

Power Generation from Biogas utilization at Landfill sites

Norte III - Final Disposal Environmental Complex

METROPOLITAN AREA OF BUENOS AIRES ARGENTINA



Marcelo E Rosso
Washington - March 2016

CEAMSE (Coordinación Ecológica Área Metropolitana SE) is responsible for the treatment and disposal of urban solid waste generated in the metropolitan area of Buenos Aires (AMBA).

CEAMSE is a government-owned, inter-jurisdictional company. Our partners are the Government of the Province of Buenos Aires and the Government of the City of Buenos Aires.

Currently, it renders its services to 42 municipalities, with a population of approximately 15,700,000 inhabitants, and the generation of about 18,100 tons of urban solid waste per day (or 470.000 tons monthly).

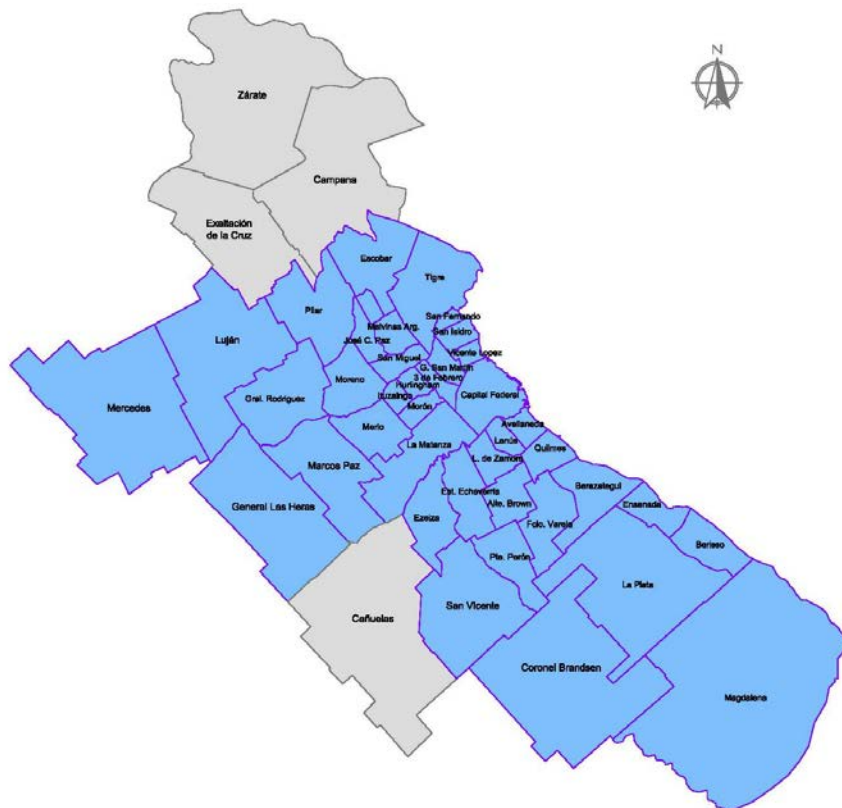
Ceamse is not responsible for the collection of waste as this is handled by each municipality. Once the waste is collected, it is then transported to one of the Transfer Stations operated by CEAMSE or directly to one of the sanitary landfills, for treatment or disposal.

Demographic Data

- 35% of Argentina's population
- 40% of the industries
- 40% of the country's waste



