

WASTE MANAGEMENT IN BRAZIL



WTERT 2016 Bi-Annual Conference at Columbia University

Sergio Guerreiro Ribeiro
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LEGACY OF THE 2016 OLYMPIC GAMES IN RIO

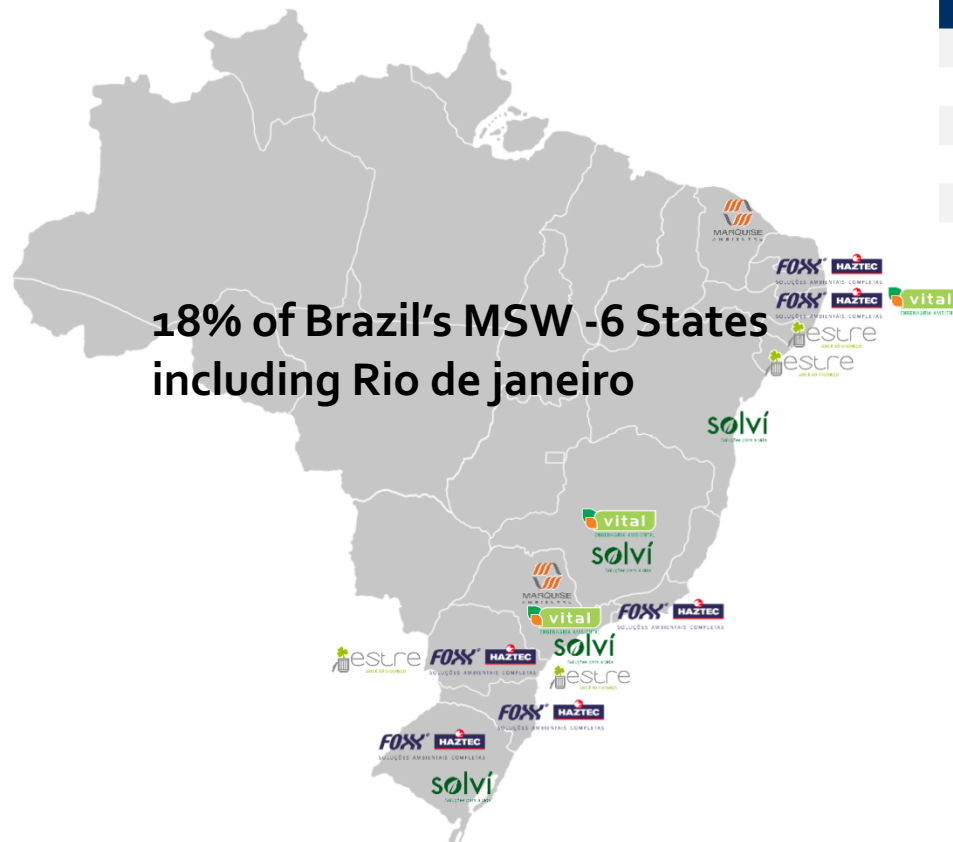
DESPITE A HUGE OPPORTUNITY
TO IMPROVE WM BEFORE THE
GAMES – **VERY LITTLE WAS
ACHIEVED**

Sector Overview (cont'd)

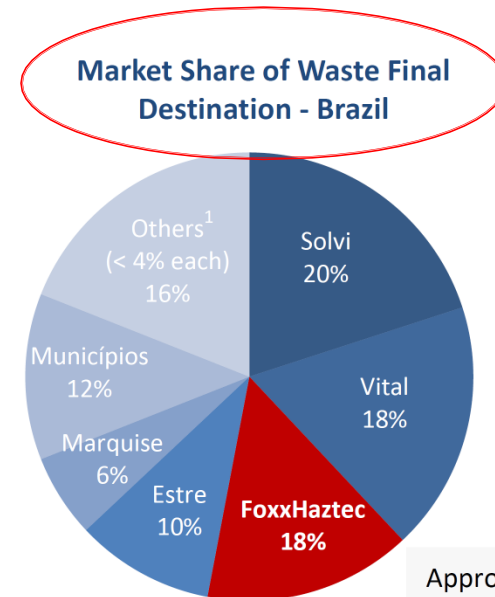
BARUERI, SP – ONLY WTE PROJECT IN BRAZIL



