LMOP National Landfill Gas Energy Special Session – Welcome Presentation

Kirsten Cappel & Lauren Aepli
U.S. Environmental Protection Agency
Landfill Methane Outreach Program
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.
More than 1,100 Partners

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>Industry Partners</td>
<td>773</td>
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<tr>
<td>Community Partners</td>
<td>145</td>
</tr>
<tr>
<td>Energy Partners</td>
<td>110</td>
</tr>
<tr>
<td>Endorsers</td>
<td>39</td>
</tr>
<tr>
<td>State Partners</td>
<td>39</td>
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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)

Nationwide Summary
632 OPERATIONAL Projects
(2,134 MW and 300 mmscfd)
~470 CANDIDATE Landfills
(865 MW or 480 mmscfd,
44 MMTCO\textsubscript{2}e/yr Potential)

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)

*Total LFG Energy Projects: **632**

*Fliğini project count from LMOP’s Landfill and Landfill Gas Energy Database as of February 2018*
2017 LFG Energy Projects & Expansions

Legend

- ▲ New High Btu (4)
- ▲ Expanded High Btu (1)
- ● New Engine (3)
- ● Expanded Engine (2)
LFG Energy Project Snapshot

632 projects in 49 states/territories

98 billion cubic feet of LFG delivered

123 MMTCO$_2$e direct CH$_4$ reductions

17 billion kilowatt-hours produced

*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

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<th>1</th>
<th>2</th>
<th>3</th>
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<tbody>
<tr>
<td></td>
<td>Landfill Gas Energy Project Development</td>
<td>Biogas to Vehicle Fuel</td>
<td>Organic Waste Management</td>
</tr>
</tbody>
</table>

- Landfill Gas Energy Project Development
- Biogas to Vehicle Fuel
- 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:

<table>
<thead>
<tr>
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<th>2007</th>
<th>2017</th>
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<tbody>
<tr>
<td>Total MW Output from Electricity projects</td>
<td>1,325 MW</td>
<td>2,138 MW</td>
</tr>
<tr>
<td></td>
<td><strong>160% increase</strong></td>
<td></td>
</tr>
<tr>
<td>Total Gas Flow to High Btu LFG projects (to pipeline and vehicles)</td>
<td>55,042 scfm</td>
<td>127,763 scfm</td>
</tr>
<tr>
<td></td>
<td><strong>230% increase</strong></td>
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- Electricity
- Direct-Use
- High Btu


- New Electricity Projects
- New Direct-Use Projects
- New High Btu Projects
Factors Affecting New LFG Projects

• Economics:
  o Low natural gas prices / low electricity rates
  o 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

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

- 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

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<th>Extent of impact varies depending on a number of factors, but includes:</th>
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<tbody>
<tr>
<td>Reduction in LFG generation rates and associated energy potential</td>
</tr>
<tr>
<td>Extension of landfill life by saving valuable space</td>
</tr>
<tr>
<td>Reduction in the amount of leachate generated</td>
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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
- LFGeost-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
LMOP National Map

Found at the bottom of the LMOP homepage

Access directly: https://www.epa.gov/lmop/lmop-national-map
LMOP National Map

Filter view by project type:
- Operational Projects
- Electricity
- Direct Use
- High Btu (includes pipeline injection to vehicle fuel)
- Vehicle Fuel (onsite or local use only)
- Landfills (divided into three "Categories" for this map)
LMOP National Map

Search for and zoom to a location
LMOP National Map

Switch to satellite imagery

See details in pop-up

Click on a project

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

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

• LMOP Database is the only one of its kind
  o Information on 2,400+ MSW landfills and 630+ operational LFGE projects
  o 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**

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