

# LMOP National Landfill Gas Energy Special Session – Welcome Presentation

**Kirsten Cappel & Lauren Aepli**

**U.S. Environmental Protection Agency  
Landfill Methane Outreach Program**



SWANA's 41<sup>st</sup> Annual Landfill Gas & Biogas Symposium  
Denver, CO • March 6, 2018

# Welcome and Agenda

## Six speakers to provide information on:

- LMOP activities
- Trends in solid waste management and LFG energy
- RNG project development
- RNG delivery options
- Biogas vehicle fuel incentives
- Automotive engine-powered generators



## Attendees today include:

- **Landfill owners/operators**
- **State/local governments**
- **Project developers**
- **Utilities / LFG energy end users**
- **Equipment/service providers**

# 2018 LMOP Special Session Speakers



**Kirsten Cappel**  
*U.S. EPA, LMOP*



**Lauren Aepli**  
*U.S. EPA, LMOP*



**William Brinker**  
*Enerdyne Power Systems, Inc.*



**Mark Torresani**  
*Cornerstone  
Environmental Group, LLC*



**David McCullough**  
*Eversheds  
Sutherland*



**Stan Steury**  
*Appalachian State  
University Energy Center*

# LMOP & LFG Energy Industry Trends

Kirsten Cappel

# Introduction

## U.S. EPA's Landfill Methane Outreach Program (LMOP):

- Established in 1994
- Voluntary program that creates partnerships among landfill owners and operators, states, municipalities, energy users and providers, and the LFG industry and communities

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

# LMOP Partners (February 2018)

**More than  
1,100 Partners**

Industry Partners	<b>773</b>
Community Partners	<b>145</b>
Energy Partners	<b>110</b>
Endorsers	<b>39</b>
State Partners	<b>39</b>

## Benefits of LMOP Partnership:

- Recognition for commitment to renewable energy
- Recognition on LMOP website
- Use of LMOP logo on Partner website (within guidelines)
- LMOP support for groundbreaking or ribbon cuttings
- Information about new developments, events, and other LFG related information

To join the Partnership, visit our website at:  
[epa.gov/lmop/join-landfill-methane-outreach-program](http://epa.gov/lmop/join-landfill-methane-outreach-program)

# New Partners Who Joined LMOP in 2017 & 2018

## LMOP INDUSTRY PARTNERS

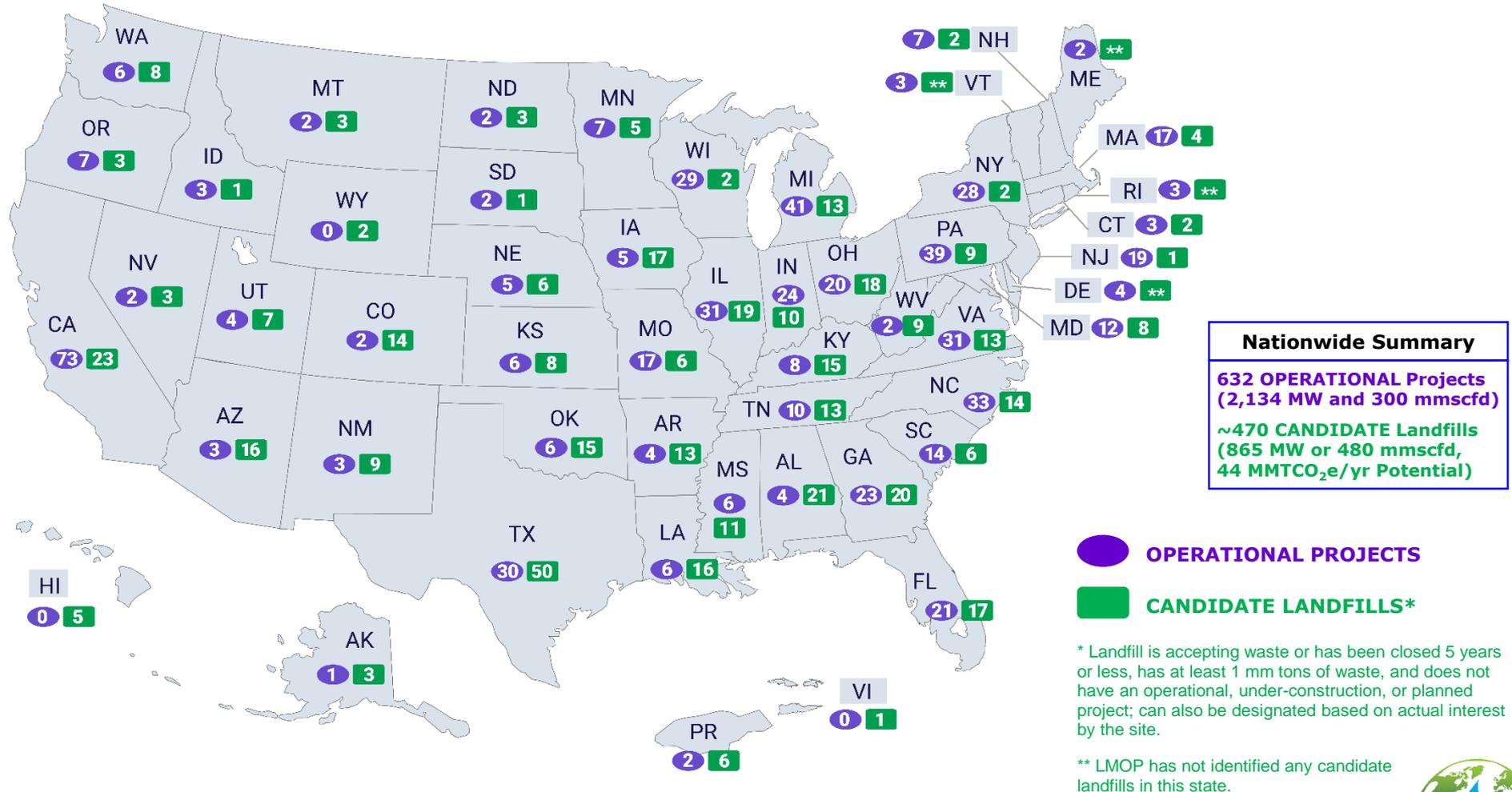
Americo Manufacturing  
Company, Inc.  
CCC Group, Inc.  
Covenant Investments 22 LLC  
DMT Clear Gas Solutions LLC  
ENCON Evaporators  
GENERON IGS  
GHGSat Inc.