National presence of main competitors



Company	States
FoxxHaztec	RJ, PE, PR, SC, RS and PB
Estre	PR, SP, SE and AL
Marquise	CE and SP
Solvi	SP, BA, MG and RS
Vital	SP and MG



Approximately **46%** of waste is under private management

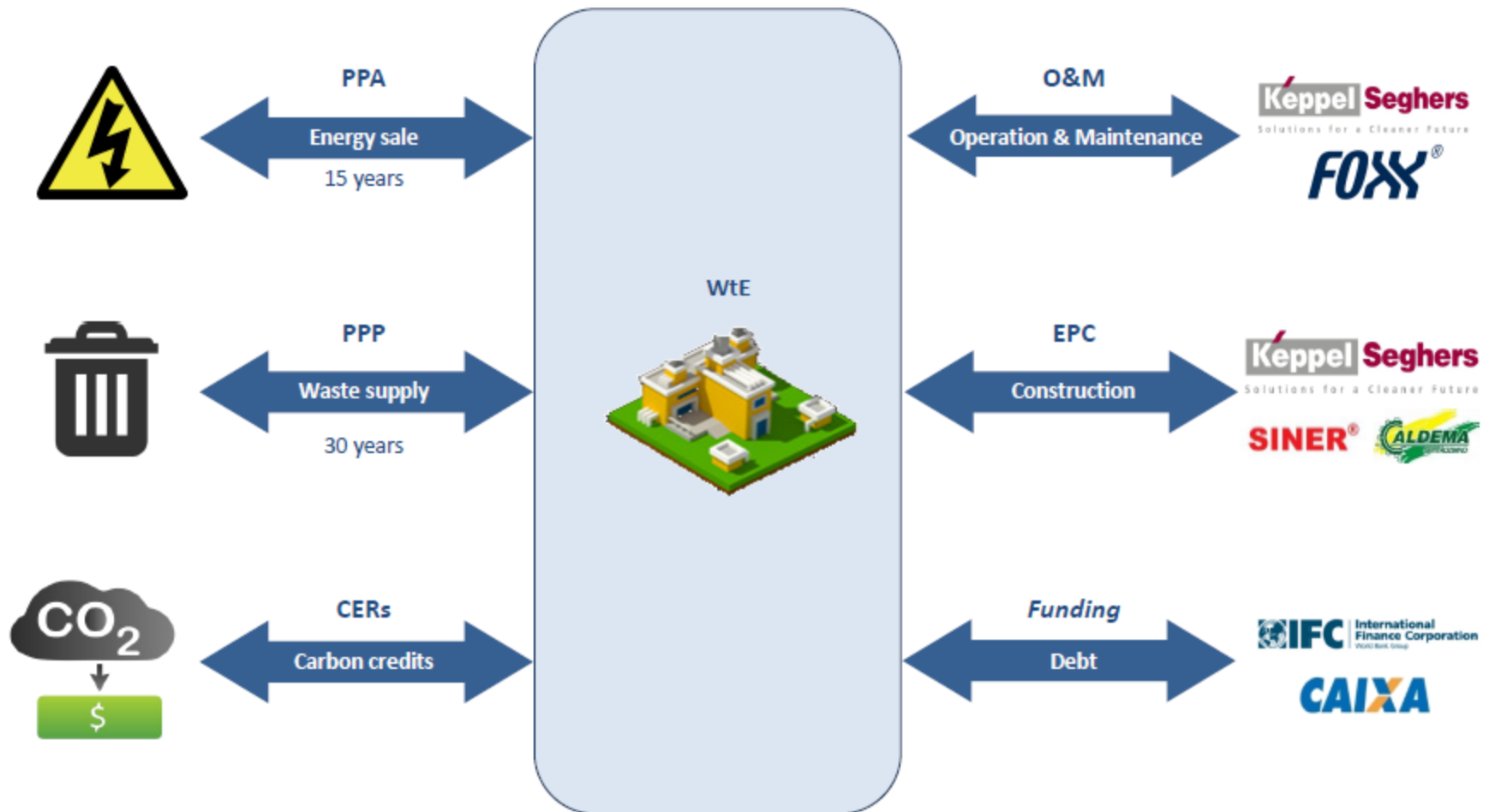
Source: estimated by the company based on ABELPE data
Note: (1) Approximately 53 companies