METROPOLITAN AREA OF BUENOS AIRES



Area of influence

- City of Buenos Aires
- 42 municipalities

Waste reception

18.100 t/day

Surface

8,800 km²

Approximate population

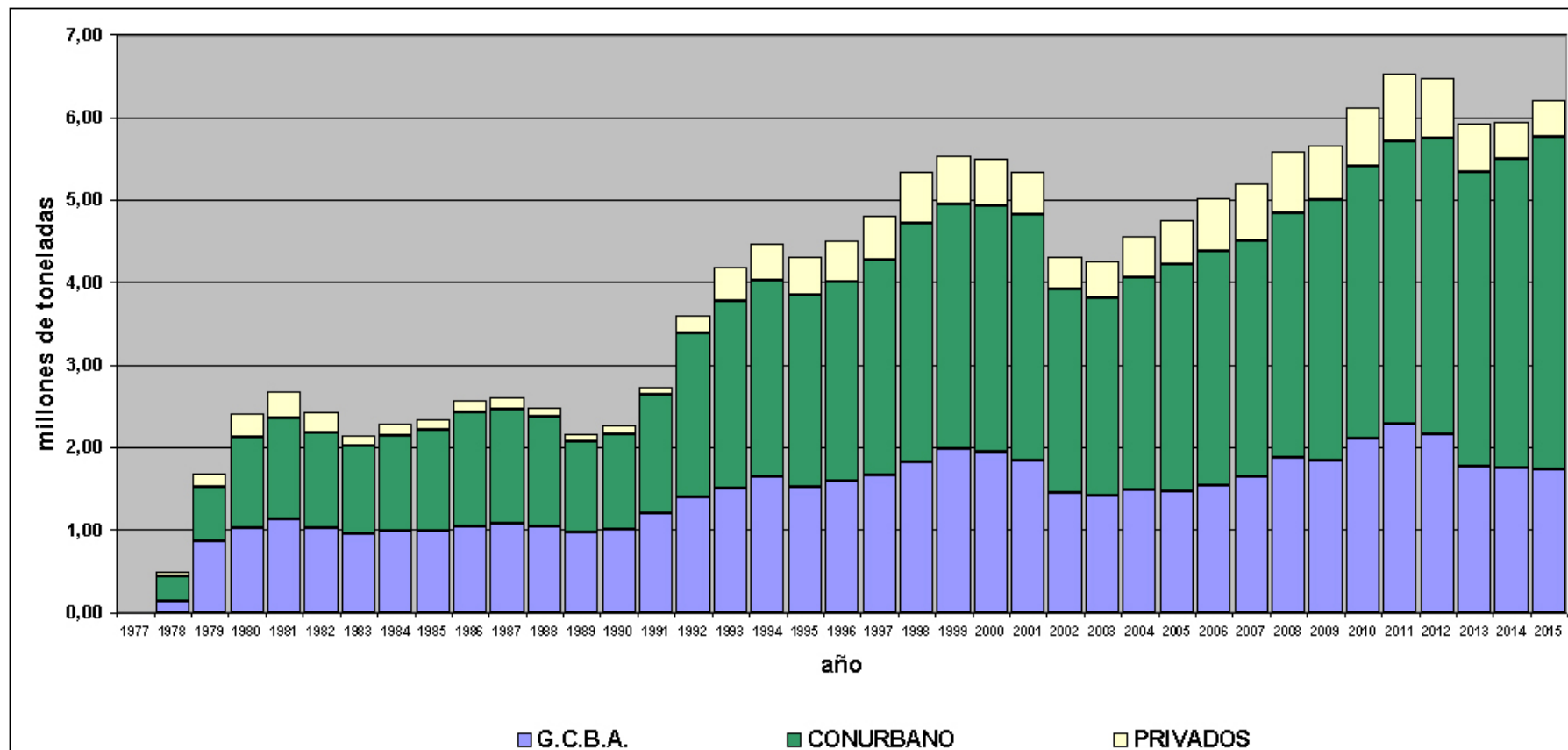
15,700,000 inhabitants

Demographic Data

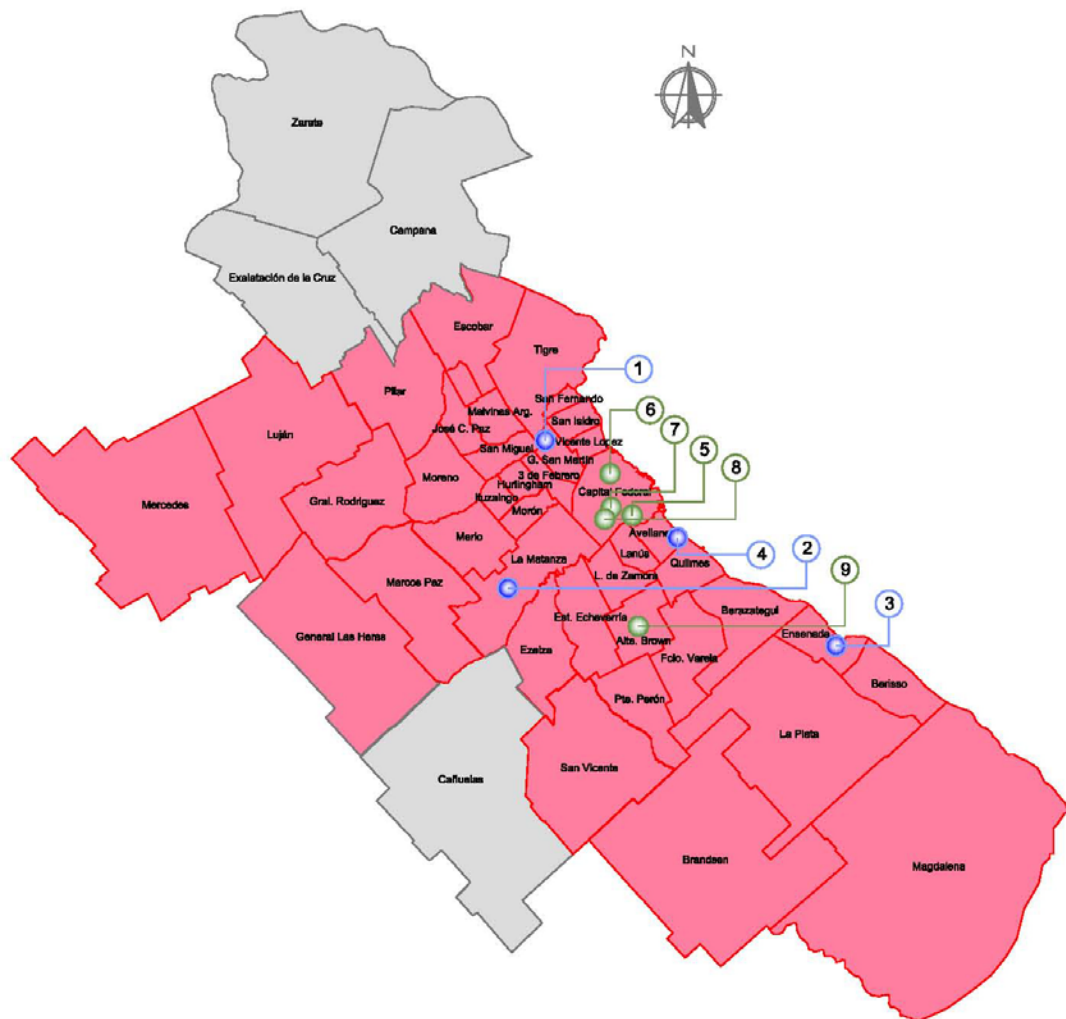
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Incoming Waste at CEAMSE