Hengye Inc.  
Industrial-Irrigation Services  
Process Combustion  
Corporation (PCC)  
Renovatio Energy Corp  
Specialized Biogas Services  
Third Evolution, Inc.  
Willexa Energy, LLC

## LMOP ENERGY PARTNER

Mueller Industries, LLC

# LFG Energy Projects (as of February 2018)



**OPERATIONAL PROJECTS**

**CANDIDATE LANDFILLS\***

\* Landfill is accepting waste or has been closed 5 years or less, has at least 1 mm tons of waste, and does not have an operational, under-construction, or planned project; can also be designated based on actual interest by the site.

\*\* LMOP has not identified any candidate landfills in this state.



# U.S. LFG Energy Project Types

**469**

Electricity

**117**

Direct-use

**40**

High Btu

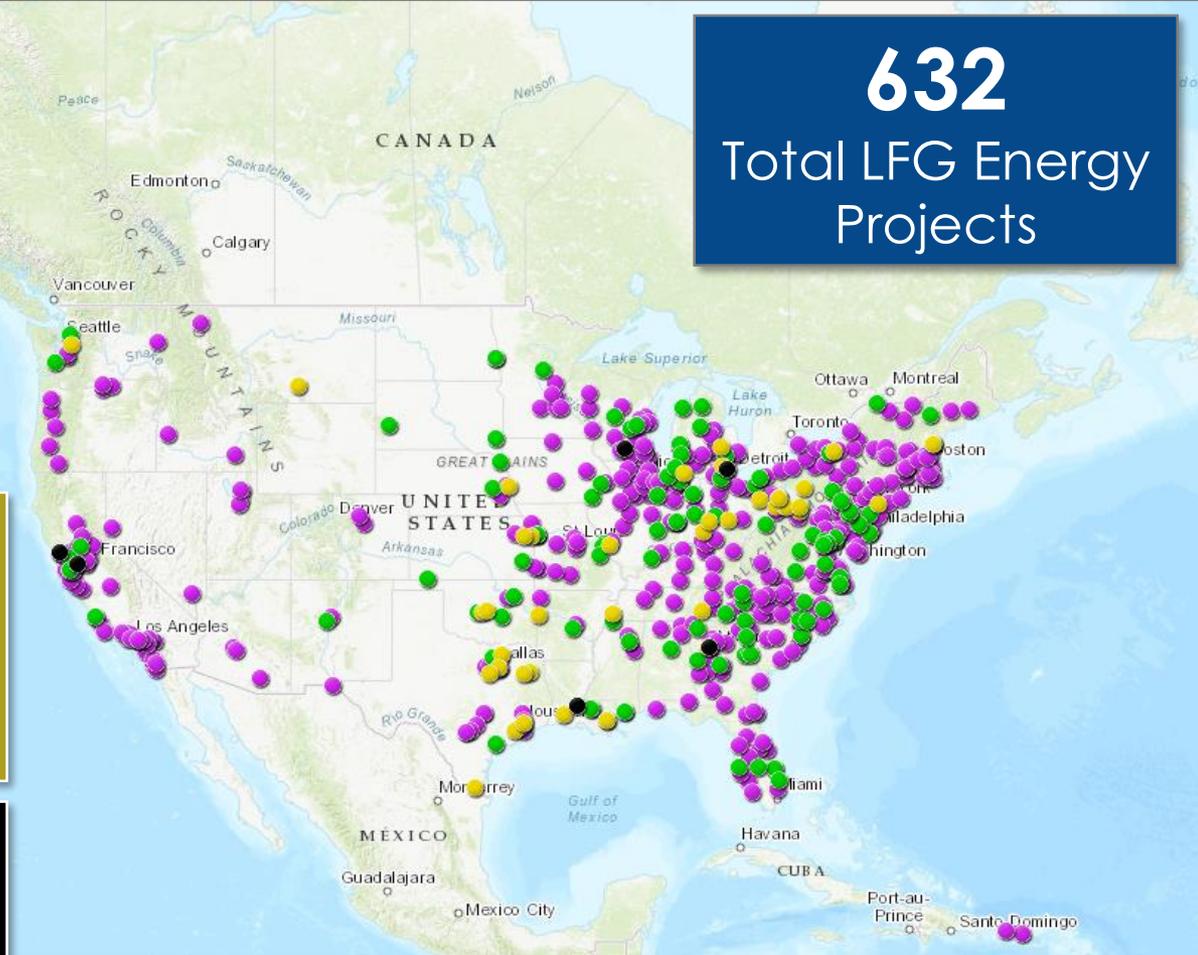
*(Includes pipeline injection-to-vehicle fuel)*