► Business Model – WtE

BARUERI, SP – ONLY WTE PROJECT IN BRAZIL



Foxx owns ERU Barueri, the first thermal waste treatment unit in Brazil. This units will be situated in São Paulo's Metropolitan Region and will have enough capacity to treat 825 tons of waste per day, with installed power of 20MW.



FOXX URE-BA AMBIENTAL LTDA.

Project is estimated at R\$320 million (~ US\$111 million)

This Summary of Investment Information (SII) is prepared by IFC to disclose a factual summary of the main elements of the potential investment. It also includes findings and recommendations related to environmental and social considerations regarding this potential investment. The purpose of the SII is to enhance the transparency of IFC's activities. For any project documentation or data included or attached herein that has been prepared by the project sponsor, authorization has been given for public release by the project sponsor. IFC considers that this SII is of adequate quality for release to the public, but has not necessarily independently verified all of the project information therein.

The SII is distributed only and this document

equity financing ratio of 71/29.

ard dates are estimates

Project number

Company name

Foxx Ure Ba Ambiental

Project description

The proposed investment is a senior loan, of BRL42 million (approximately US\$16 million), to Foxx URE BA Ambiental Ltda (the "Project Company") for the construction of a greenfield Waste-to-Energy ("WtE") facility in the municipality of Barueri, São Paulo, Brazil (the "Project"). Along with IFC, Caixa Econômica Federal ("Caixa") will also be providing a senior loan to the Project Company of BRL183 million (approximately US\$69 million). The Project's sponsor, Haztec Investimentos e Participações S.A. ("Foxx Haztec") is the first company to win a mass burning WtE contract in Brazil and is the only largest waste management company in Brazil. Municipal Solid Waste ("MSW") incineration and WtE refer to the same basic process of mass burning of MSW with an added energy-recycling process.

WITH ECONOMIC CRISIS THE MUNICIPALITIES ARE NOT PAYING FOR WM SERVICES – NOT ABLE TO PROVIDE EQUITY – THEY STILL NEED US\$ 20 MILLION



Total project cost and amount and nature of IFC's investment

The total cost of the Project is estimated at R\$320 million (~ US\$111 million) with a proposed debt / equity financing ratio of 71/29. The proposed IFC investment is a senior loan, up to a BRL42 million (approximately US\$16 million).

