

**G & E**

**Gas & Electricidad S.A.**

**VERIFICATION AND CERTIFICATION REPORT FOR  
CAMARGO POWER PLANT – FUEL SUBSTITUTION**

**CHUQUISACA - BOLIVIA**

**First Verification Period: January 1, 2005 to May 31, 2008**

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**July 10, 2008**

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# Verification and Certification Report for Camargo Power Plant – Fuel Substitution, Chuquisaca, Bolivia, 1,172 kW (ISO).

## EXECUTIVE SUMMARY

*CONSOT SRL – SERVICIOS DE CONSULTORIA*, hereinafter the Consultant, under service contract with Gas & Electricidad S.A. (G&E S.A.), has verified the Monitoring Plan presented in the “Project Design Document: Camargo Power Plant”<sup>1</sup> (PDD), dated November 2007 and submitted previously to ERT-Winrock by E+Co for validation. This document is a third party independent verification of the of Green House Gases (GHG) emission reductions achieved by Camargo fuel substitution project for electricity generation, during the period between January 1<sup>st</sup>, 2005 and May 31<sup>st</sup>, 2008. This is the first verification report. A site inspection was carried out to verify the actual site conditions, equipment, and data included in the PDD. As final result, this verification and certification report has been issued.

## 1. INTRODUCTION

Gas & Electricidad S.A. (G&E S.A.), as project owner, contracted the services of the Consultant to verify Green House Gases (GHG) emission reductions generated by Camargo Power Plant activities for electricity generation, located in the vicinity of Pampa Colorada, City of Camargo, Department of Chuquisaca, Bolivia.

The basic data for the verification were retrieved directly at the Camargo Power Plant, according to the criteria established in Annex 4, Monitoring and Verification Information of the PDD. The project and the methodology applied in the PDD correspond 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.

This report presents CONSOT SRL’s opinion regarding quantities of GHG emission reductions achieved and the amounts of Verified Emission Reductions generated by the Camargo Natural Gas Power Plant during the period January 1<sup>st</sup>, 2005 to May 31<sup>st</sup>, 2008.

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<sup>1</sup> Document prepared following “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.

## 2. OBJECTIVES

The purposes of this verification, by review of objective evidence, are to establish that:

- i. The emissions quantification included in the "Project Design Document: Camargo Power Plant", dated November 2007 conforms with the requirements of the monitoring plan in the PDD, methodology, and
- ii. The data reported are accurate, complete, consistent, transparent, and free of material error or omission.

## 3. SCOPE

The scope of the verification work carried out included the following tasks:

- Review and analysis of the Project Design Document: Camargo Power Plant, November 2007.
- Review of the calculation method of the GHG emission reductions.
- Site inspection (field visit).
- Review and analysis of the monitored data for the verification period, i.e.: Fossil fuels consumption and net caloric values, verification of historic power generation data, inspection of meters and verification of meter testing protocols, project emissions and quantification of GHG emission reductions.
- Verification of emission reductions between January 1<sup>st</sup>, 2005 and May 31<sup>st</sup>, 2008.

## 4. VERIFIER

Roberto E. Soto<sup>2</sup> and Eduardo Paz<sup>3</sup>, on behalf of CONSOT SRL, carried out the verification activities.

The verifiers visited the site and installations of the Power Plant located in area of Pampa Colorada, near the town of Camargo, Chuquisaca, Bolivia. They examined records and audited G&E's calculations presented in the PDD. The information at the Power Plant was provided by Omar Torricos Herboso, Power Generation Chief; Wilson Yucra Flores, Power Plant Operation Chief; and Enrique Cruz, Power Plant Operator.

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<sup>2</sup> Roberto E. Soto Ferreira; Bsc in Civil and Environmental Engineer (Utah State University, University, Logan, Utah, 1977), Msc in Civil Engineering (San Diego State University, San Diego, CA. 1981); Bolivian National Engineers Registry N° 3792; CONSOT SRL's General Manager.

<sup>3</sup> Eduardo Paz Castro, Industrial Engineer (University Gabriel René Moreno, Santa Cruz, Bolivia), MSc in Business Administration (Universidad Católica Boliviana, 2000); Bolivian National Engineers Registry N° 5934.

## 5. DETAILS OF FIELD VISIT

The field visit took place on June 21<sup>st</sup>, 2008. Minutes of the meetings with the power plant staff and relevant findings were drafted and signed by participants. The following installations were found during the visit:

- ✓ Fuel supply and measurement systems for natural gas.
- ✓ Energy production and measurement systems for both diesel and natural gas.