**6**

Vehicle Fuel

*(Onsite or local use only)*

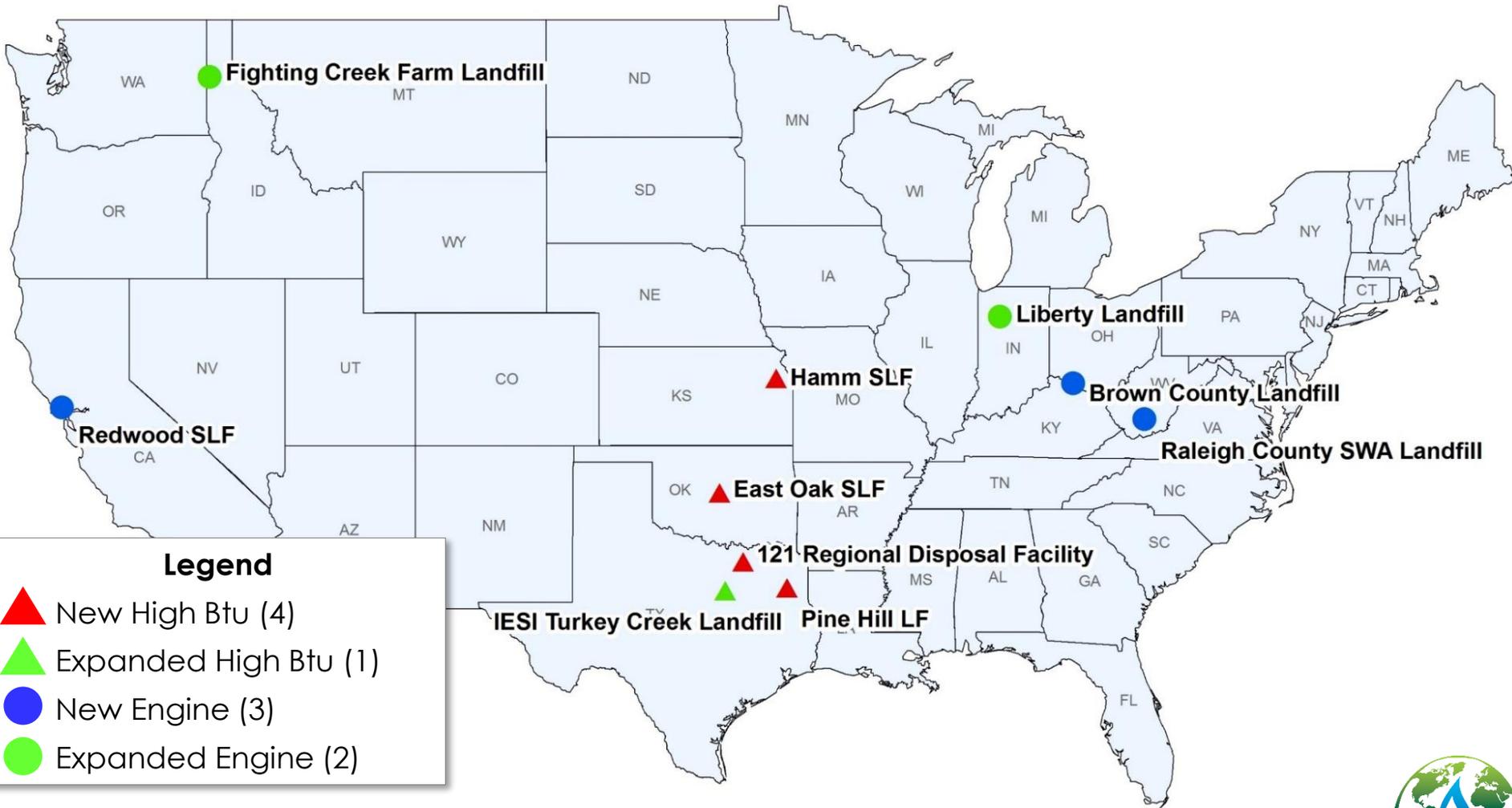
**632**  
Total LFG Energy  
Projects



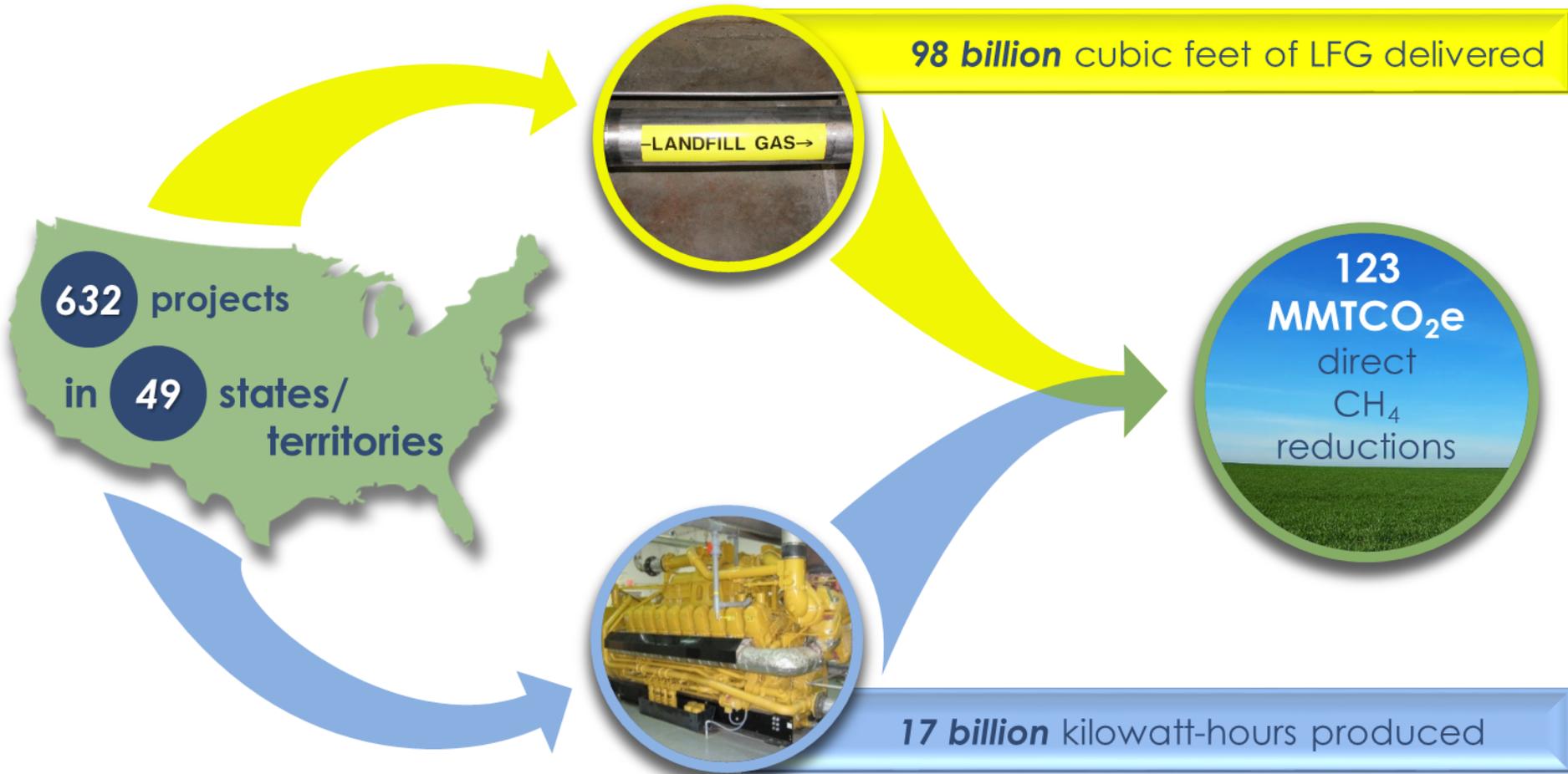
\*LFG energy project count from LMOP's Landfill and Landfill Gas Energy Database as of February 2018



# 2017 LFG Energy Projects & Expansions



# LFG Energy Project Snapshot



\*Estimated values are based on LFG energy projects operating as of February 2018. LMOP Database, Feb. 2018.



