## Hammamet, 18-20 March 2004

# Submission Process of the BL Methodologies

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# The Baselines Methodologies approved by the CDM Executive Board

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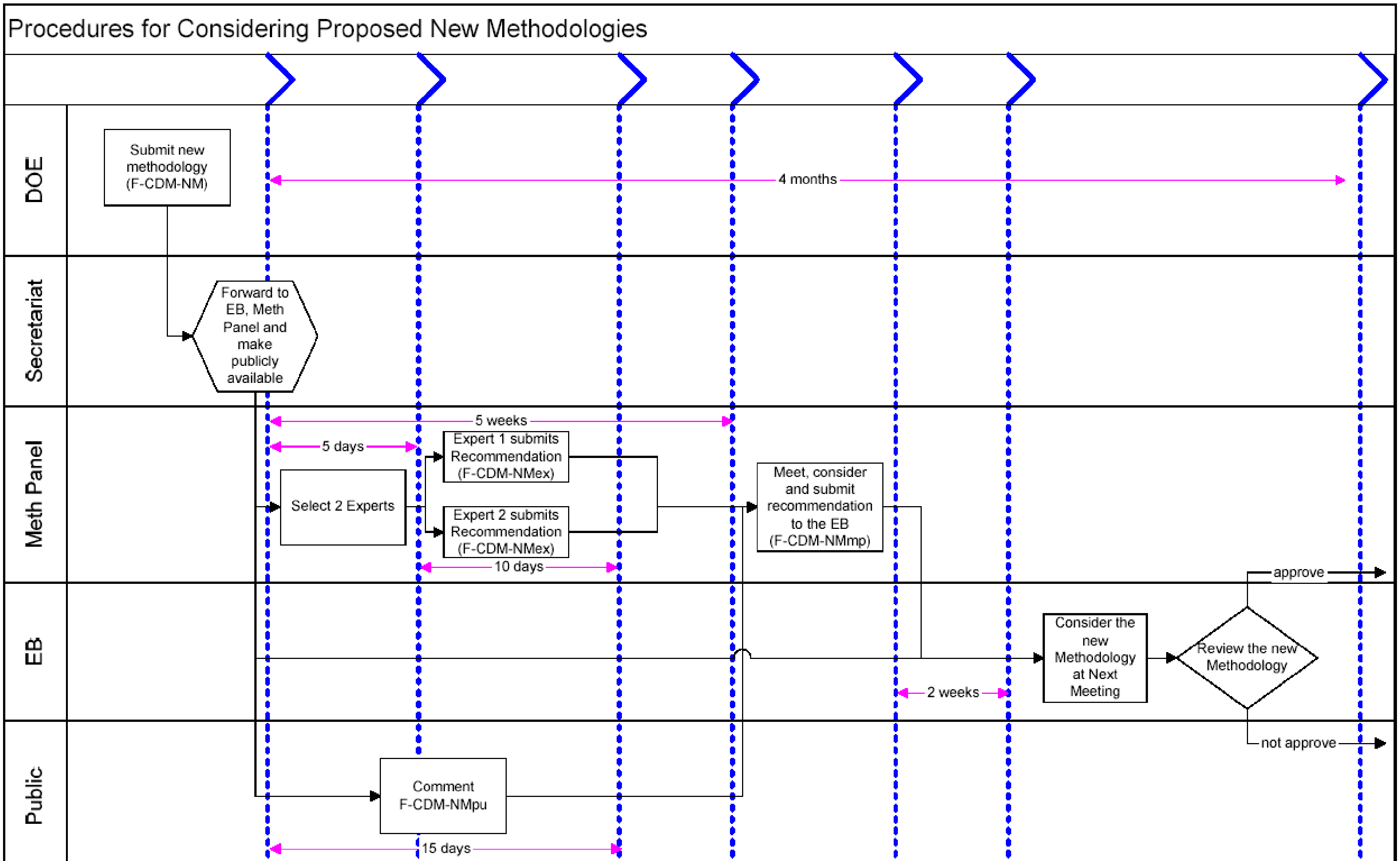
# Submission process of BL Methodologies to the EB