Files and registers were examined and certifications of operation conditions of energy metering devices were requested. The information obtained in the power plant has been cross checked with the data presented in the PDD and other sources.

The physical location of Power Plant, where GHG emissions reduction is generated, is characterized as follows:

Town:	Camargo
Province:	Nor-Cinti
Department:	Chuquisaca
Country:	Bolivia
Address:	Pampa Colorada, Camargo - Tarija Road, Km. 4 Camargo, Chuquisaca, Bolivia
Geographic Location:	Latitude South: 20° 38.716' Length West: 65° 12.678'
Altitude:	2418 m.a.s.l
Other:	Distance to Sucre, Capital of Chuquisaca Department: 325 km

Before the G&E S.A. project was implemented, all the energy consumed in the Camargo off grid system was produced by the following diesel engines with a total effective capacity at site of 600 kW:

Unit	Number of Units	Capacity (kW-ISO)	Fuel
English Electric	2	600	Diesel
Caterpillar D333	1	40	Diesel
Caterpillar D333	1	60	Diesel

Energy production with diesel engines is very common (business as usual) for most rural off grid electricity distribution systems in Bolivia, i.e. outside the area of influence of the National Interconnected System and main urban distribution systems.

The old diesel power plant is still producing energy mainly at peak hours when the demand exceeds the power production capacity of the natural gas units and, eventually, when natural gas is not available for the Power Plant. The old diesel

power plant is owned, managed, and currently operated by the local energy distribution company COSERCA<sup>4</sup>. However, according to G&E S.A. records, G&E S.A. operated the diesel engines to produce energy from May 4, 2004 until April 19, 2007. During this period, COSERCA provided G&E S.A. the diesel fuel to operate the plant and G&E S.A. kept a close manual record of the energy production. Thereafter G&E S.A. copies the electricity generation data from COSERCA's manual registry.



Camargo Power Plant in Camargo, Chuquisaca, Bolivia

The new project was implemented with three 275 kW generators Guascor type SFGLD<sup>5</sup>. The installed capacity of the plant was later increased with a fourth 347 kW Guascor generator, i.e. to a total installed capacity of 1,172 kW (ISO).

## 6. VERIFICATION PROCESS

The Consultant reviewed the PDD of the project and the project activities, as well as the characteristics of the power plant equipment to have a complete understanding of the sources and activities producing GHG emissions and emission reductions within the limits of the project. The Consultant also reviewed measurement procedures and sources of data used to estimate GHG emissions, data acquisition systems, data processing, data filing and verification of data reported and supporting document, both official documents and digital files. On the basis of this information and findings, the Consultant made an initial verification of the compliance of the monitoring plan in the PDD for the verification period with information available at the time of the completion of the PDD and for the period thereafter, until May 31<sup>st</sup>, 2008.

As result of these activities, new information requirements were made to the project owner that were absolved and documented.

<sup>4</sup> Cooperativa de Servicios Eléctricos Camargo (Local Energy Distribution Company)

<sup>5</sup> Grupo GUASCOR:

[http://www.guascor.com/caste/productos\\_y\\_servicios/motores\\_marinos\\_indus/motor\\_grup\\_gas/motor\\_gas.htm](http://www.guascor.com/caste/productos_y_servicios/motores_marinos_indus/motor_grup_gas/motor_gas.htm)

In a later stage, the consultant completed the data required in the monitoring plan for the period covered by this report and elaborated the basic calculations for the certification of the corresponding emission reductions.

## 7. RESULTS

### 7.1 Methods to calculate GHG Emission Reduction

According to the Camargo Power Plant PDD, the equations used to calculate GHG emission reductions are the following:

Baseline:

$$BE_{elec,y} = EL_{BL,y} * EF_{elec,BL} \quad \text{Equation 1}$$

Where:

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

**EL<sub>BL,y</sub>**: Electricity supplied to the captive isolated rural off grid system of COSERCA 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)

For the calculation of the Baseline emission factor for diesel generation, two calculations were made to verify the PDD values:

- Going out from the default emission factor, upper limit of 95% confidence interval, 74.80 tCO<sub>2</sub>/Tj and the specific gravity according to Bolivian regulations<sup>6</sup> for diesel specifications, net caloric value according to default value of IPCC 2006, and specific consumption of diesel of 0.30 l/kWh:

Emission Factor Diesel in Power Generation

Specific Gravity of Diesel	Net Caloric Value of Diesel	Default Emission Factor	Default Emission Factor	Specific Diesel Consumption	Emission Factor Diesel
kg/l <sup>(a)</sup>	TJ/Giga gram <sup>(b)</sup>	kgCO <sub>2</sub> /Tj <sup>(c)</sup>	kgCO <sub>2</sub> /l	l/kWh <sup>(d)</sup>	tCO <sub>2</sub> /MWh
0.88	43.3	74800	2.850179	0.3	0.8551

<sup>(a)</sup> Source: Superintendence of Hydrocarbons: Annex 1 -Table of Diesel specifications DS 26276

<sup>(b)</sup> Source: IPCC workbook 2006: Volume 2: Energy, Table 1.2

<sup>(c)</sup> Source: IPCC workbook 2006: Volume 2: Energy, Table 2.2

<sup>(d)</sup> Source: PDD, Most conservative value

<sup>6</sup> Supreme Decree Nr. 26276, Regulation of Quality of Hydrocarbons and Lubricants, Specifications, Annex C, Table No. 21.

- Going out from the same default emission factor as above mentioned, the heat content and specific gravity specified for diesel according to Bolivian regulations and selected conservative value for specific diesel consumption for power generation:

Net Caloric Value of Diesel	Net Caloric Value of Diesel	Default Emission Factor	Default Emission Factor	Specific Fuel Consumption Diesel	Emission Factor Diesel
Btu/lb <sup>(a)</sup>	Btu/l	kgCO <sub>2</sub> /Tj <sup>(b)</sup>	kgCO <sub>2</sub> /l	l/kWh <sup>(y)</sup>	tCO <sub>2</sub> /MWh
20000	36817	74800	2.91	0.3	0.8717

<sup>(a)</sup> Source: Superintendencia of Hydrocarbons: Annex 1 - Table of Specifications for Diesel oil, DS 26276

<sup>(b)</sup> Source: IPCC workbook 2006: Volume 2: Energy, Exhibit, Cuadro 2.2

<sup>(y)</sup> Source: PDD, Most conservative value

The selected value for Emission factor for generation by the baseline source of electricity in this report is 0.8551 t/MWh

The Emission reductions are calculated with:

$$ER_y = BE_{elec,y} - PE_y \quad \text{equation 2}$$

Where:

**PE<sub>y</sub>**: is the project emission in Camargo power Plant in year y expressed in tCO<sub>2</sub>

Project Emissions are calculated as follows:

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

Where:

**PE<sub>n.g.,y</sub>**: Emissions due to combustion of natural gas for production of Electricity in year y of the crediting period (tCO<sub>2</sub>) as follows.

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

Where:

**EL<sub>n.g.,y</sub>** : is the electricity produced in the Camargo Power Plant with Natural gas Fired Gen Set measured in MWh, for the year y.

## 7.2 Monitored Data

### 7.2.1 Verification Period

A total of 43 months of data was analyzed in the verification period.

### 7.2.2 Fossil Fuel Consumption and Net Caloric Value

Natural gas consumption by the Camargo Power Plant for the monitoring period was verified with Vintage Petroleum Bolivia Ltd invoices for the period January, 2005 to April, 2007 and with "Yacimientos Petrolíferos Fiscales Bolivianos" (YPFB) invoices for the period May, 2007 to May, 2008.

The Net Caloric Value (NCV) for natural gas was verified with Chromatographic analysis made by Transredes S.A.<sup>7</sup>. The annual natural gas consumption and the NCV weighted average of the gas consumed at the Camargo Power Plant are:

Date	Gas consumption (kcf)	Net Caloric Value (Btu/cf)
2005	39,168	1,100
2006	42,246	1,089
2007	45,368	1,084
Jan-May/2008	19,206	1,097

Monthly chromatographic analyses reports for the natural gas used in the Camargo Power Plant were reviewed. As a sample, such report for the month of May, 2008; is shown in Section A-1 of Annex A.

Diesel consumption by the old diesel generators was derived from the manual generation registers at site (See Section A-2 of Annex A) from January 1<sup>st</sup>, 2005 to May 31<sup>st</sup>, 2008 provided by the Head of Generation of the Camargo Power Plant. The specific consumption used in baseline calculation has been also applied in this case.

The estimated diesel consumption during the reporting period is as follows:

Year	Diesel Consumptions (Liters)
2005	31,295
2006	40,729
2007	26,810
Jan-May/2008	14,750

<sup>7</sup> Transredes S.A., a company responsible in Bolivia for the transportation of fossil fuels and for the Certification of the quality of natural gas delivered.