**SOLID WASTE IN WATER STREAMS
POLLUTING GUANABARA BAY AND THE
OCEAN – REACHED CRITICAL LEVEL IN RIO**

**HIGHLY CONTAMINATED WITH SEWAGE AND
ONLY SUITABLE DISPOSAL→ WTE**

**VIEW FROM ECOBARRIER – SEWAGE TREATMENT STATION
DOWNSTREAM FROM TRASH BARRIERS – ONE MILE FROM THE
OLYMPIC PARK**



RANDOM WASTE REMOVAL WITH HEAVY RAIN TRASH FLOWS OVER BARRIERS DAMAGING EQUIPMENT



RAMYA, COLUMBIA STUDENT, WENT TO RIO TO CHECK INFORMAL RECYCLING



WTE IS THE ONLY POSSIBLE DISPOSAL OPTION FOR THIS TRASH





**IN POOR REGIONS
WASTE PICKERS
ACCEPT ANY TYPE
OF WASTE IN
TERRIBLE SANITARY
CONDITIONS**



**THESE RECYCLERS ARE
EAGER FOR SOURCE
SEPARATED WASTE**

**MORE ADVANCED
COOPERATIVES HAVE
OWN TRUCKS GO DOOR
TO DOOR FOR
RECYCLABLES**

**BRAZIL HAS HIGH
RECYCLING RATES**

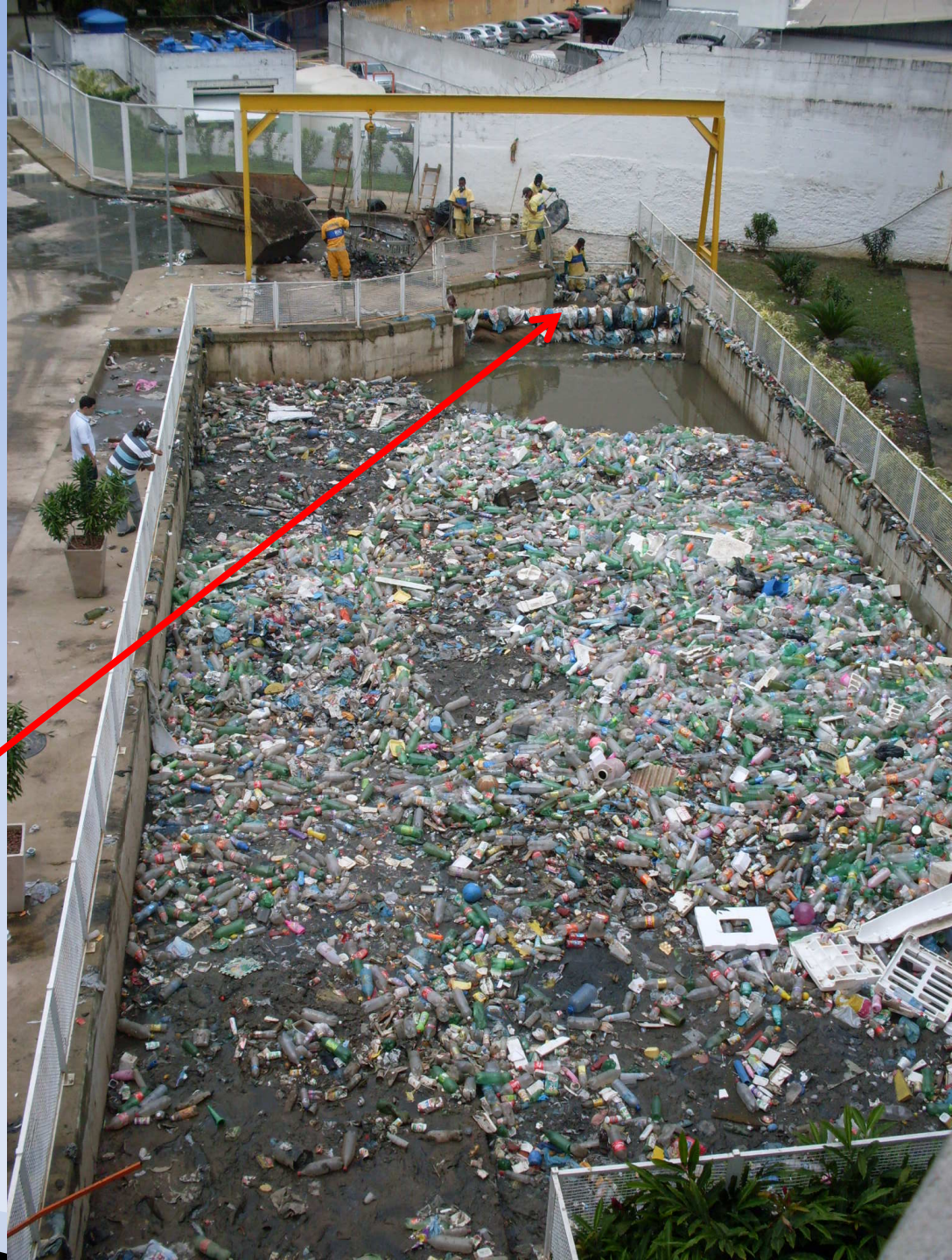




**WASTE FLOW FROM THE LARGEST
FAVELA IN RIO (ROCINHA) AFTER A
HEAVY RAIN**

**THIS WASTE ENDS UP IN THE BEACH
OR IN A LANDFILL**

**OBS: THIS IS CLOSE TO A VERY
SOPHISTICATED NEIGHBOURHOOD**



KCI TECHNOLOGIES, INC FROM BALTIMORE OPENED A COMPANY IN BRAZIL TO BUILD, SELL OR LEASE TRASH INTERCEPTORS (WATERWHEEL) THAT COLLECTS THE WASTE USING THE FLOW OF THE RIVER AND SOLAR POWER –



Water Wheel Trash Interceptor

Water Wheel Facts