# Submission Process

- Project Participants to submit new methodologies➔draft PDD with the proposed Meth.
- The DOE checks whether the PDD is complete and fits the EB guidance, and forward to the UNFCCC Sec

# Submission Process



# The first 36 proposed new methodologies submitted to the EB

| Meth. No. | Type | 1.Mark | 2.Mark | GHG reduction/yr | Country | Investor | yr. |
|---|---|---|---|---|---|---|---|
| 1 | Bagasse power | B | A | 143 ktCO2 | Brazil | Unilateral | 7 |
| 2+29 | Fuel switch from coke to charcoal in steel works | C | EB14 | ca. 1000 ktCO2 | Brazil | IFC-Netherlands & Japan | 7 |
| 3 | CO2 from NH3 production used in methanol prod. | C | | 229 ktCO2 | Trinidada & Tobago | Germany | 10 |
| 4 | Landfill gas flaring | AM2 | | ca. 800 ktCO2 | Brazil | Unilateral | 7 |
| 5 | Landfill gas electricity | B | AM3 | ca. 300 ktCO2 | Brazil | WB NCDF | 7 |
| 6 | Hydro Power | C | | 144 ktCO2 | Guatamala | PCF | 7 |
| 7 | Burning HFC23 from HCFC22 production | AM1 | | 1400 ktCO2 | South Korea | Japan | 7 |
| 8 | Hydro Power | C | | 100 ktCO2 | Costa Rica | CERUPT | 10 |
| 9+14+15+19 | Rice husk power plant (el + steam + cement) | C | AM4 | 400 ktCO2 | Thailand | Rolls-Royce Power + | 7 |
| 10 | Landfill gas electricity | B | A | 400 ktCO2 | South Africa | PCF | 7 |
| 11 | Bagasse Power | C | | 100 ktCO2 | India | Unilateral | 7 |
| 12 | Wind farm | B | | 53 ktCO2 | Jamaica | CERUPT | 10 |
| 13 | Biogas from palm oil waste water | | | 27 ktCO2 | Malaysia | Japan | 10 |
| 16 | Fuel switch from coal to natural gas | B | A | 18 ktCO2 | Chile | Nestle Chile | 7 |
| 17 | Efficiency improvement of steam use at refinery | Meth9 | | 100 ktCO2 | China | Unilateral | 10 |
| 18 | New cogeneration plant using natural gas | Deskr. | | 115 ktCO2 | Chile | Japan (J-Power) | 10 |
| 20 | Hydro Power | Meth9 | | 70 ktCO2 | Colombia | Japan (J-Power) | 7 |
| 21 | Landfill gas power for on site usage | A | | 70 ktCO2 | Brazil | CERUPT | 10 |
| 22 | Biogas power from swine manure | | | 90 ktCO2 | Chile | Canada | 7 |
| 23 | Hydro power | A | | 70 ktCO2 | Mexico | PCF | 7 |
| 24 | Wind farm | | | 45 ktCO2 | Colombia | PCF | 7 |
| 25 | Biomass residues power plant | | | 85 ktCO2 | India | Swedish Energy Agency | 10 |
| 26 | Recovering associated gas in stead of flaring | | | 670 ktCO2 | Vietnam | Japan | 10 |
| 27 | Bagasse power expansion | | | 23 ktCO2 | Brazil | CERUPT | 10 |
| 28+35 | Switch from coal/lignite to agro-biomass power | Meth9 | | 600 ktCO2 | India | PCF | 10 |
| 30 | Bagasse power and steam | | | 95 ktCO2 | India | Local | 10 |
| 31 | Power from waste heat in iron kiln | | | 37 ktCO2 | India | Unilateral | 10 |
| 32 | Biogas power from municipal waste | | | 100 ktCO2 | India | PCF | 10 |
| 33 | Energy efficient expansion of cement factory | | | 80 ktCO2 | Costa Rica | CERUPT | 7 |
| 34 | CH4 & N2O reductions from manure management | | | 20 ktCO2 | Brazil | Canada | 7 |
| 36 | 120 MW wind farm in Zafarana | | | 227 ktCO2 | Egypt | Japan (JBIC) | 7 |

