RNG WORKS

THE COALITION FOR RENEWABLE NATURAL GAS

EPA METHANE VOLUNTARY PROGRAMS

RNG Overview, EPA Resources

METHANE CHALLENGE U.S. EPA

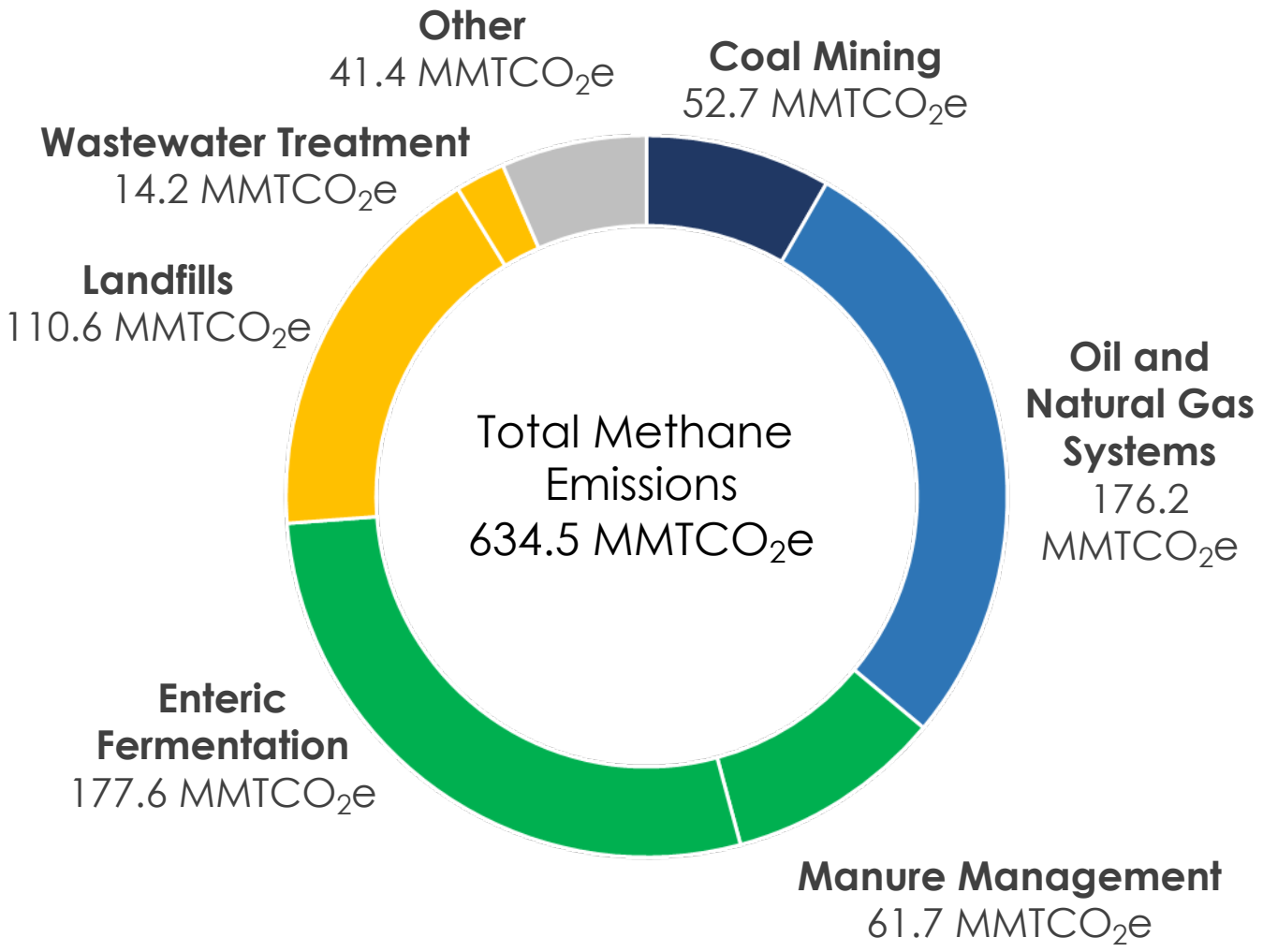
LANDFILL METHANE OUTREACH PROGRAM

AgSTAR

NaturalGas EPA POLLUTION PREVENTER

Where does methane come from?