Origin and Historical Development since 1977



SWM - Metropolitan Area of Buenos Aires

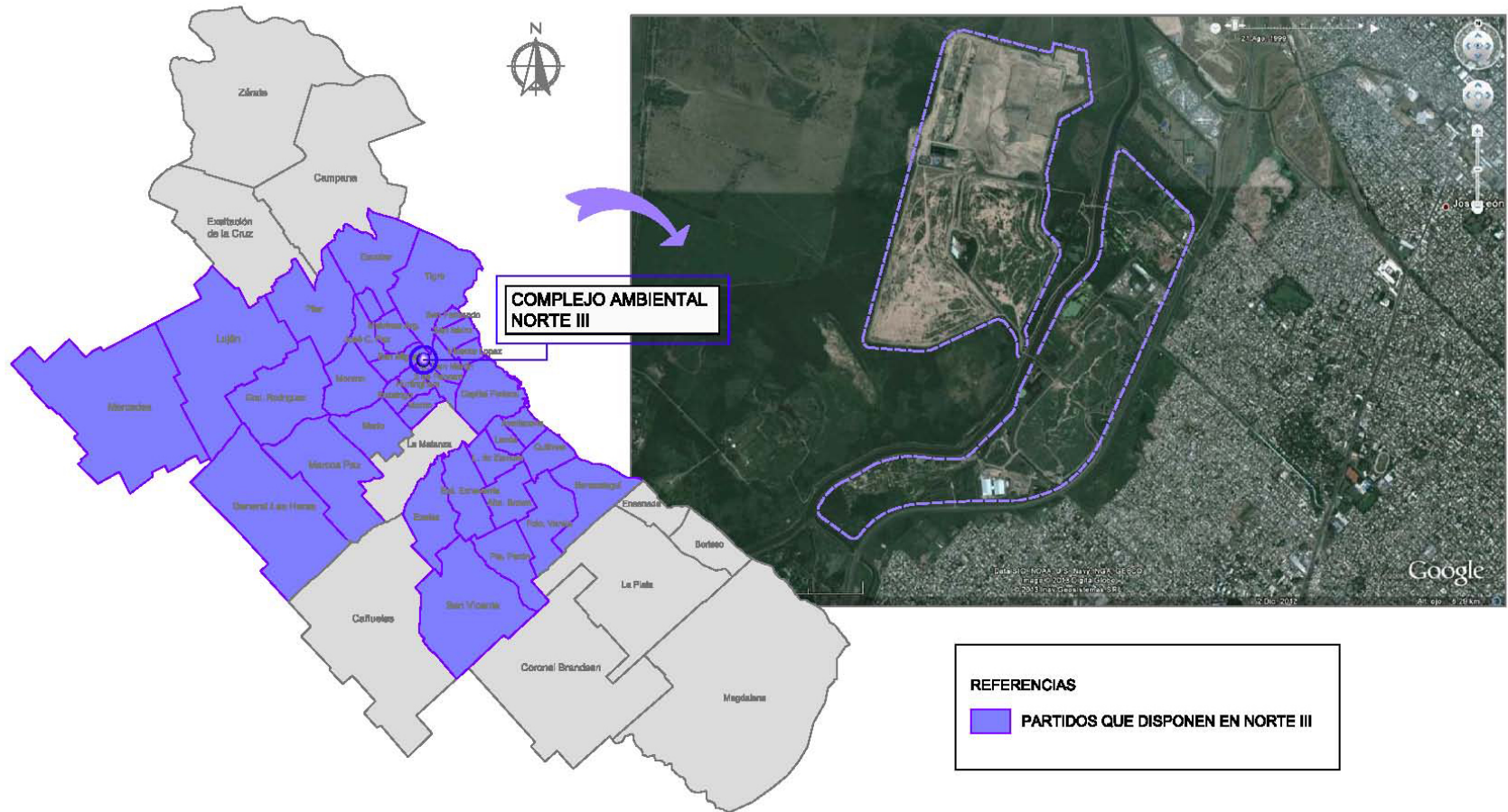


REFERENCIAS:

