

17th Annual LMOP Conference & Project Expo



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





Conference Highlights

- **715** pre-registered attendees
- Awards Luncheon
- Two Networking Events

Thanks!!!



Exhibits and Expo

*Be sure and visit the 105 Exhibits
and 3 Project Expo Landfills!!!*





Project Expo Landfills

Arkansas

– *Union County Landfill*

Oklahoma

– *City of Lawton Landfill*

Missouri

– *Eagle Ridge Landfill*



Project Snapshot

(January 2014)

636 projects
in
48 states

provided in 2013

104
billion

cf LFG delivered

16.5

billion
kWh
produced

AND

100 MMTCO₂e
direct CH₄
reductions

- ~25 projects under construction for '14/'15 and many more in the advanced planning stages

~ **450**
candidate
landfills

could annually supply

150
billion

cf LFG for direct use

6.7

billion kWh
produced

AND

33 MMTCO₂e
potential
direct CH₄
reductions
per year

OR



Estimated 2013 Environmental and Energy Benefits from Projects

- **Environmental:**

- Carbon sequestered annually by more than **91,000,000 acres of U.S. forests**, or
- CO₂ emissions from more than **259,000,000 barrels of oil consumed**, or
- CO₂ emissions from burning more than **479,000 railcars' worth of coal**

- **Energy:**

- Powering more than **1.2 million homes** and heating more than **760,000 homes**



LMOP Partner Update

- **Currently 1,097 Partners**
 - 768 Industry Partners
 - 116 Energy Partners
 - 39 State Partners
 - 136 Community Partners
 - 38 Endorsers
- **45 new Partners joined in 2013**
 - 41 Industry Partners
 - 2 Energy Partners
 - 0 State Partners
 - 1 Community Partner
 - 1 Endorser



Trends and Factors

- **Economic downturn; low carbon prices & RECs; end of ARRA funds; tax credit extensions?**
- **New direct use of LFG has slowed since 2011**
 - **Mainly due to low NG prices: \$4.39/1000 cf in Oct. 2013 down from \$13.06/1000 cf in July 2008**
- **Alternative Vehicle Fuel taking off**
 - **Renewable Fuel Standard/RINs**
 - **CNG: \$2.09/GGE v. diesel \$3.91/gal in mid-2013**
- **Electricity projects continue to dominate**
 - **37 states, DC & 4 territories have an RPS or RPG BUT abundant, low-priced NG may affect requirements**
- **Promotion of organics diversion in some cities**



LMOP '13 Accomplishments

- Supported 4 LFG energy project ribbon-cutting events and visited 8 landfills
- Co-hosted and presented at LFG Energy Workshop in Texas; Presented at SWANA LFG Symposium and WASTECON
- Conducted LFG electricity webinar
- Integrated technical inquiry and response functionality with internal data tracking system
- Updated renewable energy tax credit info on website
- Sent 20+ listservs about RFPs/RFQs, funding announcements, etc.

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
Economic Analysis:	
Average project size for projects NOT generating electricity: (million ft ³ /yr) [based on actual LFG use] (ft ³ /min)	0.000 0.000
Average project size for projects generating electricity (kWh/yr)	36,213,827
Average project size for CHP projects producing hot water/steam (million Btu/yr)	0
Total installed capital cost for year of construction (\$)	\$10,609,037
Annual costs for initial year of operation (\$)	\$1,255,822
Internal rate of return (%)	-1%
Net present value at year of construction (\$)	(\$3,160,472)
Net present value payback* (years after operation begins)	None
Environmental Benefits:	
Total lifetime amount of methane collected and destroyed (million ft ³)	7,355
Average annual amount of methane collected and destroyed (million ft ³ /yr)	490
GHG value of total lifetime amount of methane utilized in energy project (MMTCCO ₂ E)	2.62E+00
GHG value of average annual amount of methane utilized in energy project (MMTCCO ₂ E/yr)	1.74E-01
Total lifetime carbon dioxide from avoided energy generation: (MMTCCO ₂ E)	3.25E-01
(MMTCE)	8.87E-02
Average annual carbon dioxide from avoided energy generation: (MMTCCO ₂ 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 ³ /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]	0.04	0.04
Potential methane generation capacity of waste, L _c (ft ³ /ton)	3,204	3,204
Methane content of landfill gas (%)	50%	50%
Average depth of landfill waste (ft)	50	50
Landfill gas collection efficiency (%)	85%	85%
Utilization of CHP hot water/steam potential (%)	100%	100%
Expected LFG energy project lifetime (years)	15	15
Operating schedule:	Hours per day Days per week Weeks per year	24 7 52
(does not apply to leachate evaporators)		
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) Electricity generation (\$/kWh) Global warming potential of methane Greenhouse gas reduction credit (\$/MTCCO ₂ E)	\$0.000 \$0.000 21.00 \$0.000
Direct credits:	Are direct methane reductions included in GHG credit? Renewable electricity credit (\$/kWh) Avoided leachate disposal (\$/gal) ** Construction grant (\$)	Y \$0.000 \$0.000 \$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) Electricity generation (\$/kWh) CHP hot water/steam production (\$/million Btu) High Btu production (\$/million Btu)	\$5.00 \$0.0600 \$7.50 \$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%