Coal Mining	8%
Oil and Natural Gas Systems	28%
Agriculture	38%
Waste	20%
Other	7%



Source: [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018]

EPA targets the four main methane emitting sectors with voluntary partnership programs

Information for the Agriculture Sector

www.epa.gov/agstar

Success Stories

- Project profiles
- Interviews with operators

Market Trends

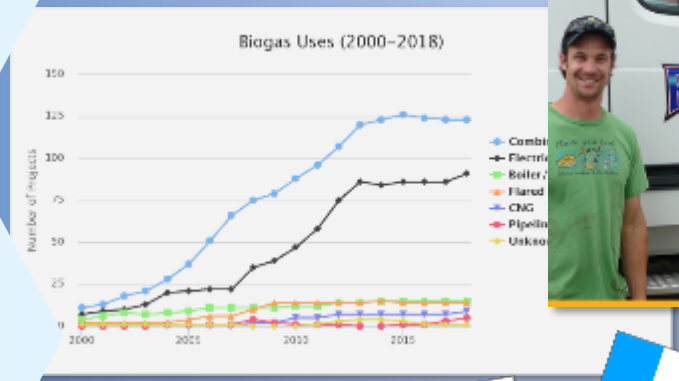
- National data for anaerobic digester projects
- Opportunities

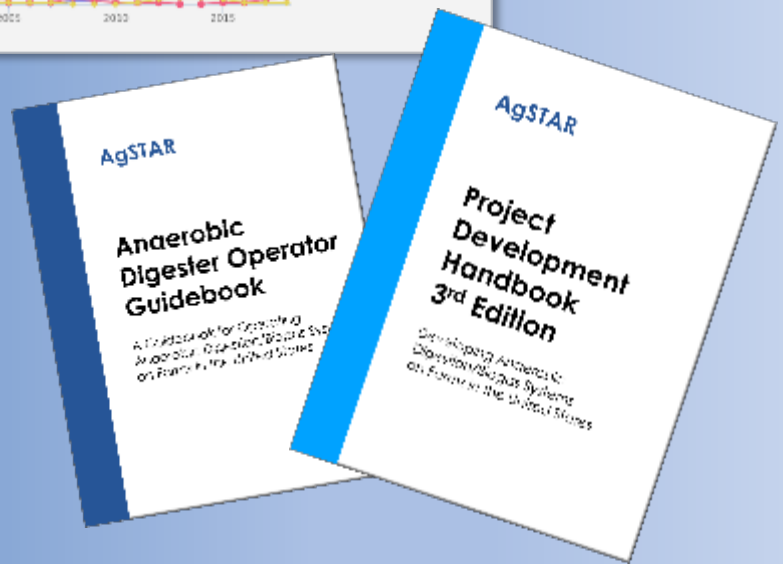
Technical Information

- Guidelines and permitting
- Project Development Handbook
- Operators guidebook (coming soon)

Collaboration

- Webinars
- Industry events



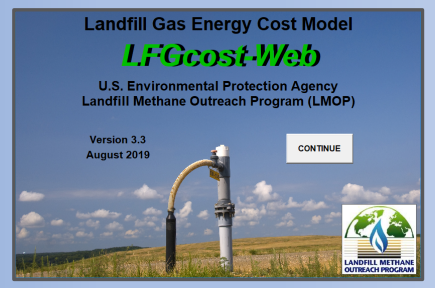


Information for the Landfill & LFG Energy Sector

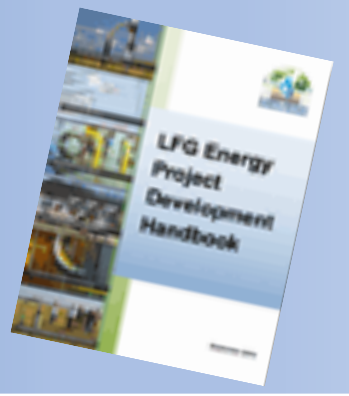
www.epa.gov/lmop

LANDFILL METHANE OUTREACH PROGRAM

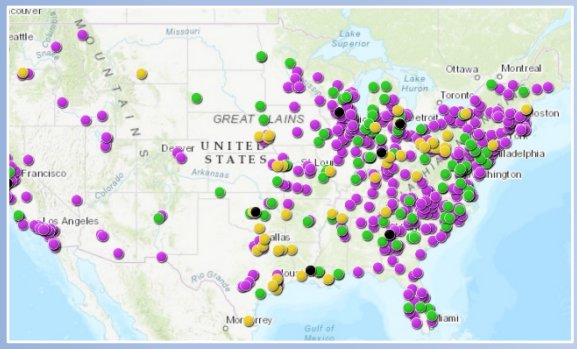
Tools
- LFGcost-Web
- RNG Flow Rate Tool
- LFG Energy Benefits Calculator
- Conversion Tool



