

# LMOP National Landfill Gas Energy Special Session – Welcome Presentation

LMOP Team:

Lauren Aepli, Kirsten Cappel,  
Tom Frankiewicz

U.S. Environmental Protection Agency  
Landfill Methane Outreach Program



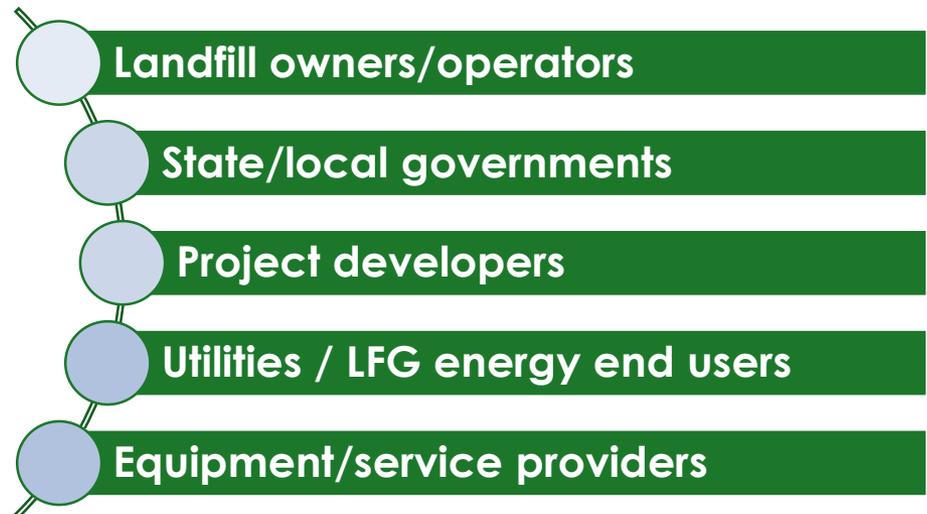
National Landfill Gas Energy Special Session  
Reno, Nevada • March 29, 2017

# Welcome and Agenda

Five speakers to provide information on:

- LMOP activities
- Updated data on U.S. generation and disposal of waste
- Trends in LFG energy project development
- Opportunities for voluntary carbon offset credits

- Attendees today include:



# LMOP Special Session Speakers

- **Kirsten Cappel**, *U.S. EPA, LMOP*
- **Evan Williams**, *Cambrian Energy*
- **Tim Flanagan**, *Monterey Regional Waste Management District*
- **Rori Cowan**, *American Carbon Registry*
- **Swarupa Ganguli**, *U.S. EPA*



# About LMOP

- Established in December 1994 (22 years!)
- Voluntary program that creates partnerships among states, energy users/providers, the landfill gas (LFG) industry and communities

***Mission: To work cooperatively with industry stakeholders and waste officials to reduce or avoid methane emissions from landfills by encouraging the recovery and beneficial use of biogas generated from organic municipal solid waste.***

# New Partners Who Joined LMOP in 2016

## LMOP INDUSTRY PARTNERS

- 360 Power Generation Consulting
- Better Carbon Solutions
- BMMGVC Magistrate Law Group Brokerage
- CalTech Global
- Clarke Energy
- CONSOR Intellectual Asset Management
- Coulomb & Joule Group
- Eagle Power

- Energ3
- Green Fuels Corp.
- Keystone Engineering
- Madei Taas Gas Power Generation
- Martin Energy Group Services
- Verdant Environmental Solutions
- XLS Energy

## LMOP COMMUNITY PARTNERS

- Soldiers to Sawyers

# 1,100 LMOP Partners

- Industry Partners: **766**
- Community Partners: **145**
- Energy Partners: **111**
- Endorser Partners: **39**
- State Partners: **39**