# Trends in the U.S. Solid Waste Industry

1

Landfill Gas  
Energy Project  
Development



2

Biogas  
to Vehicle  
Fuel



3

Organic  
Waste  
Management



# 1. Trends: LFG Energy Project Development

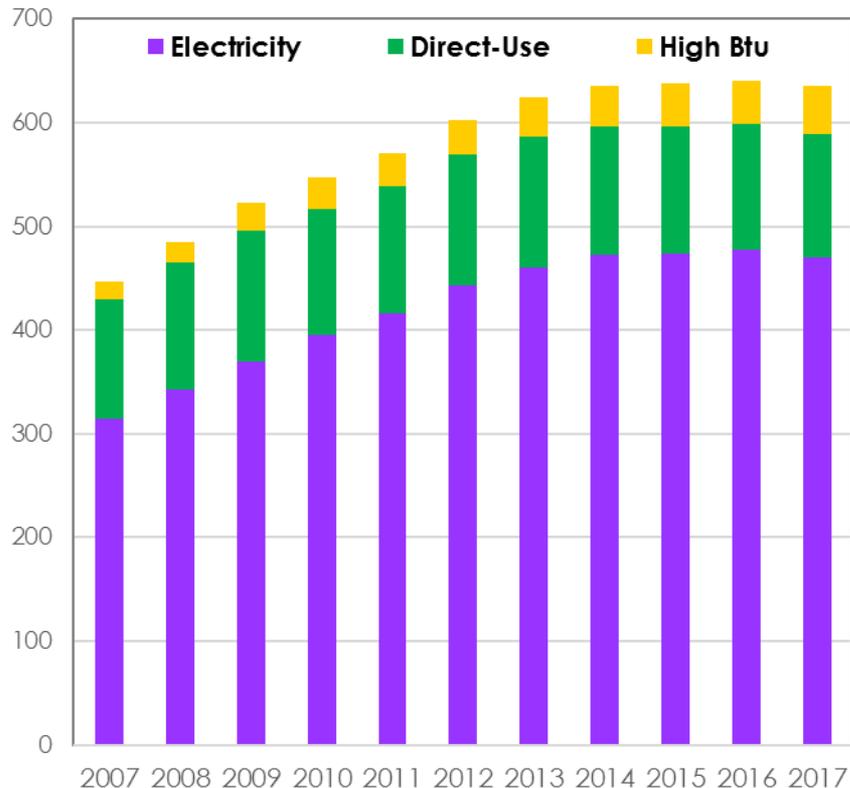
LFG energy projects have changed over the last decade

Rate of new projects coming online has slowed in the last several years; however:

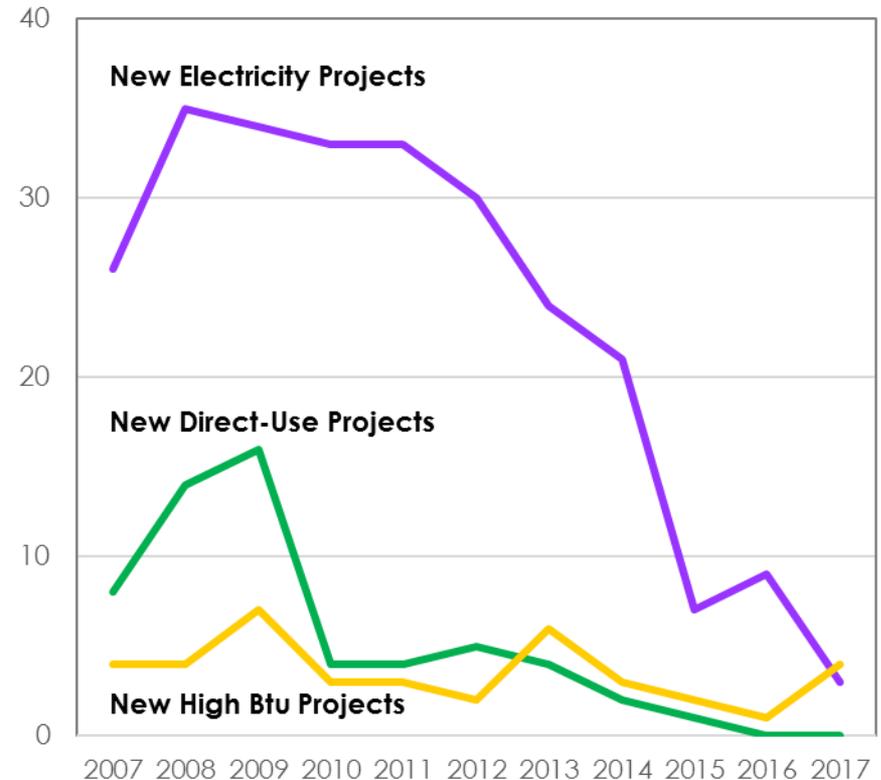
	2007	2017
Total MW Output from Electricity projects	1,325 MW	2,138 MW
<b>160% increase</b>		
Total Gas Flow to High Btu LFG projects (to pipeline and vehicles)	55,042 scfm	127,763 scfm
<b>230% increase</b>		