LMOP 2013 International MSW Accomplishments

- **Launched CCAC MSW Initiative with key lead partners**
 - Initiated partnerships in 3 CCAC cities
 - Conducted outreach to 2 additional cities
 - Convened 1st MSW CCAC Steering group meeting
- **Awarded 8 MSW grants**
 - Brazil, Chile, Ghana, Nigeria, Poland, Turkey, Ethiopia, Serbia
- **Resource Packet for Industrial Use of LFG**
- **Site visits to 20 landfills in 7 countries**
- **12 workshops – training more than 900 people**
- **Helped organize the GMI Methane Expo 2013**
- **Advanced MSW work in China, Brazil, Mexico, Indonesia, and Turkey**

Thank You, Supporters!

LMOP Capitol Club



LMOP Events



LMOP Platinum



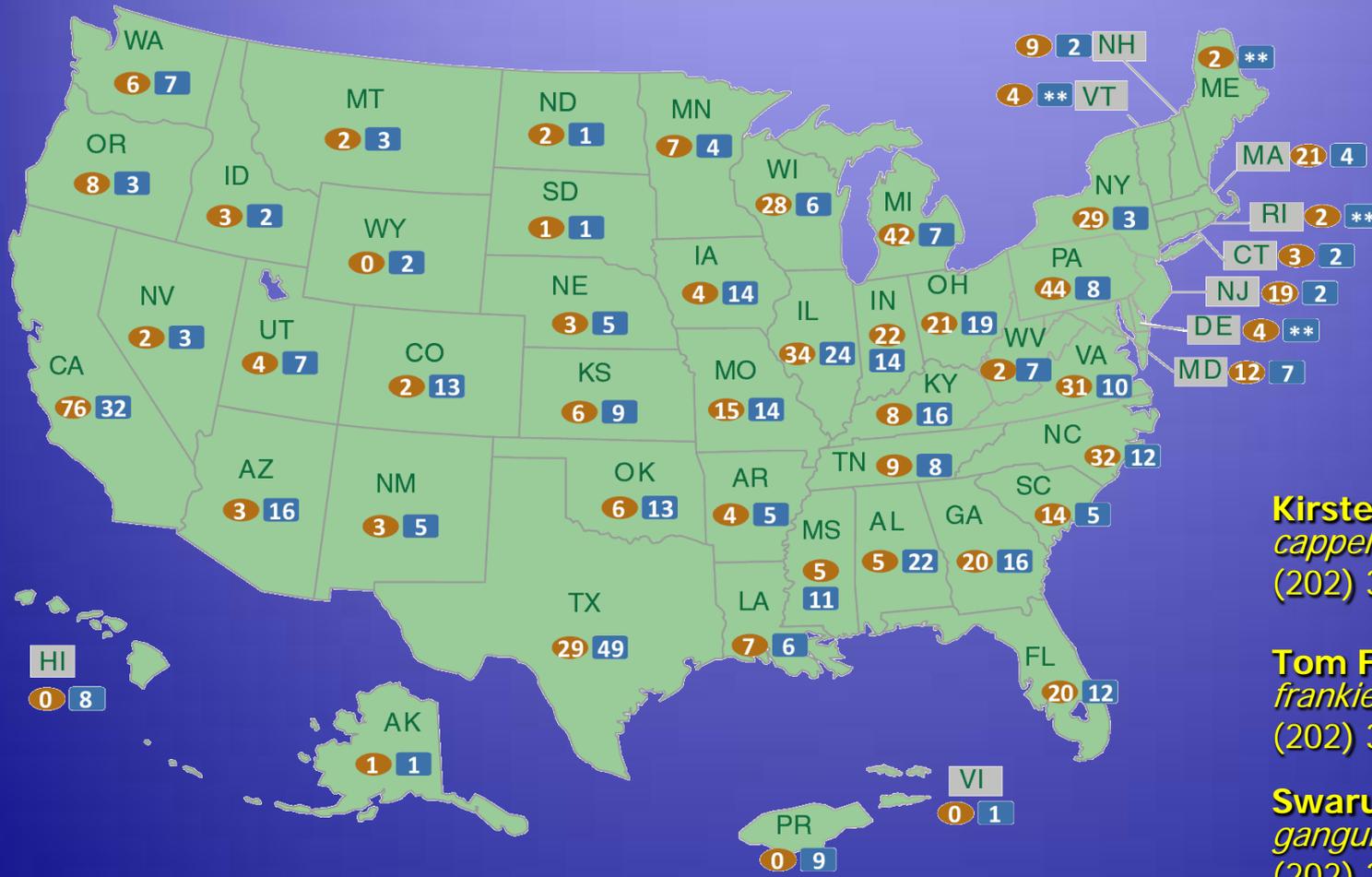
LMOP Gold



LMOP Friend



Your LMOP...



These data are from LMOP's database as of January 2014.

www.epa.gov/lmop

-  OPERATIONAL PROJECTS
-  CANDIDATE LANDFILLS

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