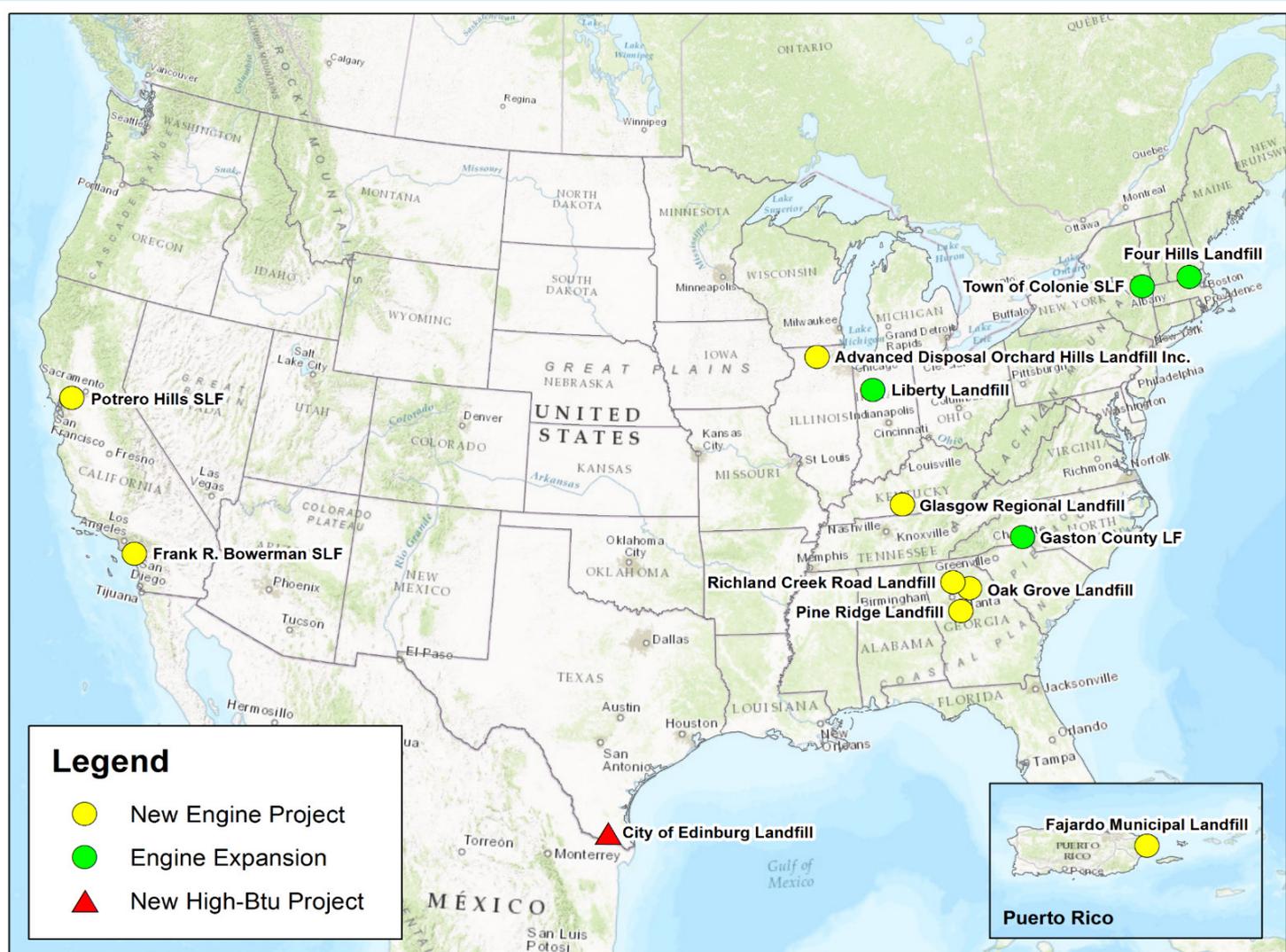
## • Benefits of LMOP Partnership:

- Recognition of Partner's commitment to and understanding of renewable energy benefits
- Identification on LMOP website – description, contact information
- Use of LMOP logo on Partner website (within guidelines)
- LMOP support for groundbreaking or ribbon cuttings
- Listserv messages from LMOP on LFG-related topics

