

Biothermica

CDM Workshop

Holiday Inn Select

Montreal

March 18, 2003



Plan of the Presentation

1. Presentation of Biothermica
2. LFG Technologies – GHG Emission Reduction
3. LFG-to-Energy : the Gazmont Case Study
4. LFG CDM Projects in Development



About Biothermica

- Technology-construction firm founded in 1987
- EPC in air pollution control and landfill gas (LFG)
- Canadian leader in LFG collection & utilization
- R&D in the fields of landfill gas, particulate filtration, biomass gasification and VOC oxidation
- Active in Europe, America, Africa and Asia
- Finances and structures private power plant projects on a BOO/BOOT basis around the world
- CDM project developer

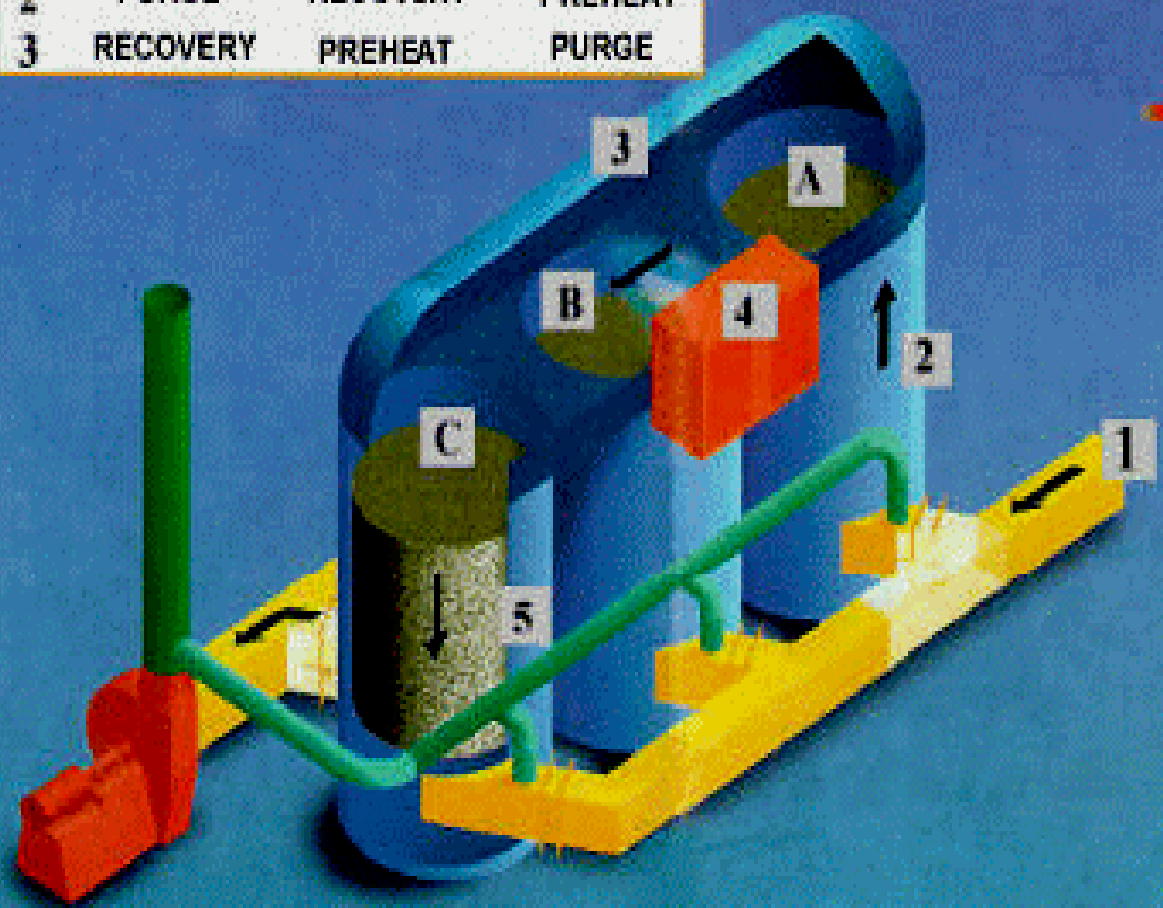


BIOTOX®

RTO Technologies

Biothermica

Cycle	A	B	C
1	PREHEAT	PURGE	RECOVERY
2	PURGE	RECOVERY	PREHEAT
3	RECOVERY	PREHEAT	PURGE





BIOTOX® Installation

Aluminium Smelters:

Pitch fumes treatment

Alcoa - Québec





BIOTOX® Statistics

• Units in operation	19
• Total flow treated (n M ³ /j)	500 000
• Sales	15.5 Millions \$
• Canada	85 %
• USA	15 %
• Destruction efficiency	93 - 99.9 %
• Thermic efficiency	81 - 96 %
• Concentration (mg / Nm ³)	300 - 5 000
• Flow variation (n M ³ /j)	3 500 - 120 000



LFG

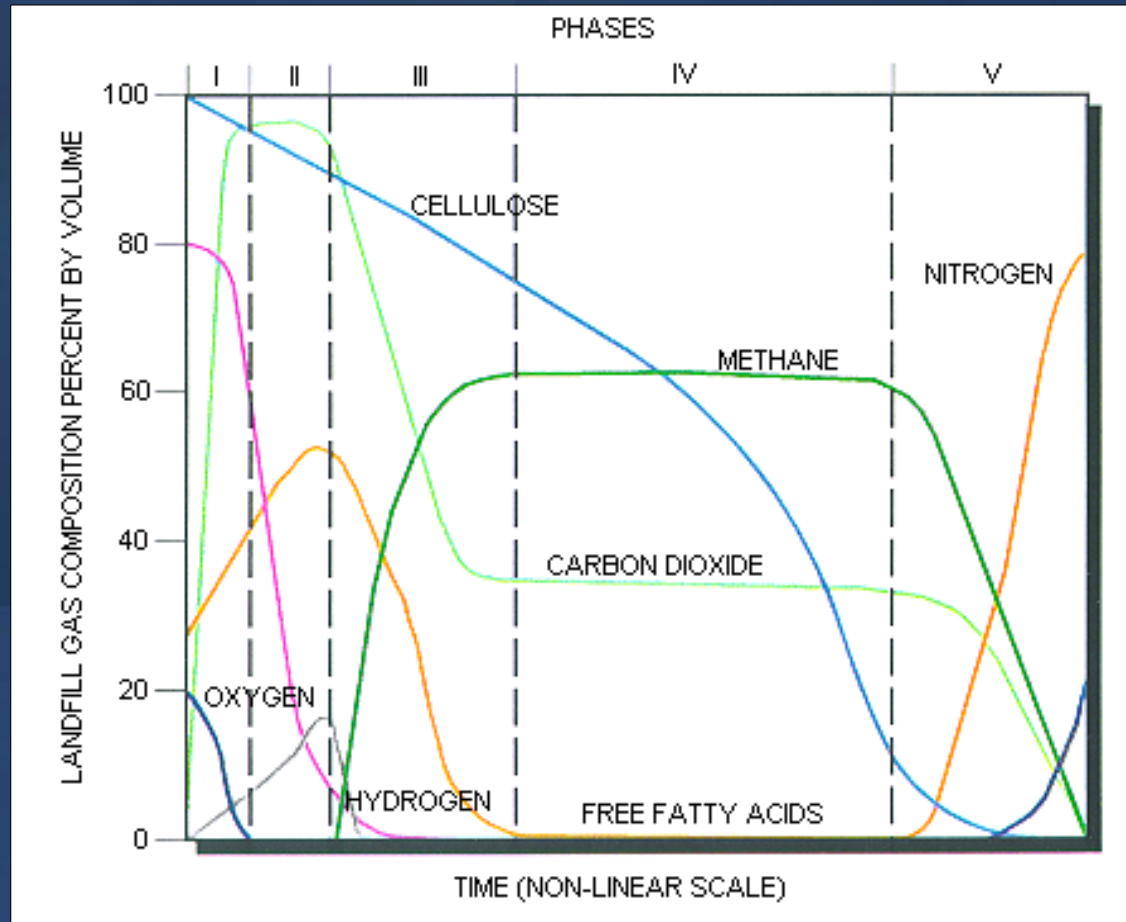
Technologies



Biothermica



LFG Generation





Impacts of Uncontrolled LFG

- Lateral migration (potential fire and explosion hazard);
- Public health hazard (carcinogenic compounds, asphyxiation);
- Stress on vegetation;
- Impacts on air quality and contribution to global climatic changes :
 - Photochemical effects and urban smog;
 - Ozone layer depletion (CFC) (Montreal Protocol);
 - Nuisance odours;
