



# Benefits of CHP and Clean Distributed Generation

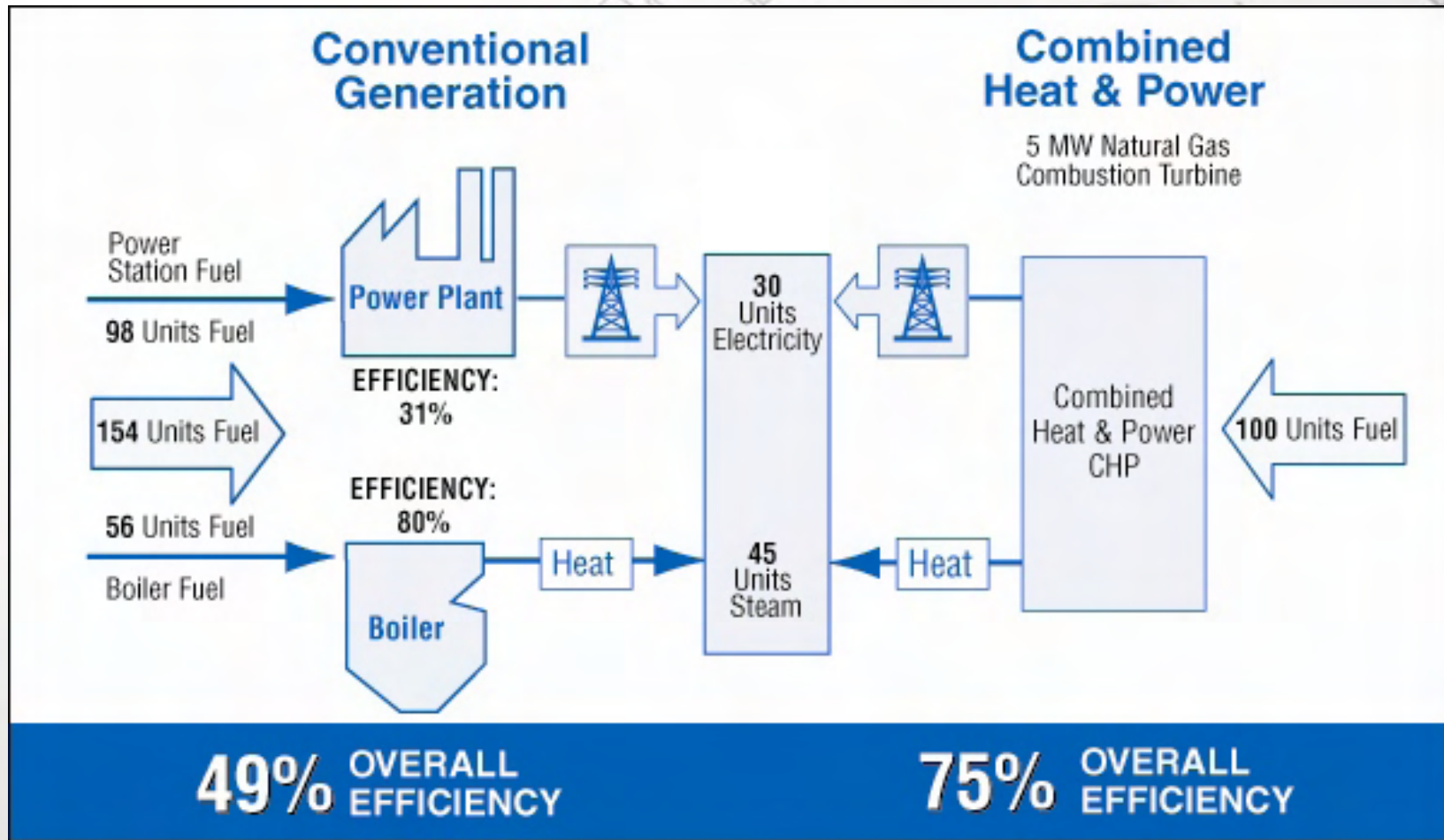
Kim Crossman  
US EPA CHP Partnership

*Presented to the CHP and Bioenergy for Landfills and Wastewater  
Treatment Plants Workshop  
August 11, 2005*

