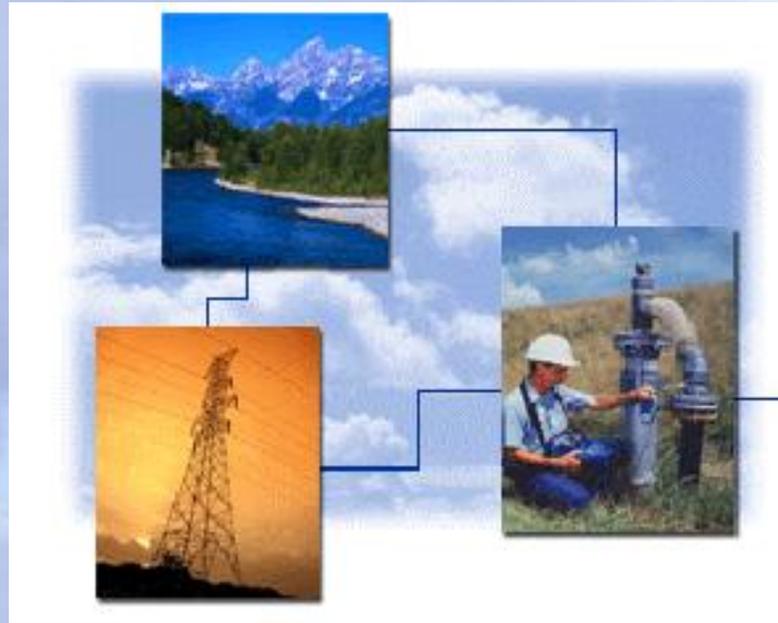


An Overview of Landfill Gas Energy in the United States



**U.S. Environmental Protection Agency
Landfill Methane Outreach Program
(LMOP)**



Victoria Ludwig

Why EPA Cares About Landfill Gas



- Methane is a potent heat-trapping gas
- Landfills are the largest human-made source of methane in the United States
- There are many cost-effective options for capturing landfill gas (LFG), reducing methane emissions, and generating energy
- LFG energy (LFGE) projects reduce local air pollution, create jobs, revenues, and cost savings

EPA's Landfill Methane Outreach Program



- Established in 1994
- Voluntary program that creates alliances among states, energy users/providers, private waste companies, the LFG industry, and communities

Mission: To reduce methane emissions by lowering barriers and promoting the development of cost-effective and environmentally beneficial landfill gas energy (LFGE) projects.

Benefits of LFGE Projects to the Environment and the End User



- Dual benefit → destroys methane and other organic compounds in LFG
- Offsets use of nonrenewable resources (coal, oil, gas) reducing air pollution emissions
- LFGE is a recognized renewable energy resource
- LFG is generated 24/7, projects have online reliability over 90%, gas supply can last 15-20 years

Benefits of LFGE Projects to the Landfill Owner and Community



- Can provide additional income stream to the landfill owner
- Community involvement including
 - Environmental benefits
 - Economic development
- Air pollution reductions may allow other industrial development

Diversity of Project Types

Electricity Generation



**Internal
Combustion
Engine**



**Gas
Turbine**



Emerging Technologies



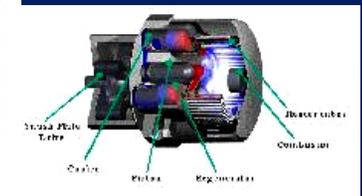
Microturbine



**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
- Greenhouses
- Hydroponics
- Aquaculture (fish farming)
- Leachate evaporation
- Vehicle fuel (LNG)

Greenhouse Burlington, NJ



Pottery Studio Sugar Grove, NC



LFG-fired Boiler Ft. Wayne, IN

State of the National LFGE Industry (2/07)