Technical Publications
- Project Development Handbook
- Fact sheets



Data
- Excel files and GIS map
- LFG energy projects
- Candidate landfills



Network
- Webinars and other events
- 1,000+ LMOP Partners
- Listserv messages

Information for the Oil and Natural Gas Sector

www.epa.gov/gasstar

Recommended Technologies

- Lessons Learned Studies
- Technology fact sheets
- Organized by equipment type

Technical Presentations

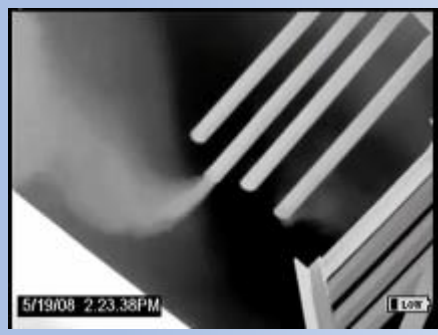
- Links to hundreds of presentations from industry experts, program partners, and stakeholders
- Searchable by title, speaker, and event

Outreach and Events

- Webinars
- Technology Transfer Workshops
- Partnership Workshops

Methane Emissions Videos

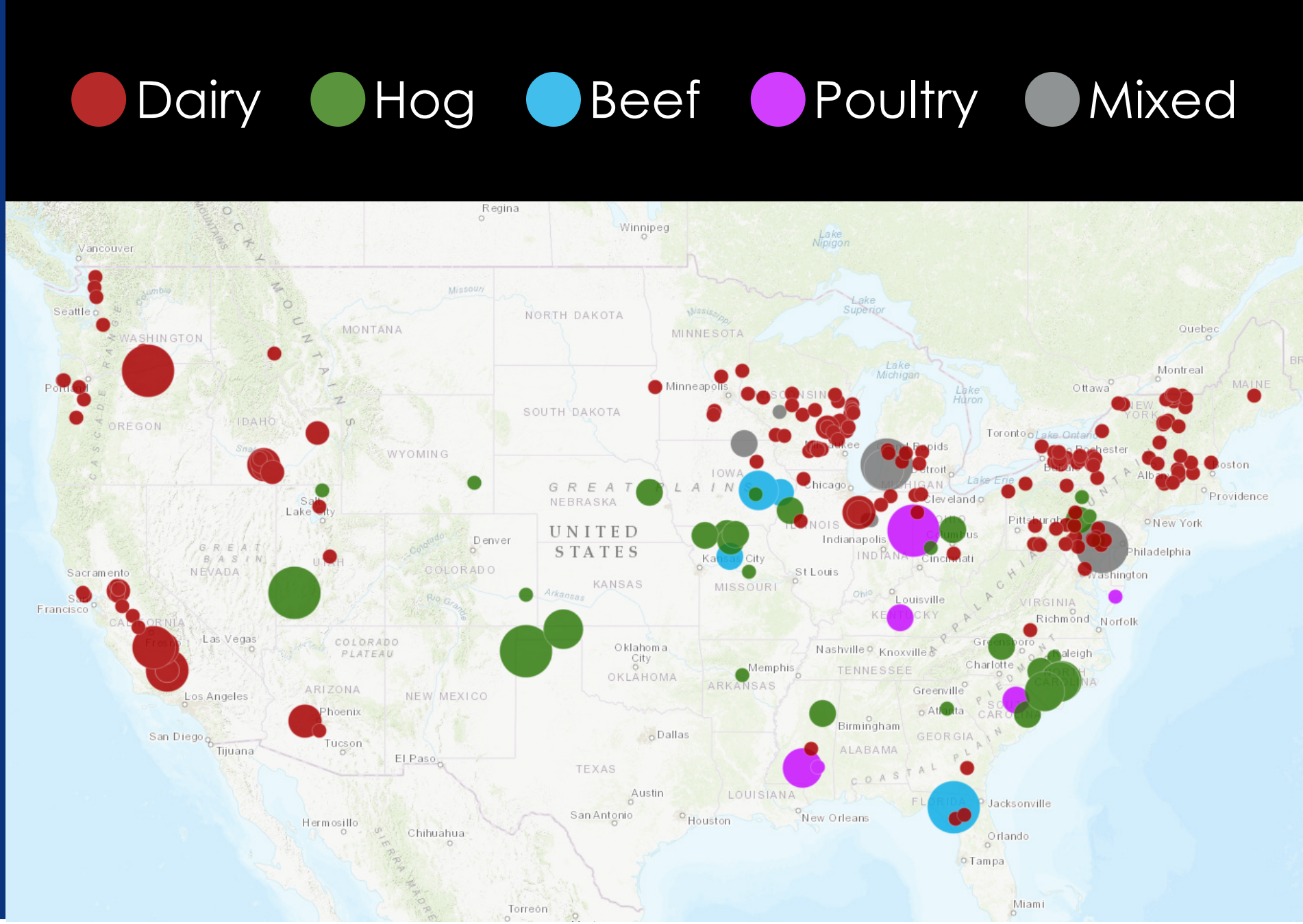
- Remote sensing leak detection
- Infrared methane videos



