



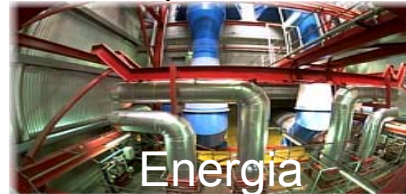
# EVAPORAÇÃO DE CHORUME E GERAÇÃO DE CRÉDITOS DE CARBONO

Experiência desenvolvida pela ONYX SASA



# ORIGEM E EXPERIÊNCIA DA EMPRESA

# ORIGEM E EXPERIÊNCIA DA EMPRESA



Receita 2003 - 30 bi €

Presença em mais de 100 países

Perto de 300.000 colaboradores



# PAISES ONDE A ONYX ESTÁ PRESENTE

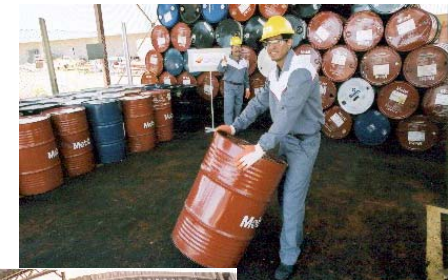


Presença em 48 países

Cerca de 75.000 colaboradores

# ATIVIDADES DESENVOLVIDAS PELA ONYX NO BRASIL

- Tratamento e Disposição Final de Resíduos Industriais e Urbanos em Células Impermeabilizadas
- Co-processamento em fornos de produção de Clinquer com destruição térmica e recuperação energética
- Gestão global de resíduos e tratamentos *Off Site*
- Sistemas de armazenamento temporário de resíduos
- Serviços laboratoriais diversos





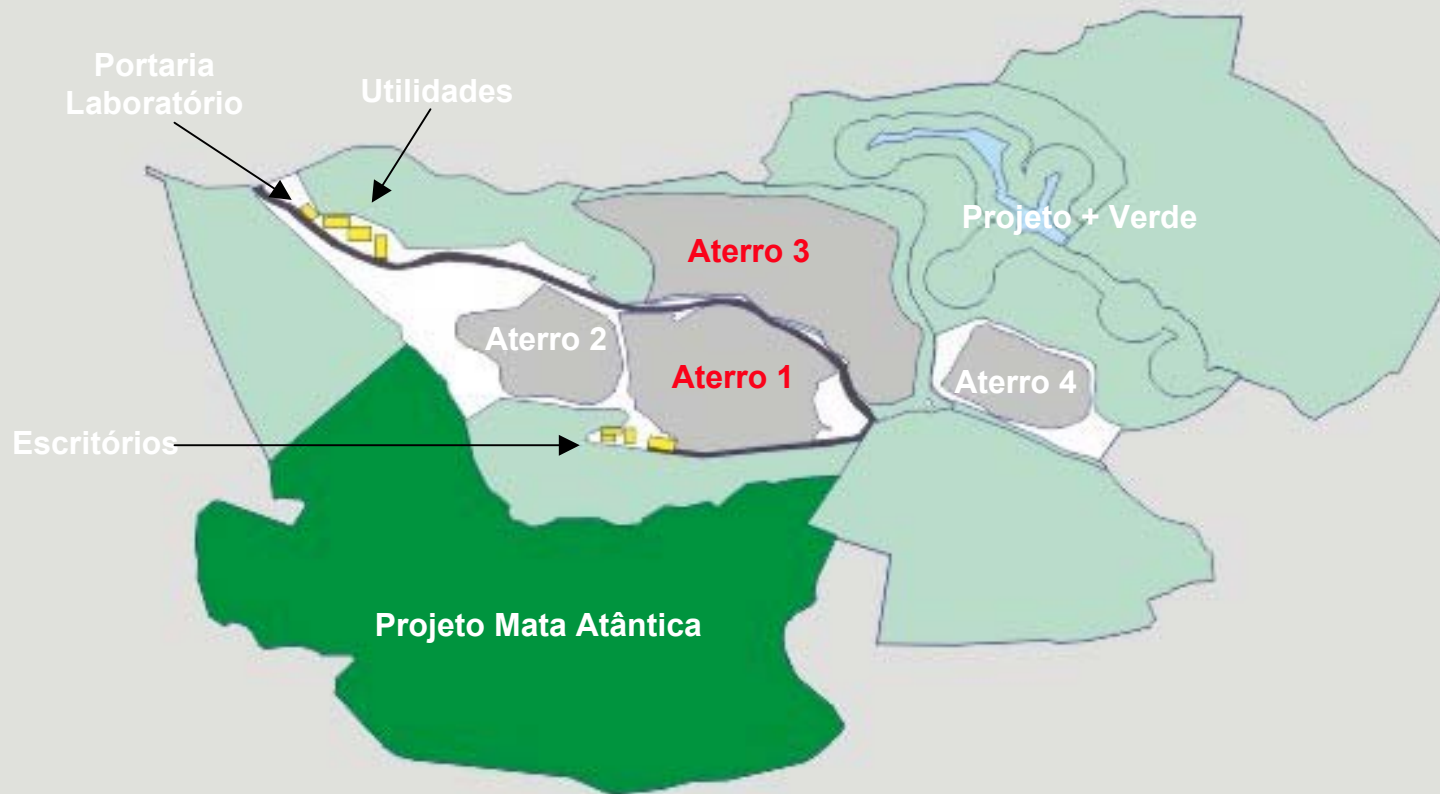
# LOCALIZAÇÃO DA ONYX SASA – Tremembé / SP





- **TRATAMENTO E DISPOSIÇÃO DE RESÍDUOS:**  
Industriais Classe I, II e III  
**Urbanos (Lixo Domiciliar)**
- **SERVIÇOS DE LABORATÓRIO PARA ANÁLISE DE:**  
Resíduos Industriais  
Águas Superficiais e Subterrâneas  
Efluentes Industriais, Chorume e Outros
- **SUPORTE PARA SOLUÇÕES DE ATERROS “IN SITU”**