### 7.2.3 Verification of Historic Power Generation

Monthly gross energy production, local consumption by the Power Plant, and energy sold to CORSECA data were also verified for the period January 1st, 2005 to May 31<sup>st</sup>, 2008.

The verification was performed reviewing existing energy meters installed to measure gross energy production and energy sold to CORSECA. The latter readings coincide with the G&E S.A.'s invoices to CORSECA. The monthly gross power generation, local energy consumption, energy delivered to COSERCA, and the monthly volumes of natural gas consumed are presented in Section A-3 of Annex A. The following table shows a summary per year:

Year	Gross Generation (kWh)	Internal Consumption (kWh)	Energy Delivery (kWh)
2005	3,468,925	360,803	3,108,122
2006	3,720,397	341,769	3,378,628
2007	3,938,072	325,352	3,612,720
Jan-May 2008	1,664,560	123,652	1,540,908

The energy produced by the diesel generators was verified from manual registers with an interval of 15 minutes during the production periods, mainly peak hours and when natural gas was not available. The corresponding summary for the verification period is the following:

Year	Diesel Generation (kWh)
2005	68860
2006	92068
2007	57862
2008	32164

### 7.2.4 Meters, Calibration and Testing

During the visit to the Camargo Power Plant, the Consultant verified the existence of two energy meters:

Details	Kind	Model	Type (Digital/Analogical)	Precision
Energy delivery	SAGA	10000	Digital	0,5%
Gross Generation	Schlumberger	EIY4	Analogical	N/A

At the request of the Consultant, G&E S.A. has ordered the verification of both energy meters by the Sucre Electrical Company (CESSA), who certified that both energy meters are working within factory design error margins and that they comply with Bolivian legislation. A copy of such certification is presented in Section A-4 of Annex A.

The Gas Meter used to determine the gas volumes billed to G&E S.A. is:

Details	Kind	Model	Type
Natural Gas	American Meter	AEG-6000	Turbine

### 7.3 Quantification of GHG Emission Reductions

The quantification of GHG emission reductions was done using the formulas and parameters presented in the project PDD.

The emission factors that correspond to the carbon content for fossil fuels utilized were obtained from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Energy, and Table 1.4 "Default CO<sub>2</sub> Emissions Factors for Combustion":

- ✓ Natural gas: 58.300 kgCO<sub>2</sub>/Tj.
- ✓ Diesel oil: 74.800 kgCO<sub>2</sub>/Tj.

The details of these calculations are:

#### 7.3.1 Natural Gas Emission factors

The natural gas emissions for the verification period are:

Natural Gas Generation

Year	Gross Generation	Natural Gas Consumption	Net Caloric Value	Specific Consumption	Heat Consumption	Emission Factors
	MWh	Mcft	Btu/cft	Btu/kWh	BTU	tCO <sub>2</sub> /MWh
2005	3,469	39,168	1,100	12,420.47	43,085,676	0.7640
2006	3,720	42,246	1,089	12,361.86	45,991,027	0.7604
2007	3,938	45,368	1,084	12,490.97	49,190,350	0.7683
2008(*)	1,665	19,206	1,097	12,653.59	21,062,668	0.7783

(\*) Corresponds to the period January-May 2008

#### 7.3.2 Diesel Oil Emission factors

The diesel emissions factors for the verification period, calculated as indicated in the PDD and using conservative values of 0.30 liters/kWh, as specific consumption, and 20.000 Btu/lb for Net Caloric Value, as established by the Bolivian Government Supreme Decree N° 26276, Table 21, are as follows:

Emission Factor Diesel in Power Generation

Period	Generacion Bruta MWh	Specific Gravity of Diesel	Net Caloric Value of Diesel	Default Emission Factor	Default Emission Factor	Specific Diesel Consumption	Emission Factor Diesel
		kg/l <sup>(a)</sup>	TJ/Giga gram <sup>(b)</sup>	kgCO <sub>2</sub> /Tj <sup>(c)</sup>	kgCO <sub>2</sub> /l	l/kWh <sup>(d)</sup>	tCO <sub>2</sub> /MWh
2005	69	0.88	43.3	74800	2.8501792	0.3	0.8551
2006	92	0.88	43.3	74800	2.8501792	0.3	0.8551
2007	58	0.88	43.3	74800	2.8501792	0.3	0.8551
2008(*)	32	0.88	43.3	74800	2.8501792	0.3	0.8551

(\*) Corresponds to the period January-May 2008

<sup>(a)</sup> Source: Superintendene of Hydrocarbons: Annex 1 -Table of Diesel specifications DS 26276