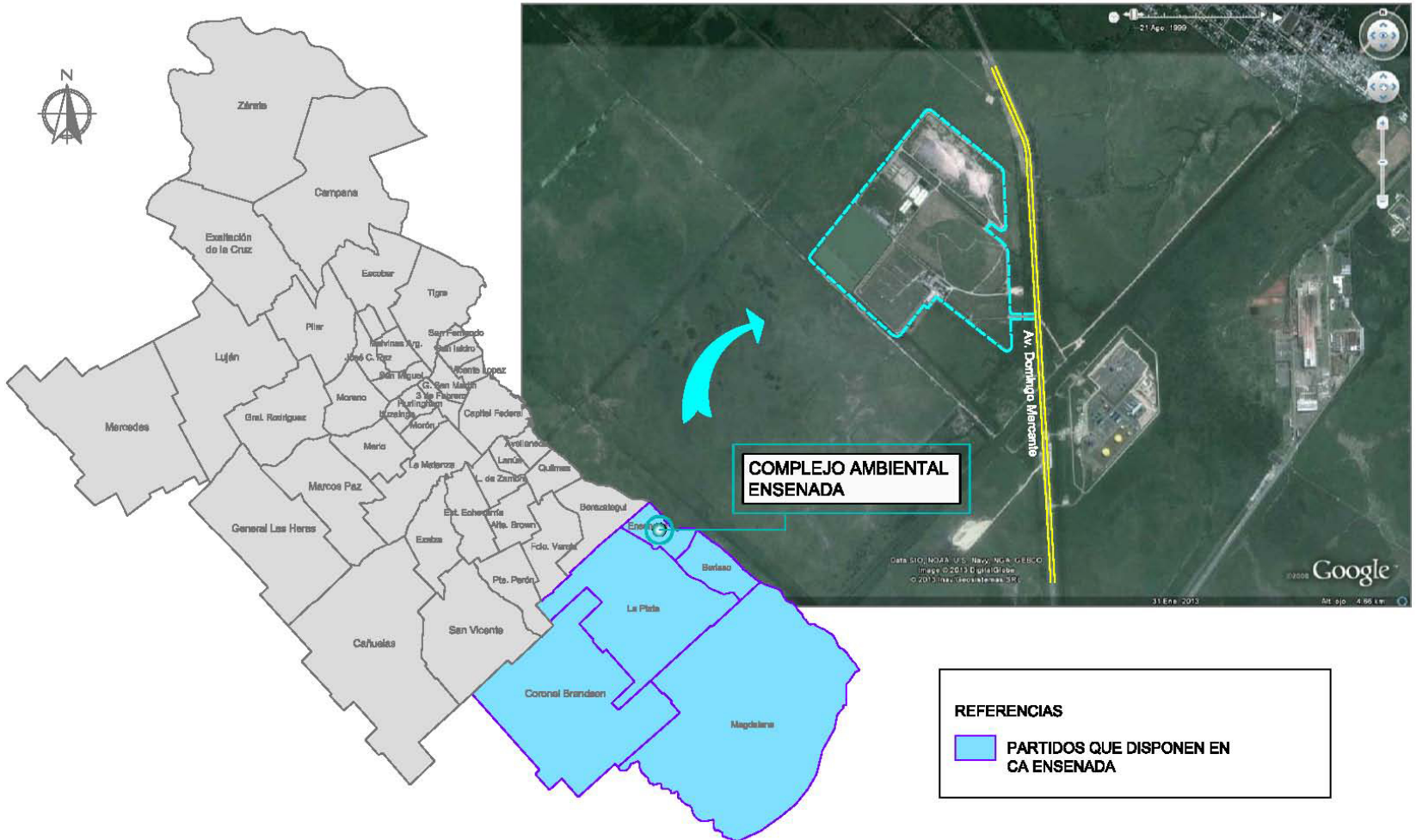
- COMPLEJO AMBIENTAL**
- ① NORTE III
- Camino Buen Ayre (Progresiva 8600)
 - ② GONZALEZ CATAN
- Domingo Scarlatti y Manuel Gallardo
 - ③ ENSENADA
- Diagonal 74 y Canal del Gato
 - ④ VILLA DOMINICO
- Acceso sudeste y Canal Santo Domingo
- PLANTA DE TRANSFERENCIA**
- ⑤ POMPEYA
- Zavaleta 858 y Perito Moreno
 - ⑥ COLEGIALES
- Cramer 290
 - ⑦ FLORES
- Balbastro 3160
 - ⑧ USINA GCBA
- Varela y Ana María Janer
 - ⑨ ALMIRANTE BROWN
- Av. Las Flores y Fonrouge

 AREA DE COBERTURA DE CEAMSE

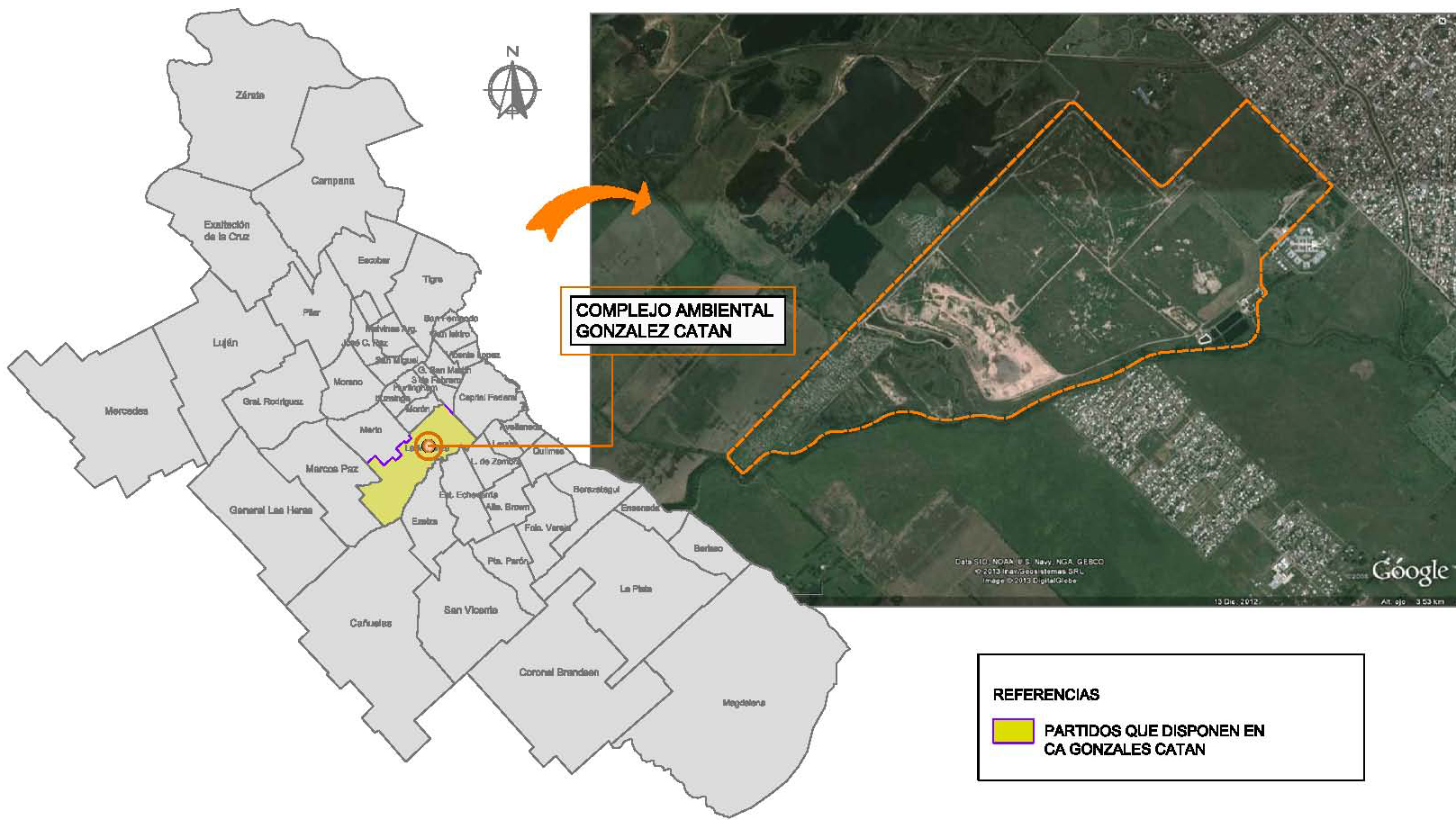
SWM - Metropolitan Area of Buenos Aires



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Norte III - Final Disposal Environmental Complex