# MAPA DAS INSTALAÇÕES DA ONYX SASA







# CHORUME E BIOGÁS

## OS PRINCIPAIS EFLUENTES DOS

### ATERROS SANITÁRIOS

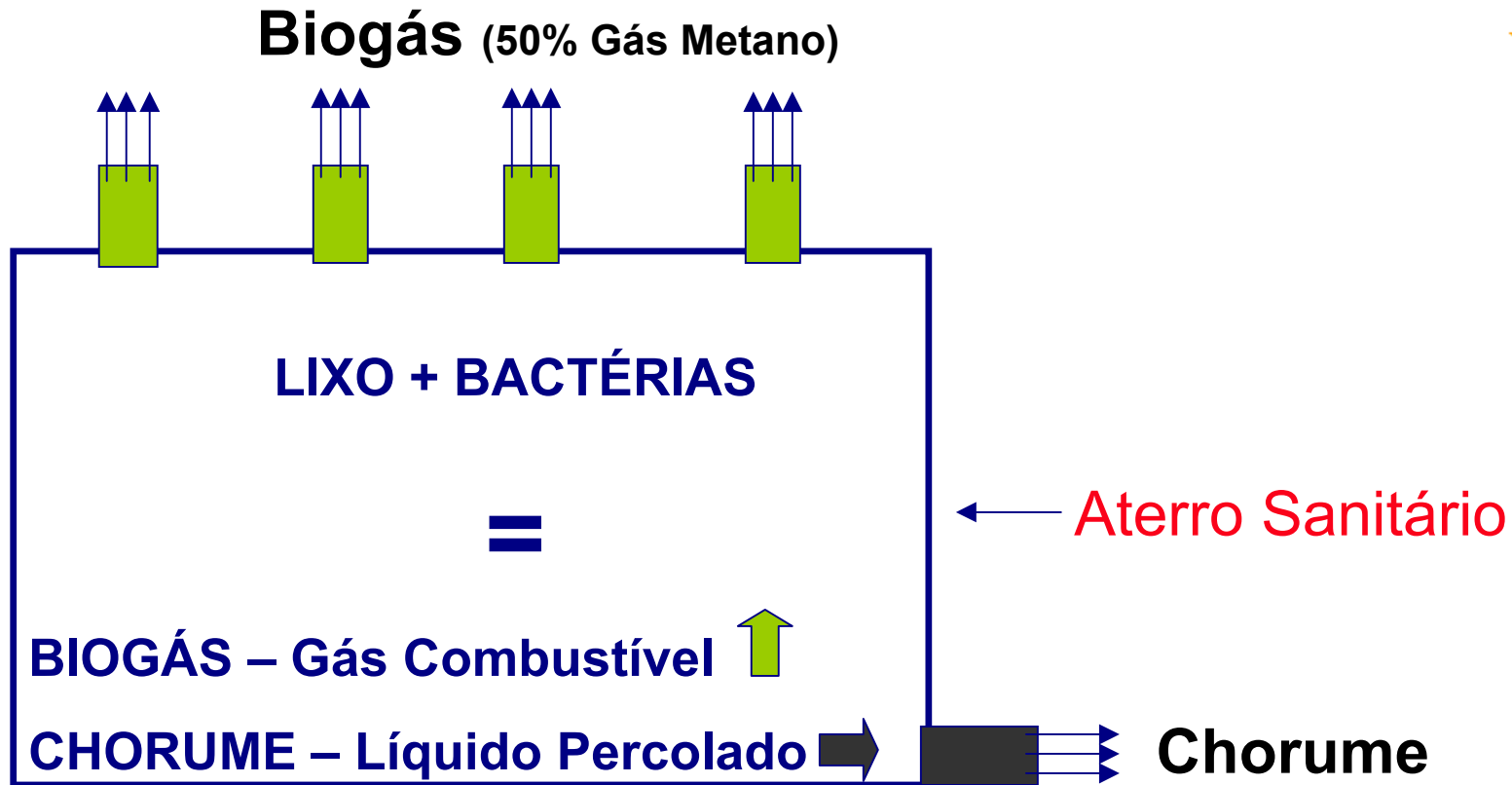
# ATERRO SANITÁRIO / CODISPOSIÇÃO



**NO BRASIL, RESÍDUO URBANO  
TEM ALTO TEOR DE MATÉRIA  
ORGÂNICA (>50%)**



# DECOMPOSIÇÃO DA MATÉRIA ORGÂNICA





# O QUE SE FAZ COM O CHORUME E O BIOGÁS ?



## **NOS ATERROS SANITÁRIOS CONVENCIONAIS:**

- **CHORUME:**

**Lagoas => Grandes Áreas / Odor / Chuva**

**SABESP => Transporte / Custo / Dependência**

- **BIOGÁS:**

**Queimado na boca dos drenos de gás**

**=> Riscos de incêndio e explosões**

**=> Queima incompleta e sem controle**

**=> Apenas a exaustão espontânea de gás é queimada**



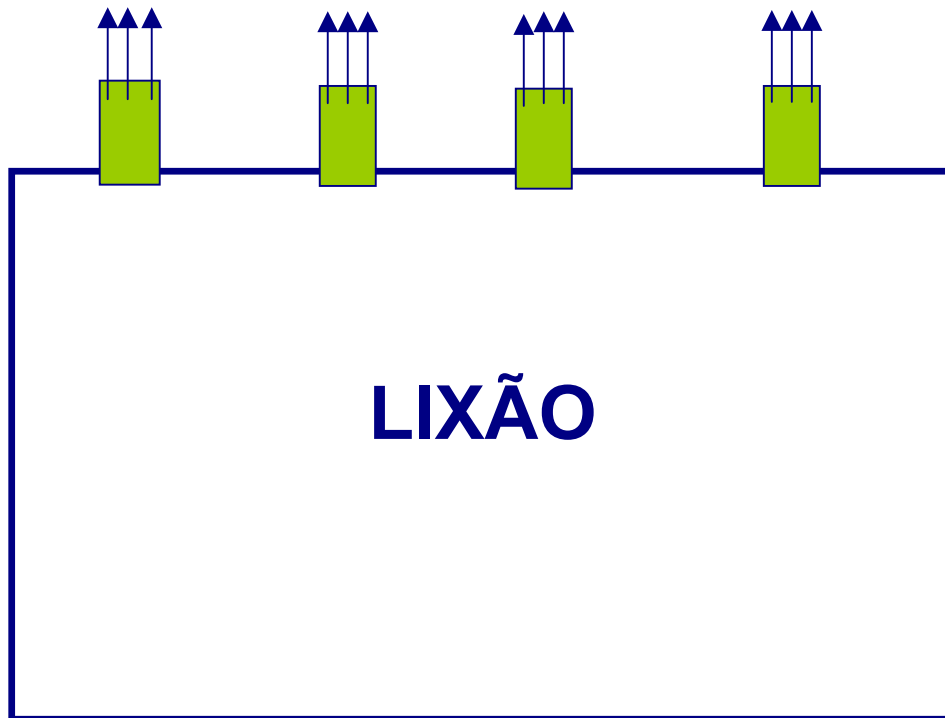
## Situação da disposição final do lixo urbano nos municípios do Estado de São Paulo

| Nota                    | 1997       | 2002       |
|-------------------------|------------|------------|
| 0 – 6 (inadequada)      | 502        | 192        |
| 6 – 8 (controlada)      | 116        | 162        |
| <b>8 – 10(adequada)</b> | <b>27</b>  | <b>291</b> |
| <b>TOTAL</b>            | <b>645</b> | <b>645</b> |

Fonte: Inventário CETESB

# BIOGÁS NOS LIXÕES

O Biogás é lançado diretamente na atmosfera contribuindo para ocorrência do “Efeito Estufa”, proporcionando riscos de incêndios, explosões e escorregamentos de taludes





# CHORUME NOS LIXÕES



**O Chorume não é tratado adequadamente, poluindo as águas subterrâneas, córregos e rios**



# COMO O BIOGÁS E O CHORUME SÃO TRATADOS NA ONYX SASA

# BIOGÁS NA ONYX SASA



**Na ONYX SASA, os poços de Biogás são conectados a um coletor principal e o gás é bombeado até a unidade de tratamento**



**METANO.....50,0% a 55,0%**  
**GÁS CARBÔNICO.....35,0% a 38,0%**  
**OXIGÊNIO .....1% a 2%**  
**UMIDADE E OUTROS.....14% a 5%**



