

# *16<sup>th</sup> Annual LMOP Conference & Project Expo*



***LMOP team: Tom Frankiewicz,  
Swarupa Ganguli, Chris Godlove, and  
Victoria Ludwig***

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





# *Conference Highlights*

- **661** pre-registered attendees
- Awards Luncheon

**Thanks!!!**



# *Exhibits and Expo*

*Be sure and visit the 82 Exhibits and 4 Project Expo Landfills!!!*





# *Project Expo Landfills*

## Michigan

- *Delta County Landfill*

## Oklahoma

- *Lawton Landfill*

## Nebraska

- *Douglas County  
Recycling & Disposal  
Facility*

## Texas

- *J.C. Elliott Landfill*



# *Project Snapshot*

*(October 2012)*

- **605 operational projects**
  - **15 billion kWh** of electricity produced and **101 billion cubic feet** of LFG delivered in '12
- **At least 35 projects under construction for '13 and more in the advanced planning stages**
- **At least 445 candidate landfills with 840 MW of potential capacity or 155 billion cubic feet/yr of LFG for direct use – either way, ~10 MMTCE in potential emission reductions!**



# *Estimated 2012 Environmental and Energy Benefits*

- **Environmental:**

- Carbon sequestered annually by **22,000,000 acres of pine or fir forests**, or
- CO<sub>2</sub> emissions from **241,000,000 barrels of oil consumed**, or
- Annual greenhouse gas emissions from **20,000,000 passenger vehicles**, or
- CO<sub>2</sub> emissions from burning **565,000 railcars' worth of coal**

- **Energy:**

- Powering **1,097,000 homes** and heating **724,000 homes**



# ***LMOP Partner Update***

- **Currently 1,062 Partners**
  - 737 Industry Partners
  - 114 Energy Partners
  - 39 State Partners
  - 135 Community Partners
  - 37 Endorsers
- **54 new Partners joined in 2012**
  - 37 Industry Partners
  - 2 Energy Partners
  - 0 State Partners
  - 13 Community Partners
  - 2 Endorsers



# *Market Overview*

- 300% increase in LFG energy project counts from 1995 to 2012
- Electricity projects continue to dominate
  - 37 states, DC & 4 territories have an RPS or RPG
  - Production tax credit extension – now if construction begins prior to January 1, 2014
- Direct use of LFG has slowed since 2011, mainly due to LOW natural gas prices
  - \$3.90/MMBtu in Oct. 2012 down from \$13.06/MMBtu in July 2008
- Alternative Vehicle Fuel taking off
  - CNG: \$2.12/GGE v. diesel \$4.13/gal in mid-2012
- Carbon markets not active for LFG



# ***LMOP 2012 Accomplishments***

- Made data updates for ~1,000 landfills in LMOP database based on GHGRP CY2010 data
- Streamlined on website:
  - Contact forms
  - Award application process
  - Funding guide
- Supported 6 LFG energy project ribbon-cutting events
- Sent 20+ listservs about RFPs/RFQs, funding announcements, etc.
- Webinar about *LFGcost-Web* attended by 50 LMOP Partners

# LMOP's LFGcost Model

## Required User Inputs:

Type of Input Required	Input Data
Year landfill opened	1960
Year of landfill closure	2025
Area of LFG wellfield to supply project (acres) [assumes 1 well/acre]	100
Method for entering waste acceptance data [CHOOSE ONLY ONE METHOD]:	Average annual waste acceptance rate (tons/yr) Waste acceptance rate calculator (in WASTE worksheet) Annual waste disposal history (in WASTE worksheet)
LFG energy project type: (D)irect use, (B)oiler retrofit, (T)urbine, (E)ngine, (H)igh Btu, microtu(R)bine, small en(G)ine, lea(C)hate evaporator, CHP engine (CE), CHP turbine (CT), or CHP microturbine (CM)?	E
Will LFG energy project cost include collection and flaring costs? (Y)es or (N)o	Y
For leachate evaporator projects only: Amount of leachate collected (gal/yr)	
For boiler retrofits only: Will boiler retrofit costs be combined with direct-use project costs? (Y)es or (N)o	
For boiler retrofits only: Distance between end user's property boundary and boiler (miles)	
For direct-use, high Btu, and CHP projects only: Distance between landfill and end use, pipeline, or CHP unit (miles)	
For CHP projects only: Distance between CHP unit and hot water/steam user (miles)	
Year LFG energy project begins operation	2013