# Approved BL Methodologies

# 9 approved BL

1. Incineration of HFC 23 waste streams - Korea (AM0001)➔1400 kte$CO_2$/an
2. GHG Reduction through Landfill Gas Capture and Flaring -  Salvador da Bahia - Brazil (AM0002) ➔800 kte$CO_2$/an
3. Simplified financial analysis for Landfill gas capture-  Nova Gerar - Brazil (AM0003) ➔300 kte$CO_2$/an
4. Grid Connected biomass power generation – Val De Rosario (AM0004)-143kte$CO_2$/an

# 9 approved BL

5. CH4 recycling for Electricity Generation from landfills – South Africa➔400 kteCO2/an
6. Enery Swithing – Graneros, Chili➔18 kteCO2/an
7. CH4 recycling for Electricity Generation from landfills– Brazil/CERUPT➔70 kteCO2/an
8. Hydroelectric project - Mexique➔70 kteCO2/an
9. Grid Connected biomass power generation - Thailand ➔400 kteCO2/an

# 4 approved BL to be presented

1. Enery Switching – Graneros, Chili
2. GHG Reduction through Landfill Gas Capture and Flaring - Salvador Da Bahia, Brazil
3. Cogeneration Bagasse – Val de Rosario/Brazil
4. CH4 recycling for Electricity Generation from landfills – South Africa

# Presentation of 4 Approved Metodhologies

# 1.Fuel Switching
# Graneros, Chili

# Fuel Switching – Graneros, Chili

- Méthodology:
  - ✓ Title : BL Met. For industrial Fuel Switching from coal and petroleum products to natural gas
  - ✓ Adopted Approach
    a. Existing actual or historical emissions
  - ✓ Also consistent with:
    b. Emissions of a technology that represents an economically attractive course of action, taking into account barriers to investments

# Fuel Switching – Graneros, Chili

- Description/action :
  - ✓ NestlCompany: Food for babies and instant Coffee, etc.
  - ✓ Fuel Switching from Coal to NG to produce of Steam and Heat Process
    ersion of 2 boilers and 2 hot-air furnaces

    ir furnaces

    avoided/yr
    extension

# Fuel Switching – Graneros, Chili

- Reasons justifying the additionality :
  - ✓ Coal is much more competitive
    - US$ 2.55 per million Btu,

    VS

    - US $ 3.50 per million Btu for NG

    (-27%)
  - ✓ Energy bill will rise by US$ 183,000 due to the switching to NG
  - ✓ No support is provided by the Chilian Gov. for such fuel switching operation