Highlights from the Waste and Agricultural Sectors

Anaerobic Digester Projects on Livestock Farms in the United States

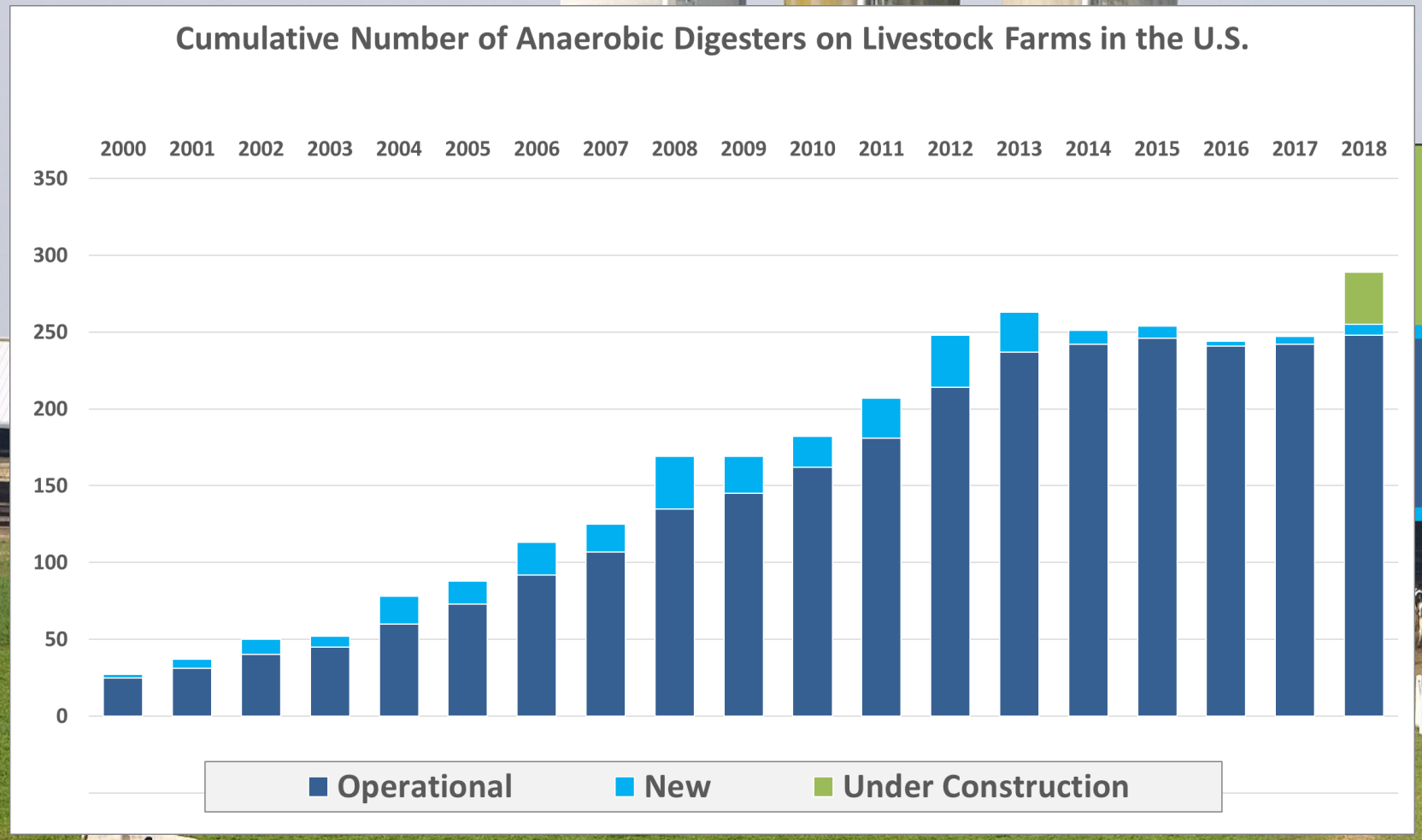
255 operational projects in the United States (March 2020)