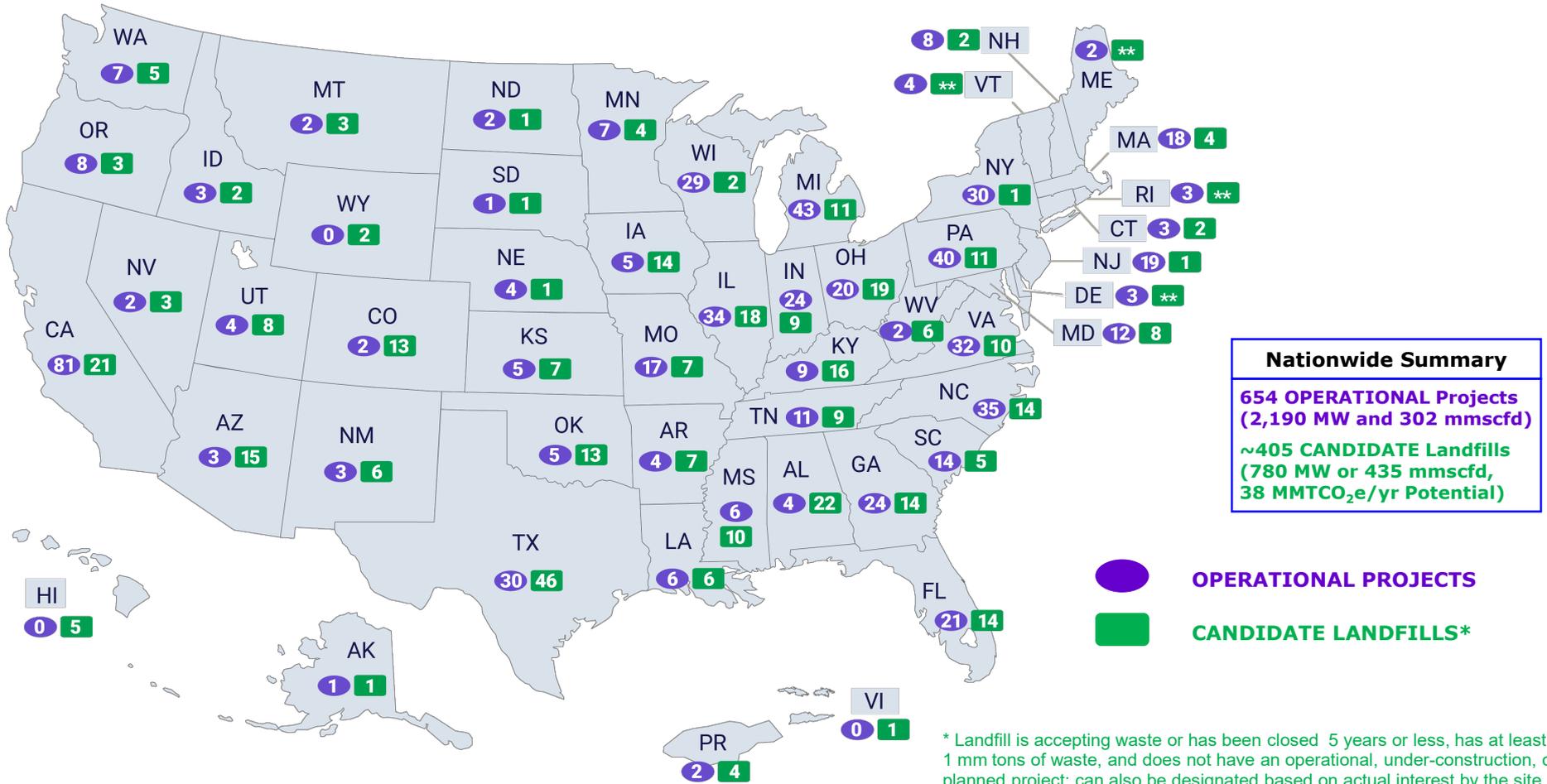
# Trends in the U.S. Solid Waste Industry

- States and municipalities are increasingly moving towards diversion of organic waste from landfills
  - ~26 states have laws that address landfilling organic waste
- Federal and local initiatives emerging to address/minimize food waste
- Growing and sustained interest in LFG to vehicle fuel
- LFG energy project development has slowed in recent years
  - 9 new projects and 4 expansions in 2016
  - Economic factors continue to challenge project financial feasibility

# New 2016 LFG Energy Projects/Expansions



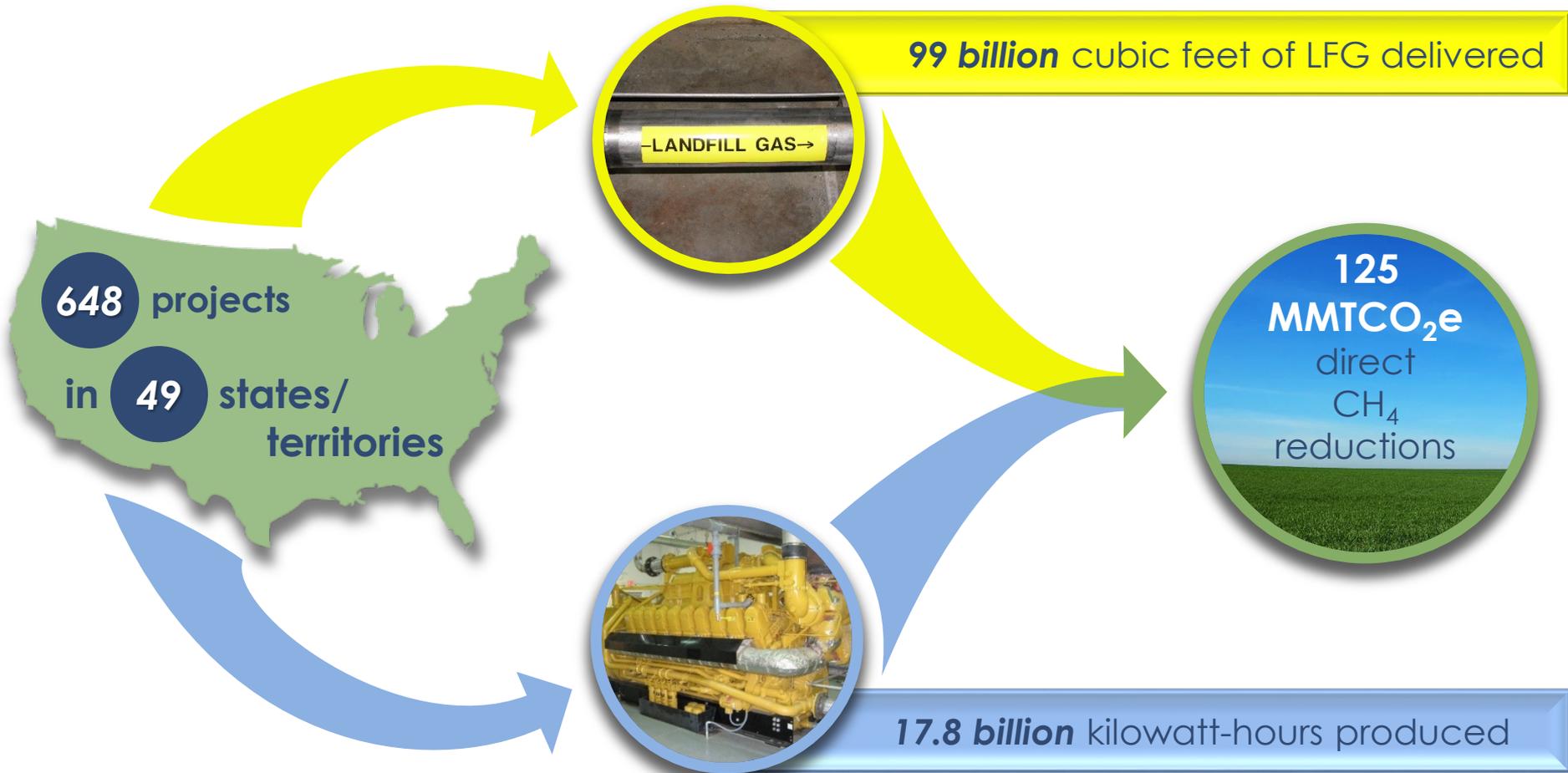
# LFG Energy Project Development in the U.S.