<sup>(b)</sup> Source: IPCC workbook 2006: Volume 2: Energy, Table 1.2

<sup>(c)</sup> Source: IPCC workbook 2006: Volume 2: Energy, Table 2.2

<sup>(d)</sup> Source: PDD, Most conservative value

### 7.3.3 Baseline Calculations

The Baseline emissions for the verification period, calculated using diesel oil emissions factors, are the following:

<b>BE<sub>elec,y</sub> = EL<sub>BL,y</sub> * EF<sub>elec,BL</sub></b>			
Year	Total Gross Generation	Emission Factor	Emissions
	MWh	tCO <sub>2</sub> /MWh	tCO <sub>2</sub>
2005	3538	0.8551	3,025
2006	3812	0.8551	3,260
2007	3996	0.8551	3,417
2008(*)	1697	0.8551	1,451
Total			11,152

(\*) Corresponds to the period January-May 2008

### 7.3.4 Project Emissions

The Project Emissions for the verification period, calculated using natural gas emissions factors, are as follows:

#### Project Emissions with Natural Gas

Year	Energy Generation	Emissions
	MWh	tCO <sub>2</sub>
2005	3469	2,650
2006	3720	2,829
2007	3938	3,026
2008(*)	1665	1,296
Total	12792	9,800

(\*) Corresponds to the period January-May 2008

## 7.4 Emergency Generation

The emergency energy generation with the old diesel power generators is part of the project activities to cover the energy demand of the captive Camargo off-grid distribution system. The summary of the production with diesel during the period of verification and the corresponding emissions is the following:

### Project Emissions with Diesel

Year	Energy	Emissions
	MWh	tCO <sub>2</sub>
2005	69	59
2006	92	79
2007	58	49
2008(*)	32	28
Total	251	215

(\*) Corresponds to the period January-May 2008

## 7.5 Total Project Emissions

The total Project emissions are:

### Total Project Emissions

Year	Energy	Emissions
	MWh	tCO <sub>2</sub>
2005	3,538	2,709
2006	3,812	2,908
2007	3,996	3,075
2008(*)	1,697	1,323
Total	13,043	10,015

(\*) Corresponds to the period January-May 2008

## 7.6 Verified Emission Reductions

The Verified Emission Reductions for the verification period, January 1, 2005 to May 31, 2008, due to the implementation of the Camargo Natural Gas Power Plant, are as follows:

### Emission Reductions

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

Year	Baseline	Project Emissions	Emission Reductions
	tCO <sub>2</sub>	tCO <sub>2</sub>	tCO <sub>2</sub>
2005	3,025	2,709	316
2006	3,260	2,908	352
2007	3,417	3,075	342
2008(*)	1,451	1,323	128
Total	11,152	10,015	1,137

(\*) Corresponds to the period January-May 2008

## 8. CONCLUSIONS ON DATA QUALITY

The data included in the PDD, monitoring plan, emissions quantification, and the methodology applied for the emission reductions assessment, comply with the requirements of Decision 17/CP.7 on Simplified Modalities and Procedures for Small Scale Clean Development Mechanism project activities (UNFCCC).

## 9. VERIFICATION AND CERTIFICATION OPINION

The Consultant represented by the verifiers, hereby issues a verification and certification opinion in the following terms:

**Name of the Project:** Camargo Power Plant, Chuquisaca – Bolivia, Fuel Substitution.

**Project Owner:** Gas & Electricidad S.A., Sucre Bolivia.

**Project Promoter:** E&Co, Blommfield, New Jersey, U.S.A.

### **Scope of the Verification:**

The Consultants carried out the verification and certification of the Greenhouse Gas Emission Reductions, according to CDM Executive Board CoP/MoP Decision 21/CP.8, document FCCC/CP/2002/7/Add.3. and Decision 17/CP.7, Annex, Sections H. and I., generated by the Camargo Power Plant – Fuel Substitution Project, during the period January 1, 2005 to May 31, 2008.

**Total Greenhouse Gas Emission Reductions verified:** 1,137 tCO<sub>2</sub>e

### **PDD Submitted for approval and approved Methodology applied for verification:**

“Project Design Document: Camargo Power Plant”, dated November 2007, submitted previously to ERT-Winrock.

PDD was submitted prepared according to “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, document FCCC/CP/2002/7/Add.3. Type III, “Other Project Activities”, Category III.B “Switching Fossil Fuels”, Version 11, Sectoral Scope 01, EB 33.