 - GHG (Kyoto Protocol)



LFG and Climatic Changes

- Gas composed of approximately 60% CH₄ and 40% CO₂;
- Presence of more than 250 VOCs (H₂S, CH₆, Toluene, Benzen, etc...)
- CH₄ = 21,5 X the warming potential of CO₂
- Important contribution to the greenhouse effect :
 - 5% of total GHG emissions in USA;
 - 20-25% of total GHG emissions in developping countries.
- Can easily be recovered with the help of a LFG collection system.



Estimation of LFG generation and recovery potential





Objectives

- LFG collection system and the LFG power plant design
- GHG reductions potential (CDM project)
- Structure the various contracts related to the implementation of a LFG-to-energy project (PPA, BSA)



Methodology

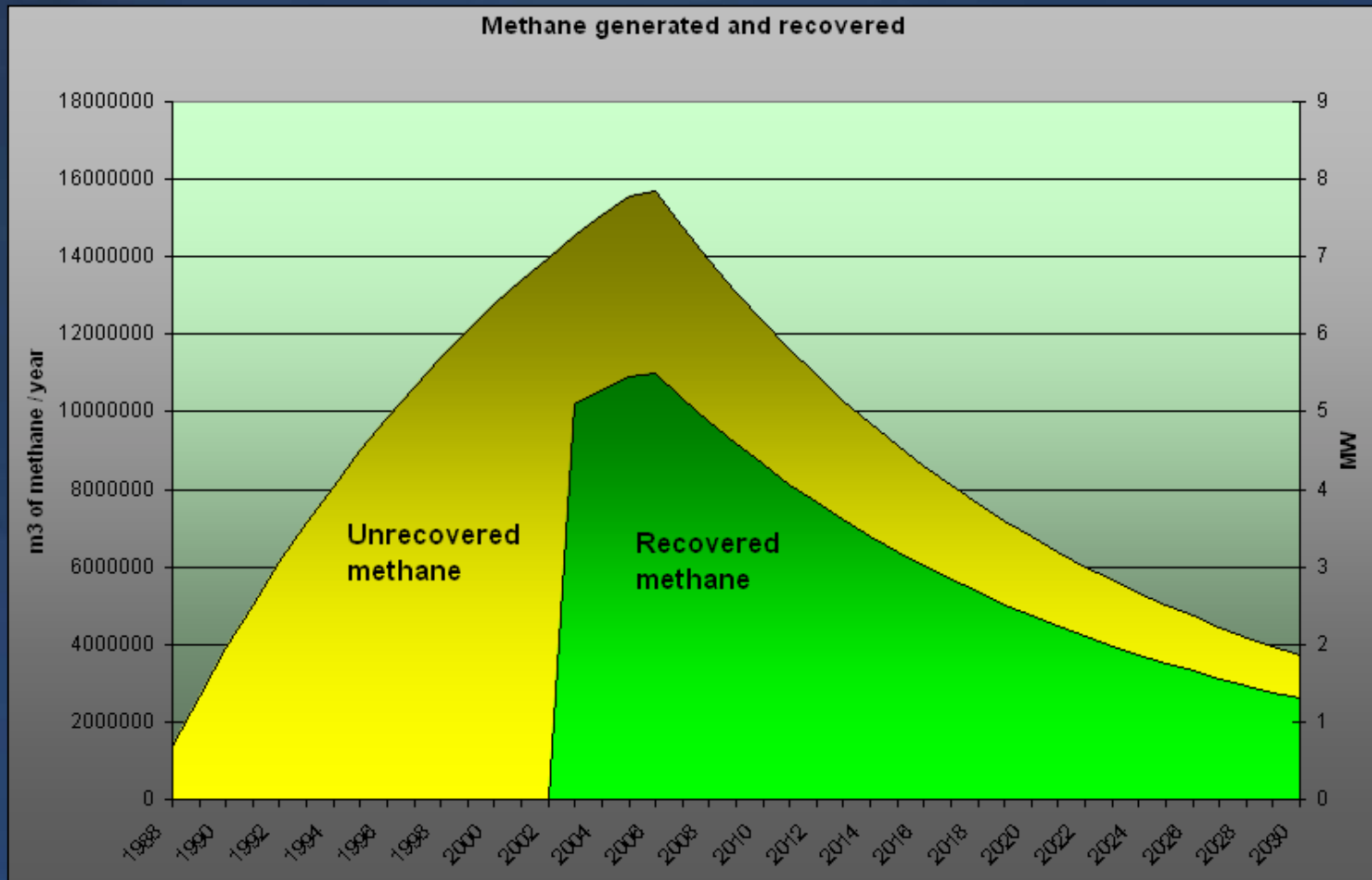
1. Is there a chance to find LFG?