# Fuel Switching – Graneros, Chili

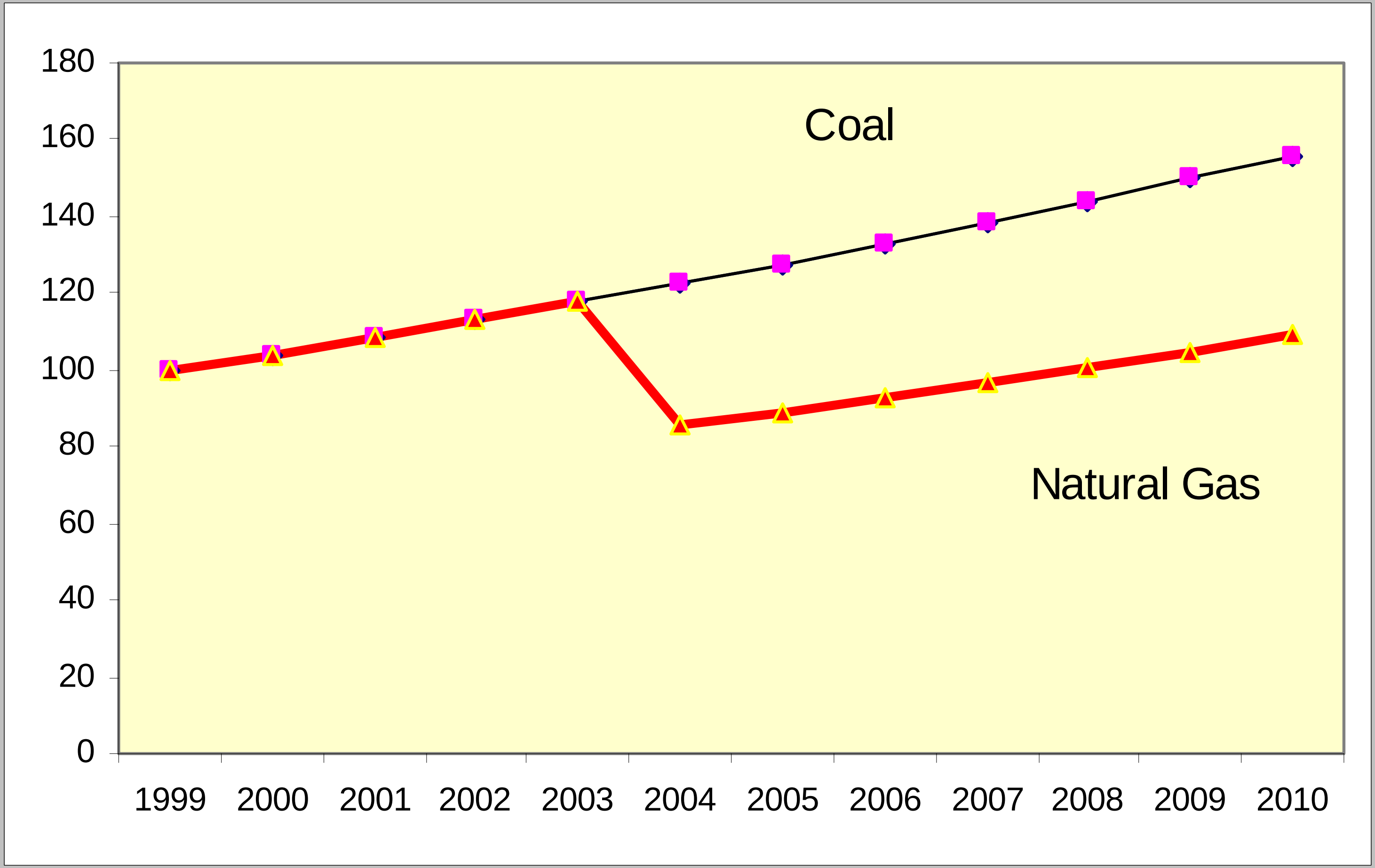
- Assumption LB : DYNAMIC:
  - ✓ Increasing coal demand: 4.12% per year (trend 1999-2002)
  - ✓ LB dynamic: actual consumption will determine the Nbr of CERs to be considered (via Monitoring)

# Fuel Switching –

## Graneros, Chili

- Principles of the LB: what would be the Coal consumption if the project is not implemented:
  - ✓ The useful heat requirement is calculated from the actual NG consumption using the NG-fired boiler/furnace efficiencies
  - ✓ This useful heat is translated into Coal consumption using Coal-fired boiler/furnace efficiencies