**O Chorume após retirado dos Aterros é armazenado em tanques especiais antes de ser encaminhado para tratamento**





- **ETE Local => Córrego Pequeno**
- **Lagoas => Grandes Áreas / Odor**
- **SABESP => Transporte / Custo / Dependência**
- **Busca de Outras Alternativas**



# EVAPORAÇÃO DE CHORUME COM APROVEITAMENTO ENERGÉTICO DO BIOGÁS

INÍCIO DE OPERAÇÃO: MARÇO / 2001



# SISTEMA DE TRATAMENTO DO CHORUME (EVAPORAÇÃO)

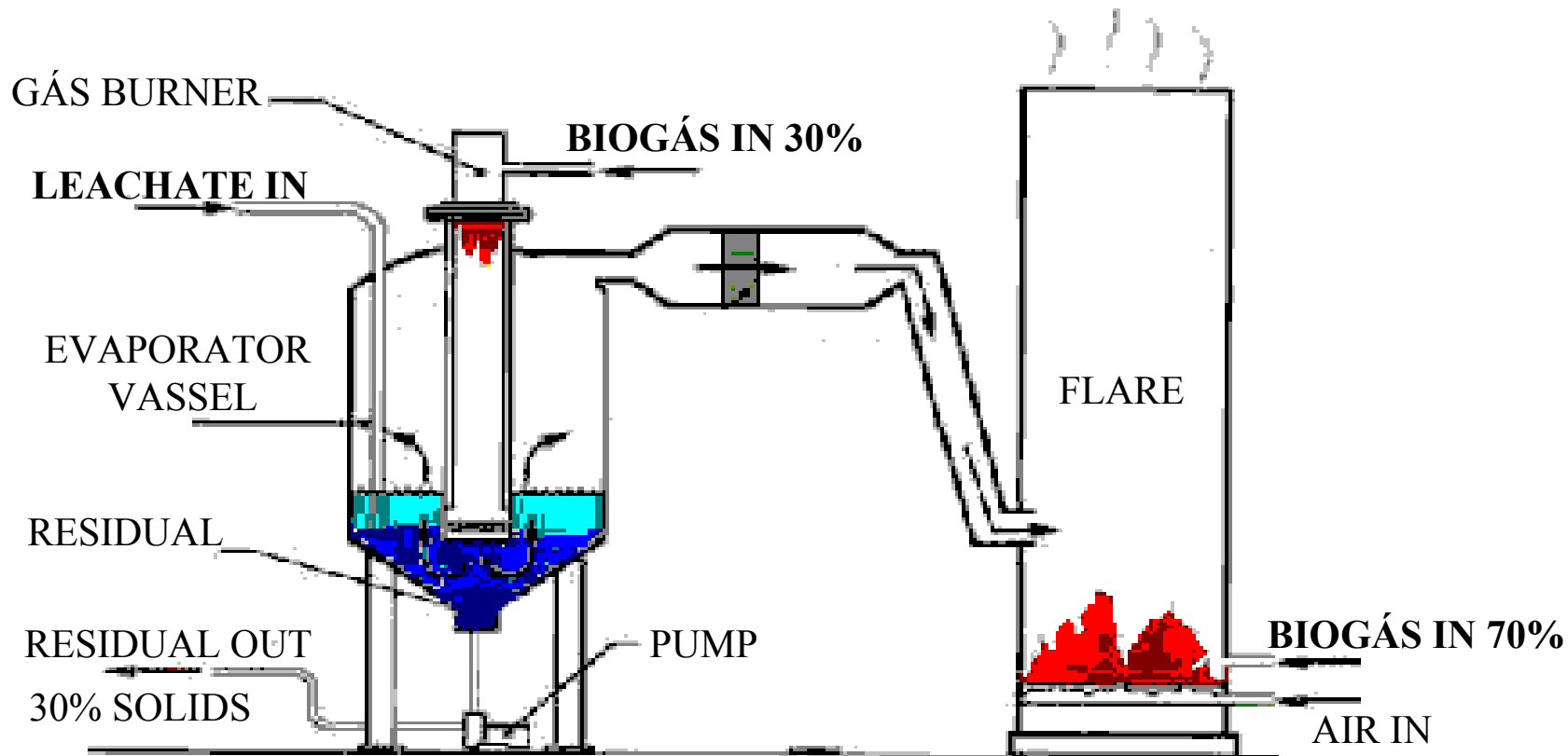




# COM APROVEITAMENTO ENERGÉTICO DO BIOGÁS



# FLUXOGRAMA DE EVAPORAÇÃO DE CHORUME



# PAINEL DE CONTROLE DO FLARE E DO EVAPORADOR



# SISTEMA DE SUCÇÃO DE BIOGÁS





# ENTRADA DE BIOGÁS NO EVAPORADOR



# ENTRADA DE BIOGÁS NO FLARE





# SISTEMA DE CAPTAÇÃO E ENTRADA DE AR NO EVAPORADOR



# FLARE PRINCIPAL E AUXILIAR







## **VAZÃO MÉDIA DE BIOGAS**

**2001 – 450 m<sup>3</sup>/h**

**2012 – 2200 m<sup>3</sup>/h**

## **CAPACIDADE ATUAL DE EVAPORAÇÃO**

**19 m<sup>3</sup>/dia**

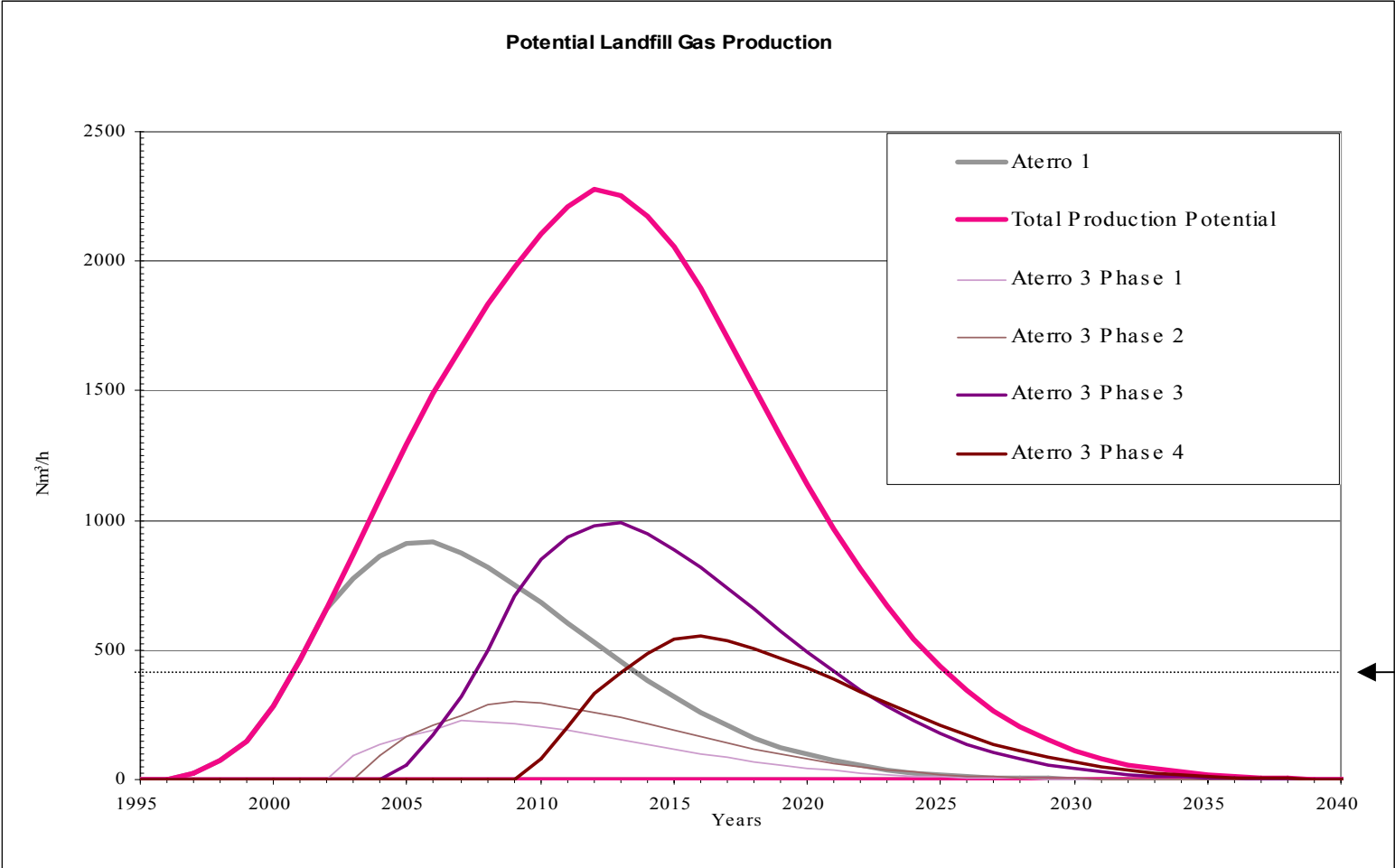