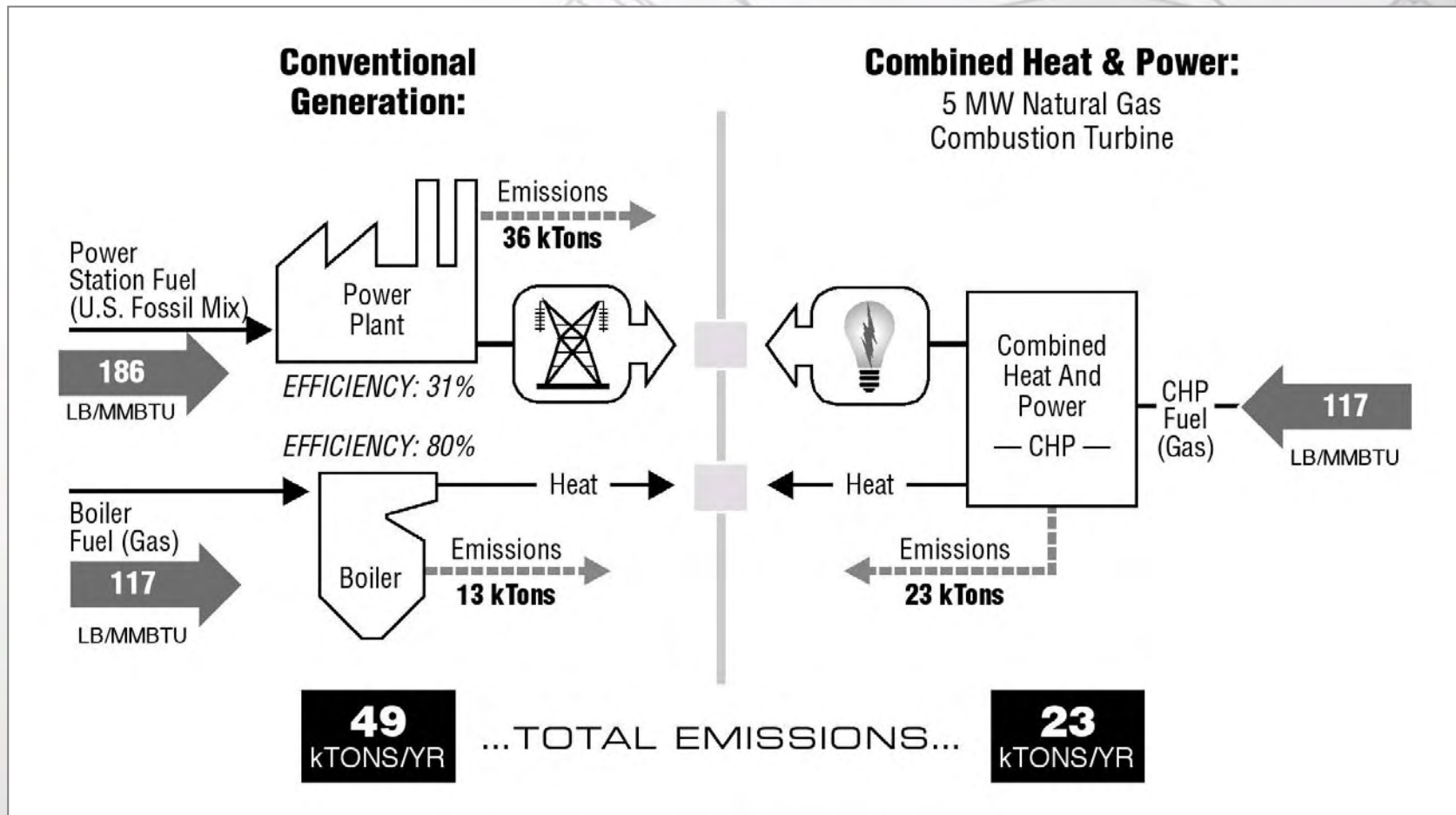
# Combined Heat and Power (CHP) Defined

- The simultaneous production and use of at least two forms of usable energy from the combustion of one fuel
  - Fuels: natural gas, coal, oil, biomass, biogas
  - Outputs: electricity, shaft power, hot water, steam, chilled water, dehumidification
- A proven, highly efficient alternative to separate power and heat production
- 80,000 MW of existing CHP in United States
- 312 MW of existing biogas CHP in United States

# Efficiency Advantages of CHP



# Environmental Benefits of CHP- CO<sub>2</sub> Example



# The Benefits of CHP

- **Environment:** reduces GHG emissions
- **Economic:** reduces energy costs
- **Reliability:** decreases impact of power outages
- **Security:** increases national energy security