# Consumption Growth at de Graneros (base 100 in 1999)

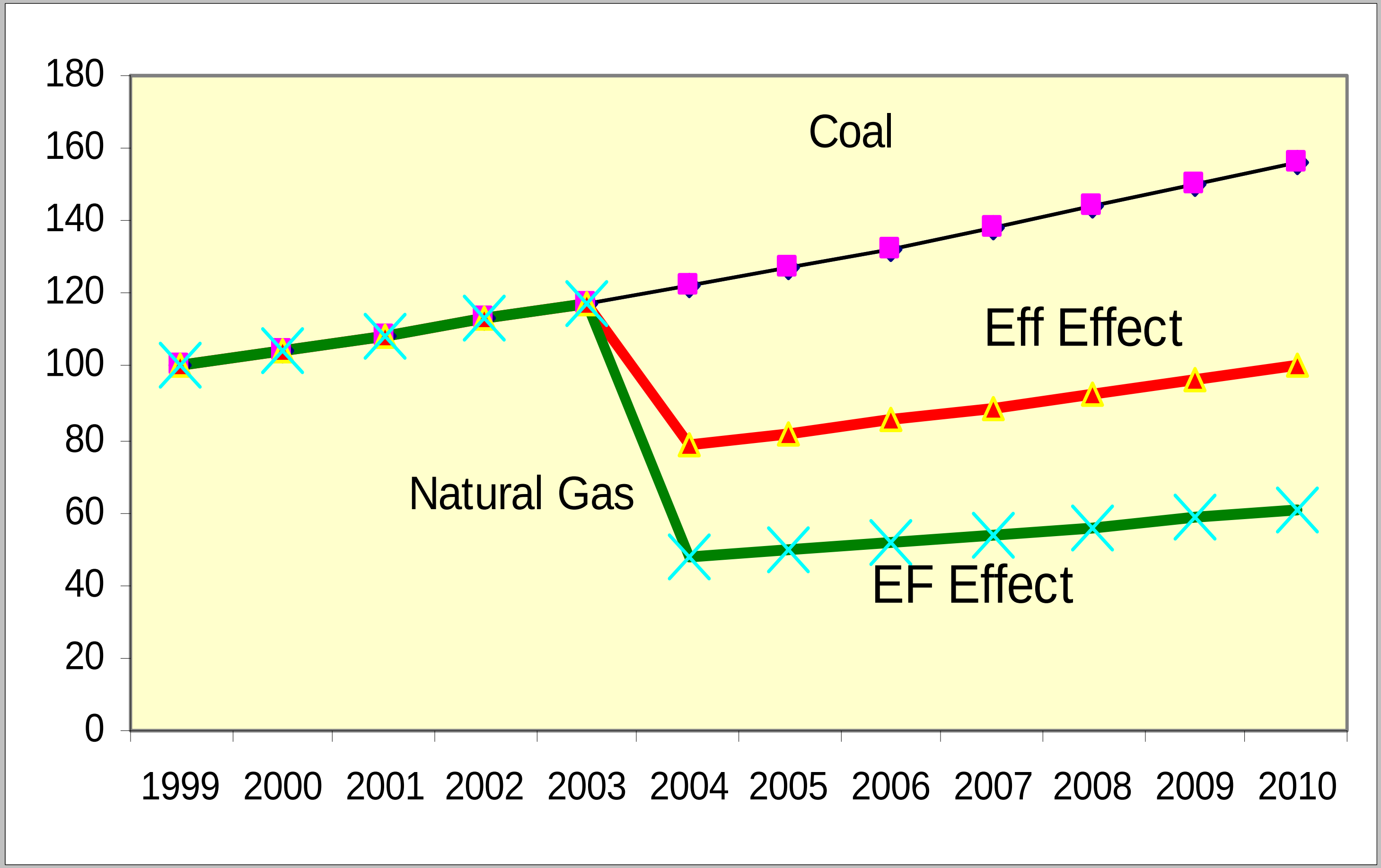


# Fuel Switching –

# Graneros, Chili

- Project Activity :
  - ✓ Investment : US$ 550,000
  - ✓ Emissions avoidance resulting:
    - ✓ from the difference in efficiency between coal and NG (45% VS 70%)
    - ✓ From the difference in Emission Factors between coal and NG (4.1 $tCO_2e$/toe VS 2.5 $tCO_2e$/toe)