Source: AgSTAR Digester Database, March 2020

The size of the circle indicates the number of animals that feed the digester.

Farm Digester Market is Growing



34 anaerobic digestion projects currently under construction

248 anaerobic digestion projects currently operational

\+ **~8,100** Potential biogas systems

Source: AgSTAR Digester Database, AgSTAR Market Opportunities Report

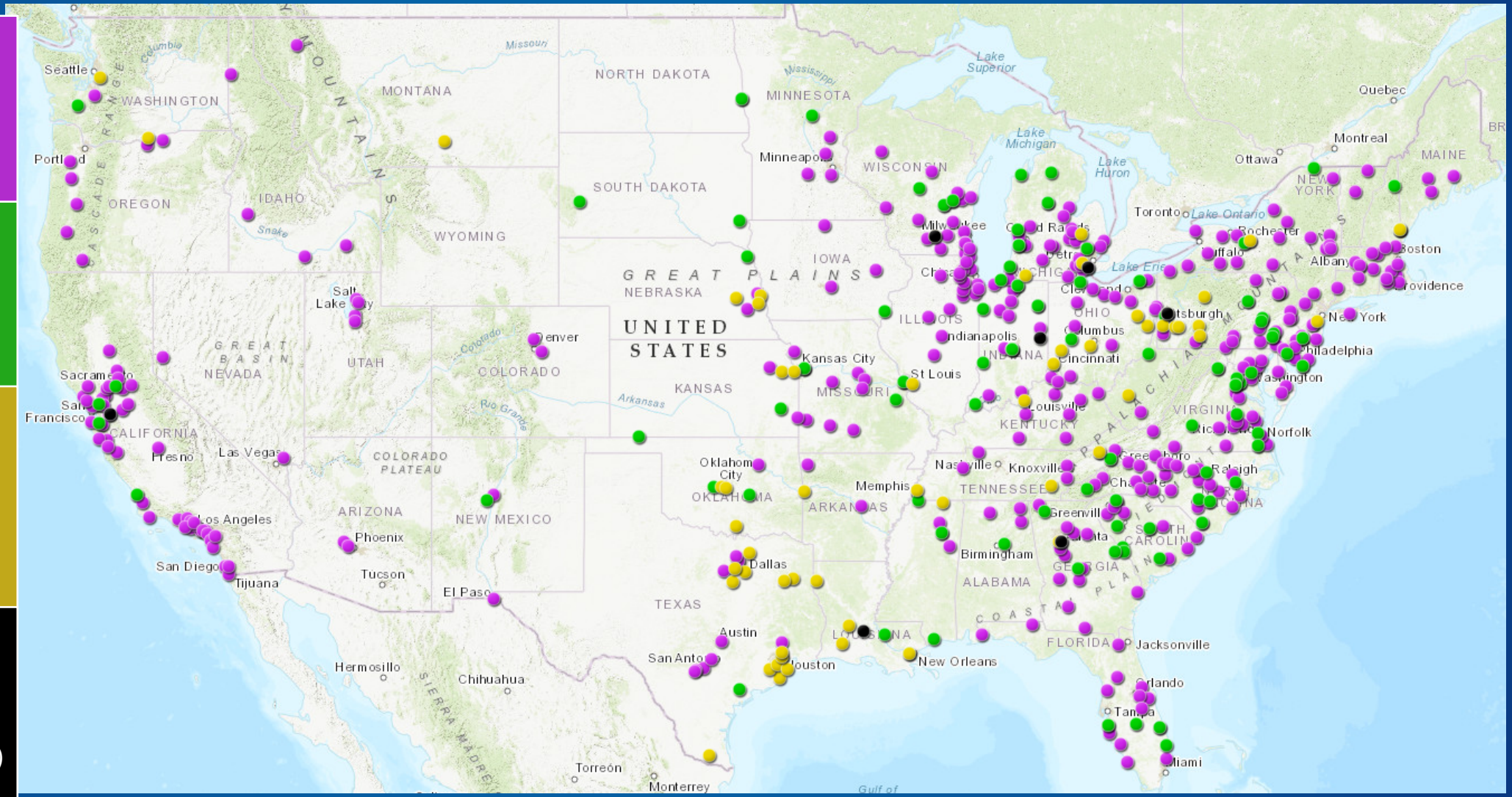
565 Total Landfill Gas Energy Projects in the United States

