electricidad S.A. operates the gas fired power plant, whereas COSERCA operates the diesel plant whenever it is necessary depending on demand profile, emergency or planned maintenance over gas fired power plant.

#### Measurement Procedures

##### 1) Diesel Power Plant

- a. Diesel Fuel: Diesel is provided and managed by COSERCA who buys it clearing all regulations from the local diesel refueling station, regularly in 5,000 or 10,000 liter closed cistern batches. Then diesel is placed at COSERCA's central storage facility next to the power plant where total available volume is calculated by the wet altitude in a removable scale. Diesel is then withdrawn normally on a daily basis from the central storage tank using-fixed volume containers to refuel engine-side fuel tanks in each genset. COSERCA holds and is solely responsible of the spreadsheet detailing the balance of consumed and remaining diesel on a daily and monthly basis if any diesel is consumed.
- b. Power Generation: COSERCA personnel holds control of spreadsheets detailing power generation parameters including generated energy, maximum power

generated, quality parameters, operation time (normally during peak hours) and diesel consumed. All spreadsheets can be identified by date and responsible for operations.

## 2) Natural Gas Power Plant

- a. Natural Gas: It is provided by the El Puente-Camargo pipeline which feeds only the power plant. Control spreadsheets are filled on hourly basis by G&E personnel taking account of metered gas at the inlet point of the Pampa Colorada Power plant. This information is crossed to the total amount of gas received at El Puente, leading to efficiency ratios for both plants which should trigger any abnormal situation as excessive gas consumption or gas leakage in the pipeline. Yearly, Transredes, the firm in charge of the gas transportation to El Puente holds coordinated calibration procedures for such metering station, whereas the providing firm for the metering system in Pampa Colorada, ICI Ltda., gives calibrations services for such metering system. Transredes also issues at least three (3) chromatographic analysis for the supplied gas to Tarija, which is exactly the same as for Pampa Colorada Power Plant.
- b. Power Generation: G&E personnel operates and registers at least 50 parameters per hour detailing overall performance of the power plant. There are 2 systems used for this purpose: Human-Machine-Interface (HMI) which is totally digital and automated and analogic or mechanical controls such as gauges, thermometers, amp meters, volt meters, etc. A brief description of the monitoring and register system for the power plant is described in the next section.

### **Human - Machine Interface**

This SCADA capable system was designed and implemented by GUASCOR and holds top technology and reliable trademarks as Merlin Gerin, Schneider, Telemecanique, and Elektra. The system is capable to operate remotely, display main variables and analyze them to trigger alarms and perform certain operations.

A touch screen helps interact with the PLC in order to obtain information and execute maneuvers for each individual genset.

Several screens display real time information and overall status of different system components, starting with single-line diagram displaying charge status, individual engine operation parameters, variable trends, alarm reports and special purpose operation screens such as automated start-ups, synchronism and parallelism and operational parameter setup protected by password.

The screens available in the system detail main aspects of HMI capabilities, i.e.:

- Main Menu
- Single Line Diagram

- Operation Parameters Control Screen
- Power Monitoring Per Genset
- Operational Variables Trending
- Historic Alarms Report
- General Operation Parameters Setup

This HMI allows the plant to run within a reliable range with almost no human interaction, however, in order to avoid malfunction and oversee automatic control, personnel controls all analogic or non automated sources, reading several variables each hour and doublechecking them to field test when necessary, clearing this way other mechanic matters non detected by the system which are precisely the source of potential system failures.

Regular tasks include jacket temperature readings, seal failure detection, oil and refrigerant level, filter cleaning, safety devices monitoring, spark plug and valve gaps etc.

The following image shows a daily control spreadsheet detailing all monitored variables. All information is stored in a data base used to analyze trends, deviation behaviors and programming specific maintenance tasks:

**Field Data Spreadsheet – Genset No. 1**

FECHA & HORA	Kw	FP	Hz	AG. PRIN.	AIRE	ACEITE	AGUA AUX.	TEMP. ENT. PRINC.	TEMP. SAL. PRINC.	TEMP. ENT. SECUNDARIA	TEMP. SAL. SECUNDARIA	MEZCLA	ACEITE	AGUA
06-noviembre 07:00	144	0,99	50,5	79	46	60	45	58,0	61,0	45,0	47,0	0,6	5,8	1,2
06-noviembre 08:00	132	0,99	50,5	79	46	63	44	57,0	59,0	44,0	45,0	0,5	5,8	1,2
06-noviembre 09:00	127	0,98	50,5	79	47	63	45	57,0	59,0	45,0	46,0	0,4	5,8	1,2
06-noviembre 10:00	129	0,98	50,5	79	48	65	46	59,0	61,0	46,0	48,0	0,4	5,8	1,2
06-noviembre 11:00	128	0,98	50,5	79	49	66	46	58,0	60,0	46,0	47,0	0,4	5,8	1,2
06-noviembre 12:00	129	0,98	50,5	79	49	62	47	60,0	62,0	47,0	48,0	0,4	5,8	1,2
06-noviembre 13:00	120	0,98	50,5	79	49	62	47	60,0	62,0	47,0	49,0	0,4	5,8	1,2
06-noviembre 14:00	136	0,98	50,5	80	49	62	48	61,0	63,0	48,0	49,0	0,4	5,8	1,2
06-noviembre 15:00	150	0,98	50,5	80	50	62	49	62,0	64,0	49,0	50,0	0,6	5,8	1,2
06-noviembre 16:00	153	0,98	50,5	80	48	62	47	59,0	61,0	47,0	48,0	0,6	5,8	1,2
06-noviembre 17:00	154	0,98	50,5	80	48	62	47	60,0	62,0	47,0	48,0	0,6	5,8	1,2
06-noviembre 18:00	179	0,99	50,5	80	48	62	47	60,0	62,0	47,0	48,0	0,8	5,8	1,2
06-noviembre 19:00	193	0,99	50,5	80	46	62	45	57,0	59,0	45,0	46,0	0,8	5,8	1,2
06-noviembre 20:00	200	0,99	50,5	80	47	63	47	60,0	62,0	46,0	48,0	0,9	5,8	1,3
06-noviembre 21:00	197	0,99	50,5	80	47	63	47	60,0	62,0	47,0	49,0	0,9	5,8	1,3
06-noviembre 22:00	160	0,99	50,5	79	45	62	47	58,0	60,0	46,0	47,0	0,7	5,8	1,3

**Central Power and Gas Parameters Display**