## Outputs:

Type of Output	Output Data
<b>Economic Analysis:</b>	
Average project size for projects NOT generating electricity: (million ft <sup>3</sup> /yr) [based on actual LFG use]	0.000
Average project size for projects generating electricity (kWh/yr)	0.000
Average project size for CHP projects producing hot water/steam (million Btu/yr)	36,213,827
Total installed capital cost for year of construction (\$)	0
Annual costs for initial year of operation (\$)	\$10,609,037
Internal rate of return (%)	\$1,255,822
Net present value at year of construction (\$)	-1%
Net present value payback* (years after operation begins)	(\$3,160,472)
	None
<b>Environmental Benefits:</b>	
Total lifetime amount of methane collected and destroyed (million ft <sup>3</sup> )	7.355
Average annual amount of methane collected and destroyed (million ft <sup>3</sup> /yr)	490
GHG value of total lifetime amount of methane utilized in energy project (MMTCCO <sub>2</sub> E)	2.62E+00
GHG value of average annual amount of methane utilized in energy project (MMTCCO <sub>2</sub> E/yr)	1.74E-01
Total lifetime carbon dioxide from avoided energy generation: (MMTCCO <sub>2</sub> E)	3.25E-01
(MMTCE)	8.87E-02
Average annual carbon dioxide from avoided energy generation: (MMTCCO <sub>2</sub> E/yr)	2.17E-02
(MMTCE/yr)	5.91E-03

## Optional User Inputs (User inputs are currently set to suggested default data):

Type of Optional Input	Suggested Default Data	User Input Data
LFG energy project size: Gas rate = (M)inimum, (A)verage, ma(X)imum, or (D)efined by user (must enter design flow rate below)? For user-defined project size only: Design flow rate (ft <sup>3</sup> /min)	M	M
Methane generation rate constant, k (1/yr) [0.04 for typical climates, 0.02 for arid climates, 0.1 for bioreactors or wet landfills]	---	
Potential methane generation capacity of waste, L <sub>c</sub> (ft <sup>3</sup> /ton)	0.04	0.04
Methane content of landfill gas (%)	3,204	3,204
Average depth of landfill waste (ft)	50%	50%
Landfill gas collection efficiency (%)	50	50
Utilization of CHP hot water/steam potential (%)	85%	85%
Expected LFG energy project lifetime (years)	100%	100%
Operating schedule: (does not apply to leachate evaporators)	15	15
Hours per day	24	24
Days per week	7	7
Weeks per year	52	52
Will cost of metering station that serves as custody transfer point be borne by end user?	Y	Y
Loan lifetime (years)	10	10
Interest rate (%)	8.0%	8.0%
General inflation rate (% - applied to O&M costs)	2.5%	2.5%
Equipment inflation rate (%)	1.0%	1.0%
Marginal tax rate (%)	35.0%	35.0%
Discount rate (%)	10.0%	10.0%
Down payment (%)	20.0%	20.0%
Energy tax credits:		
Landfill gas utilization or high Btu production (\$/million Btu)	\$0.000	\$0.000
Electricity generation (\$/kWh)	\$0.000	\$0.000
Global warming potential of methane	21.00	21.00
Greenhouse gas reduction credit (\$/MTCCO <sub>2</sub> E)	\$0.000	\$0.000
Are direct methane reductions included in GHG credit?	Y	Y
Renewable electricity credit (\$/kWh)	\$0.000	\$0.000
Avoided leachate disposal (\$/gal) **	\$0.000	\$0.000
Construction grant (\$)	\$0	\$0
Royalty payment for landfill gas utilization (\$/million Btu)	\$0.000	\$0.000
Cost uncertainty factor (entered as % adjustment)	0.0%	0.0%
Initial year product price: **		
Landfill gas production (\$/million Btu)	\$5.00	\$5.00
Electricity generation (\$/kWh)	\$0.0600	\$0.0600
CHP hot water/steam production (\$/million Btu)	\$7.50	\$7.50
High Btu production (\$/million Btu)	\$6.500	\$6.500
Annual product price escalation rate (%)	2.0%	2.0%
Electricity purchase price for projects NOT generating electricity (\$/kWh) **	\$0.075	\$0.075
Annual electricity purchase price escalation rate (%)	2.0%	2.0%