399
Electricity

99
Direct-Use

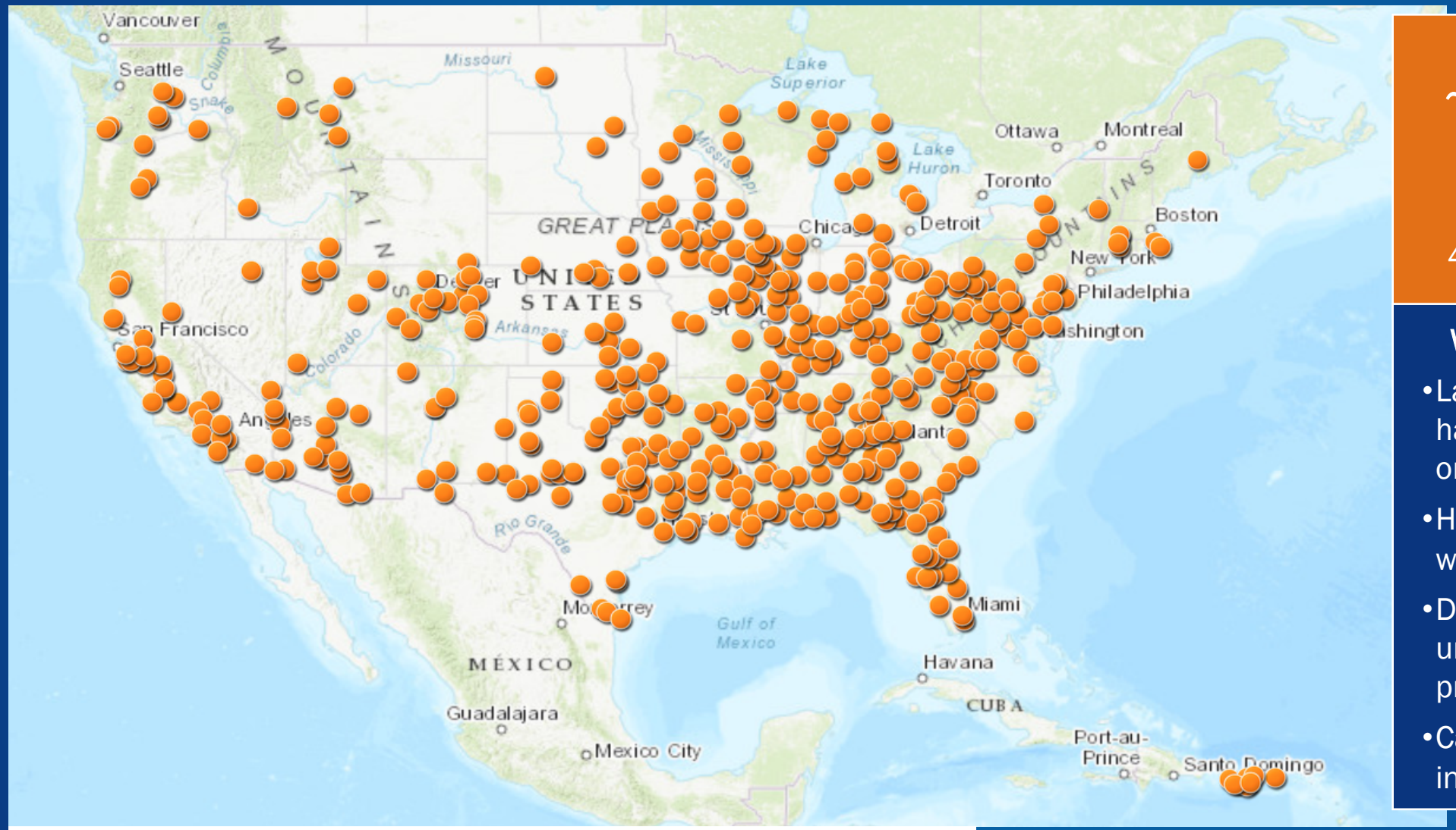
58
Renewable Natural Gas
(Includes pipeline injection-to-vehicle fuel)