These data are from LMOP's database as of March 2017.



# Project Snapshot for 2016



# LFG Energy Co-Benefits

Create local, renewable and consistent energy

Reduce local air pollution

Lead to health benefits

Generate revenue and jobs

in the community

and beyond

# LMOP Accomplishments in 2016

## Landfill Methane Outreach Program

CUMULATIVE

**22 years**  
(1995-2016)

~ **648** LFG  
energy  
projects  
assisted

~ **425 million** metric tons of  
carbon dioxide equivalents  
reduced or avoided

Environmental benefit of the  
carbon sequestered by  
about **401 million** acres of  
U.S. forests in one year



2016

**9 new** LFG  
energy  
projects  
assisted

**4** LFG energy  
**project**  
**expansions**  
assisted

**1.0 million** metric tons of  
carbon dioxide equivalents  
reduced or avoided

Environmental  
benefit of the  
carbon  
sequestered by  
more than **943,000**  
acres of U.S.  
forests in one year



# LMOP Website – Updated

## Landfill Methane Outreach Program (LMOP)

Share Contact Us

### LFG energy projects reduce methane emissions

- 654 projects operating in 2016
- Pulling LFG from ~600 landfills
- Reducing 125 MMTCO<sub>2</sub>e of methane this year



1 2 3 4

### LMOP Accomplishments>>



LMOP is a voluntary program that works cooperatively with industry stakeholders and waste officials to reduce or avoid methane emissions from landfills. LMOP encourages the recovery and beneficial use of biogas generated from organic municipal solid waste. [Learn more about LMOP.](#)

### Learn



- [Landfill Gas \(LFG\)](#)
- [Benefits of LFG Energy](#)
- [Frequent Questions](#)

### Engage



- [Join the Program](#)
- [LMOP Listserv](#)
- [Connect with LMOP Partners](#)

### Access Data



- [LFG Energy Project Data](#)
- [Landfill Technical Data](#)
- [Data by State](#)

### Research and Analyze



- [Project Development Handbook \(PDH\)](#)
- [LFGcost-Web](#)
- [Regulations Affecting Landfills or LFG](#)



### Publications, Tools and Resources

Access an [array of resources](#) related to methane or waste.

### International Activities

Learn about [LMOP's international](#) methane reduction efforts.

### Webinars and Events

View current and past LMOP [webinars, workshops and conferences](#).



# LMOP Website – Updated (cont.)

Available at [epa.gov/lmop](http://epa.gov/lmop)

## Archive of LMOP Listserv Messages

Access messages about a variety of topics

### Opportunity for LFG to Pipeline Gas Project in Wisconsin



The U.S. EPA Landfill Methane Outreach Program (LMOP) is pleased to provide its Partners and other interested stakeholders information about a **request for proposals (RFP)** from Dane County, Wisconsin.