Estimation of LFG generation by mathematical modeling :

- Amount of waste landfilled (if possible : rates)
- Characteristics of the waste in place (% organic matter and % of humidity)
- Local meteorological conditions (average temperature and average precipitations)



Mathematical Modelling





Methodology

2. Is there a real quantity of LFG?

Integrated Surface Sampling

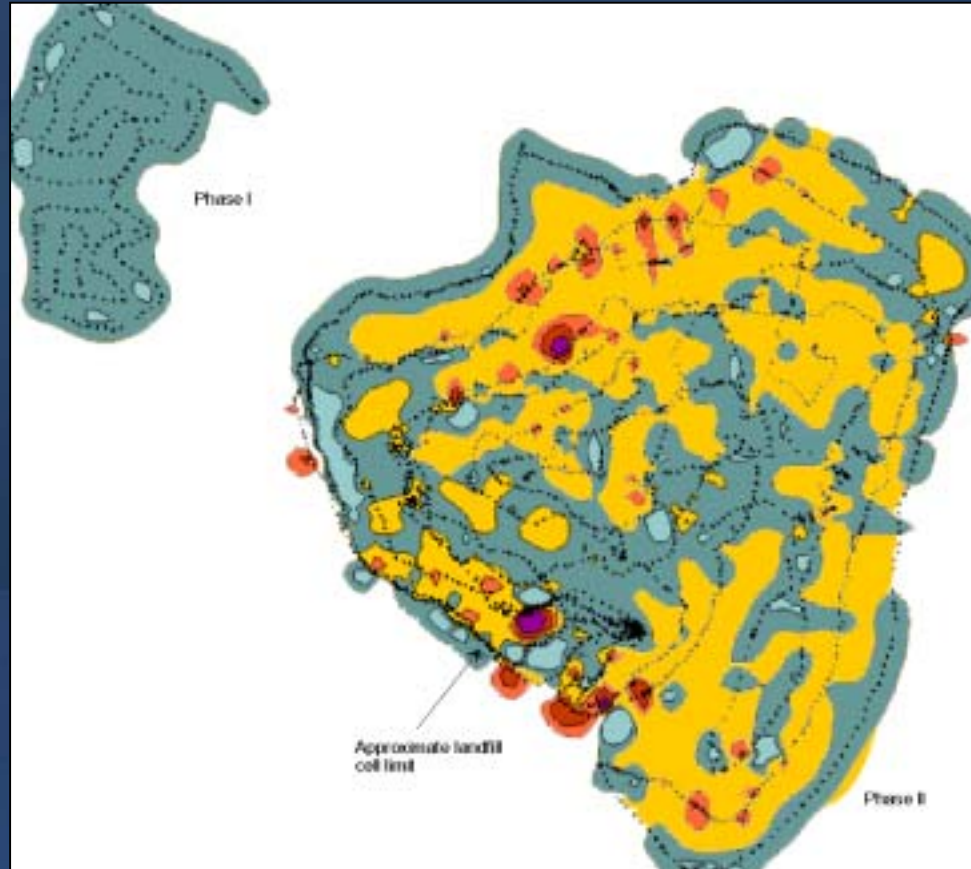
- Used to determine the extent of LFG vertical migration;
- Used to locate the « hot spots » (in order to help in the design of the recovery system)
- Calibration of the LFG generation mathematical model to establish the final LFG generation curve