# Biogas 101

- Biogas is a by-product of the anaerobic decomposition of MSW in landfills or sludges at wastewater treatment facilities
- If uncontrolled, biogas contributes to smog and the risk of global climate change, and may cause health and safety concerns
- 300 scfm of biogas = ~ 800 kW electricity
- Biogas
  - ~ 50% methane ( $\text{CH}_4$ )
  - ~ 50% carbon dioxide ( $\text{CO}_2$ )
  - <1% non-methane organic compounds (NMOCs)

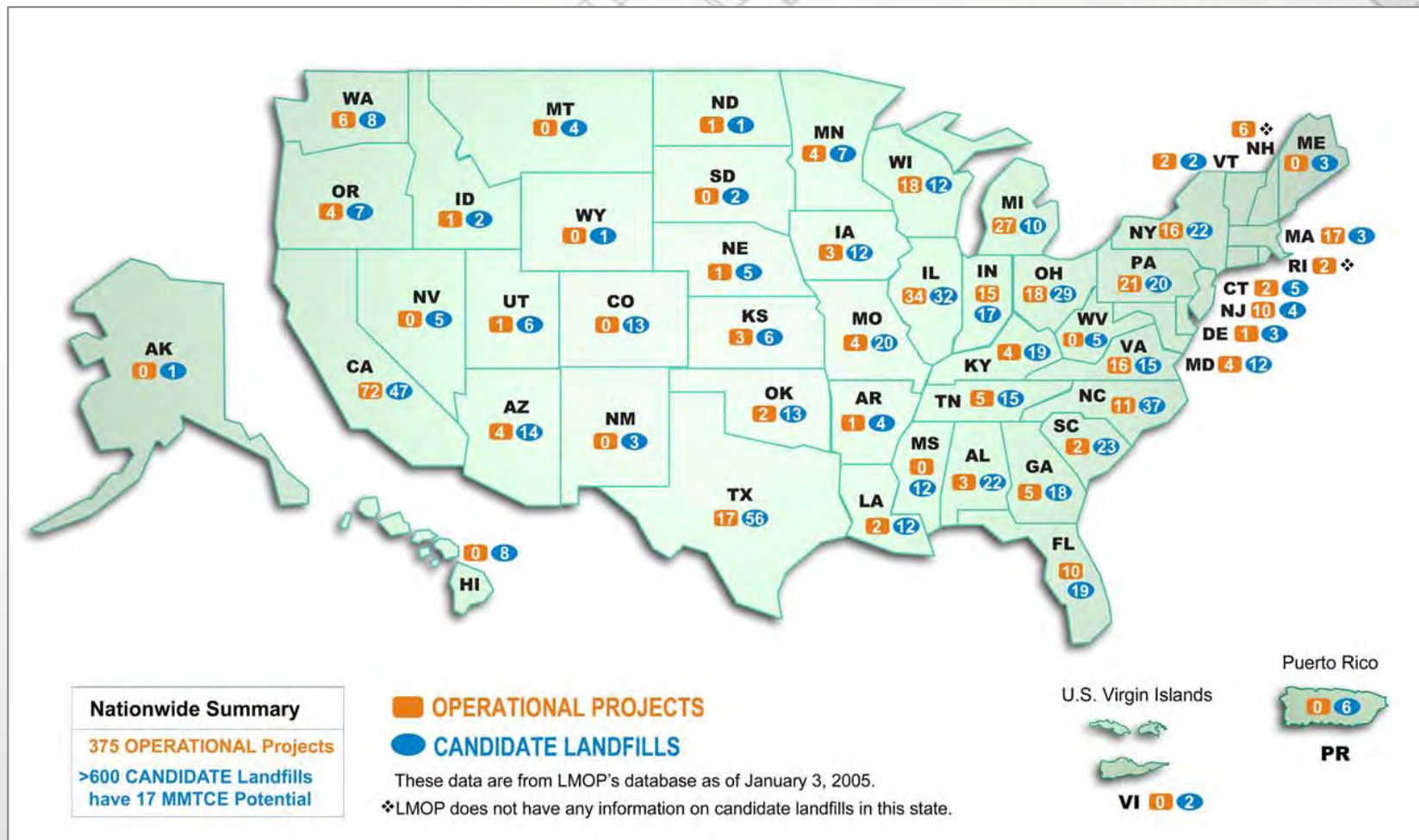
# The Benefits of Biogas Combustion

- **Environment:** clean fuel, reduces GHG emissions and pollution
- **Economic:** opportunity fuel, reduces energy costs
- **Reliability:** on-site fuel, decreases impact of power outages
- **Security:** renewable fuel, increases national energy security