Location of Norte III - Final Disposal Environmental Complex



The Norte III environmental complex is to be found in the municipalities of San Martín, San Miguel and Tigre (Campo de Mayo) in the province of Buenos Aires.



THE GENREM PROGRAM

Program for “Awarding Supply Contracts for those with Renewable Energy Sources”

These projects were implemented via public tender, by **ENARSA** in 2010 for the generation of upto 20MW of electricity from Biogas. The aim of this tender was to encourage the development of power generation from renewable sources and to strengthen the sustainable development of renewable energy throughout Argentina.

The implementation of these projects have contributed towards the objective of National Law N° 26.190 and its regulatory decree N°562/09, for the use of renewable energy sources. This regulation establishes that within 10 years, **i.e. by 2016, 8% of electricity should be supplied from renewable energy sources.**

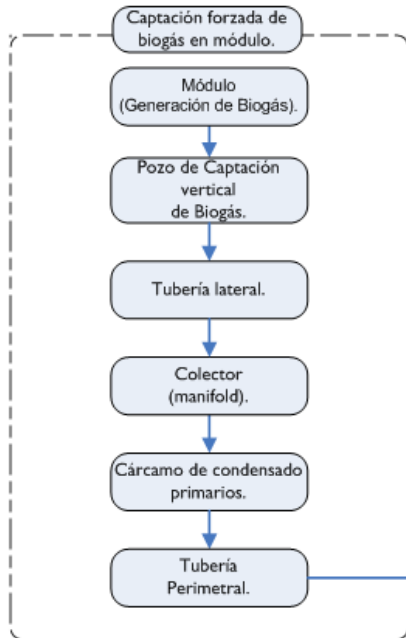
In exchange for the investment made by winning companies, **ENARSA** would buy this energy **at a USD rate for a period of between 8 and 14 years.**



FLOW PROCESS CHART

Diagrama de Flujo Tratamiento de biogás y Generación de energía eléctrica
Módulo Norte III c

Captación, Conducción y Monitoreo de Biogás.



Cámara de condensado secundaria.

Skid.

Separador de humedad (Demister).

6500 Nm³/hr.

6500 Nm³/hr.

6500 Nm³/hr.

Tratamiento de Biogás (Quemado controlado) y Aprovechamiento (Generación de energía eléctrica).

Antorcha de quemado de biogás. (4500 Nm³/hr)

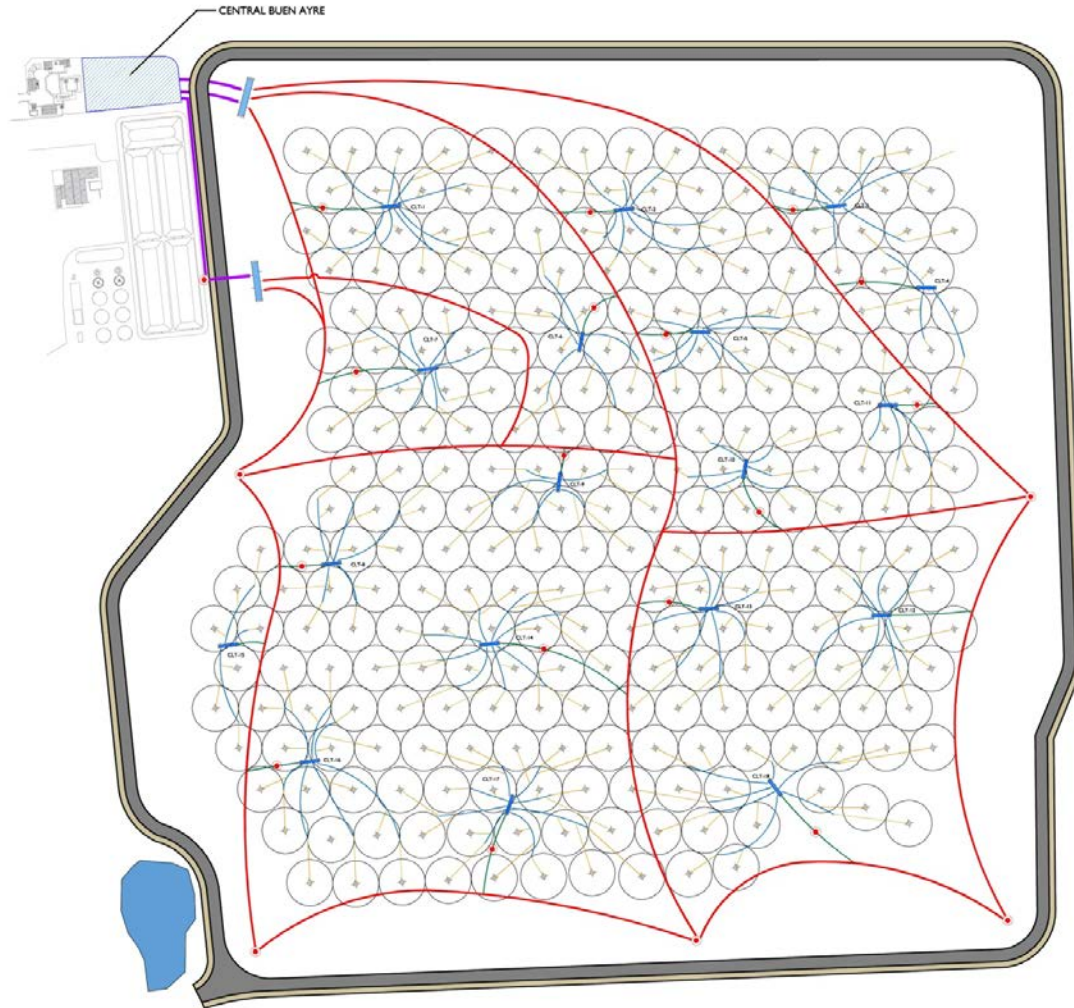
Antorcha de quemado de biogás. (4500 Nm³/hr)