### **Verification opinion on Data quality and materiality:**

The quantification of the Emission reductions complies with the approved monitoring methodology and the data used for these calculations are complete transparent and without material error or omission.

**Period of verification:**

January 1<sup>st</sup>, 2005 to May 31<sup>st</sup>, 2008

**Date of the verification:**

July 10, 2008

**Authorized signatures:**

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**10. Reference Documents**

## Key reference documents:

- ✓ PDD, Version 3, November 28th, 2007
- ✓ Methodology AMS ID "Switching Fossil Fuels", III.B./Version 11, Sectoral Scope:01 EB 33

## Register data:

- ✓ Generation Gas Units spread sheet
- ✓ Generation Diesel Units spread sheet and manual copy
- ✓ Gas Consumption spread sheet
- ✓ Diesel Consumption spread sheet and manual copy

## Other documents:

- ✓ Energy delivery invoices from G&E S.A. to COSERCA
- ✓ Vintage Petroleum Boliviana Ltd. Natural Gas invoices
- ✓ Yacimientos Petroliferos Fiscales Bolivianos (YPFB) Natural Gas invoices
- ✓ Calibration certificates meters (CESSA)
- ✓ Chromatographic analysis made by Transredes S.A.

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**CHUQUISACA - BOLIVIA**

**Annex A**

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Santa Cruz de la Sierra, Bolivia

July 03, 2008

ANNEX A

A-1 Chromatographic Analysis Report



**REPORTE ANÁLISIS CROMATOGRÁFICO**

MES: **Mayo-08**

CAMPO: Tarija	01-May-08	08-May-08	15-May-08	22-May-08	29-May-08	PROMEDIO MENSUAL
PRESION: (PSIG)	310	305	320	320		
TEMPERATURA: (°F)	68	68	68	67		
COMPONENTES	% MOL	% MOL	% MOL	% MOL	% MOL	% MOL
N2	0,73	0,70	0,70	0,77		0,73
CO2	1,63	1,63	1,63	1,59		1,62
C1	86,03	86,08	86,22	87,42		86,42
C2	7,66	7,61	7,57	6,99		7,46
C3	2,67	2,72	2,73	2,14		2,57
iC4	0,42	0,42	0,38	0,33		0,39
nC4	0,56	0,55	0,51	0,46		0,52
iC5	0,14	0,14	0,13	0,14		0,14
nC5	0,09	0,09	0,08	0,09		0,09
C6	0,07	0,06	0,05	0,07		0,06
TOTAL	100,00	100,00	100,00	100,00	0,00	100,00
GRAVEDAD ESPECIFICA	0,658	0,657	0,656	0,649	0,000	0,654
PODER CALORIF SECO A 60 °F	0	0	#DIV/0!	0	#DIV/0!	0
PODER CALORIF SATURADO A	1.100,0	1.099,9	1.096,9	1.086,8	0,0	1.095,0
PUNTO DE ROCIO HC						
PUNTO DE ROCIO H2O						



## A-2 Monthly Diesel Consumption Data

	Englis G-2	Caterpillar G-3	Caterpillar G-4	Total Diesel
Date	Diesel Consumption	Diesel Consumption	Diesel Consumption	Consumptions
Jan-05	1230	795	1175	3200
Feb-05	2010	905	1022	3937
Mar-05	2960	1006	1149	5115
Apr-05	3460	960	1110	5530
May-05	3970	966	1290	6226
Jun-05	3730	677	1229	5636
Jul-05	690	93	238	1021
Aug-05	350	53	127	530
Sep-05	0	0	0	0
Oct-05	0	0	0	0
Nov-05	0	0	0	0
Dec-05	25	30	45	100
Jan-06	0	0	0	0
Feb-06	0	0	0	0
Mar-06	0	0	0	0
Apr-06	4040	1110	1260	6410
May-06	0	0	0	0
Jun-06	5340	1500	1790	8630
Jul-06	4995	1513	1692	8200
Aug-06	5900	1785	1905	9590
Sep-06	4515	1350	1413	7278
Oct-06	300	80	75	455
Nov-06	0	25	63	88
Dec-06	0	25	53	78
Jan-07	0	15	75	90
Feb-07	0	24	137	161
Mar-07	0	164	478	642
Apr-07	0	251	327	578
Apr-07	130	190	277	597
May-07	0	538	1022	1560
Jun-07	1500	0	1365	2865
Jul-07	1850	0	1159	3009
Aug-07	730	725	1058	2513
Sep-07	1350	905	1095	3350
Oct-07	3780	567	1640	5987
Nov-07	2180	0	990	3170
Dec-07	1350	30	908	2288
Jan-08	955	600	685	2240
Feb-08	210	630	785	1625
Mar-08	1250	905	1125	3280
Apr-08	1470	815	1210	3495
May-08	2080	905	1125	4110