# Biogas and CHP – Proven Technologies

- Landfill gas
  - CHP applications - 89 MW, 24 sites
  - DG-only applications - 9,000 MW, 252 sites
- WWTP CHP
  - Biogas applications - 176 MW, 48 sites
  - Blended fuel applications - 47 MW, 8 sites
  - Gas/oil applications – 55 MW, 11 sites

# Status of LFGE Project Development and Candidate Landfills by State



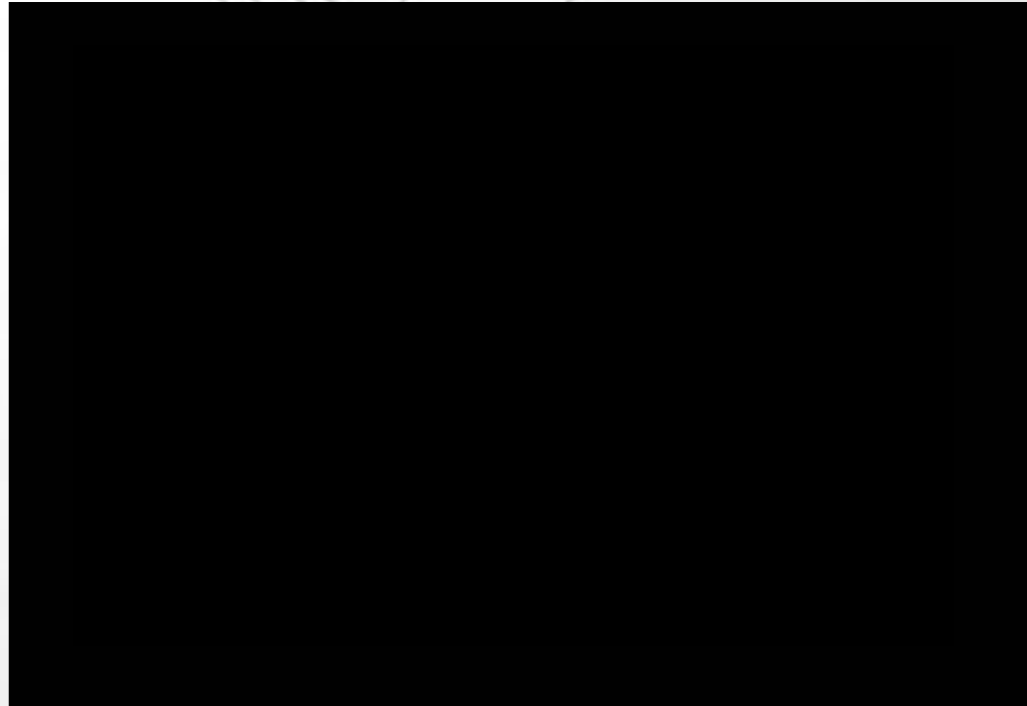
# Landfill Gas, DG and CHP- Winning Options

- LFG is a recognized renewable energy resource
  - Green-e, EPA Green Power Partnership, Sierra Club
- LFG is generated 24/7 and projects have online reliability over 90 percent
- Serves as the “baseload renewable” for many green power programs (RPS, RECs, tax credits)
  - More than 50 green power programs currently have LFG in portfolio