Pretratamiento de biogás.

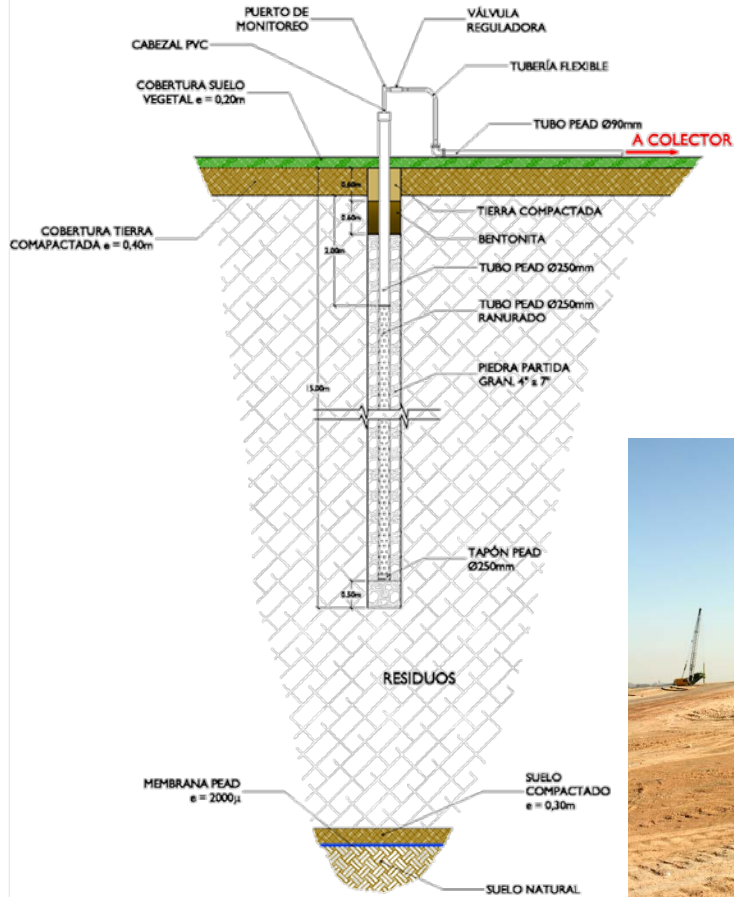
Central térmica de generación de energía eléctrica a partir de biogás.

Cantidad de moto generadores: 6
Potencia: 11.8 MW.

