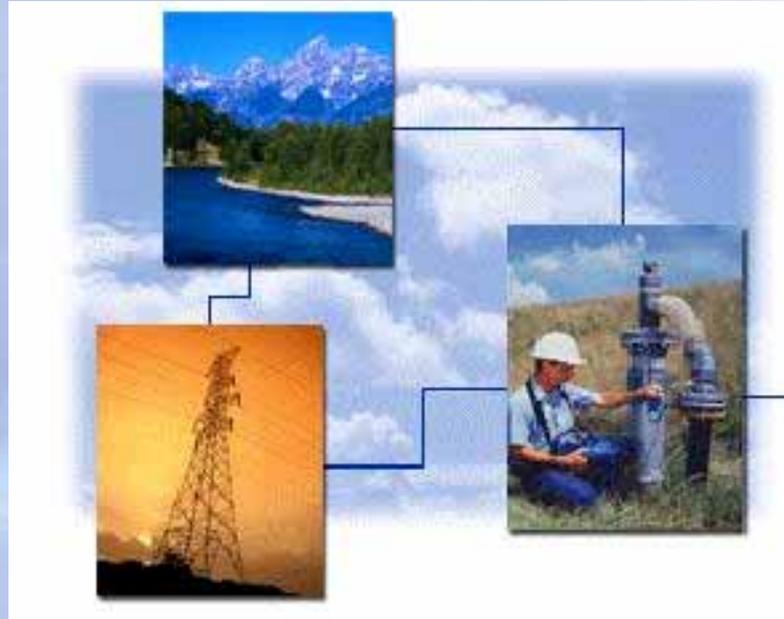




# ***Texas Landfill Gas Energy Workshop***



**Hosted by:**

**U.S. Environmental Protection Agency**

**Landfill Methane Outreach Program (LMOP)**

**Texas Commission on Environmental Quality (TCEQ)**

**Austin, TX - May 6, 2003**

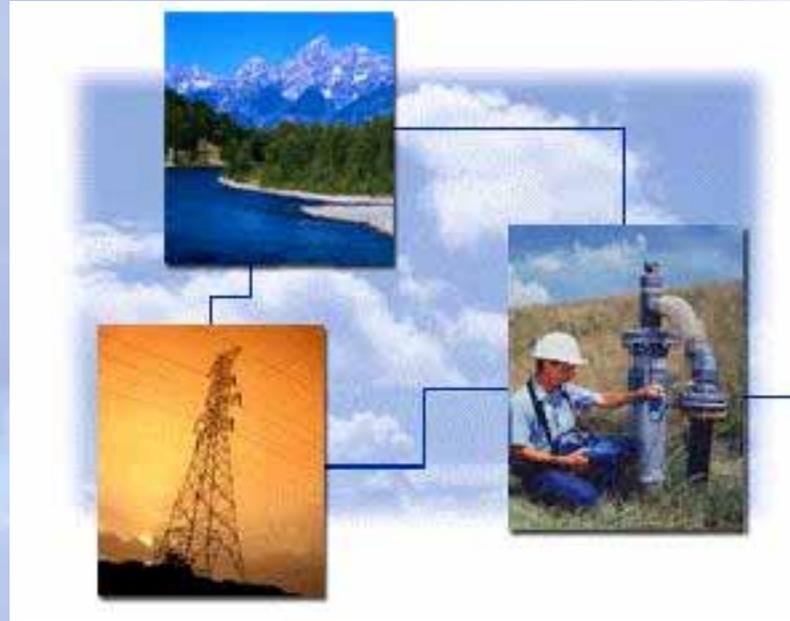


# Workshop Logistics



- Overview of U.S. and Texas LFG Energy - Past, Present, and Future Trends
- Regulatory and Policy Implications for LFGE in Texas
- 3:15 Break
- Case Studies: Texas LFGE Projects
- 5:00 Adjourn

# *An Overview of Landfill Gas Energy in the U.S. and Texas*



Presented by:

Brian Guzzone, Team Leader

U.S. Environmental Protection Agency

Landfill Methane Outreach Program (LMOP)



Austin, TX - May 6, 2003



# Why Does EPA Care About LFG?



- Methane is a potent heat-trapping gas.
- Landfills are the largest human-made source of methane in the US.
- There are many cost effective options for reducing methane emissions while generating energy.
- Projects reduce local air pollution.
- Projects 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, the landfill gas 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.*



# Program Recognition



“Another real success that proves the value of voluntary programs is EPA’s effort to reduce methane emissions. Through these programs, which include the ***Landfill Methane Outreach Program***, methane emissions today are actually 5% lower than they were in 1990.”