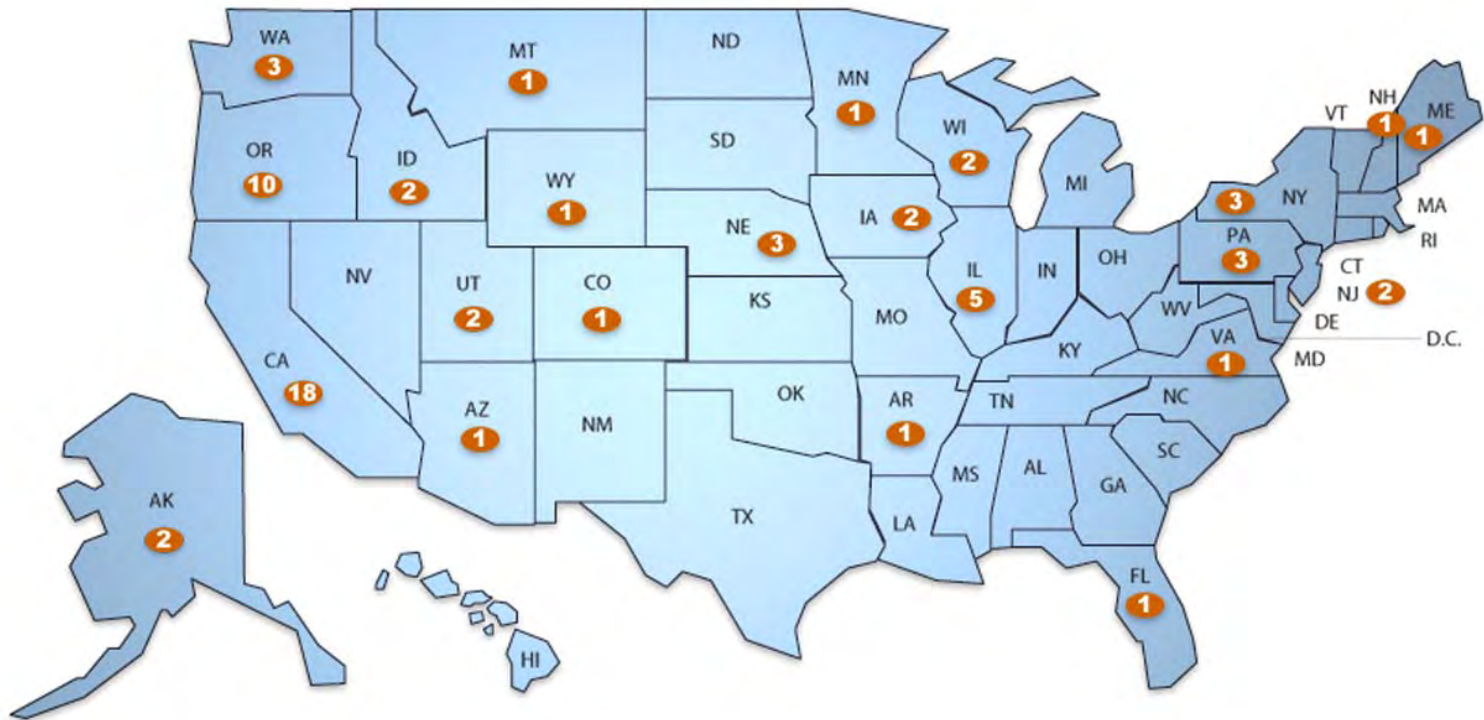
# Landfill Gas, DG and CHP Winning Options (Cont.)

- Levelized cost of 4-6 cents per kWh for new electricity projects
- LFG CHP can act as a long-term price and volatility hedge against fossil fuels
- Co-ops, munis, and utilities are already using LFG

# Video: BMW's LFG Project



# Distribution of WWTP CHP Projects by State



# Benefits of CHP to Wastewater Treatment Plants

- Produces power at a cost below retail electricity
- Displaces purchased fuels for thermal needs
- Qualifies as a renewable fuel for green power programs
- Enhances power reliability for the plant – serves as an additional back-up supply
- Can act as a long-term price and volatility hedge against purchased fuels and electricity

# Pima County Arizona Wastewater Treatment Plant – CHP

- Seven Waukesha engine/generator packages, 2.5 MW<sub>E</sub>, 3.5 MW<sub>T</sub> of 260°F water
- Produces 243 cfm biogas @ 60% CH<sub>4</sub>, 35 percent of energy needs
- Thermal energy: digester heat, HVAC, chilled water, domestic hot water
- Electricity generation: 5 cents/KWh (includes maintenance)
- Rebuild 28-year-old engines, each with 40,000 hours of operation

# Pima County Arizona Wastewater Treatment Plant – CHP

“We are producing our energy at a substantially lower cost than any other method known today in Southern Arizona.”

*Gary Blomstrom, Power Plant Supervisor*

“We’ve had excellent availability, 99.999% uptime...Acting as our own utility, we are far superior in terms of reliability and efficiency over the local utility.”

*Martin Jones, Lead Co-generation  
Power Plant Operator*

# For More Information

Kim Crossman  
Combined Heat and Power  
Partnership  
U.S. EPA  
crossman.kim@epa.gov  
ph.: (202) 343-9388  
fax: (202) 343-2208  
[www.epa.gov/chp](http://www.epa.gov/chp)

Brian Guzzone  
Landfill Methane Outreach  
Program  
U.S. EPA  
guzzone.brian@epa.gov  
ph.: (202) 343-9248  
fax: (202) 343-2202  
[www.epa.gov/lmop](http://www.epa.gov/lmop)