Flux Chamber Testing

- Used to evaluate the flux ($l/s/m^2$) of methane produced.

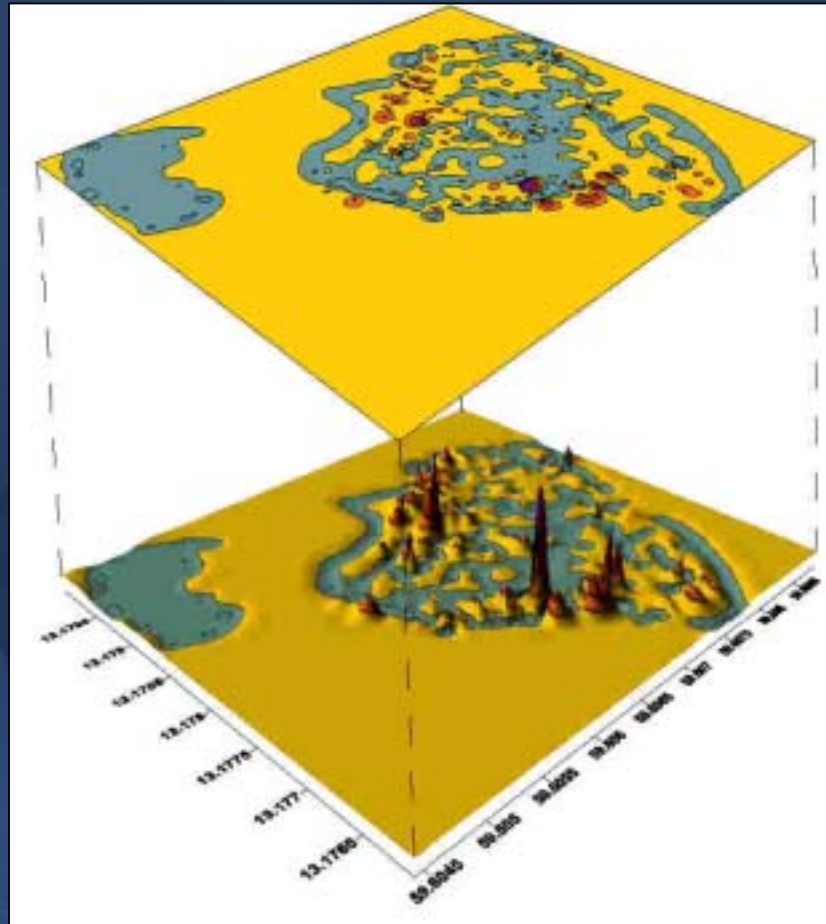


Integrated Surface Sampling





Integrated Surface Sampling





Flux Chamber Testing





Methodology

3. What are the chances to pump LFG?

Dynamic pumping tests

- Water level;
- Potential of LFG that could be pumped by one well;
- Radius of influence (number of wells to be installed);
- Determine the expected overall % of recovery; combined with the generation curve, we know how much LFG will be destroyed.