# Emission reduction at de Graneros (base 100 in 1999)



# Fuel Switching – Graneros, Chili

- Emission caculations:
  1. Estimated NG consumption starting from 2004 (to be monitored)➔Emission calculations
  2. Useful Energy (Heat) consumed (from pt 1 above)
  3. Useful Energy converted into coal, using the current coal efficiency➔Emission calculations

# Fuel Switching –

## Graneros, Chili

- Emission caculations:

1. Estimated NG consumption starting from 2004 ➔e.g.2,000 toe.
2. Useful Energy (Heat) consumed : 2,000 x 0.7=1,400 toe➔5,000 tCO2e
3. Useful Energy converted into coal, using the current coal efficiency➔ 1,400/0.45=3,111 toe➔ 12,755 tCO2e

# Fuel Switching – Graneros, Chili

- General Formula for Emission reductions within the project boundaries:

BL

1. Direct Emissions on site (if coal) + Fugitives emissions off-site (coal production, transport, etc.)

( Minus )

Project

2. Direct Emissions on site (NG) + Fugitives emissions off-site (gas treatment, Gas transport, etc.)

# 2. Salvador Da Bahia Landfill Project - Brazil

# Salvador Da Bahia
# Landfill Project - Brazil

- Méthodology:
  - ✓ Title : GHG reductions through Landfill Gas Capture and Flaring where the baseline is established by a Public Concession Contract
  - ✓ A mix of two approaches:
    - b. Émissions from a Technology that represents an economically attractive course of action
    - c. Main focus on approach (c): “The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.”

# Salvador Da Bahia
# Landfill Project - Brazil

- Description:
  - ✓ Lanndfill located at 20 km from Salvador (Brazil)
  - ✓ 850,000 tons of Solid Wastes disposed (with 65% organic materials)
  - ✓ Concession Contract for managing the landfill allocated to Vega Bahia (The project Proponent)
  - ✓ 300,000 teCO2 avoided/yr
  - ✓ 7 yrs with possible extension 2 x 7 years

# Salvador Da Bahia
# Landfill Project - Brazil

- Reasons justifying Additionality :
  - ✓ In Brazil, no regulatory texts to recover and destroy $CH_4$ → actual situation 0%
  - ✓ The Concession does not discuss $CH_4$ recovery
  - ✓ The environmental licence for the landfill specifies that there should be biogas capture, without specifying a capture rate
  - ✓ VEGA proposal to the BID stipulates a recovery of 19-24% of $CH_4$ → baseline

# Salvador Da Bahia
# Landfill Project - Brazil

- Assumptions BL
  - ✓ Quantity of $CH_4$ to be recoverd and burned➔calculated on the basis of a formula linked to the actual wastes received
  - ✓ Methane generation Conditions unchanged (Organic fraction, Humidity Factor, temperatures, etc.)

# Salvador Da Bahia Landfill Project - Brazil

- Project activity:
  - ✓ Investment to increase CH4 collection pipes capacities and burning ➔ monitoring is easy
  - ✓ The project will flare 75%-80% of the CH4➔above the contractuel arrangements: 19-24%

# Salvador Da Bahia
# Landfill Project - Brazil

- Emission calculations:
  1. Quantity of $CH_4$ to be burned according to the contract (19-24%)
  2. Quantity of $CH_4$ to be burned according to the project (75-80%)
  3. The verification process shall confirm that the $CH_4$ generation conditions are still the same (organic fraction, etc.) + 19-24% are still among the most efficient 20%

# Salvador Da Bahia
# Landfill Project - Brazil

- Monitoring:
  - ✓ Direct Measures of the recovered and bur burned $CH_4$
  - ✓ Quantities of Solid Waste disposals

# 3. Cogeneration Bagasse – Val de Rosario/Brazil

# Cogeneration Bagasse - Brazil

- Méthodology:
  - ✓ New méthodology derived from the Project from Thailand using rice husk
  - ✓ « Methodology of Econergy for reducing emissions resulting from cogeneration connected to the grid, using bagasse»
  - ✓ Bagasse: the residus of the sugar cane that is left after juice extraction