## A-3 Monthly Generation and Gas Consumption Data

Date	Gross Generation (kWh)	Internal Consumptions (kWh)	Energy delivery (kWh)	Gas consumption (kcf)
Jan-05	242,410	25,654	216,756	3,143
Feb-05	257,035	28,255	228,780	3,139
Mar-05	289,270	32,206	257,064	3,545
Apr-05	281,790	31,354	250,436	3,580
May-05	272,040	30,648	241,392	2,796
Jun-05	280,205	32,069	248,136	2,873
Jul-05	298,638	30,039	268,599	3,417
Aug-05	310,085	29,953	280,132	3,294
Sep-05	301,752	29,833	271,919	3,238
Oct-05	318,762	30,554	288,208	3,438
Nov-05	306,876	29,548	277,328	3,309
Dec-05	310,062	30,690	279,372	3,396
Jan-06	318,252	31,352	286,900	4,130
Feb-06	288,359	27,491	260,868	3,547
Mar-06	330,100	30,256	299,844	4,061
Apr-06	233,338	21,798	211,540	2,976
May-06	332,277	30,457	301,820	3,428
Jun-06	313,361	30,277	283,084	3,330
Jul-06	313,361	28,053	285,308	3,628
Aug-06	319,405	32,825	286,580	3,393
Sep-06	307,589	31,777	275,812	3,301
Oct-06	330,559	28,639	301,920	3,565
Nov-06	314,597	24,805	289,792	3,392
Dec-06	319,199	24,039	295,160	3,495
Jan-07	330,672	25,592	305,080	3,533
Feb-07	300,536	22,412	278,124	3,481
Mar-07	328,431	23,835	304,596	3,540
Apr-07	306,508	22,780	283,728	3,577
May-07	328,341	23,977	304,364	3,770
Jun-07	334,220	25,720	308,500	3,864
Jul-07	350,407	27,199	323,208	4,176
Aug-07	347,443	30,363	317,080	4,111
Sep-07	323,714	27,818	295,896	3,863
Oct-07	332,079	32,983	299,096	3,845
Nov-07	323,984	30,032	293,952	3,780
Dec-07	331,737	32,641	299,096	3,828
Jan-08	337,045	25,809	311,236	3,889
Feb-08	313,124	22,256	290,868	3,658
Mar-08	342,239	27,723	314,516	3,932
Apr-08	332,767	24,995	307,772	3,832
May-08	339,385	22,869	316,516	3,895

**A-4 CESSA Energy Meters Verification Report**



COMPANIA ELECTRICA SUCRE. S. A.

**COMPANIA ELECTRICA SUCRE S.A**  
 c. Ayacucho # 254 (Administración)  
 c. Diego Centeno Zona Planta Diesel (Técnica)  
 E-mail: cessa-sucre@entelnet.bo  
 Telf.: (4) 6453126 - Fax: 6460292  
 Casilla # 287  
 Sucre - Bolivia

Formulario No\_2521

**ACTA DE CONTRASTE DE MEDIDOR IN SITU**

Artículo I. Reclamación No \_\_\_\_\_

En la ciudad de Sucre a Hrs...16.45.00.del 28./06./2008...se hicieron presentes el Sr...Omar Torrez y el Sr: Hilarion Zelaya. por CESSA. Código 439...  
 En las instalaciones del (a)Sr.(a) GAS Y ELECTRICIDAD...(LOC. CAMARGO).....  
 De No de Cliente .....con el objeto de realizar la revisión del medidor  
 Con las sigientes características:

No Med	2070003	Marca	Schlumberger.	Clase . I	Tension	3x230/400 V.
	4					
Indice	1954850	Modelo	LD3	Kd 1.2	Corriente	2.5/10
Hilos	4	Fases	3	1kWh/ Rev.	C/Indirecta.	

Ctes de 1500/5 Amperios.