LFG-to-Energy: The Gazmont Case Study



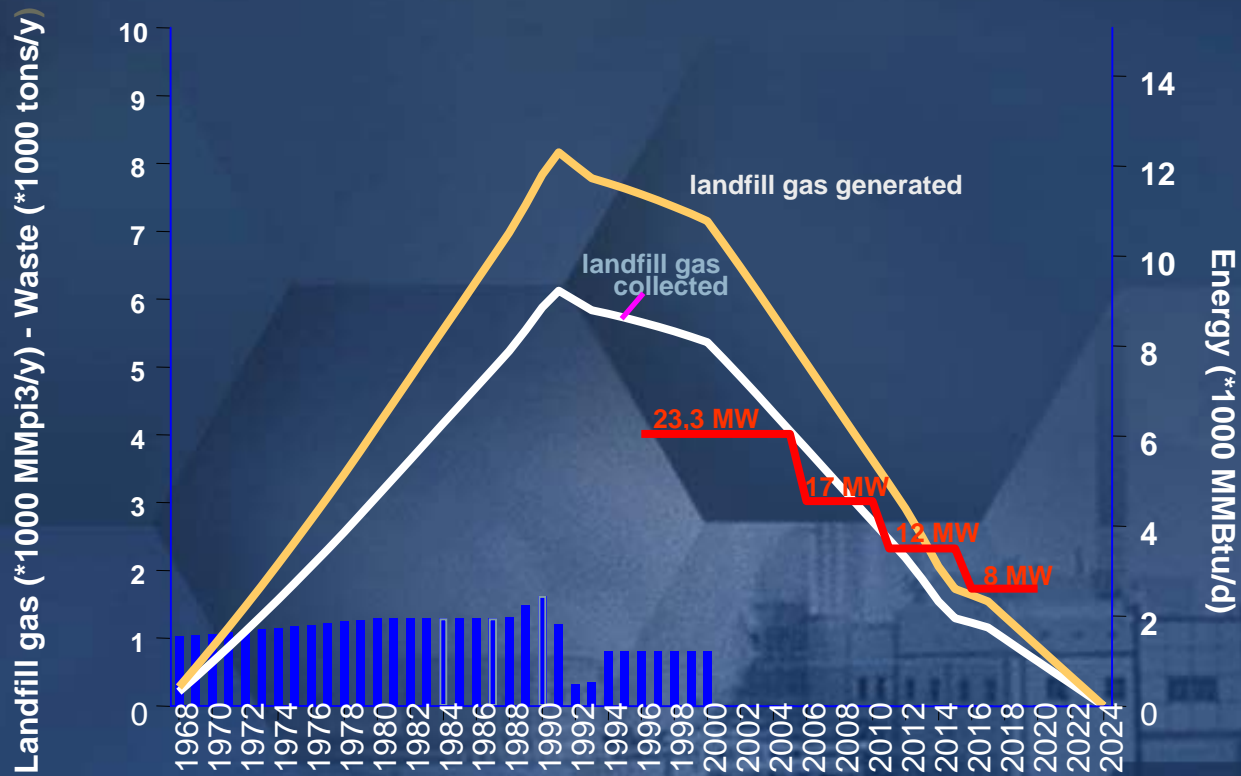


Technical and Financial Aspects

- Investment (1996 \$) 37,5 million \$
- Electricity production 180 millions kW
- LFG flow 23 MW
- LFG flow 15 000 scfm
- Calorific value (HHV) 330 BTU/scfm
- Load factor 96,1%