# Cogeneration Bagasse - Brazil

- Description:
  - ✓ 143,000 te$CO_2$ avoided/yr
  - ✓ 7 yrs with possible extension 2 x 7 years

# Cogeneration Bagasse - Brazil

- Assumptions :
  - ✓ Cogeneration using bagasse comes in substitution to fossil fuels and hydroelectricity utilized for power generation in the reference scenario or BL
  - ✓ Future development of the electrical sector in Brazil → increasing quantities of fossil fuels (mainly Nat Gas) → utilisation of bagasse → partly replace marginal power plant that use mainly Nat Gas

# Cogeneration Bagasse - Brazil

- Reasons justifying Additionality:
  - ✓ Th economic performance of the projects without CERs are insufficient➔unable to remove technical, institutionnal, and financial barriers:
    - ✓ Brazil is currently intensively investing on the development of Nat Gas.  The thermal electricity will reach  17%  in 2004 (vs 9% in 2001)
    - ✓ Brazil is not investing on bagasse campanies➔ there is a need to envisage new spirit towards liberalization of the Elec. sector

# Cogeneration Bagasse - Brazil

- Reasons justifying Additionality:
  - ✓ Cost for cogénération: US$ 35 to US$ 105/MWh
  - ✓ Marginal cost for electricity in Brazil : US$ 33/MWh
  - ✓ Investment on cogeneration should be compared against other investment opportunities with equal risks
  - ✓ Internal Rate of Return➔ 2004-2011➔16% (without CERs), and 22% (with CERs=US$5)

# Cogeneration Bagasse - Brazil

- Reasons justifying Additionality:
  - ✓ High transaction costs➔ bureaucracy to obtain agreements for Environmental impact assessment➔Institutional burdens
  - ✓ No standard conractual agreements for selling electricity to the grid (guaranty of duration, guarantee of effective payment, etc.)➔Regulatory burdens
  - ✓ Presidentiel Decree to develop cogeneration waited since 1997, never published ➔Regulatory burdens
  - ✓ No guarantee of performances of Bagasse Cogenerator➔Technical burdens

# Cogeneration Bagasse - Brazil

- Baseline:
  - ✓ South-South-East and Midwest grid which will receive the electricity from the cogenerator➔avoid thermal emissions of the related grid
  - ✓ Conservative assumption: Bagasse would have been burned instead of getting landfilled (CH4 - emissions)

# Cogeneration Bagasse - Brazil

- Baseline:

  CH4 due to open incineration of biomass + CO2e for the production of alternative electricity (from the grid)

# Cogeneration Bagasse - Brazil

- Baseline :

Emission Factor → combined between (i) EF from operating margin of the grid (weighed average excluding hydro) and
(ii) Power plant that are foreseen to enter in the grid in the future (base: top 20% best or the 5 most recent plants) → 0.644 $tCO_2/MWh$

L'EB recommanded to include a proportion of hydro in the first term

# Cogeneration Bagasse - Brazil

- Baseline → for conservativeness:
  - ✓ BL: $N_2O$ excluded for simplification
  - ✓ BL : Biomass Incineration → $CO_2$ non accounetd for, $N_2O$ excluded for simplification

# Cogeneration Bagasse - Brazil

- Project Activity :

  CH4 due to Electricity Generation =

  Quantity of biomass utilised x energy content x t-CH4/Tj x GWP

# Cogeneration Bagasse - Brazil

## ❑ Project Activity

- ✓ $CO_2$ not accounted for, $N_2O$ excluded for simplification
- ✓ $CH_4$ due to storage ➔ minor because of limited storage duration

# Cogeneration Bagasse - Brazil

- Emissions avoided:
  EA=

  + Emissions due to BL

  - CH4 due to electricity generation by the project
  - Emissions of CO2, CH4 et N2O due to transport of Bagasse to the cogeneration site)
  - Emissions CO2, CH4 et N2O for auxiliary starting of the cogenerator