*~ Christine Todd Whitman, Administrator, U.S. Environmental Protection Agency  
December 2002*



# Texas LMOP Partners



- **COMMUNITY PARTNERS**

City of Corpus Christi

- **ENERGY PARTNERS**

Austin Energy

- **STATE PARTNER**

Texas Commission on Environmental  
Quality

- **INDUSTRY PARTNERS**

Argent Consulting Services

Biogas Energy, LP

Consortium Service Management  
Group, Inc.

- **INDUSTRY PARTNERS (CONT.)**

CROMECO, Inc.

EMCON/OWT, Inc.

Energy Developments, Inc.

Las Animas Landfill Gas, LLC

McKinney American, Inc.

McMichael International

Q2 Technologies, LLC

Run Energy LP

SCFM Compression Systems

Toro Energy, Inc.

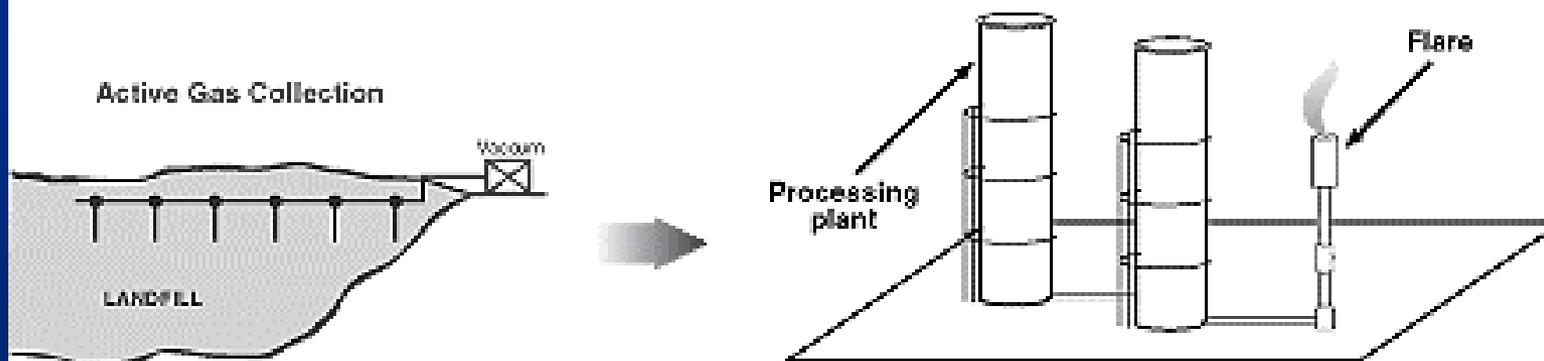
Virtus Energy Research Associates

VR Systems, Inc.

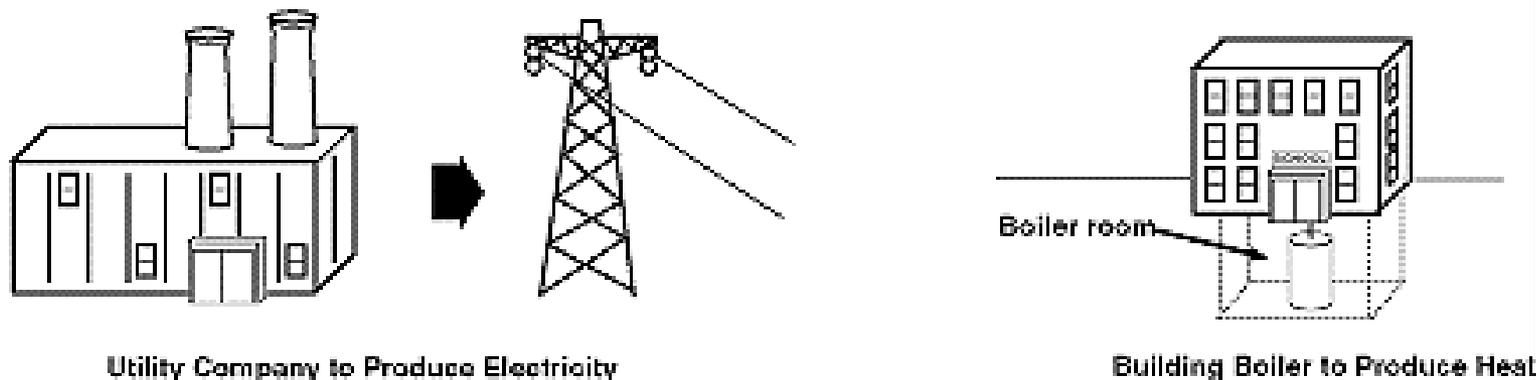
Westmar, Inc.