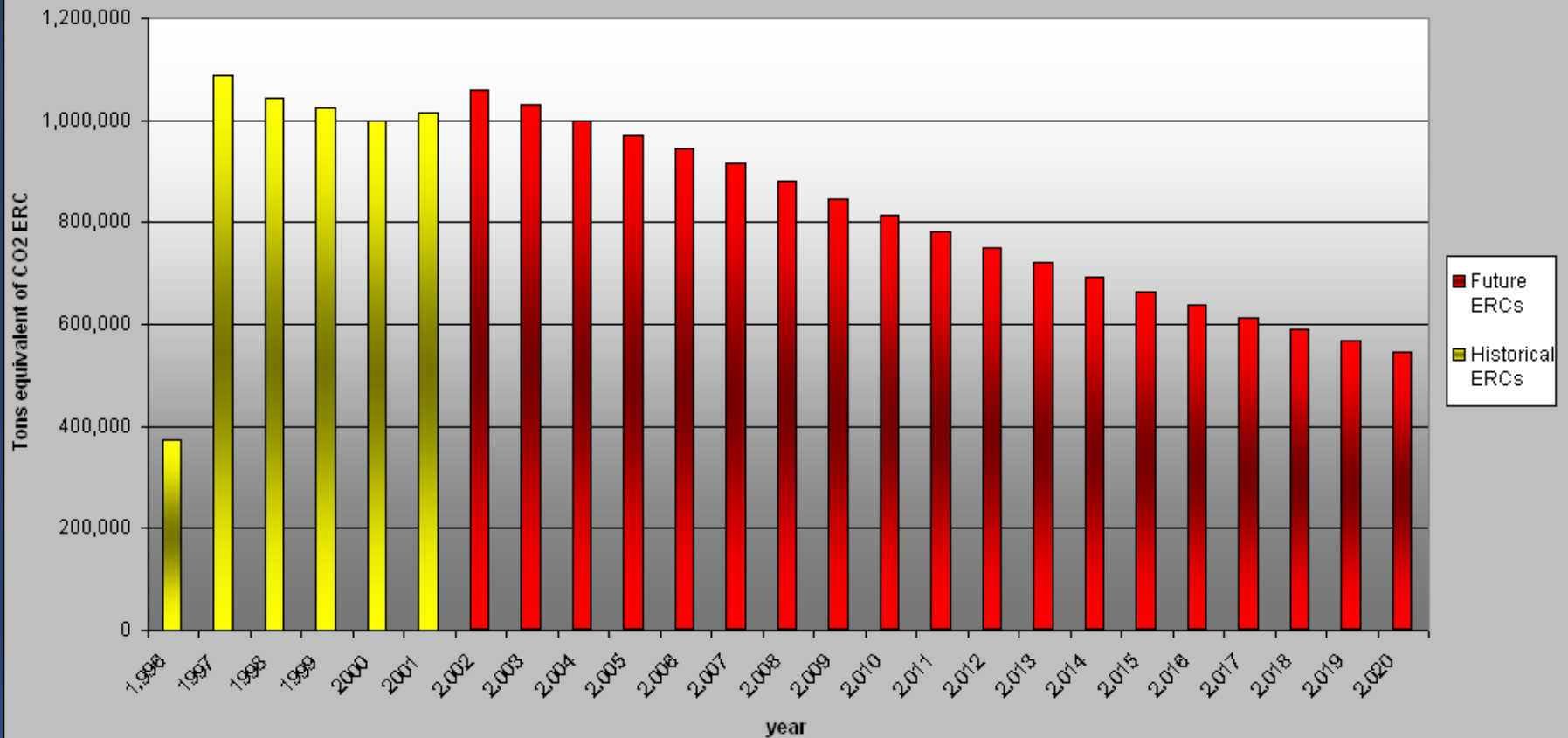
LFG Generation and Power Generation





GHG Reduction

GAZMONT 25 MW Landfill gas power plant
ERCs generation





GHG Reduction

- Most important GHG reduction project in the Province of Quebec (Prix ÉcoGeste);
- Reduction of more than 1,000,000 tons CO₂e of GHG a year;
- More than 5,000,000 tons CO₂e of GHG reduced up to date;
- More than 15,000,000 tons CO₂e of GHG reduction to come.



LFG CDM Projects in Development



Biothermica



Countries

AFRICA

Baseline Study in 2 countries

ASIA

LFG Assessment Studies in several countries

CARIBBEAN

Baseline Study in 1 country

SOUTH & CENTRAL AMERICA

LFG Assessment Studies in several countries



Our approach

PHASE I

- **LFG flaring – Recovery system will progress with the operation of the site**
- **Register the PHASE I as a CDM projet**

PHASE II

- **Implementation of the LFG-to-energy power plant**
- **Register the PHASE II as another CDM project**



CERs generation