# 4. CH4 recovery from Landfills for Electricity Generation – South Africa

# Prototype Carbon Fund

# CH4 recovery from Landfills for Electricity Generation – South Africa

- Methodology:
  - ✓ « Baseline Methdology for CH4 Recovery from Landfill gas used for electricity generation»
  - ✓ Based on approach 48(b) ➔ Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment;

# CH4 recovery from Landfills for Electricity Generation – South Africa

- Project activities:
  - ✓ CH4 collection
    - ➔Partly burned
    - ➔Generation of Electricity➔sold to the grid
  - ✓ Installation of 180 CH4 extraction holes
  - ✓ 10 MW El. (68 GWh/yr)
  - ✓ CH4 Recovery rate : 83% by 2012

# Projet decription:

- ✓ Investment cost: US$ 12.2 millions➔Bank Loan: 8 yrs at 10%
- ✓ 3 landfill sites considered: 5,000 tons of Solid Wastes/day
- ✓ 400,000 te$CO_2$ avoided/yr
- ✓ Duration: 7 yrs subject to extension : twice x 7 years

# CH4 recovery from Landfills for Electricity Generation – South Africa

- Reasons justifying additionality:

✓ The project would not be economically relevant without CDM:

- El. Prodcution cost: US$ 42/MWh
- Municipality of Durban is currently charged between US$ 15.6/MWh (peak-load) and US$ 6/MWh (out of peak-load)
- Marginal cost of Electricity in South Africa : US$ 22.5/MWh within the next 10 years

- Reasons justifying additionality:
  - ✓ Current regulations do not require CH4 recovery

# CH4 recovery from Landfills for Electricity Generation – South Africa

- Baseline :
  - ✓ CH4 flaring for security purposes (currently only 7% du CH4)
  - ✓ No electricity production needed
  - ✓ Extraction holes added only for security purposes
  - ✓ Electricity ESKOM : mainly based on coal

# CH4 recovery from Landfills for Electricity Generation – South Africa

- Baseline :
  - Average $CO_2$ Emissions for the ESKOM grid:
  - 0.89 $tCO_2$ /MWh

- Project Activity:

Recovery of CH4: 83% in 2012

CH4 due to electricity generation =

Quantity of biomass utilised x energy content x t-CH4/Tj x GWP for El a

**Key steps of the primary calculation method**

*Methane combusted in engines* | *Methane combusted in flares*

**Step 1**

Take the metered gross annual electricity production (kWh) – (H)

**Step 2**

Obtain total energy input to engines (in GJ) – (I) by multiplying with generator heat rate. Use manufacturer information for heat rate – (h) (15,000 kJ/kWh as default).

**Step 3**

Convert total energy input (in GJ) – (I) to tons of methane – (J), using calorific content of methane – (j) (37,000 kJ/m3) and weight of methane – (e) (0.000714 t CH4/m3)

**Step 4**

Calculate proportion of methane in LFG – (c), using volume of methane combusted in engines – (V) and LFG sent to engines (H)

**Step 5**

Calculate tons of methane combusted in flares – (K), using methane sent to flares – (C), flare efficiency – (a) (default 0.97), methane content in LFG – (c), and weight of methane – (e) (0.000714 t CH4/m3)

**Step 6**

Calculate proportion of project wells to total landfill gas collected – ( k), using volumes of LFG sent to engines – (X), to flares – (C), and collected from baseline wells – (B)

**Step 7**

Calculate net amount of methane – (M), by adding methane combusted in engines – (J) and in flares – (K), and correcting for contribution of baseline wells to total landfill gas collected – (k)

**Step 8**

Obtain emission reductions – (N) by multiplying net amount of methane combusted – (M) with the global warming potential of methane – (f) (GWP factor: 21)

# Baseline for CDM projects

# Thanks