# LFG Energy 101

## LANDFILL GAS PROCESSING AND TREATMENT



## LANDFILL GAS TRANSPORT AND END USERS





# LFGGE Projects Provide Dual Benefits



- Destroys methane and other organic compounds in LFG
  - Each 1 MW of generation = planting ~12,000 acres of trees per year, removing the emissions of ~8,800 cars per year, or preventing the use of ~93,000 barrels of oil per year
- Offsets use of nonrenewable resources (coal, oil, gas) reducing emissions of:
  - SO<sub>2</sub> contributes to acid rain
  - NO<sub>x</sub> contributes to ozone formation and smog
  - PM is a respiratory health concern
  - CO<sub>2</sub> is a global warming gas





# State of the LFGE Industry

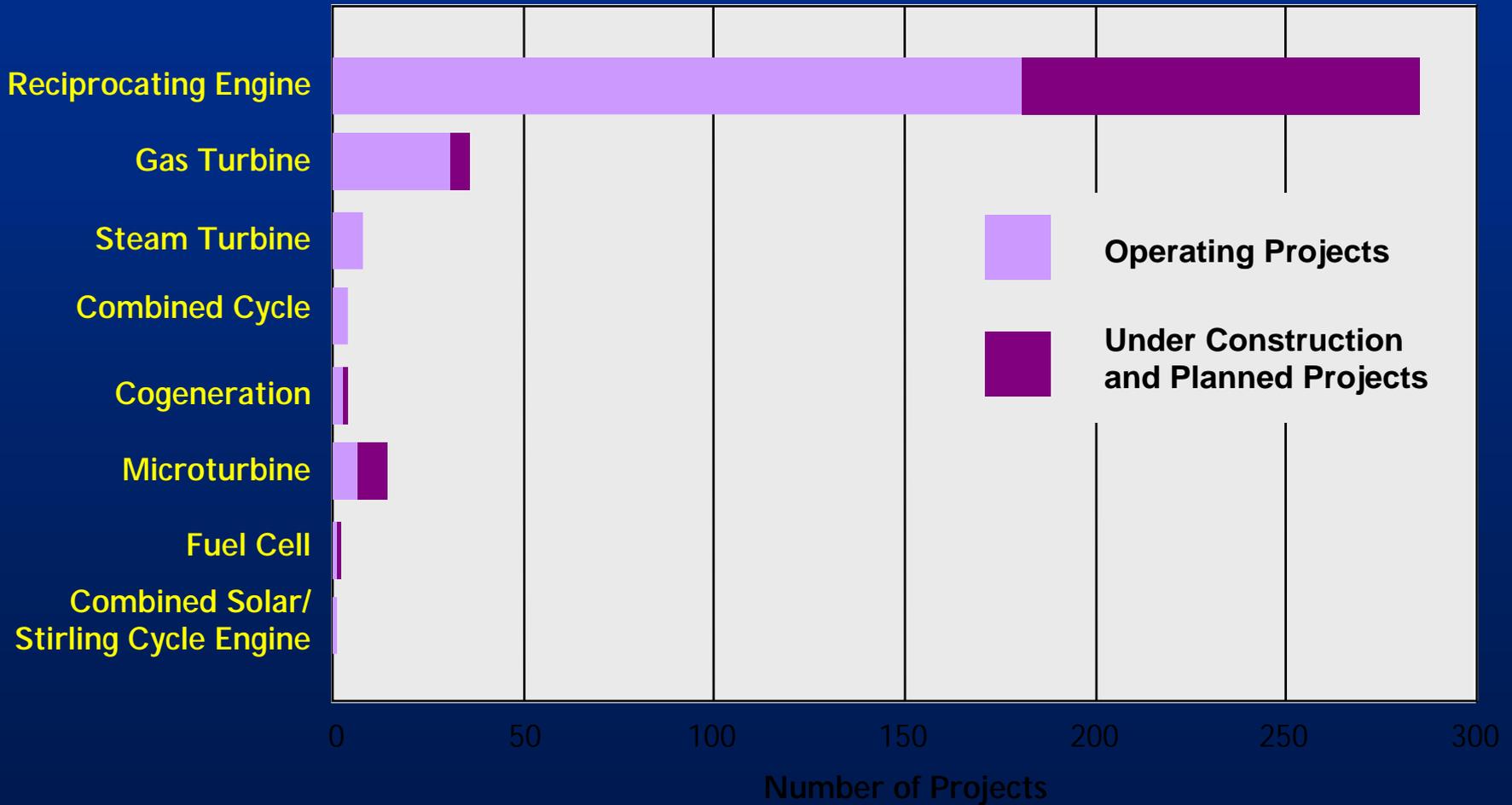


- **340 Operational projects**
  - 1000 megawatts (MWs) of electricity produced, and
  - 230,000,000 cubic feet per day of landfill gas used in direct use applications
- **At least 100 under construction and planned projects**
- **>600 landfill candidate sites**