## **COMPARATIVO DE CUSTO**

**O tratamento de chorume no sistema atual representa  
42% do custo do tratamento e transporte p/ SABESP**



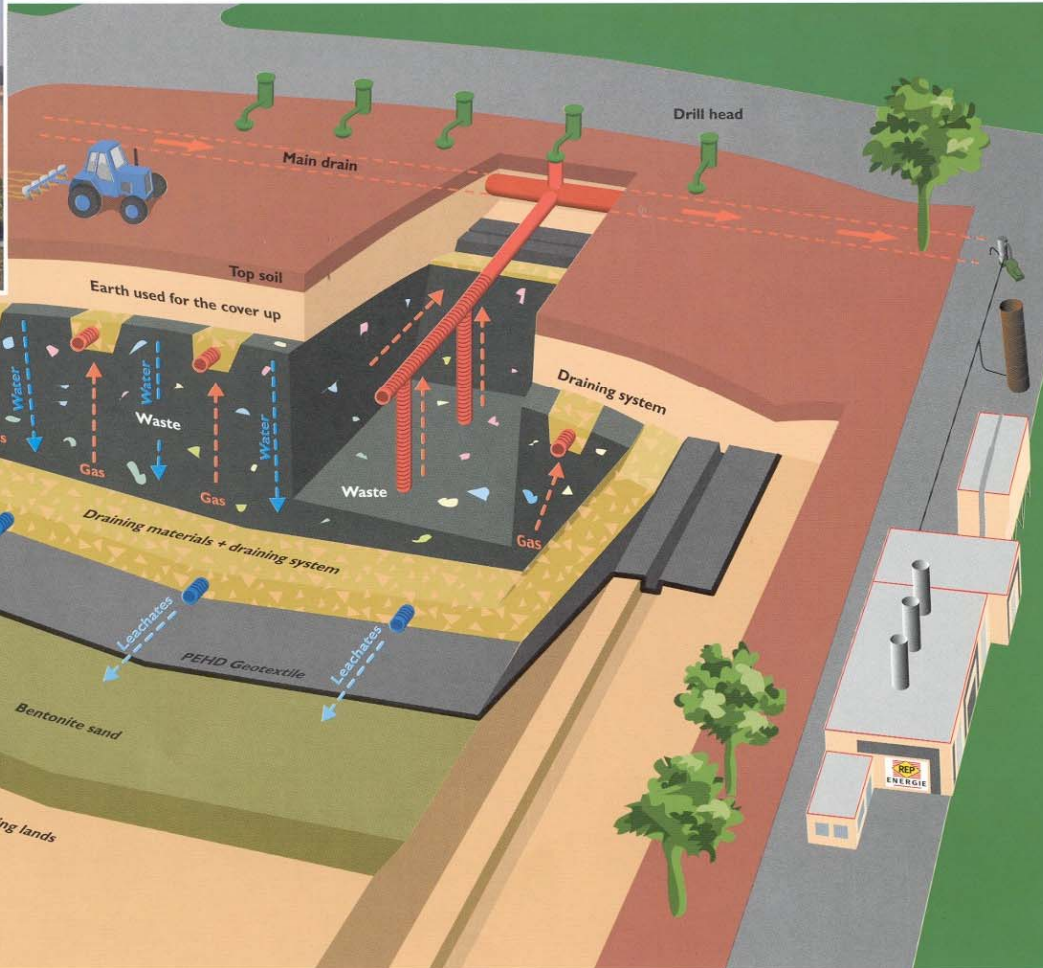
# PROJETO MDL ONYX SASA

# POTENCIAL DE GERAÇÃO DE BIOGÁS NA ONYX SASA



Suficiente para E-VAP

# VISITA ATERRO SANITÁRIO DE PARIS – SET/2001



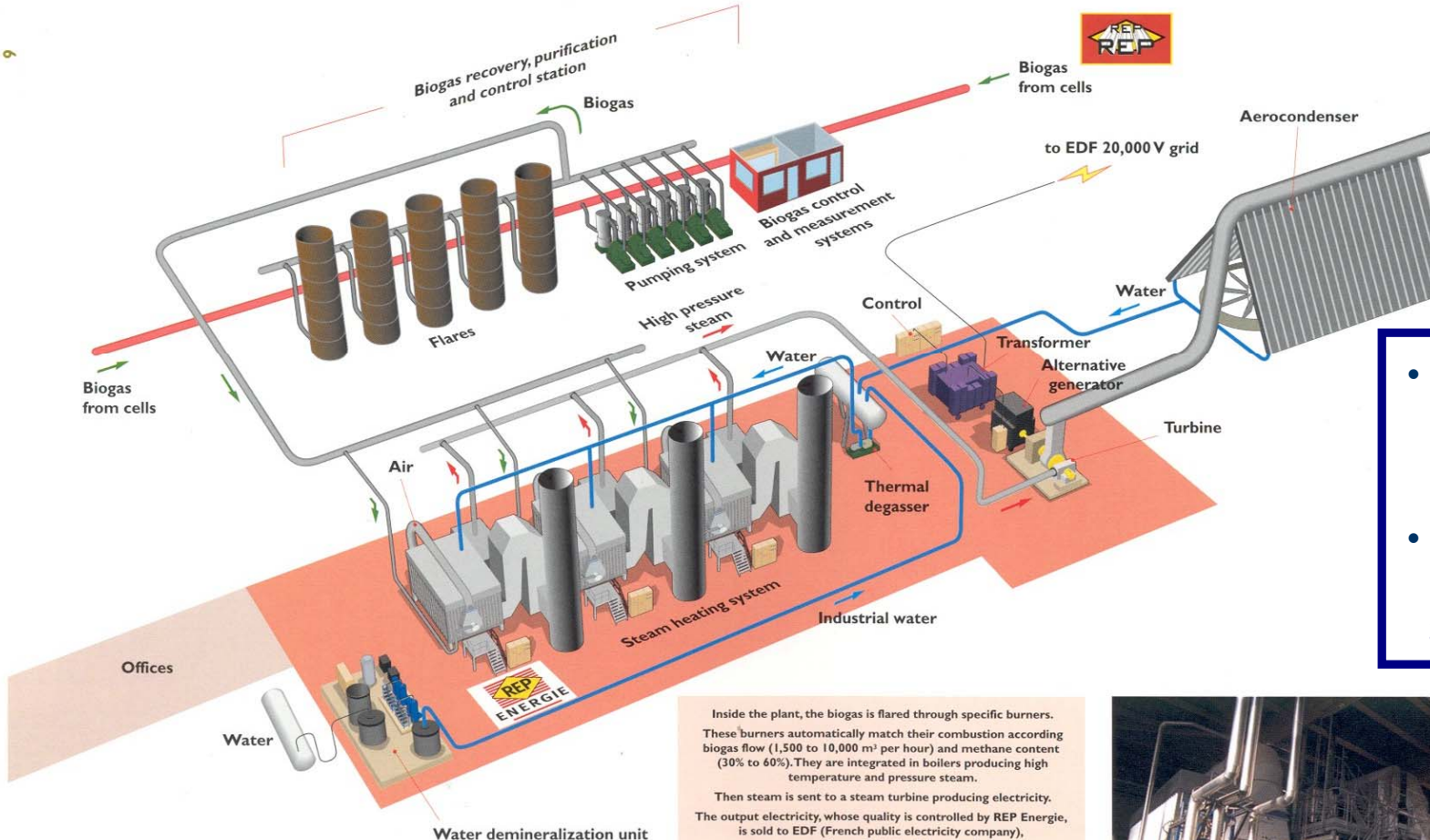
Bore holes are drilled every 50 meters in staggered rows with horizontal drains every 25 meters. After analysis, leachates are sent to the treatment plant of Bonneuil-en-France.

- Lixo Urbano  
2 MM hab  
1 MM t/ano
- Biogás  
(até 10.000 m<sup>3</sup>/hora) c/  
CH<sub>4</sub> (até 60%)

SCHEMATIC CROSS SECTION OF A FILLED-IN CELL AND CULTIVATION PROGRAMME AFTER BIOGAS EXTRACTION



# VISITA ATERRO SANITÁRIO DE PARIS – SET/2001



- **Biogás => Boiler => Turbina a Vapor = Eletricidade**
- **Fornece 85 M de KWh por ano => 30.000 pessoas**