**Deadline for Written Inquiries: February 3, 2017**  
**Proposals Due: February 14, 2017**

Dane County is requesting proposals for fabrication, delivery, installation and start-up of a **biogas cleaning system to convert landfill gas (LFG) into high-Btu biomethane** at the Dane County Landfill Site #2, located at 7102 U.S. Highway 12, Madison, Wisconsin. Only firms with capabilities, experience and expertise with similar projects should submit proposals. Performance and Payment bond are required for this project.

Dane County will be the **owner/operator** of the biogas cleaning system and retain rights to all the biomethane. The biogas cleaning system will be designed to have a flexible operating range, with a **minimum flow of 500 scfm and maximum of 1,750 scfm LFG**, and must be easily expanded in the future, up to 2,600 scfm LFG. The primary function of the biogas cleaning equipment will be to **achieve the pipeline quality standards set by ANR Pipeline Company**.

Dane County has a power purchase agreement expiring in 2019 for LFG electricity produced at Site #2. The County plans for the new pipeline injection project to replace the electricity project at the beginning of 2019.

Site #2 is currently collecting ~1,200 to 1,400 scfm LFG with an average methane content of ~50-55%. Waste is still being accepted at the site, and total LFG production is estimated to peak at 2,600 scfm around 2030. The LFG has been sampled and analyzed and results are available within the RFP. Additional gas testing will not be performed prior to the proposal deadline.

Average annual biogas quality readings from the last three years are also included in the RFP. Proposing firms must notify Dane County in writing by **February 3, 2017** if they desire to have additional historical data on the landfill's LFG.

Proposals must be submitted by mail, and must be received by **2:00 PM (local time) on Tuesday, February 14, 2017**. Electronic submittals will not be accepted.

## Frequent Questions about Landfill Gas

LMOP provides responses to some common questions that can help increase your understanding of the program, landfill gas (LFG) and LFG energy projects. The questions and answers are organized into three categories below. For information from EPA on broader topics, see [Methane](#) or [Climate Change](#).

LMOP

Landfill Gas

LFG Energy Projects

### LFG Energy Projects

Can landfill gas be used for energy?	+
What are the economic benefits of using landfill gas as a resource?	+
What are the environmental benefits of using landfill gas as an energy resource?	+
Who uses recovered landfill gas?	+
Are landfill owner/operators required to develop and implement LFG energy projects?	+

## Selection of Frequent Questions

Review answers to common questions



# LFGcost-Web – Updated

Available at [epa.gov/lmop](http://epa.gov/lmop)

## LFGcost-Web, Version 3.1

*Evaluate the initial economic feasibility of an LFG energy project*

### Released November 2016

*Updated based on a 2015 peer review as well as other revisions*

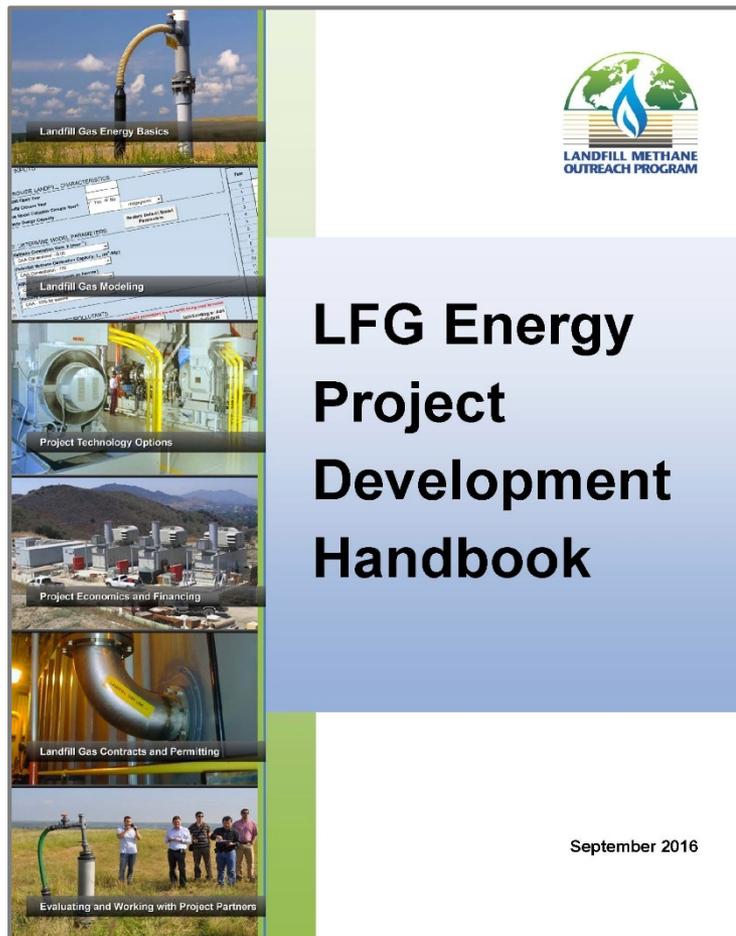
- Updated approach for calculating electricity revenue and avoided CO<sub>2</sub> grid factors based on regional electricity grids
- Added ability to enter user-defined project sizes without entering landfill waste data