# Technology Trends

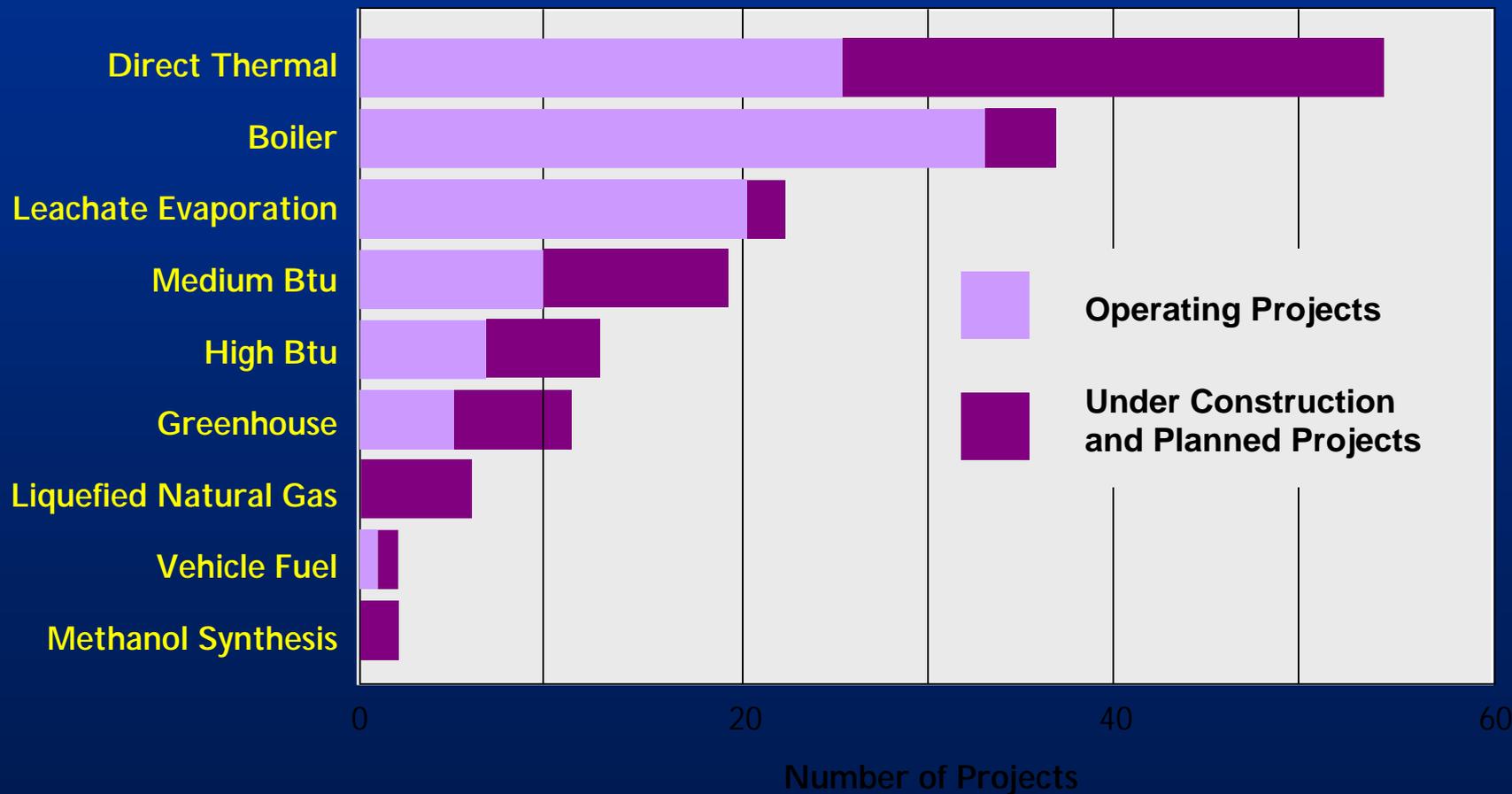
## *Electricity Projects*





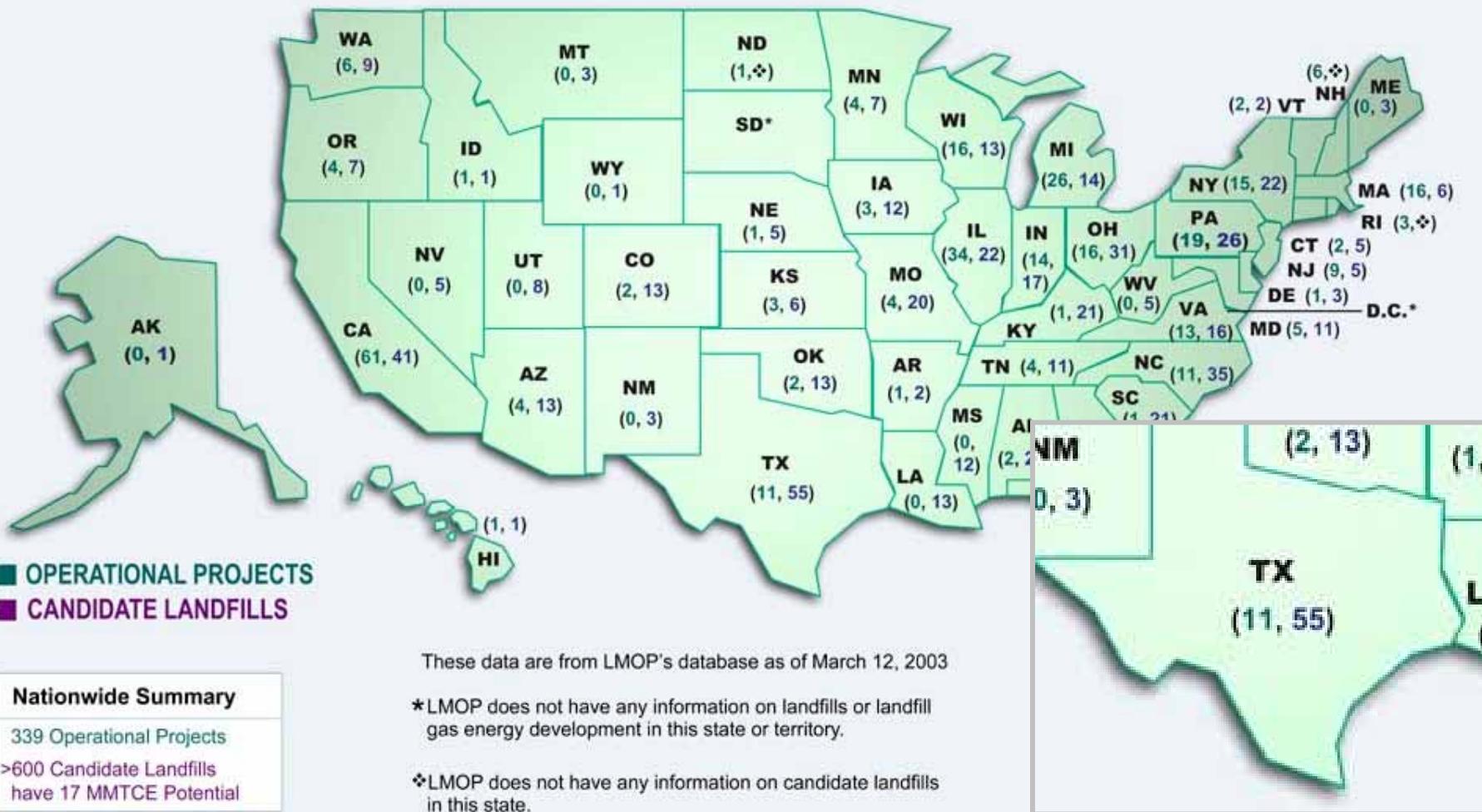
# Technology Trends

## *Direct Use*





# Status of Operational LFGE Projects and Candidate Landfills





# Environmental Benefits from Current LFGE Projects



- **Estimated Annual Benefits:**
  - **Planting 17,000,000 acres of forest, or**
  - **Preventing the use of 130,000,000 barrels of oil, or**
  - **Removing the carbon dioxide emissions of 12,000,000 cars, or**
  - **Offsetting the use 290,000 railcars of coal.**



# Landfill Gas and Green Power *A Winning Combination*



- LFGE is a recognized renewable energy resource (*Green-e*, EPA GPP).
- LFG is generated 24/7 and available over 90% of the time.
- Serves as the “baseload renewable” for many green power projects.
- LFG is among the most cost competitive renewable resources available (\$0.04 - 0.06/kW).
- LFG can act as a long-term price and volatility hedge against fossil fuels.
- Utilities are already using LFGE.