# LFG Energy Project Growth: 2007-2017

## Total Operating Projects (2007-2017)



## New Projects Brought Online (2007-2017)



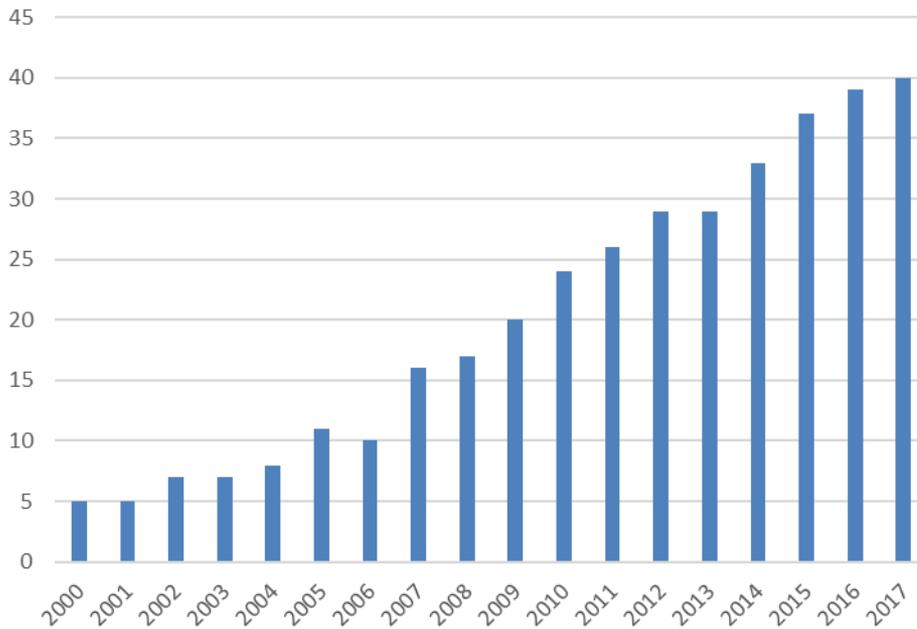
# Factors Affecting New LFG Projects

- Economics:
  - Low natural gas prices / low electricity rates
  - Expiration of the renewable electricity production tax credit (Section 45 of the U.S. tax code)
- Interconnection logistics and gas quality requirements
- Permitting challenges
- Uncertainty about future LFG generation rates (e.g., organic waste diversion)

# 2. Trends: Biogas to Vehicle Fuel

## Growing and sustained interest in LFG to vehicle fuel

Operating Vehicle Fuel Projects 2000-2017



### Currently:

- 6 operating projects create LFG-to-vehicle fuel for onsite use
  - 7 more planned
- 34 operating High Btu pipeline projects provide cleaned gas for vehicle fuel at the other end of the pipeline

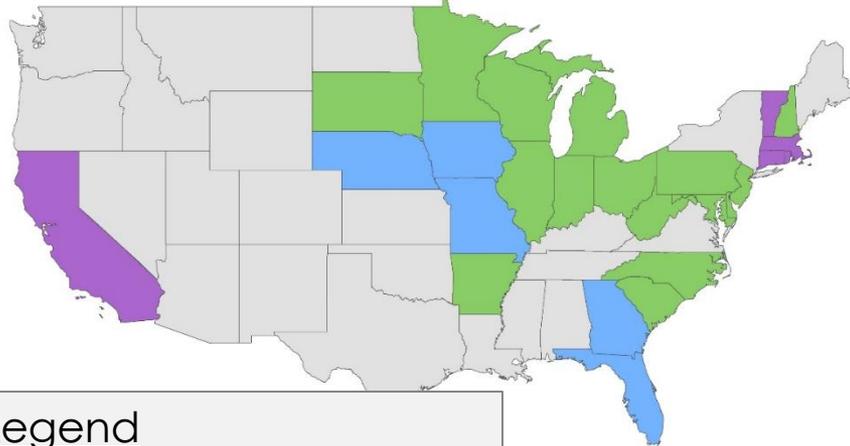
# Incentives & Drivers for LFG to Vehicle Fuel Projects

- Renewable fuel credits – Federal and State
  - EPA Renewable Fuel Standard and California Low Carbon Fuel Standard
- Corporate and municipal sustainability goals as well as county mandates can include CNG fleet conversions
  - Examples: UPS, Ryder, City of San Diego (CA), Atlanta (GA)
- Local air quality benefits of RNG
  - Reduces criteria pollutant emissions
- Long-term fuel cost savings (compared to diesel/gasoline)
- Technology efficiencies and advancements
- Local natural gas distribution companies seeking low-carbon feedstocks in 20+ states with economy-wide GHG reduction targets

# 3. Trends: Organic Waste Management

States and municipalities are increasingly interested in diversion of organic waste from landfills

State Policies Addressing Landfilling of Organic Waste



## Legend

- Yard Waste Ban (16)**
- Yard Waste Ban with LFGE exception (5)**
- Food waste ban\* (5)**

- While, many yard waste bans went into effect in late 1980s/early 1990, more recent focus on diverting food waste
  - ~26 states have laws that address landfilling organic waste
  - ~ 200 communities offer source separated organic waste collection programs

\*In most cases, statewide food waste bans apply to large food waste generators; not residential food waste.

# Landfill & LFG Energy Impacts from Organic Waste Diversion

Extent of impact varies depending on a number of factors, but includes:

Reduction in LFG generation rates and associated energy potential

Extension of landfill life by saving valuable space

Reduction in the amount of leachate generated

***Knowledge of organic waste management trends is important to better understand how the trends may affect landfill operations and existing/future LFG energy project development***

# LMOP Tools and Resources

Lauren Aepli

# LMOP Tools and Resources

## Data

- LFGE Projects
- Candidate Landfills
- Excel files and GIS map

## Tools

- *LFGcost-Web*
- LFGE Benefits Calculator
- Conversion Cool

## Technical Publications

- *Project Development Handbook*
- Fact Sheets

## Network

- Webinars
- 1,100+ Partners
- Listserv messages

# Updated Tools and Resources in 2017

- Benefits Calculator

- Added capability to estimate avoided emissions for electricity generating projects based on their regional location

- *LFGcost-Web V3.2*

- Added ability to estimate job creation and economic benefits for two project types
- Updated reference sources