The Inner Harbor Water Wheel is capable of removing 50,000

THE STATE OF RIO DE JANEIRO LIKED THE IDEA BY DIDN'T HAVE THE RESOURCES TO BUY, RENT OR LEASE THESE MACHINES – KCI LEFT BRASIL

Water Wheel Parts

- 1 Two trash containment booms direct trash and debris to the front of the Water Wheel
- 2 The debris raking system helps to move trash and debris to the front of the conveyor belt
- 3 The conveyor belt lifts trash and debris from the water and deposits it into the dumpster barge
- 4 The sail fabric cover protects the Water Wheel from wind and rain
- 5 The water wheel harnesses the current of the river to turn the conveyor belt
- 6 The dumpster barge stores trash and debris
- 7 The solar panel array provides additional power to turn the water wheel

Direction of river current

GOOD NEWS

WTERT BRASIL HAS DONE A PARTNERSHIP WITH THE **BIOMASS-TO-ENERGY** SECTOR IN BRAZIL BRINGING MODERN **WTE** TECHNOLOGY

BASED ON THE BEST WTE PLANTS IN THE WORLD A SOLUTION COMBINING SUGAR CANE BAGASSE AND NATURAL GAS WAS DEVELOPED AND THE IDEA HAS BEEN BOUGHT BY **GAS BRASILIANO** (PETROBRAS) AND **SIEMENS** (GAS AND STEAM TURBINES)

General View of *Gas*Brasiliano Concession Area

AREA

8.328.750 inhabitants (20,2% of State population)

✂ 141.623 km² (57% of State area)