# Financial Incentives and Green Power Offerings



## ● Texas

- Renewable Generation Requirement (2000 MWs by 2009)
- Green Pricing, Green Power and RECs
- Austin Energy GreenChoice
- Reliant Energy

## ● Federal

- Section 29 Tax Credit (~1.5 cents/kWh; GCCS installed by June 30, 1998; credits due to sunset in 2007)
- Renewable Energy Production Incentive (~1.5 cents/kWh; local/state government or non-profit electric co-op facilities; project must be in by 9/03; available through 2013)



# 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

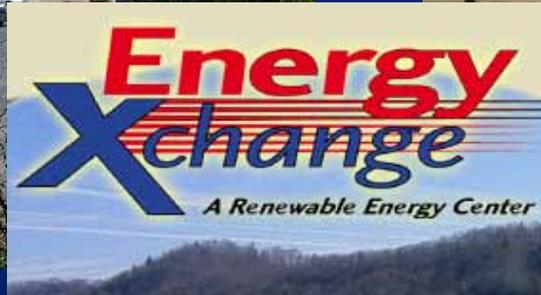
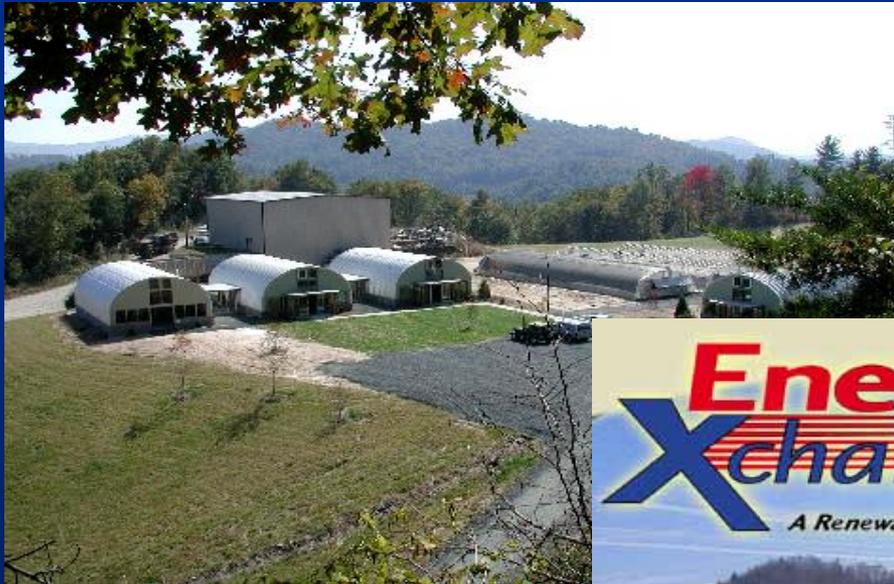