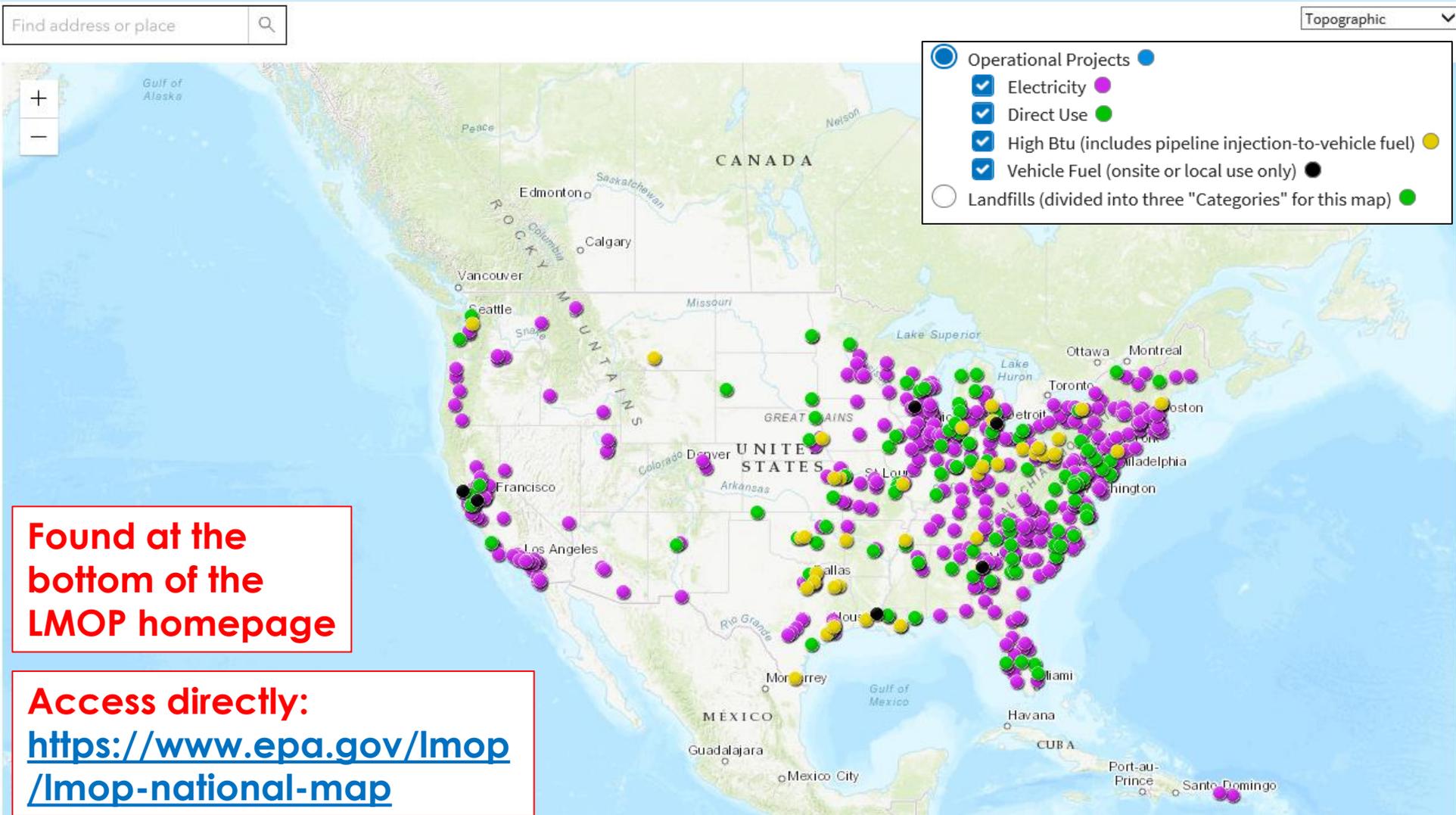
- GIS map of LFGE projects and landfills

- New interactive map on LMOP's homepage
- Shows projects and landfill data geographically