DISTRIBUTION NETWORK

957 km

✂ 07 City Gates

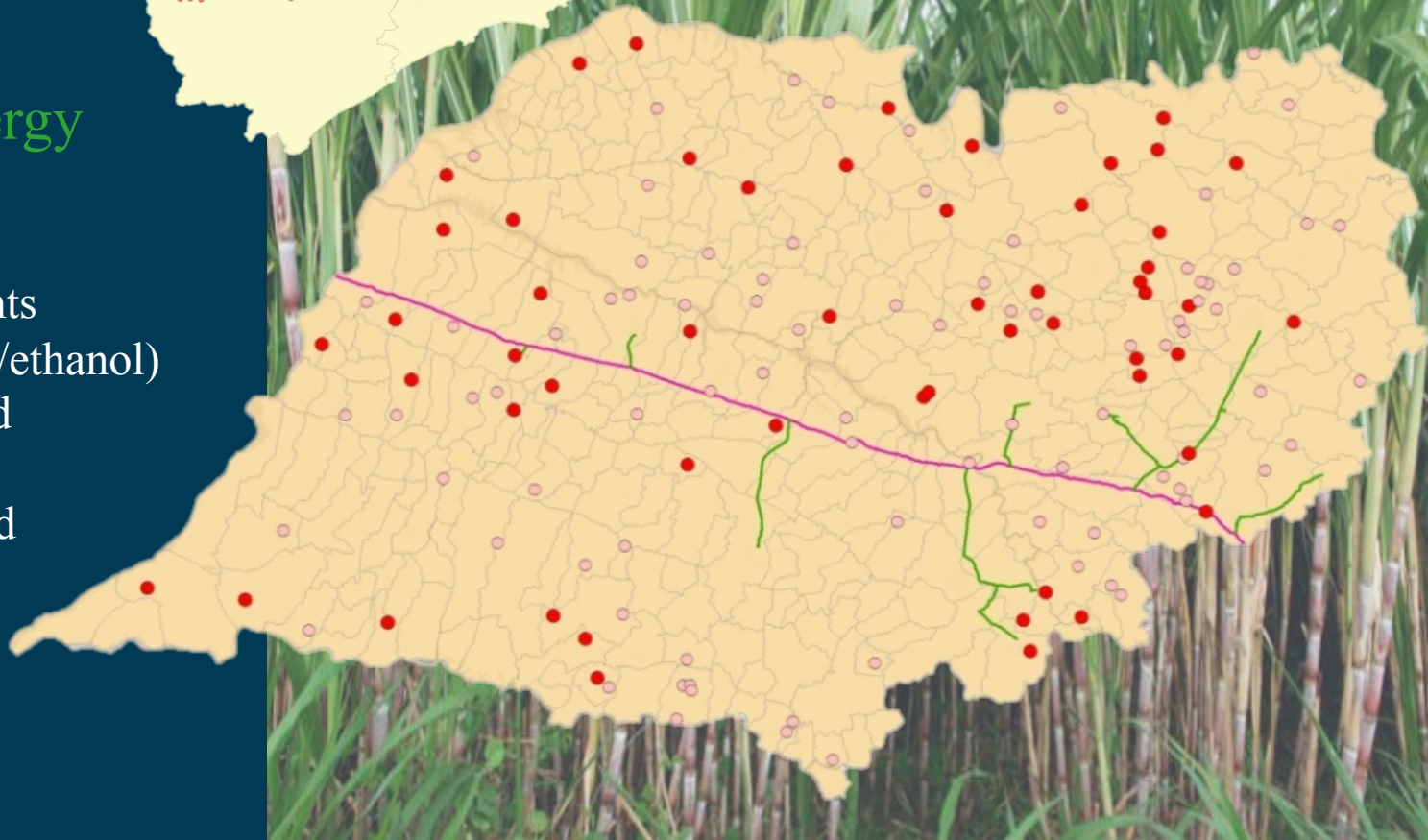
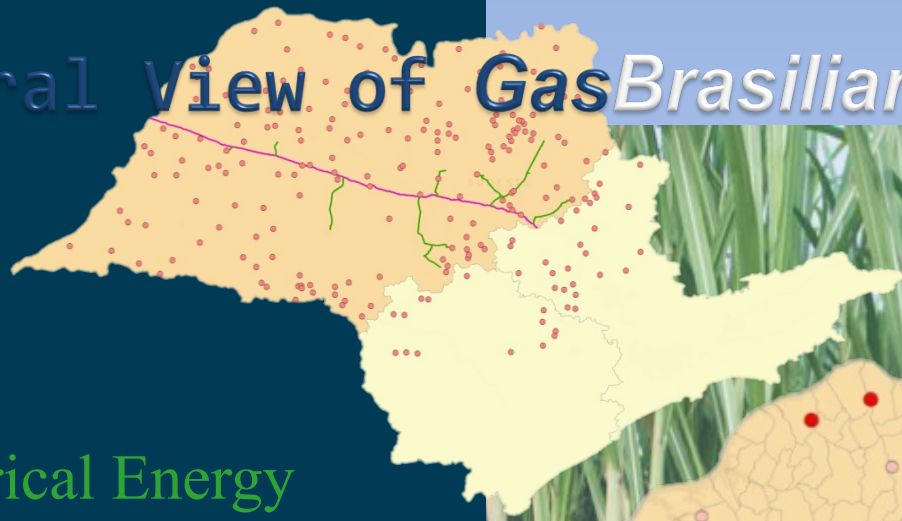
Área (km ²)	Population
 140 mil	8,2 milhões
 30,5 mil	10,4 milhões
 41,2 mil	8 milhões
 132 mil	10,8 milhões
 92 mil	10,5 milhões



