



# **Methane to Markets**

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## ***Accomplishments and Opportunities for the LFG Industry***

**Rachel Goldstein**

**U.S. Environmental Protection Agency**

**Landfill Methane Outreach Program**

# Global Landfill Methane Emissions Trends

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- Industrialized Nations Declining

- Increased LFG regulation
- Increased recycling of organics/paper
- Increased LFG utilization (>1100 worldwide)

- Developing Nations Sharply Increasing

- Shift from open dumps to sanitary/engineered landfills
- Increased MSW generation and disposal
- Lack of LFG regulation and recycling

# Diversity of Project Types

## *Electricity Generation*

**Internal  
Combustion  
Engine**



**Gas  
Turbine**



## Emerging Technologies



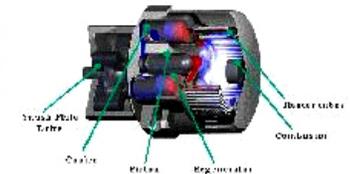
**Microturbine**



**Organic Rankine  
Cycle Engine**



**Stirling "External  
Combustion" Engine**



# Diversity of Project Types

## *Direct Use of LFG*

- Direct-use projects are growing
  - Boiler applications - replace natural gas, coal, fuel oil
  - Combined heat & power (CHP)
  - Direct thermal (dryers, kilns)
  - Natural gas pipeline injection
    - Medium and high-Btu
  - Greenhouse
  - Leachate evaporation
  - Vehicle fuel (LNG)
  - Artist studios
  - Hydroponics
  - Aquaculture (fish farming)

**Greenhouse Burlington, NJ**



**Pottery Studio Sugar Grove, NC**



**LFG-fired Boiler Ft. Wayne, IN**

# Landfill Technical Subcommittee

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- Co-Chairs
  - Argentina and Italy
- Current Landfill Subcommittee Membership
  - Argentina, Australia, Brazil, Canada, China, Colombia, Ecuador, India, Italy, Japan, Korea, Mexico, Nigeria, Russia, Ukraine, United Kingdom, United States
- India Landfill Subcommittee Contacts-
  - 1 from Ministry of Urban Development, 1 from Central Electricity Authority

# U.S. Involvement: 2006 Landfill Highlights

- U.S. EPA co-sponsored LFG workshops and training seminars in Russia, India (with USAID), and Ukraine.
- USAID supported implementation of a LFG-fired power plant in Brazil.
  - An amount equivalent to 2.5 MMTCO<sub>2</sub>E will be avoided from 2007 through 2012.
- United States and Mexico collaborate to energize M2M projects.



# U.S. Involvement: 2006 Landfill Highlights

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- Pre-feasibility study and pump test completed in Ensenada, Mexico; two studies underway (January '07) in Ecuador.
- Australia and US developed and distributed landfill candidate criteria and data collection profile to Partners
- U.S. EPA spearheaded development of global database of disposal sites and LFG project opportunities.

# M2M Partnership in Action



**Ensenada pump test**



**Loja, Ecuador – taking field measurements**



**Ukraine Workshop and site visits**



**Delhi LFGE Workshop**

# U.S. Involvement: Looking Forward

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- Developing projects that achieve direct and rapid emission reductions.
- Building capacity, providing training, and overcoming technical, policy, and market barriers (see lessons learned)
- Planning the Partnership Expo.
  - support approximately 6-10 assessments and pre-feasibility studies
- Finalize and launch international landfill database in mid 2007

# Key Priority for 2007: Partnership Expo

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- October 30- November 1, Beijing, China
- Key Objectives
  - Showcase methane project opportunities, identify projects with financing opportunities from all 19 country Partners
  - Showcase methane recovery and use technologies and services
  - Sector tracks on key technical, policy, financial, and other project development issues
- Participating organizations are those interested in methane recovery and use project development
  - Project developers
  - Financial institutions
  - Equipment manufacturers/vendors
  - Site and/or project managers
  - Non-governmental organizations
  - National and international policy makers, etc.

# Landfill Lessons Learned

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- There are serious technical hurdles regarding basic landfill management and landfill gas system O&M that must be overcome in most developing countries.
- Lack of awareness of all LFG uses.
- Contractual disputes (e.g., gas rights) must be addressed.
- M2M Partner Country participation varies widely.
- Political change presents unique challenges.
- Carbon credits are driving almost all projects.

# LMOP International Assistance Overview

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## Three Main Types of Project Support:

- **Training and technical support**: Assist with project identification, assessment, gas modeling, design, end-user identification, and development
- **Financing**: Work with international agencies and the private sector to identify financing
- **Outreach**: Work with project partners to communicate project benefits on local and national levels
- **Data collection**: As part of international database



## USG Next Steps and Plans for 2007

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- Identify landfills in Partner countries and support approximately 10-15 pre-feasibility studies
  - Projects to be characterized for showing at the 2007 Project Expo
  - Have started in Ecuador, Argentina, China, and Ukraine
  
- Finalize and launch international landfill database in early 2007
  - Database will be available on-line to make potential project opportunities readily available to investors

## Possible Candidate Landfills

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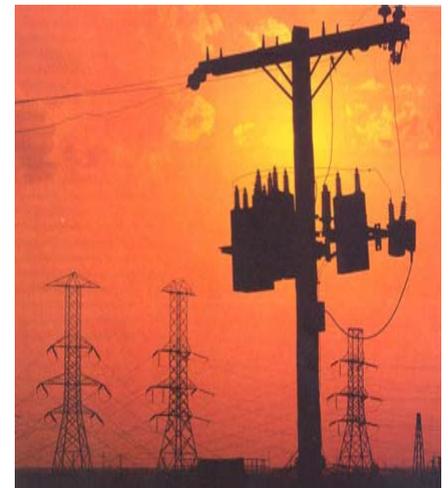
- Delhi- 4 dump sites, 3 of which look promising for landfill gas to energy
- Mumbai- 4 dump sites, some pre-feasibility work at one landfill
- Hyderabad
- Kolkata
- Others? Please share your data

# For More Information...

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**[www.methanetomarkets.org](http://www.methanetomarkets.org)**

- Rachel Goldstein (U.S.EPA)
  - [Goldstein.rachel@epa.gov](mailto:Goldstein.rachel@epa.gov)
  - +1.202.343.9391



## For More Information

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