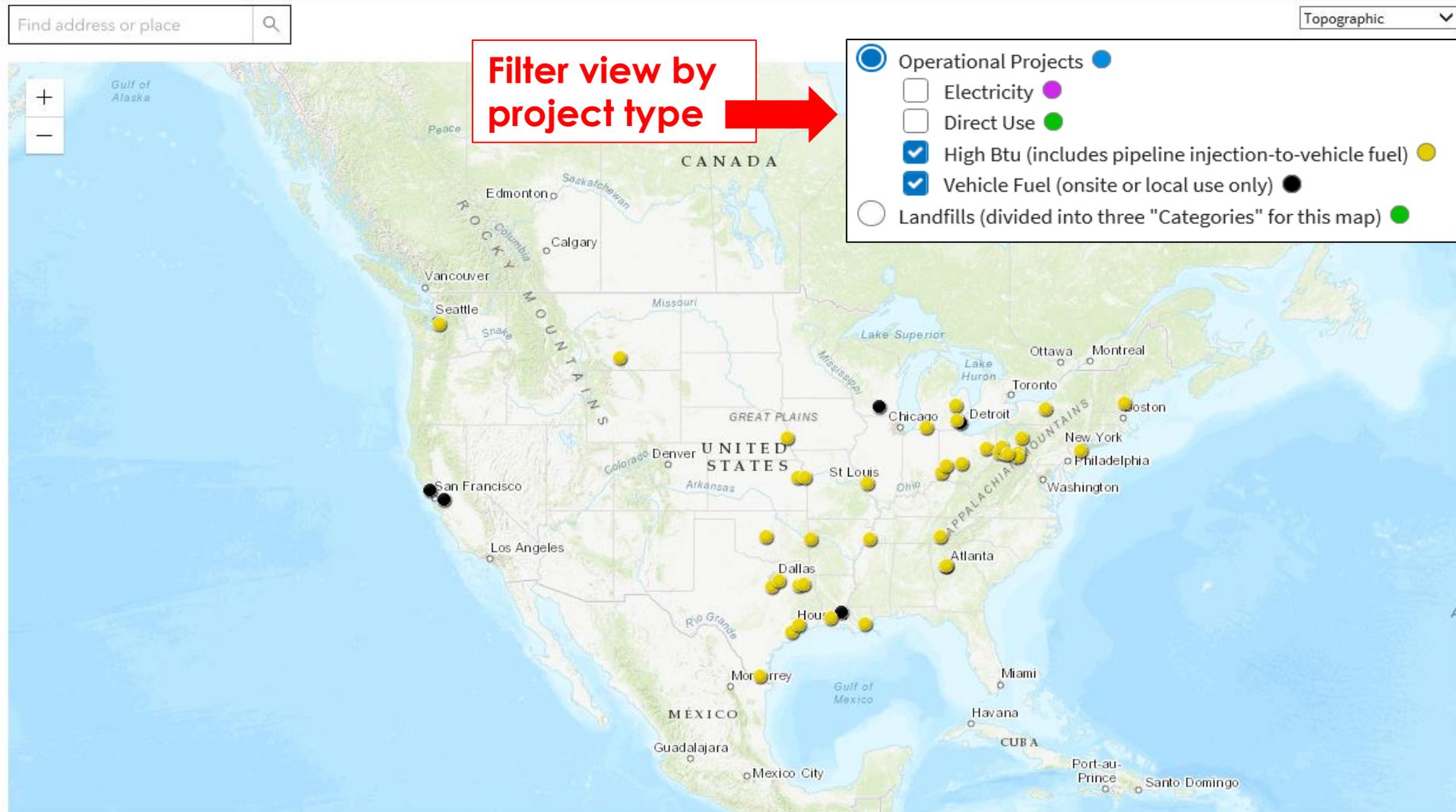
Map of 10 AVERT Regions



# LMOP National Map



# LMOP National Map



# LMOP National Map

Denver, CO, USA

Topographic

Search result

Denver, Colorado

Zoom to

**Search for and zoom to a location**



# LMOP National Map

Switch to satellite imagery



Imagery with Labels

Find address or place



See details in pop-up

Click on a project

**Denver Regional Landfill (North); Front Range Landfill; Denver Regional Landfill (South)**

GHGRP ID	1007700; 1003911; 10
County, State	Weld; Boulder, CO
Landfill Owner Organization(s)	Republic Services, Inc.; Waste Connections Inc. - Central Region
Initial Project Start Date	10/31/2011
LFG Energy Project Type	Reciprocating Engine
Project Type Category	Electricity
Total MW Capacity	3.20
Total LFG Flow to Project (mmsfd)	
End User(s)	United Power Cooperative
Project Developer(s)	Aria Energy
Project Owner(s)	Aria Energy

Zoom to



# LMOP Voluntary Data Collection

- LMOP Database is the only one of its kind
  - Information on 2,400+ MSW landfills and 630+ operational LFGE projects
  - Data is a key resource for the U.S. GHG Inventory
- Ensuring landfill and LFG energy project data is up to date and accurate is critical

## **Notably, the LMOP Database is used to:**

- Recognize LMOP Partner accomplishments and leadership in LFG energy
- Highlight LMOP Partner achievements in generating renewable energy and reducing methane emissions

# LMOP Data Improvements

- LMOP updates landfill and LFG energy project data through communication with Partners\*

- Traditionally, LMOP has requested information from Partners via email with Excel spreadsheets

- In 2018, LMOP will begin transition to electronic reporting of voluntary data

- If you are an LMOP Partner involved in a project, expect to hear from us in the coming months

- Timeline for implementation and instructions will be provided

- Electronic reporting will streamline and improve the efficiency of reporting data

**We will make every effort to enable a smooth and simple transition**

## Coming Soon



Partners will be able to provide data updates via voluntary LMOP module in e-GGRT

\*ICR No. 1849.07, OMB Control No. 2060-0446

# 2018 Global Methane Forum



**Global Methane Initiative**



**CLIMATE & CLEAN AIR COALITION**  
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

# GLOBAL METHANE FORUM

April 16-18, 2018  
Toronto, Canada



[globalmethane.org/GMF2018](http://globalmethane.org/GMF2018)

# 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!**

# Thank you!

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On site at Brown Station Road Sanitary Landfill,  
Prince George's County, MD

*Visit our website at*  
**[epa.gov/lmop](http://epa.gov/lmop)**