**LFGcost-Web is available online to all stakeholders and transparent, allowing users to edit optional inputs**

# Key LMOP Resources

Available at [epa.gov/lmop](http://epa.gov/lmop)



## Project Development Handbook

*Improve understanding to develop successful projects*

- Provides project-specific considerations
- Helps stakeholders who are new to LFG energy projects
- Highlights useful online resources and successful LFG energy projects

# Key LMOP Resources (cont.)

Available at [epa.gov/lmop](http://epa.gov/lmop)

## Landfill and LFG Energy Project Data

Download details about projects and landfills

**Includes data for over 2,400 landfills in the U.S.**

- Excel files cut the LMOP data in various ways to help you find what you are looking for
- Cross-references EPA's greenhouse gas reporting program (GHGRP)

	A	B	C	D	E	F	G	H	I	J	K
	GHGRP ID	Landfill ID	Landfill Name	State	Physical Address	City	County	Zip Code	Latitude	Longitude	Ownership Type
2	1007341	1994	Anchorage Regional Landfill	AK	15500 E. Eagle River Loop Road	Eagle River	Anchorage	99577	61.293281	-149.60214	Public
3	1007341	1994	Anchorage Regional Landfill	AK	15500 E. Eagle River Loop Road	Eagle River	Anchorage	99577	61.293281	-149.60214	Public
4	1010389	11941	Capitol Disposal Landfill	AK	5600 Tonsgard Court	Juneau	Juneau	99801	58.3528	-134.4947	Private
5		10980	Central Landfill - MatSu Borough	AK	1201 N. 49th State Street Just off the Palmer-Wasilla Highway	Palmer	Matanuska-Susitna	99645	61.59	-149.21	Public
6	1005349	12216	Central Peninsula Landfill (CPL)	AK	46915 Sterling Highway	Soldotna	Kenai Peninsula	99669	60.44714	-151.10369	Public
7		10960	Kodiak Island Borough Landfill	AK	1203 Monashka Bay Road	Kodiak	Kodiak Island	99615	57.80874	-152.40761	Public
8	1004380	11020	Merrill Field Landfill	AK	800 Merrill Field Drive	Anchorage	Anchorage	99501	61.21266	-149.84012	Public
9	1006806	10961	South Cushman Landfill	AK	455 Sanduri Street	Fairbanks	Fairbanks North Star	99701	64.80476	-147.70085	Public
10		11000	Unalaska Landfill	AK	1181 Summer Bay Road	Unalaska	Aleutians West	99685	53.88463	-166.50657	Public
11		27	MSWLF	AL	Athens/Limestone County SLF Strain Road off Highway 31	Athens	Limestone	35611	34.7634	-86.9399	Public
12		16	Bishop Landfill Company	AL	379 Pleasant Grove Cutoff Road	Albertville	Marshall	35950	34.27823	-86.33707	Private
13	1004245	2005	Black Warrior Solid Waste Facility	AL	3301 Landfill Drive						
14		2006	Blount County/Nectar/Hayden LF & TS	AL	2390 Armstrong Loop						
15	1004415	2408	Brundidge Landfill	AL	515 Cleanwater Drive						



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Facility Level  
Information on  
GreenHouse gases  
Tool  
Refresh View

# Example Informational Materials

Available at [epa.gov/lmop](http://epa.gov/lmop)



## U.S. EPA Landfill Methane Outreach Program and Landfill Gas Energy

Creating partnerships and renewable energy across the country

January 2017

### What is LFG?

Much of the waste we generate ends up in municipal solid waste (MSW) landfills. Landfill gas (LFG) is a natural byproduct of the decomposition of organic material within landfills, and contains about 50 percent methane (CH<sub>4</sub>) and 50 percent carbon dioxide (CO<sub>2</sub>). MSW landfills are the third-largest source of human-related methane emissions in the United States, accounting for approximately 18.2 percent of these emissions in 2014.<sup>1</sup> Methane is a potent greenhouse gas (GHG) 28 to 36 times more effective than CO<sub>2</sub> at trapping heat in the atmosphere over a 100-year period.<sup>2</sup> Learn more about landfill methane at [epa.gov/lmop/basic-information-about-landfill-gas](http://epa.gov/lmop/basic-information-about-landfill-gas).