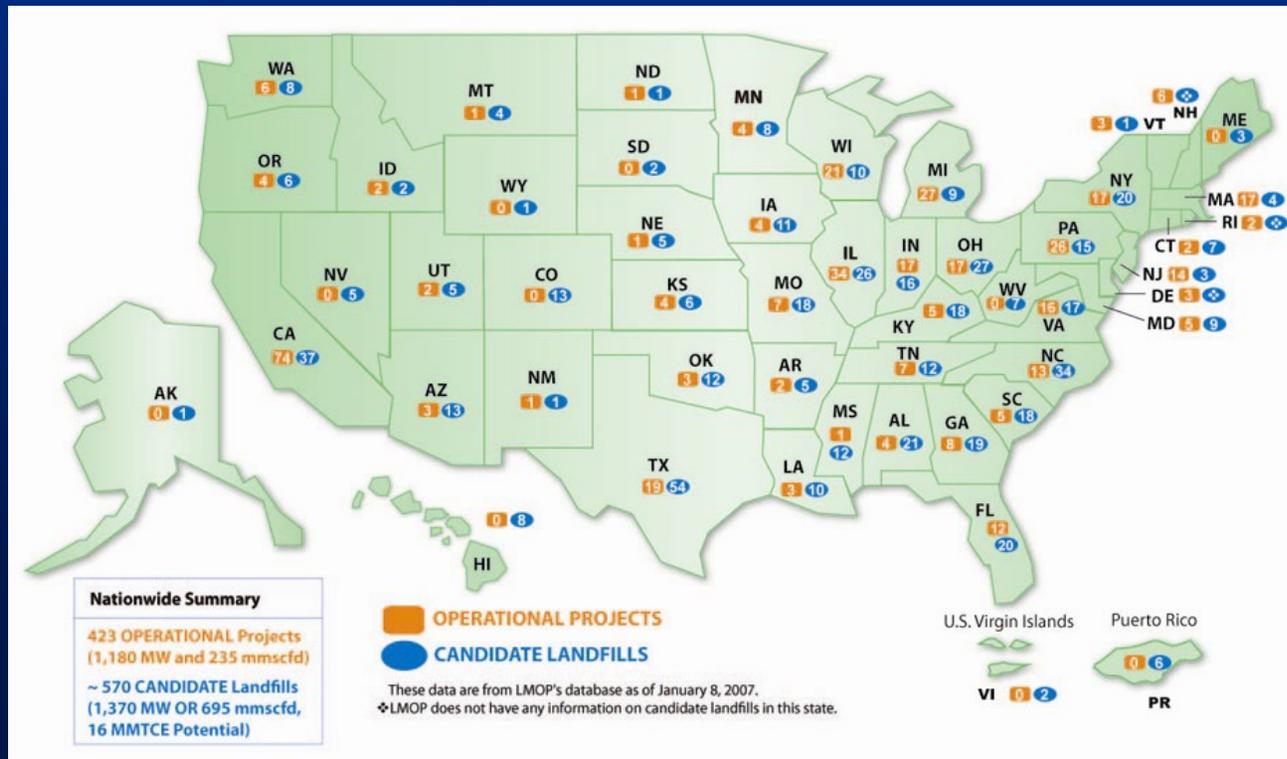
- At least 420 operational projects in 40 states supplied:
 - 10 billion kilowatt hours of electricity and 75 billion cubic feet of landfill gas to direct-use applications in 2006
- Estimated **Annual Environmental Benefits:**
 - Planting nearly **20,000,000 acres of forest**, or
 - Preventing the use of nearly **170,000,000 barrels of oil**, or
 - Removing emissions equivalent to nearly **14,000,000 vehicles**
and
 - Powering over **780,000 homes** and heating nearly **518,000 homes**



Landfill Gas Energy Projects and Candidate Landfills



Currently ~570 candidate landfills with a total gas generation potential of 700 million cubic feet per day or ~15,000 MMBtu/hr



LMOP Partner Tools and Services



- Partnerships and networking (over 600)
- Direct Project Assistance
 - Feasibility studies, end user searches
- Newsletter and listserv
- Technical Resource
- LFG Advocate
- Project Promotion