LFG-fired Boiler  
Ft. Wayne, IN



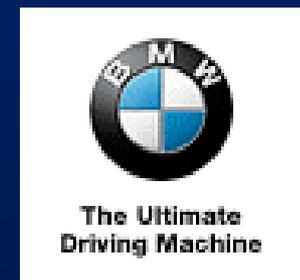
# EnergyXchange, NC

## *Engaging Communities*





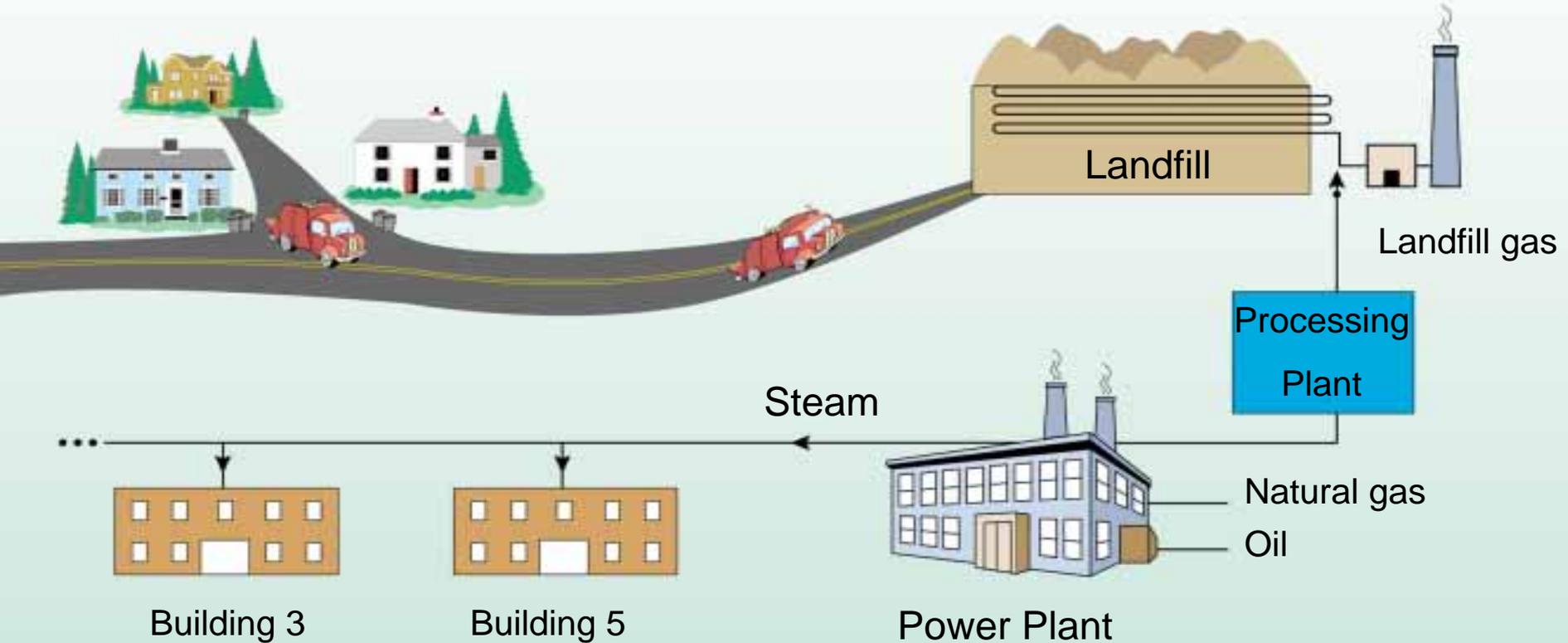
# Look Who's Using Landfill Gas





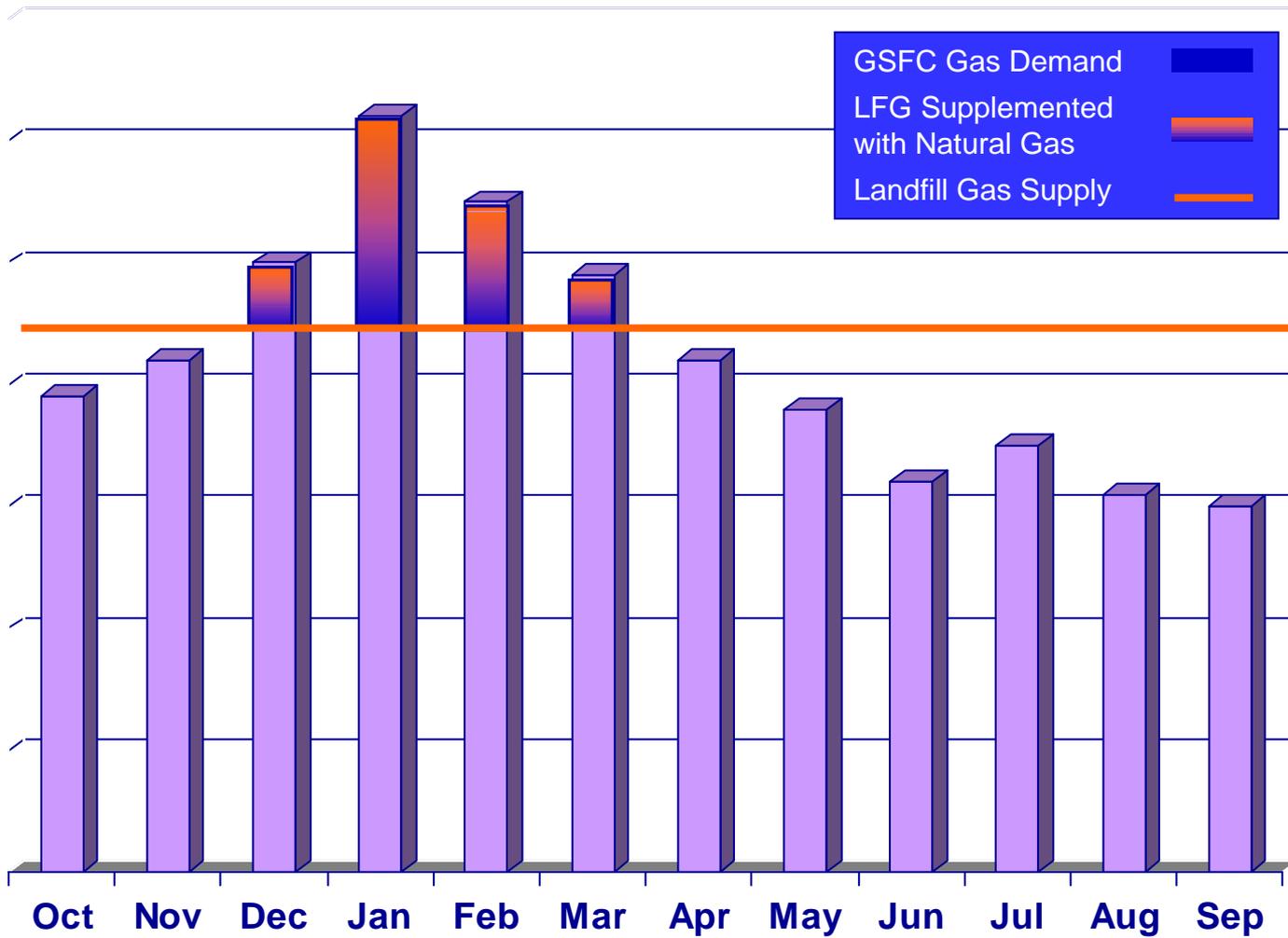
# Direct Use Case Study

## NASA Goddard Space Flight Center, Greenbelt, Maryland





# Direct Use Case Study Supply v. Demand at GSFC





# *Direct Use Case Study* **GSFC Project Benefits**



- ✓ NASA wins by saving \$350K/year on fuel cost, and no cost to the government
- ✓ NASA increases energy reliability
- ✓ Public and Private Partnerships
  - ✓ Developers win by making a profit from selling the LFG
  - ✓ County wins by sharing the LFG fee
- ✓ Reduced local emissions
- ✓ Sustainability goals - 80% of NASA's renewable energy source goal met through this project
- ✓ Offset fossil fuel usage





# *Direct Use Case Study* **GM Truck Assembly Plant** **Fort Wayne, Indiana**



- Direct use of LFG in boiler since Feb '02. Replaces fuel oil.
- 9-mile pipeline.
- Produces steam to heat assembly plant and process equipment, and to drive turbines to produce chilled water and to pump water.
- Estimated cost savings: \$400K annually.
- Positive public reaction.



LFG-fired Boiler  
Ft. Wayne, IN





## *Direct Use Case Study*

# **SC Johnson & Son, Inc. Waxdale Plant Racine, Wisconsin**



- Have used LFG in boilers for 14 years.
- Combined heat and power (CHP) LFG turbine project under construction.
- Will produce 3.2 MW of electricity. Recover waste heat to produce 17,000 lb/hr steam.
- Reduce plant fossil fuel use by 50%.  
Reduce plant GHG emissions by 47%.
- Projected energy savings \$2.4 million/yr.





# There Are Still Many Untapped LFG Resources



- Currently over 600 candidate landfills and a total MW potential of over 1,700 MW.
- Total expected annual environmental benefits if all projects were developed/producing power:
  - Planting over 20 million acres of forest, or
  - Removing the emissions from over 14.6 million cars on the road, or
  - Powering over 1 million homes per year.