### What is LFG Energy?

Many cost-effective options exist to capture and destroy LFG by converting it into energy, thereby reducing methane emissions. LFG can fuel internal combustion engines, turbines, microturbines, or other technologies to produce electricity. LFG is also used directly as an alternative to fossil fuels in equipment such as boilers, heaters and kilns, or is refined for use in vehicles or injection into natural gas pipelines. See examples of LFG energy projects at [epa.gov/lmop/landfill-gas-energy-project-data-and-landfill-technical-data](http://epa.gov/lmop/landfill-gas-energy-project-data-and-landfill-technical-data).

### What is LMOP?

LMOP is a voluntary program that works cooperatively with industry stakeholders and waste officials to reduce or avoid methane emissions from landfills. LMOP encourages the recovery and beneficial use of biogas generated from organic MSW as it contains methane, a potent GHG and the primary component of natural gas. LMOP forms partnerships with communities, landfill owners and operators, utilities, energy users, states, project developers, tribes and nonprofit organizations to overcome barriers to project development. LMOP Partners are listed at

[epa.gov/lmop/about-partners-landfill-methane-outreach-program](http://epa.gov/lmop/about-partners-landfill-methane-outreach-program).

### What are the Benefits of LFG Energy?

Communities with an LFG energy project enjoy a variety of benefits, including:

- Job creation, revenues and cost savings.
- Improved local air quality and reduced GHG emissions.
- Reliable local fuel source and less fossil fuel usage.
- Enhanced image as an innovative community.

Read more about the benefits of LFG energy at [epa.gov/lmop/benefits-landfill-gas-energy-projects](http://epa.gov/lmop/benefits-landfill-gas-energy-projects).

For more information about LMOP, program resources and LFG energy, see [epa.gov/lmop](http://epa.gov/lmop).

### LMOP Assistance and Resources

#### Project Development Process.

LMOP offers several assistance options, including:

- LFG Energy Project Development Handbook
- Landfill and LFG Energy Project Database
- LFGcost-Web (cost model)
- Feasibility assessments
- Environmental benefits calculator
- Posters and flyers for ribbon cuttings (for Partners)

#### Financing LFG Energy Projects.

Securing funding can be a barrier to LFG energy project development. LMOP directs stakeholders to resources with information about pertinent funding mechanisms through its Resources for Funding LFG Energy Projects webpage at [epa.gov/lmop/resources-funding-landfill-gas-energy-projects](http://epa.gov/lmop/resources-funding-landfill-gas-energy-projects).

#### Networking and Information.

LMOP's partnerships create a vital network of landfills, states, communities and companies. LMOP provides information through:

- Partner listings
- Listserv email messages
- Webinars and workshops

### LFG Energy Is Truly Green

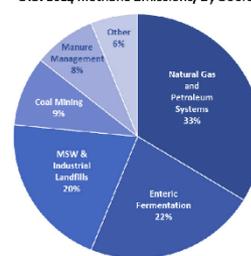
In 2014, methane accounted for about 10.6 percent of all U.S. greenhouse gases emissions from human activities.

LFG energy projects mitigate global climate change by preventing methane from escaping into the atmosphere. Instead, LFG is captured and used as a reliable, renewable energy resource.

#### Properties of Methane

Chemical Formula	CH <sub>4</sub>
Lifetime in Atmosphere	12 years
Global Warming Potential (100-year)	25

#### U.S. 2014, Methane Emissions, By Source



[epa.gov/climatechange/ghgemissions/usinventoryreport.html](http://epa.gov/climatechange/ghgemissions/usinventoryreport.html)

### LFG and Green Pricing Programs

Green pricing programs offer premium rates for power provided from renewable energy resources. Many states require utilities to offer green pricing to customers, and utilities are increasingly offering green pricing options even without a legal requirement. At least 30 green pricing programs include LFG.<sup>1</sup> States may also adopt renewable portfolio standards (RPS) that specify the minimum amount of customer load to be supplied from eligible renewable energy sources. At least 37 states accept LFG energy in their RPS and renewable energy resource procurement goals.<sup>2</sup>

LFG is a good fit for green power programs for several reasons:

- LFG is recognized by energy certification programs as a renewable energy resource.<sup>3</sup>
- LFG can serve as a "baseline renewable", providing online availability exceeding 90 percent.
- Most states have landfills that can support LFG energy projects.
- Energy produced from LFG is one of the more cost-competitive forms of renewable energy.
- Several financial incentives exist, e.g., federal tax credits and state grants.