9
Vehicle Fuel
(Onsite or local use only)



LFG energy project count from LMOP's Landfill and Landfill Gas Energy Database as of August 2020

Candidate Landfills



LFG energy project count from [LMOP's Landfill and Landfill Gas Energy Database](#) as of August 2020

~ 475 Candidate Landfills

(898 MW or 499 mmscfd, 45 $MMTCO_2e$/year Potential)

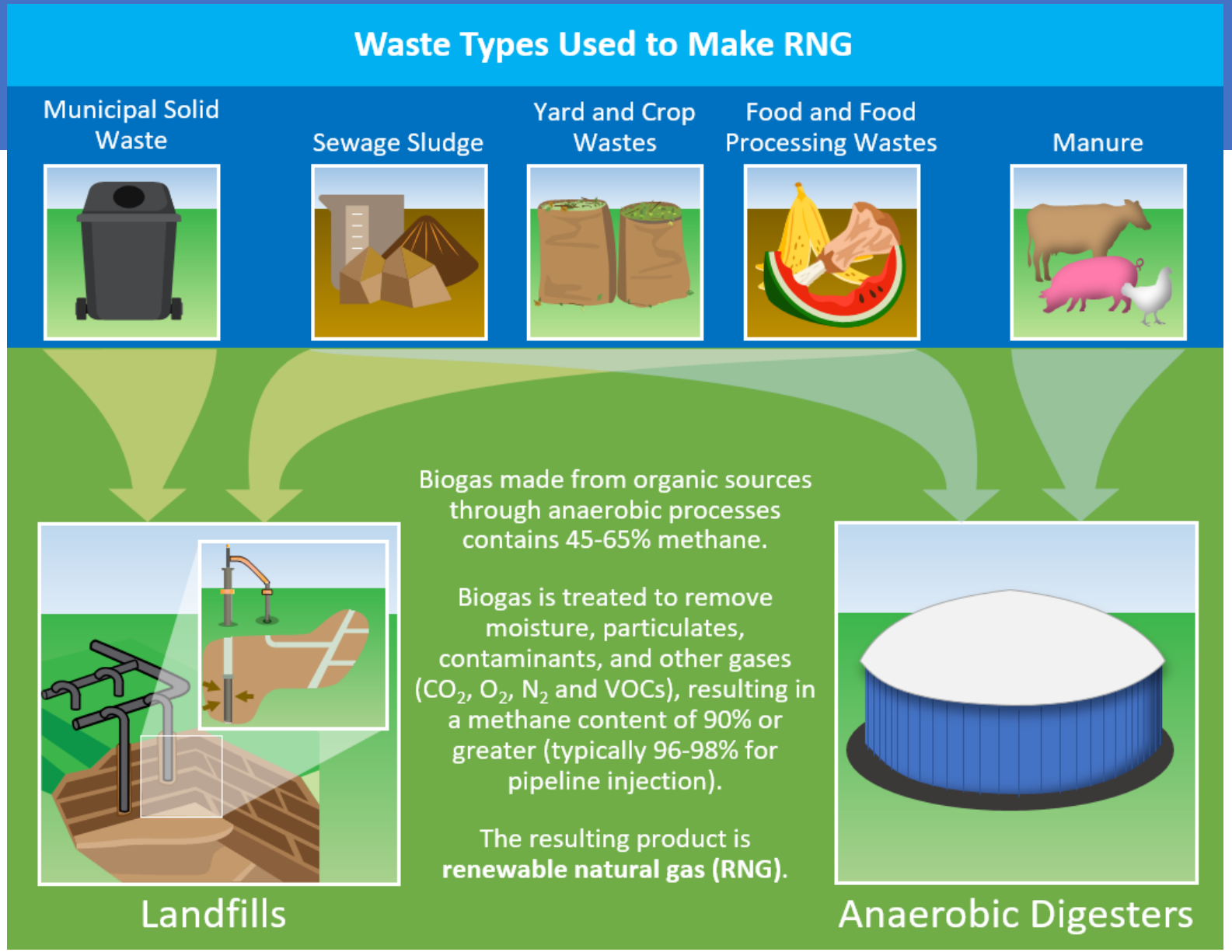
What is a candidate landfill?