# Current and Potential LFGE Projects in Texas



- **Operational**

Arlington Landfill

Atascocita Landfill

Austin Community Landfill

Castle Road Landfill

City of Brownwood Landfill

Dallas-Fort Worth Landfill

McCarty Road Landfill

McCommas Bluff Landfill

Rosenberg Landfill

Sunset Farms-Austin Landfill

Tessman Road Landfill

- **Under Construction**

Blue Bonnet Landfill

City of Conroe Landfill

City of Waco Landfill

Coastal Plains Landfill

Hutchins Landfill

J.C. Elliot Landfill

Sanifill of Texas-Baytown Landfill

Security Recycling and Disposal Landfill

- ***More Than 55 Candidate Landfills – Too many to list!!!***



# Estimated Annual Environmental Benefits



- **Current** - 11 projects (41 MWs and 13,900 cfm)
  - Planting **157,000 acres** of forest.
  - Removing the CO<sub>2</sub> emissions of **116,000 cars**.
  - Preventing the use of **1.24 million barrels of oil**.
  - Provides enough energy to **power 27,200 homes** and **heat 112,000 homes**.
- **Potential** - 186 MWs from 56 sites
  - Planting additional 358,000 acres of forest.
  - Removing the CO<sub>2</sub> emissions of additional 265,000 cars.
  - Preventing the use of additional 2.82 million barrels of oil.
  - Provide enough energy to power additional 123,000 homes.



# LMOP Partner Tools and Services



- Partnerships and networking (over 350)
- Newsletter and listserv
- Direct Project Assistance
  - Feasibility studies, end user searches
- Technical Assistance Resource
- LFG Advocate
- PR/Ribbon Cuttings

GM and Toro  
Ribbon-Cutting Ceremony

May 2002





# LMOP Partner Recruitment Tools and Services



- Database
- Green Pricing Accreditation Involvement
- State Workshops/Conferences
  - working with state partner and SWANA
- Peer Matching
- Web Site (e.g., publications, database)
- *7th Annual LMOP Conference and 2003 LMOP Partner Awards*  
January 2004, Washington, DC



# For More Information



- [www.epa.gov/lmop](http://www.epa.gov/lmop)
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202-564-2666