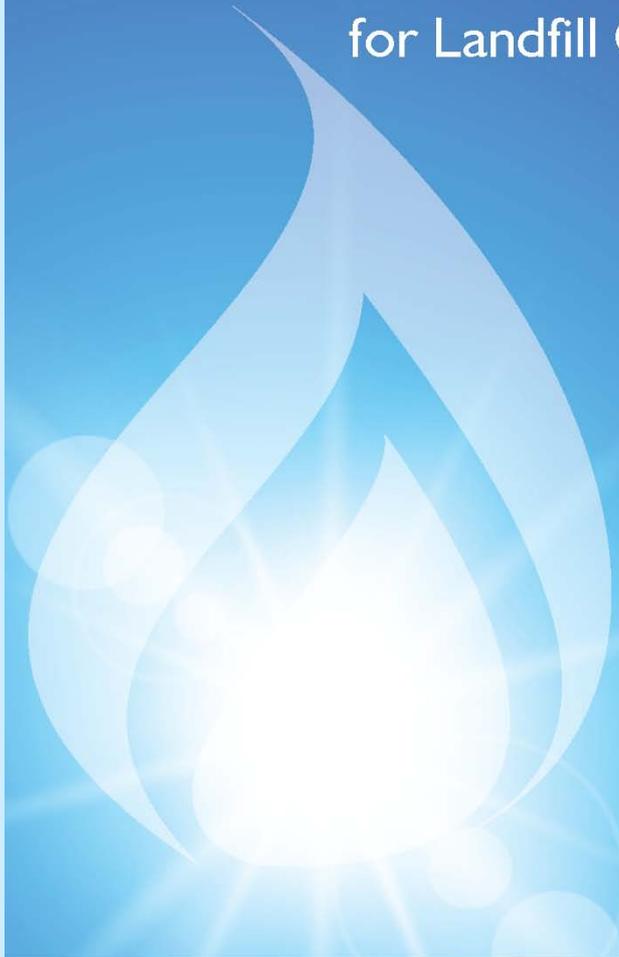


# ***Global Methane Initiative '12 Landfill Accomplishments***

- **New engine projects online in Ukraine & Argentina**
- **Prepared 3 landfill reports (assessment studies, pre-feasibility studies, and desktop evaluations); 2 study tours**
- **Site visits to 34 landfills in 10 countries**
- **16 workshops – training 1,200+ people**
- **5 Landfill Inventories from Grant Work**
- **Released International Best Practices Guide (IBPG) for LFG Energy – featured in papers/presentations at ISWA Annual Congress and Global Waste Management Symposium**
- **Developed 2 guidebooks for RFP development in Mexico & Colombia**
- **Launch of Climate & Clean Air Coalition (CCAC)**