NIIC PROJECT CENTRAL BUEN AYRE



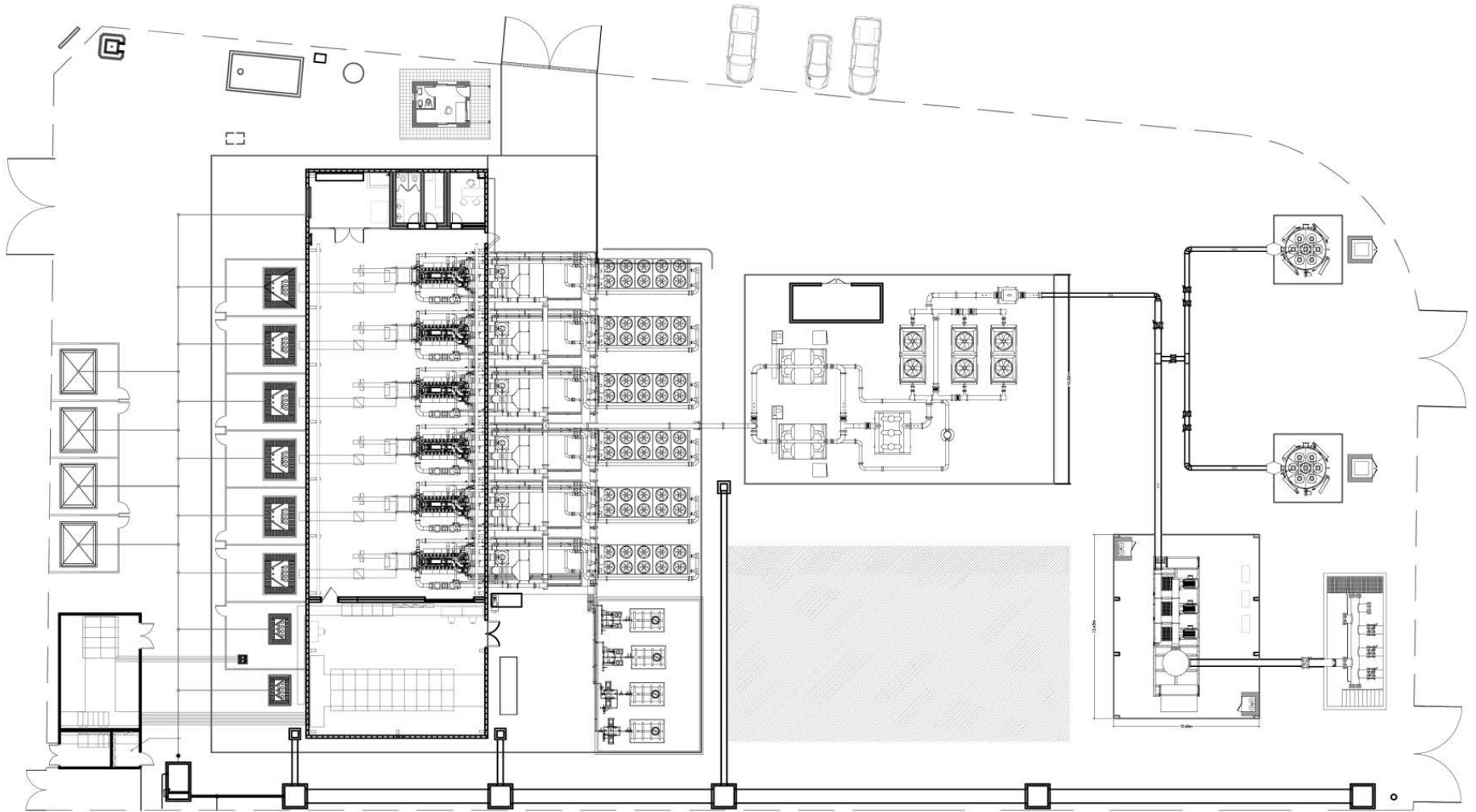
DETAILS OF EXTRACTION WELLS



- Number of Wells: 273 (RI=25m c/u)
- Location: as previously shown
- Depth: 15 metres
- Extraction gas pipes:
Ø=250 mm. of PEAD
- Filler Material: broken stones, earth and bentonite
- Secondary Lateral Pipes: 3

Head of pipe.

LAYOUT - CENTRAL BUEN AYRE



DETAILS OF SUCTION EQUIPMENT AND BIOGAS DRIVERS

The Biogas suction system consists of 3 blowers, each with a 250 HP capacity, that carry out the suction and drive process for the Biogas utilization system.



Capacity: 6500 Nm³/h per unit.

Multistage type Centrifugal Blowers.

Variable speed drives to optimize energy consumption and evenly regulate suction in the module.

DETAILS OF BIOGAS TREATMENT

Cooling system, Separation and Filtration

With a 99% efficiency rate, it consists of:

- A cyclone which separates particles and drops of liquid $> 15\mu$
- A dehumidifier/filter that eliminates liquid particles and solid $> 0.3 - 0.8 \mu$.



Siloxanes Removal System

With a 95% efficiency rate, it consists of a special resin filter which absorbs the siloxanes.

ELECTRIC ENERGY GENERATION

- The priority of the captured biogas is to fuel the motor generators.
- Energy is produced by the coupling of **6 (six)** motor-generators, achieving a combined production capable of generating 11,796 Mwe of electric power, and providing an effective output of 10 MW of renewable energy to the National Grid.

Brand Name	Caterpillar
Model	G3520 C DM 8647
Installed Power	1,966 MWe
Phases	3
Frequency	50 Hz
Speed	1500 rpm
Biogas Consumption (100%)	841 Nm³/h

The set of motor-generators have an annual availability of more than 85%, with an electrical output of 38%.

Generation of low voltage (400 V), which subsequently rises to 13,2 kV.