Inside the plant, the biogas is flared through specific burners. These burners automatically match their combustion according biogas flow (1,500 to 10,000 m<sup>3</sup> per hour) and methane content (30% to 60%). They are integrated in boilers producing high temperature and pressure steam.

Then steam is sent to a steam turbine producing electricity. The output electricity, whose quality is controlled by REP Energie, is sold to EDF (French public electricity company), connection point being 3 km ahead.

**BIOGAS RECOVERY PLANT:  
OPERATING DIAGRAM**





## Análise para o caso ONYX SASA

- **GERAÇÃO DE ENERGIA ELÉTRICA:**  
Para consumo próprio  
Para “exportação”
- **AMPLIAÇÃO DO E-VAP**  
Aumento do chorume gerado no novo Aterro
- **UTILIZAÇÃO DO MDL** (Mecanismo de Desenvolvimento Limpo)  
(Metano é um dos gases causadores de Efeito Estufa)



## RESPONSABILIDADES

- **TIME ONYX PARIS-FRANÇA:**
  - Tecnologias a serem utilizadas
  - Business Plan / Baseline (cálculos CER's e definições)
  - Busca de Cliente
- **TIME ONYX SASA BRASIL**
  - Dados específicos da ONYX SASA
  - Business Plan / Baseline (legislação)
  - Letter of Approval
  - Stakeholders