# International Best Practices Guide for Landfill Gas Energy Projects



# Thank You Supporters!

## LMOP Capitol Club



## LMOP Platinum



## LMOP Events



## LMOP Gold



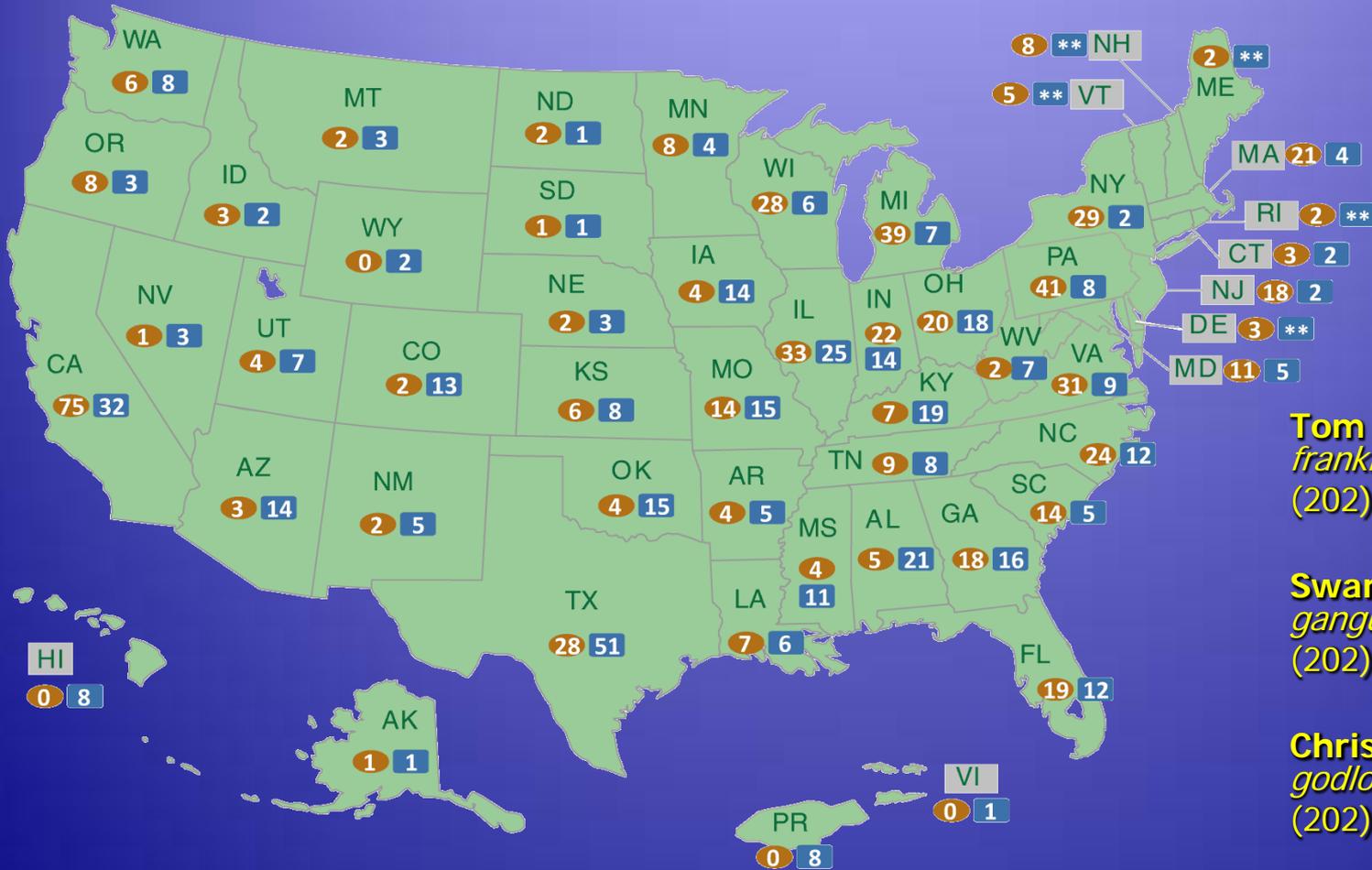
## LMOP Friend



AXDSIC

AXD-Leader in Blower Gas Skids

# Your LMOP...



**Tom Frankiewicz**  
*frankiewicz.thomas@epa.gov*  
 (202) 343-9232

**Swarupa Ganguli**  
*ganguli.swarupa@epa.gov*  
 (202) 343-9732

**Chris Godlove**  
*godlove.chris@epa.gov*  
 (202) 343-9795

**Victoria Ludwig**  
*ludwig.victoria@epa.gov*  
 (202) 343-9291

These data are from LMOP's database as of October 2012.

- OPERATIONAL PROJECTS
- CANDIDATE LANDFILLS\*

[www.epa.gov/lmop](http://www.epa.gov/lmop)