ELECTRIC ENERGY GENERATION

Powerhouse Electricity
Motor-generators

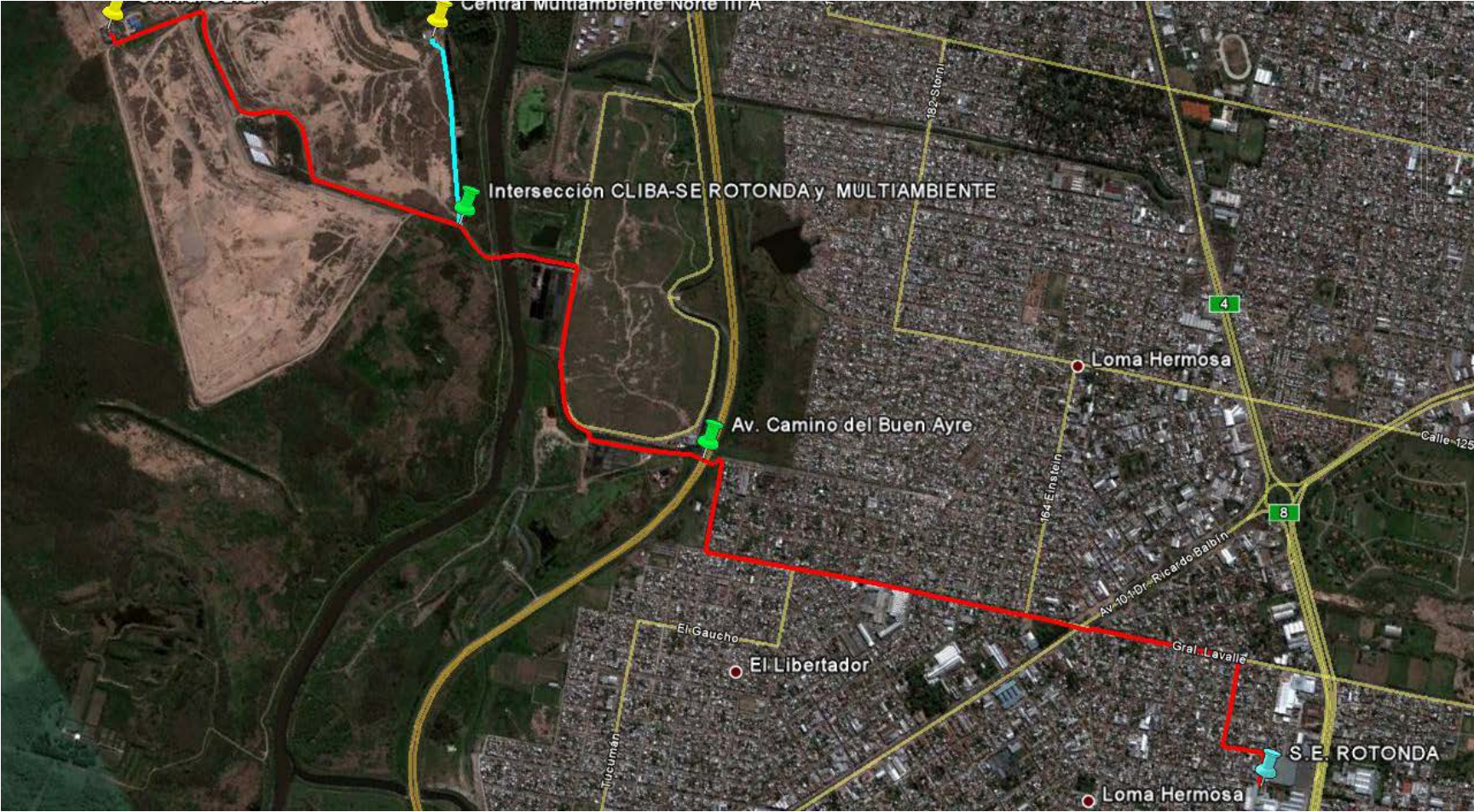


Control Board:
Measurement, Input and Output Cells

ELECTRIC TRANSMISSION SYSTEM (ELECTRIC CABLE-DUCTS)

- The power generated is transported (approximately 7.2kms) via a medium voltage underground cable (13.2 kV) to a substation of EDENOR located in Tres de Febrero (substation Rotonda), which is connected to the national grid.
- The transmission system consists of two double 185 mm² ternary cables that permits each one to carry a maximum of 10 MW enabling an alternating power flow.
- Fibre optic communication links and protections run in parallel.
- Major construction work in three sites were carried out in order to lay the cables:
 - ✓ Crossing the Reconquista river and the Güemes stream
 - ✓ Crossing Buen Ayre highway
 - ✓ Crossing the National Highway N° 8

ELECTRIC CABLE-DUCTS LINKING CA NIII AND “ROTONDA” EDENOR



RELEVANT DETAILS OF CENTRAL BUEN AYRE

Main Suppliers:

-Caterpillar (Finning): Powerhouse (motogeneradores), John Zink, Edenor

Investment: \$ 136,352,000 (U\$ 30,300,000)

MDL Project Period: 10 years

Number of CER´s: 6,043,349

Maximum flow of captured biogas: 13.100 Nm³/h (año 2013)

Number of vertical extraction wells: 273



RELEVANT DETAILS OF CENTRAL BUEN AYRE

Construction period of the Biogas Thermal Power Plant: 13 months

Power generation period: 14 years

Power Capacity: 11.796 MW (6 CAT G3520C x 1.966 MW)

Annual availability of motors: 85 %

Distance covered of Electrical Wire Ducts: 7.2 kms.

Type: Underground

Tension: 13.2 kV (Medium Voltage)



RELEVANT DETAILS OF CENTRAL BUEN AYRE

Interconnection with SADI: Substation "Rotonda" Edenor

Contracted Energy Limit: 1,211,070 MWh

Tariff (fixed price in USD): U\$D124 per MWh

Ability to generate energy for: 20,000 households

Savings equivalent to: 22,000,000 m³ of natural gas

TOTAL ACCUMULATED ENERGY GENERATED TO DATE

237.810.894 KW



PROJECT FOR THE DEGASSING AND ELECTRICAL POWER GENERATION AT MODULE NIIIA CDM 2785



7 MW of Installed
Power
5 MW For Dispatch



RELEVANT DETAILS OF “MULTIAMBIENTE DEL PLATA S.A.”

Main Suppliers:

-*Biotecnogas Srl ItaliaJ, Edenor.*

Investment: USD\$ 1.2 millon per installed Mw.

MDL Project Period: 10 years

Number of CER´s: 260.339 año

Maximum Flow of captured biogas: 3,000 Nm³/h (año 2013)

Number of vertical extraction wells: 250



RELEVANT DETAILS OF “MULTIAMBIENTE DEL PLATA S.A.”

Construction period of the Biogas Thermal Power Plant: 5 months

Power generation period: 8 years

Power Capacity: 5 GE Jenbacher x 1420 kW

Annual availability of motors: 8,000 hours

Distance covered with Electrical Wire Ducts : 7.2 kms.

Type: Underground

Tension: 13.2 kV (Medium Voltage)



RELEVANT DETAILS OF “MULTIAMBIENTE DEL PLATA S.A.”

Interconnection with SADI: Substation “Rotonda” Edenor

Contracted Energy Limit: 250.000 MWh

Tariff (fixed price in US): D\$ USD\$ 120 per MWh

Ability to generate energy for: 10,000 households

TOTAL ACCUMULATED ENERGY GENERATED TO DATE:

111,116,734 KWh



CONSTRUCTION OF POWER GENERATION FACILITIES



System Reliability
Test - Tuesday
29th May @18.35
hrs



First Dispatch
SADI
Saturday 19th
May @ 14.31 hrs.



Thank You!

Marcelo E. Rosso

Email: mrosso@ceamse.gov.ar

New Technologies and Environmental
Control Manager at
CEAMSE