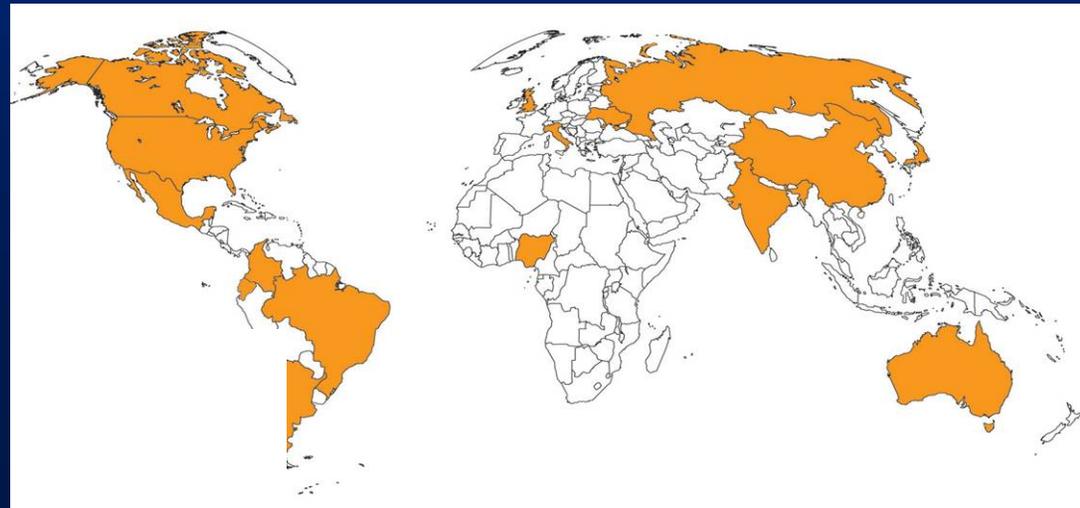
LMOP Partner Tools and Services



- Project and Candidate Database
- Web Site (e.g., publications, database)
www.epa.gov/lmop
- Annual National Conference

- Advances recovery and use of methane as a valuable clean energy source
- Encourages development of **cost-effective** methane recovery and use opportunities in
 - coal mines, landfills, oil and gas systems and agriculture (manure waste management)
- Private companies, multilateral development banks and other relevant organizations participate by joining the **Project Network** – *over 350 organizations now participating*
- 19 Partner Countries

Argentina	Japan
Australia	Korea
Brazil	Mexico
Canada	Nigeria
Colombia	Poland
China	Russia
Ecuador	Ukraine
Germany	United Kingdom
India	United States
Italy	



U.S. Involvement in M2M



- U.S. EPA is coordinating efforts across the USG and staffs the Partnerships Administrative Support Group



- U.S. commitment
 - Pledge of \$53 million over five years
- Key activities to advance project development
 - Identify and assess project opportunities
 - ◆ Pre-feasibility and Feasibility studies
 - Support technology transfer, training, and capacity building
 - ◆ Workshops and Conferences
 - ◆ Study tours
 - ◆ Developing Reports / Databases / Clearinghouses
 - Address barriers to project development and increase access to information
 - ◆ Financial/market, regulatory, technical
 - Technology demonstration and deployment



The Project Network



- Project network members are private firms, development banks, NGOs or other governmental and non-governmental entities with an interest in methane recovery and use projects
- Currently about 350 organizations including:
 - World Bank
 - Asian Development Bank
 - UN Economic Commission for Europe
 - Consultants and Project Developers
- Organizations can join on-line at www.methanetomarkets.org

Methane to Markets 2007 Partnership Expo



The Methane to Markets Partnership Expo will provide a forum to:

- Highlight methane capture and use technologies and services.
- Showcase project opportunities to potential investors.
- Discuss the key technical, policy, financing, and regulatory issues related to project development.



Beijing, China

*30 October – 1 November
2007*



Methane to Markets

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Methane to Markets