*CER's (Certificado de Redução de Emissões 1 CER = 1 ton CO2 eq.)*



**Governo Holandês – *Senter Internationaal***

**Programa CERUPT para compra de Créditos de Carbono através da sistemática do MDL**

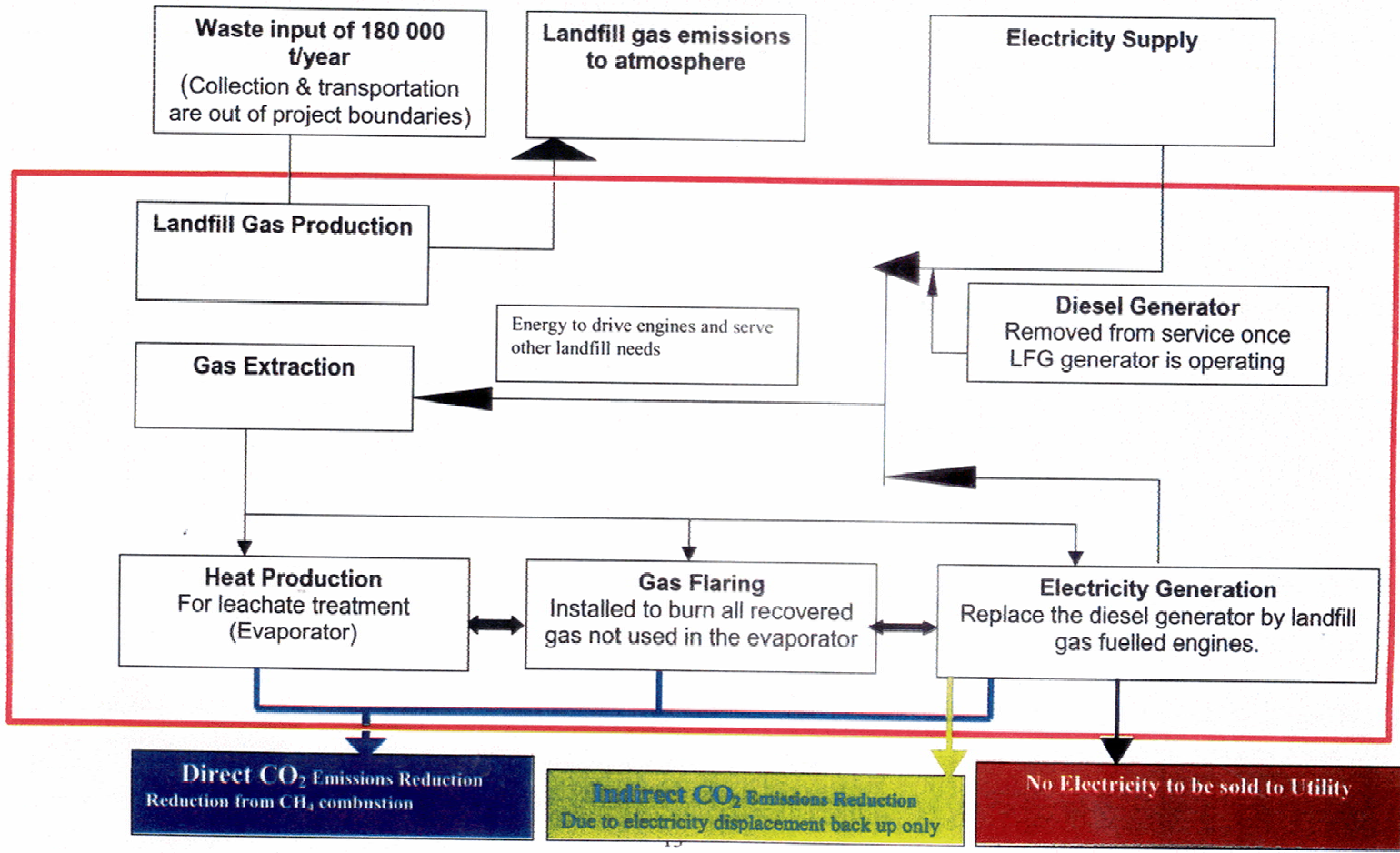
**Concorrência Internacional Aberta**



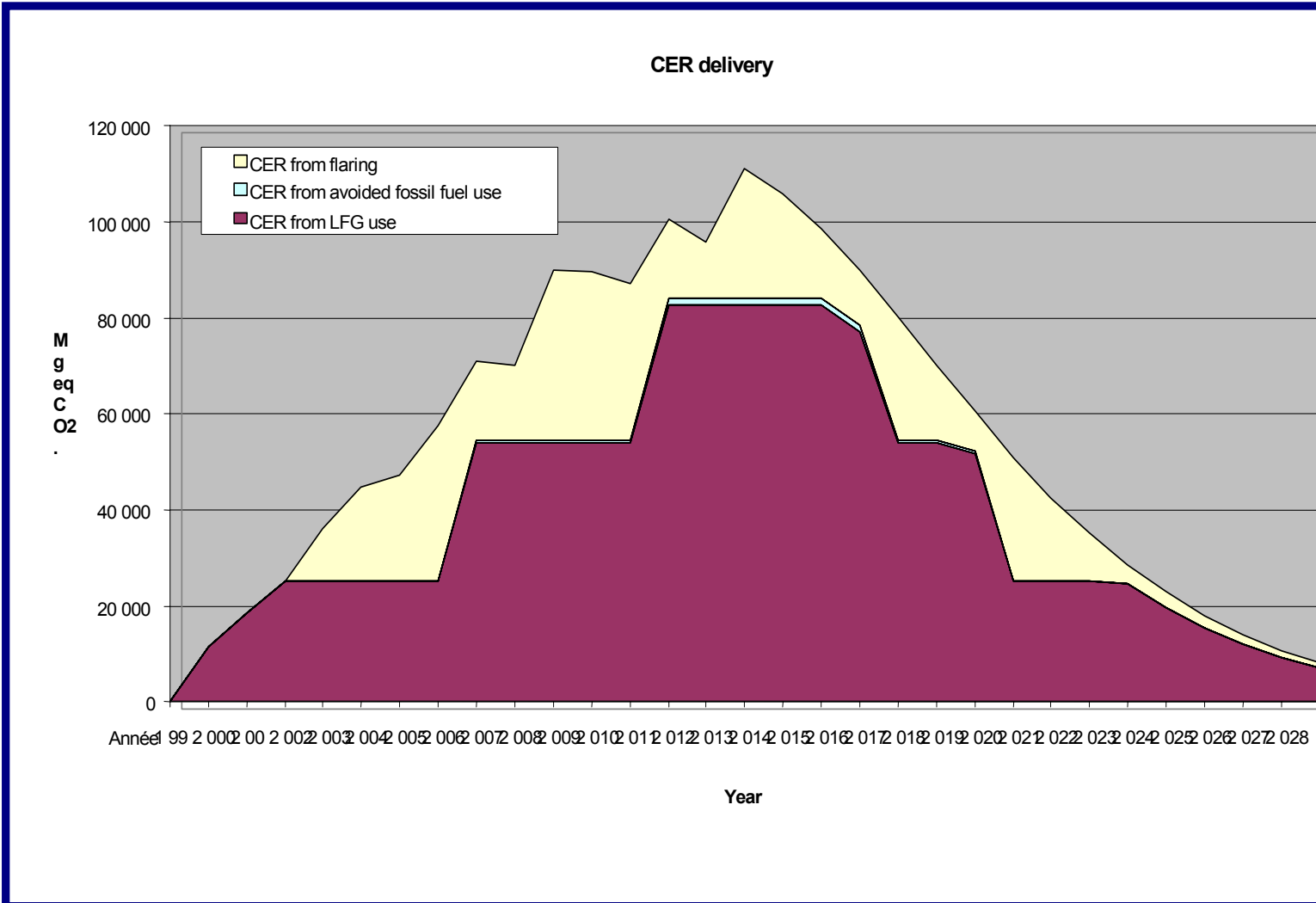
# EMISSÕES DIRETAS E INDIRETAS



2.2 – The Project boundaries diagram - PHASE 1



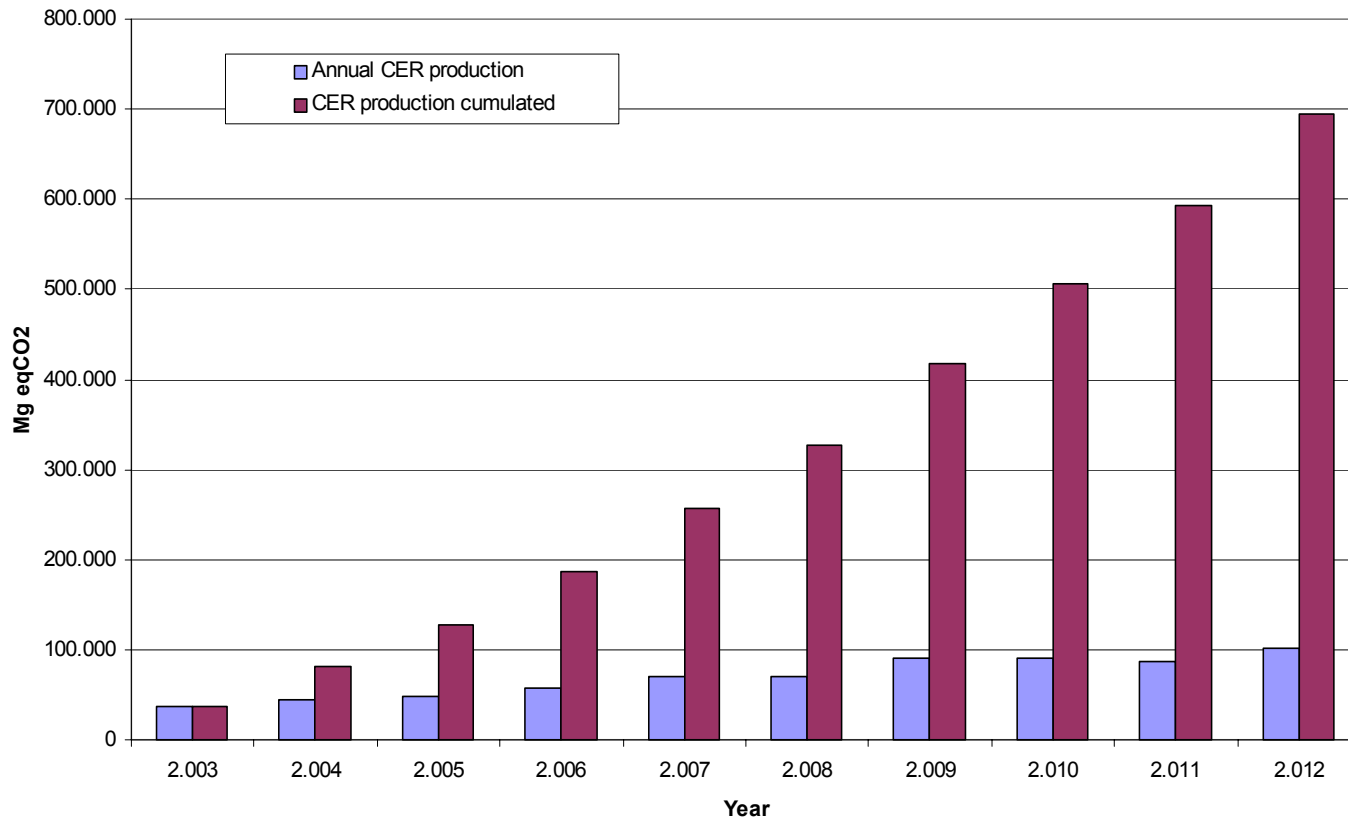
# CÁLCULO DOS CER'S DISPONÍVEIS



# CER'S DISPONÍVEIS PARA ENTREGA AO CERUPT - HOLANDA



Annual CER Production



# LETTER OF APPROVAL



**CT** Ministry of Science and Technology  
**BRASIL** Secretariat of Science and Technology Policies and Programs  
Esplanada dos Ministérios Bloco E Sala 218  
70067 - 900 Brasília - DF  
Home Page: <http://www.mct.gov.br/cilma>  
Tel.: (61) 317-8128/7613  
Fax: (61) 226-0834  
e-mail: [gmeira@mct.gov.br](mailto:gmeira@mct.gov.br)

OFICIO/SEPCT/DPTM/Nº 022/2002

Brazilian, 13 de September de 2002

Dear Mr. de Boer:

I am writing in reply to your letter DGM/IMZ/2002065361 of August 8, 2002, addressed to Minister Ronaldo Mota Sardenberg, Minister of Science and Technology, on the subject of cooperation between Brazil and the Netherlands on CDM projects.

The Government of Brazil has deposited the instrument of ratification of the Kyoto Protocol on August 23, 2002.


A presidential decree has established the Inter-Ministerial Commission of Global Climate Change, a copy of which is attached. As it can be seen, one of the functions of that commission is to approve CDM projects in the sense of Article 12 of the Kyoto Protocol. In the wording of the Marrakech Accords, the commission is thus the designated national authority. Information to this effect has been sent to the UNFCCC Secretariat.

The Government of Brazil welcomes the development of CDM projects with the Netherlands. It does not have any objection to the credits for emission reductions being transferred to the Dutch Government, after the subtraction of the share of proceeds that are mandated by the applicable regulations.

From a formal point of view, you will agree that it will be necessary for the projects to be submitted in the appropriate format to a designated operational entity and to the Inter-Ministerial Commission, processes that can only take place after the entry into force of the Kyoto Protocol. In this regard, I can assure you that my Government is doing what it can to cooperate in making it happen as soon as possible.

I am aware of the two projects that have been pre-selected in Brazil for consideration for CDM support by the Netherlands. I can inform that we will accept them for consideration by the Inter-ministerial Commission at the appropriate time.

Yours sincerely,

  
Leda Sylvia Meira Filho  
Secretary on Science and Technology Policies and Programs  
Ministry of Science and Technology

Mr. Yvo de Boer  
Directorate General for Environmental Protection  
Directorate International Environmental Affairs  
Ministry of Housing  
Spatial Planning and the Environment



# ENCONTRO STAKEHOLDERS



## Lista de Presença

Apresentação do Projeto de Aproveitamento do Biogás para Geração Elétrica,  
de acordo com o Protocolo de Kyoto

Data: 17 de agosto de 2002  
Horário: Das 8h30 às 11h