General View of GasBrasiliانو Concession Area

Electrical Energy Generation

- 140 Power Plants
- 54 Mills (sugar/ethanol)
Connect to Grid
- 12 GW installed



DESPITE THE DIFFICULTIES BRINGING WTE TO BRAZIL, ENERGY FROM BIOMASS (SUGAR CANE BAGASSE) USES SIMILAR TECHNOLOGY AND SHARE SIMILAR PROBLEMS

Moagem de cana-de-açúcar e produção de açúcar e etanol - safra 2015/2016

Estados	Cana-de-açúcar (mil toneladas)	Açúcar (mil toneladas)	Etanol Anidro (mil m³)	Etanol Hidratado (mil m³)	Etanol Total (mil m³)
Acre	86	0	0	5	5
Alagoas	16.382	1.228	215	163	378
Amazonas	216	12	0	6	6
Bahia	3.816	80	46	175	221
Ceará	209	0	0	15	15
Espírito Santo	2.810	71	89	62	151
Goiás	73.522	1.892	1.314	3.375	4.689
Maranhão	2.455	13	146	41	187
Mato Grosso	17.151	337	508	818	1.326
Mato Grosso do Sul	47.817	1.302	646	2.131	2.777
Minas Gerais	64.853	3.245	1.059	2.010	3.069
Pará	682	22	30	11	41
Paraíba	5.586	129	175	170	344
Paraná	42.108	2.807	601	972	1.574
Pernambuco	11.394	822	154	196	350
Piauí	967	67	29	3	33
Rio de Janeiro	1.066	0	0	59	59
Rio Grande do Norte	2.468	138	52	37	89
Rio Grande do Sul	61	0	0	4	4
Rondônia	191	0	0	13	13
Santa Catarina	0	0	0	0	0
São Paulo	368.323	21.567	6.426	8.151	14.577
Sergipe	2.296	105	26	86	112
Tocantins	2.366	0	143	69	213
Região Centro-Sul	617.709	31.221	10.643	17.581	28.225
Região Norte-Nordeste	49.115	2.616	1.017	991	2.008
Brasil	666.824	33.837	11.661	18.572	30.232

BRAZIL PROCESSES 666 MILLION TONNES OF SUGAR CANE PER YEAR

25% OF THIS IS BAGASSE – A BIOMASS RESIDUE FROM THE ETHANOL / SUGAR INDUSTRY

BAGASSE IS BURNED IN BOILERS TO GENERATE PROCESS STEAM AND POWER

IN THE PAST EFFICIENCY WAS LOW BUT NOW THE ELECTRICITY HAS GAINED PRIORITY

**CRUZ ALTA POWER PLANT – HYBRID REHEAT CYCLE 100/22 bar - 450 ° C –
POWER 50 MWe AND 135 T/H OF PROCESS STEAM**



CRUZ ALTA CONTAINS IDEAS OF SOME OF THE MOST ADVANCED WTE PLANTS PLUS SOME REQUIREMENTS OF ETHANOL FROM SUGAR CANE → CHP



HIGH PRESSURE (100 bar) / LOW SUPERHEATING (450 ° C)

EXTERNAL REHEAT WITH SMALL GAS TURBINE



DAN POWER A TOP BOILER MANUFACTURER
AND TRADITIONAL SUPPLIER TO SIEMENS
POWER PLANTS IN BRAZIL WILL SUPPLY A 220
T/H BOILER - 100 BAR / 450 C STEAM



**CRUZ ALTA – PROCESSES 4,000,000
TON/YEAR OF SUGAR CANE**

**GAS BRASILIANO WILL CONSTRUCT
A 50 MILE GAS PIPELINE TO SUPPLY
CRUZ ALTA AND OTHER NEARBY
INDUSTRIES**

**THE IRR OF THE PROJECT
IS MORE THAN 60%**



THANK YOU VERY MUCH



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SERGIO GUERREIRO RIBEIRO

sergiog@wtert.com.br