### LFG End User Success Stories

LFG energy projects provide significant cost savings and long-term, sustainable energy to end users. Examples include:

- **Coca-Cola's Atlanta Syrup Branch** facility gets nearly all of its energy in the form of electricity, steam and chilled water from green power generated at a nearby landfill, providing Coca-Cola with real energy savings. The project generates 48 million kilowatt-hours of green power per year.
- The **U.S. Navy** has saved approximately \$1.3 million annually in utility costs at the Marine Corps Logistics Base in Albany, Georgia, since its first LFG cogeneration plant started up in 2011. This facility is made up of one dual-fuel engine generator, a heat recovery steam generator and two dual-fuel boilers.
- In 2012, **Gundersen Health System's** Onalaska Campus became the first energy-independent medical campus in the country by using LFG piped from the local landfill in La Crosse County, Wisconsin to power a generator. The electricity is sold to a local utility while the recovered waste heat supplies 100 percent of campus heat energy needs. Gundersen saves \$300,000 annually in space heating and hot water costs.
- The **U.S. Department of Justice** obtains 80 percent of the electricity used by Federal Bureau of Prisons' Allenwood Correctional Complex from the combustion of LFG at the nearby landfill in Lycoming County, Pennsylvania.

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<sup>1</sup> U.S. DOE, Energy Efficiency & Renewable Energy. The Green Power Network. <https://eere.energy.gov/greenpower/markets/pricing.shtml?page=0>

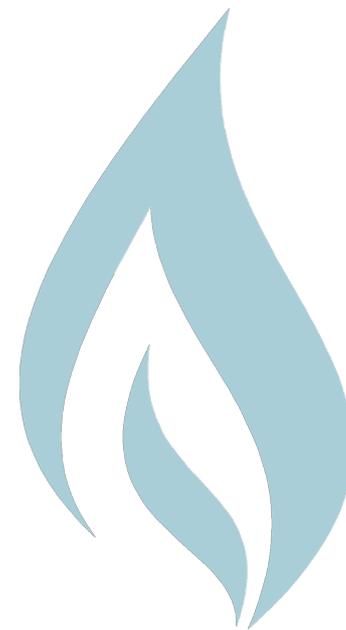
<sup>2</sup> Database of State Incentives for Renewables & Efficiency (DSIRE). [www.dsireusa.org](http://www.dsireusa.org)

<sup>3</sup> Green-e certification program for green power products ([www.green-e.org](http://www.green-e.org)) and U.S. EPA Green Power Partnership ([www.epa.gov/greenpower/](http://www.epa.gov/greenpower/))



# Moving Forward: Activities in 2017

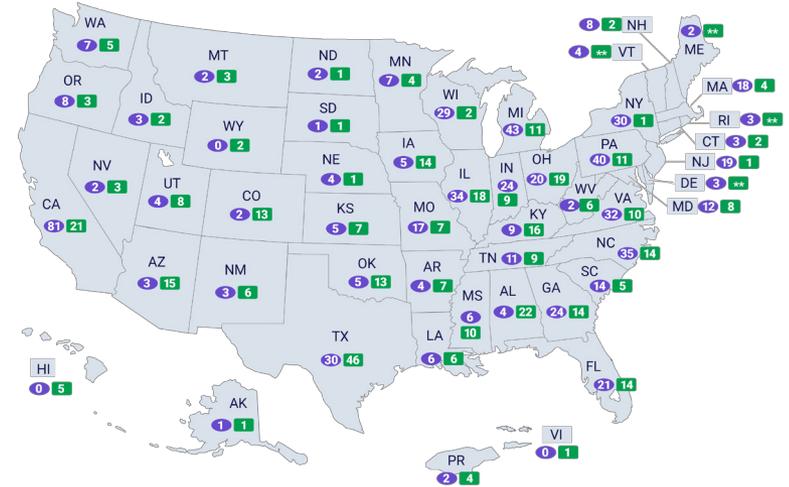
- Provide new technical materials
- Release new version of *LFGcost-Web*
  - Job creation estimates
- Host webinars on topics of interest to stakeholders
- Explore new way for Partners to submit project data



# Upcoming Landfill/LFG Energy Data Collection

## We need your help to keep LMOP's Database current

- When you receive a request to update your LFG energy project/landfill data\*, please respond
- By responding to the request, you are helping to keep our comprehensive, nationwide database up-to-date and accurate – beneficial to all LMOP Partners and the LFG industry!



**The LMOP Database is the only one in the country that contains comprehensive information on U.S. LFG energy projects**

\*OMB Control No. 2060-0446  
Approval expires 3/31/19

# How Can We Work Together?

- Facilitating information sharing – LMOP Database, webinars, listserv
- Providing technical information about LFG energy project development and opportunities to reduce emissions from MSW landfills more broadly
- Analyzing resource availability through LFG modeling
- Performing initial feasibility analysis using *LFGcost-Web*



**We welcome your feedback on our resources,  
website, etc.**

# LMOP Contact Information

## **Kirsten Cappel**

U.S. EPA

Landfill Methane Outreach  
Program

[cappel.kirsten@epa.gov](mailto:cappel.kirsten@epa.gov)

## **Lauren Aepli**

U.S. EPA

Landfill Methane Outreach  
Program

[aepli.lauren@epa.gov](mailto:aepli.lauren@epa.gov)