| Nº  | Nome completo             | Instituição / Empresa   | Assinatura |
|-----|---------------------------|-------------------------|------------|
| 1.  | Silvana Penteado          | CNO Mantigueira Trinc   |            |
| 2.  | EDGARD L. PENTEADO        | ALCAN                   |            |
| 3.  | Denise Pereira de Azevedo | SE Engenharia Ambiental |            |
| 4.  | Wanda Regina do Prado     | SE Engenharia Ambiental |            |
| 5.  | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 6.  | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 7.  | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 8.  | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 9.  | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 10. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 11. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 12. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 13. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 14. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 15. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 16. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 17. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 18. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 19. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 20. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |
| 21. | Carla Regina de Almeida   | SE Engenharia Ambiental |            |

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## PRINCIPAIS ETAPAS

|                                   |                    |                      |
|-----------------------------------|--------------------|----------------------|
| <b>Publicação da Concorrência</b> | <b>01/nov/2001</b> |                      |
| <b>Entrega da Pré Proposta</b>    | <b>31/jan/2002</b> | <b>80 entregues</b>  |
| <b>Escolha Pré Proposta</b>       | <b>27/mai/2002</b> | <b>26 escolhidos</b> |
| <b>Apresentação das Propostas</b> | <b>26/set/2002</b> |                      |
| <b>Anúncio dos vencedores</b>     | <b>13/mar/2003</b> | <b>18 vencedores</b> |
| <b>Assinatura do Contrato</b>     | <b>04/dez/2003</b> |                      |

# CONTRATO COM GOVERNO HOLANDÊS



SENTER Internationaal

CONTRACT

No. CER01/69

## The parties,

1. The State of the Netherlands, represented by the Minister of Housing, Spatial Planning and the Environment, acting through the Senter agency, herein legally represented by ir. W.J. Zwolve, Acting Director, hereafter to be referred to as 'the Netherlands', and

2. The legal entity CGEA ONYX with registered office in Nanterre, France, herein legally represented by Mr. G. Crawford listed as Vice-President Environment / Quality, in the companies' register, hereafter to be referred to as 'The Contractor',

Referring to the proposal submitted by the Contractor to The Netherlands, dated the 24<sup>th</sup> of September 2002, The Netherlands reference CER01/69, titled 'Onyx Landfill Gas Recovery Project - Tremembé - São Paulo', hereafter to be referred to as 'the CDM project', parties have reached understanding regarding a Contract by which the Netherlands shall purchase Certified Emission Reductions (CERs) resulting from the Clean Development Mechanism (CDM) project (hereinafter: "Contract");