Precintos encontrados:		Estado	Precintos dejados:		Estado
Tapa del Medidor	Fabrica		Tapa de Medidor		
Tapa de Bornes	Plomo		Tapa de Bornes	4567	
Tapa Cajon	Plomo		Tapa Cajon	4583	

<b>Resultados de Ensayo "In Situ" Giro en Vacio:</b>	<b>SI</b>	<b>NO</b>	<b>X</b>
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Ensayos en Carga Baja y Alta					Valor encontrado				Valor Dejado	
No	Carga	I A	Cos 0	Revoluc med	Ensay	Patron	Med	Erro%	Med	Erro%
1	Nomin	5	1	10	1	1000	1011	-1.088		
2	Peque	0.25	1	2	2	200	199	0.503		
3	Induct	5	0,5	10	3	1000	986	1.420		
Error prom porcentual %									0.278 %	/

El Medidor funciona: Dentro de Norma  Fuera de Norma \_\_\_\_\_

Artículo II. Calificacion del Consumidor  
 El consumidor esta conforme con las pruebas efectuadas?: SI  NO \_\_\_\_\_

El consumidor esta conforme con las explicaciones?: SI  NO \_\_\_\_\_

Observaciones: La contratación se encuentra dentro los rangos permitidos con error de 0.278 %...Es un medidor Electro Mecánico de conexión indirecta .....  
 A horas 17.55....del 28./06./2008 ..se concluye el acto firmado al pie Los presentes:

.....  
 Por el consumidor

.....  
 Por el Distribuidor CESSA  
 Lic. Juan Pablo Dalence Vidal  
 GERENTE COMERCIAL  
 CESSA

.....  
 Por el Representante  
**Omar Corrales S.C.**  
**JEFE DE GENERACION**  
**Gas & Electricidad S.A.**



**COMPAÑIA ELECTRICA SUCRE S.A**  
 c. Ayacucho # 254 (Administración)  
 c. Diego Centeno Zona Planta Diesel (Técnica)  
 E-mail: cessasucre@entelnet.bo  
 Telf.: (4) 6453126 - Fax: 6460292  
 Casilla # 287  
 Sucre - Bolivia

**COMPANIA ELECTRICA SUCRE. S. A.**

Formulario No 2520

**ACTA DE CONTRASTE DE MEDIDOR IN SITU**

Artículo I. Reclamación No \_\_\_\_\_

En la ciudad de Sucre a Hrs...14.05.del 28./06.../2008...se hicieron presentes el Sr Omar Torrez y el Sr: Hilarion Zelaya por CESSA. Código. 439...  
 En las instalaciones del (a)Sr.(a) GAS Y ELECTRICIDAD ( LOC. CAMARGO ).....  
 De No de Cliente .....con el objeto de realizar la revisión del medidor  
 Con las siguientes características:

No Med	108146	Marca	Saga 1000	Clase		Tension	94/485
Indice	32415.90	Modelo	1317SN5P	Kd	0.6	Corriente	2.5/10
Hilos	4-3	Fases	3	1kWh/ Rev.		C/ Indirecta.	

Precintos encontrados:		Estado	Precintos dejados:		Estado
Tapa del Medidor	FABRICA		Tapa de Medidor		
Tapa de Bornes	Plomo		Tapa de Bornes	4503	
Tapa Cajon	plomo		Tapa Cajon	4563	

<b>Resultados de Ensayo "In Situ" Giro en Vacio:</b>	SI		NO	X
--	----	--	----	---

Ensayos en Carga Baja y Alta					Valor encontrado				Valor Dejado	
No	Carga	I A	Cos 0	Revoluc med	Ensay	Patron	Med	Erro%	Med	Erro%
1	Nomin	5	1	10	1	500	500	0.000		
2	Peque	0.25	1	2	2	100	101	-0.990		
3	Induct	5	0,5	10	3	500	501	-0.200		
					Error prom porcentual % <b>-0.397 %</b> /					

El Medidor funciona: Dentro de Norma  Fuera de Norma \_\_\_\_\_

Artículo II. Calificación del Consumidor  
 El consumidor esta conforme con las pruebas efectuadas?: SI  NO \_\_\_\_\_

El consumidor esta conforme con las explicaciones?: SI  NO \_\_\_\_\_

Observaciones: La contratación se encuentra dentro los rangos permitidos con error de - 0.397 %...Medidor Electrónico con Memoria Masiva de conexión indirecta.....

A horas 16.15....del 28./06./2008 ..se concluye el acto firmado al pie Los presentes:

.....  
 Por el consumidor

.....  
 Por el Distribuidor CESSA

.....  
 Por el Representante

Lic. Juan Pablo Dalence Vidal  
 GERENTE COMERCIAL  
 CESSA

**Omar Correas H.**  
 JEFE DE GENERACION  
 Gas & Electricidad S.A.