## Whereas:

- The Netherlands, as a result of the agreements documented in the framework of the Kyoto Protocol, wishes to purchase CERs;
- The Netherlands has ratified the Kyoto Protocol and is working to comply with the participation requirements for Kyoto Protocol Article 12 projects as laid down in the Marrakech Accords (UNFCCC/CoP7);
- The Contractor wishes to develop the CDM project to realise the generation of CERs;
- In view of the Letter of Approval of the Brazilian Government, signed by Mr. Ronaldo Mota Sardenberg, Minister of Science and Technology of the Federative Republic of Brazil, and in view of the Declaration of Approval, signed by the State Secretary for Housing, Spatial Planning and the Environment, acting as the Designated National Authority of The Netherlands, the Netherlands will be legally entitled to the CERs generated by the CDM project;

Now therefore the Parties hereto agree as follows:

## Article 1

1. The Annexes to this contract form an integral part of this contract. The following documents are Annexes to this contract:
- a) Annex 1: Delivery Schedule;
  - b) Annex 2: The Terms of Reference (ToR), CERUPI 2001, dated November 1<sup>st</sup>, 2001, in which Senter represents The Netherlands;
  - c) Annex 3: The Tender submitted by the Contractor on the 24<sup>th</sup> of September 2002, and the Delivery Schedule as faxed on the 29<sup>th</sup> of October 2002. The Tender includes a Letter of Approval from Brazil dated 26<sup>th</sup> of September 2002;
  - d) Annex 4: A statement by the Netherlands Designated National Authority approving the Project as a CDM Project dated 13<sup>th</sup> of March 2003;

2

SENTER Internationaal

- 7) If the Netherlands cancel this Contract as provided for in Article 4 and this cancellation is in no way caused by, provoked by or related to any activities of the Contractor and/or the failure of the Contractor to perform or to procure the performance of any of the activities or submit any of the documents as set out in Article 4, all obligations of the Contractor under this Contract shall cease.

## Article 5

This Contract enters into force upon the date it is signed.

Signed on 11/11/03 in The Hague.

For the State of the Netherlands, the  
Minister of Housing, Spatial Planning  
and the Environment,

ir. W.J. Zwolve  
Acting Director

4/12/03

The Contractor  
CGEA ONYX

Mr. G Crawford

Mr. G Crawford  
Vice president environment / quality

7

# PROJETO MDL ONYX SASA – CERUPT HOLANDA



## PROPOSTA INICIAL

|                            |                     |
|----------------------------|---------------------|
| <b>Quantidade de CER's</b> | <b>695.880</b>      |
| <b>Crediting Time</b>      | <b>10 anos</b>      |
| <b>Início Previsto</b>     | <b>2003</b>         |
| <b>Life Time</b>           | <b>&gt; 20 anos</b> |

## CONTRATO

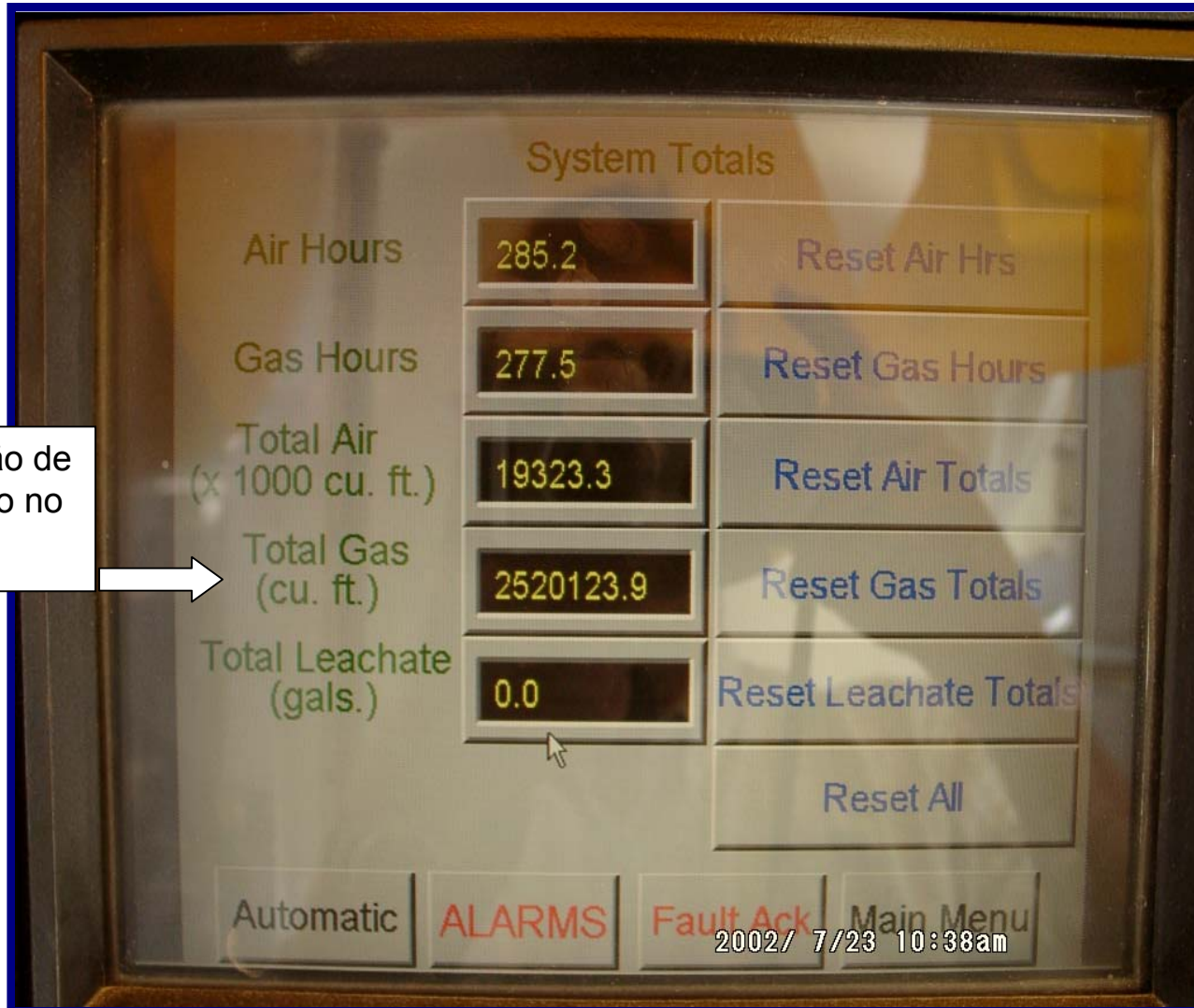
|                            |                |
|----------------------------|----------------|
| <b>Quantidade de CER's</b> | <b>487.115</b> |
|----------------------------|----------------|



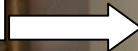
# MONITORAMENTO – ENTREGA DOS CER'S



# MONITORAMENTO – VAZÃO DE BIOGÁS



Leitura da vazão de biogás utilizado no E-VAP



# MONITORAMENTO EM CAMPO – COMPOSIÇÃO DO BIOGAS



# CONSIDERAÇÕES FINAIS



**Potencial Mercado Brasileiro  
MDL - Complexidade do Processo  
Regionalização – Iniciativa Privada**

**MDL - Financiamento Adicional para  
Correta Disposição Final do Lixo Urbano**

[www.onyx-environnement.com](http://www.onyx-environnement.com)

[www.onyx-veolia.com.br](http://www.onyx-veolia.com.br)

[breno.palma@onyx-groupve.com.br](mailto:breno.palma@onyx-groupve.com.br)