- Landfill is accepting waste or has been closed for five years or less
- Has at least one million tons of waste
- Does not have an operational, under-construction or planned project
- Can be designated based on interest by the site

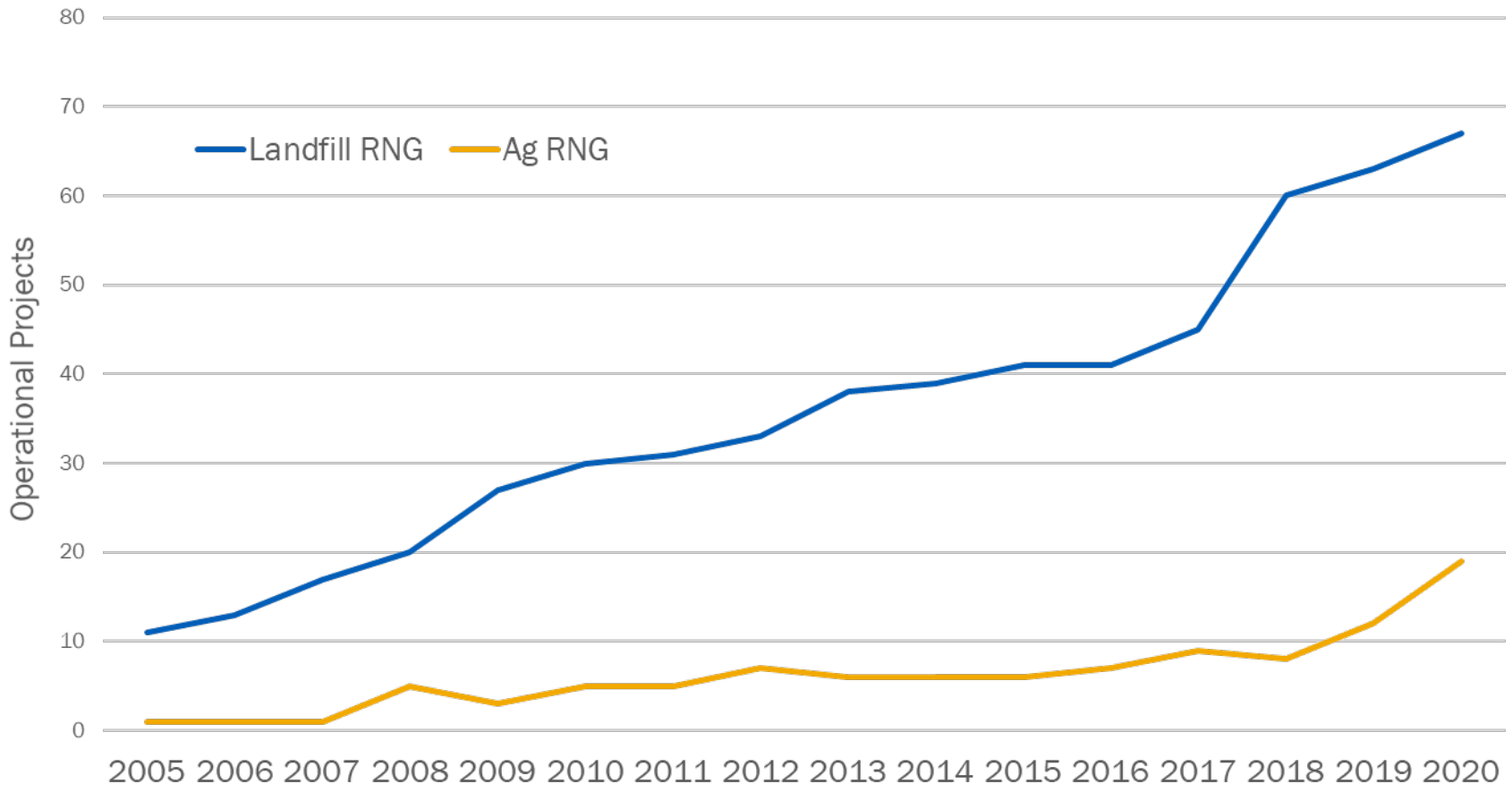
RNG Trends and EPA Resources

What is RNG?

RNG is a term used to describe anaerobically-generated biogas that has been upgraded (or refined) for use in place of fossil natural gas



Trends in RNG Project Development



- **AgSTAR and LMOP publish data on operational and planned RNG projects across the U.S.**
- **Project data includes:**
  - Project developer
  - Equipment supplier
  - End user
  - Gas flows
  - Location
  - Receiving pipeline

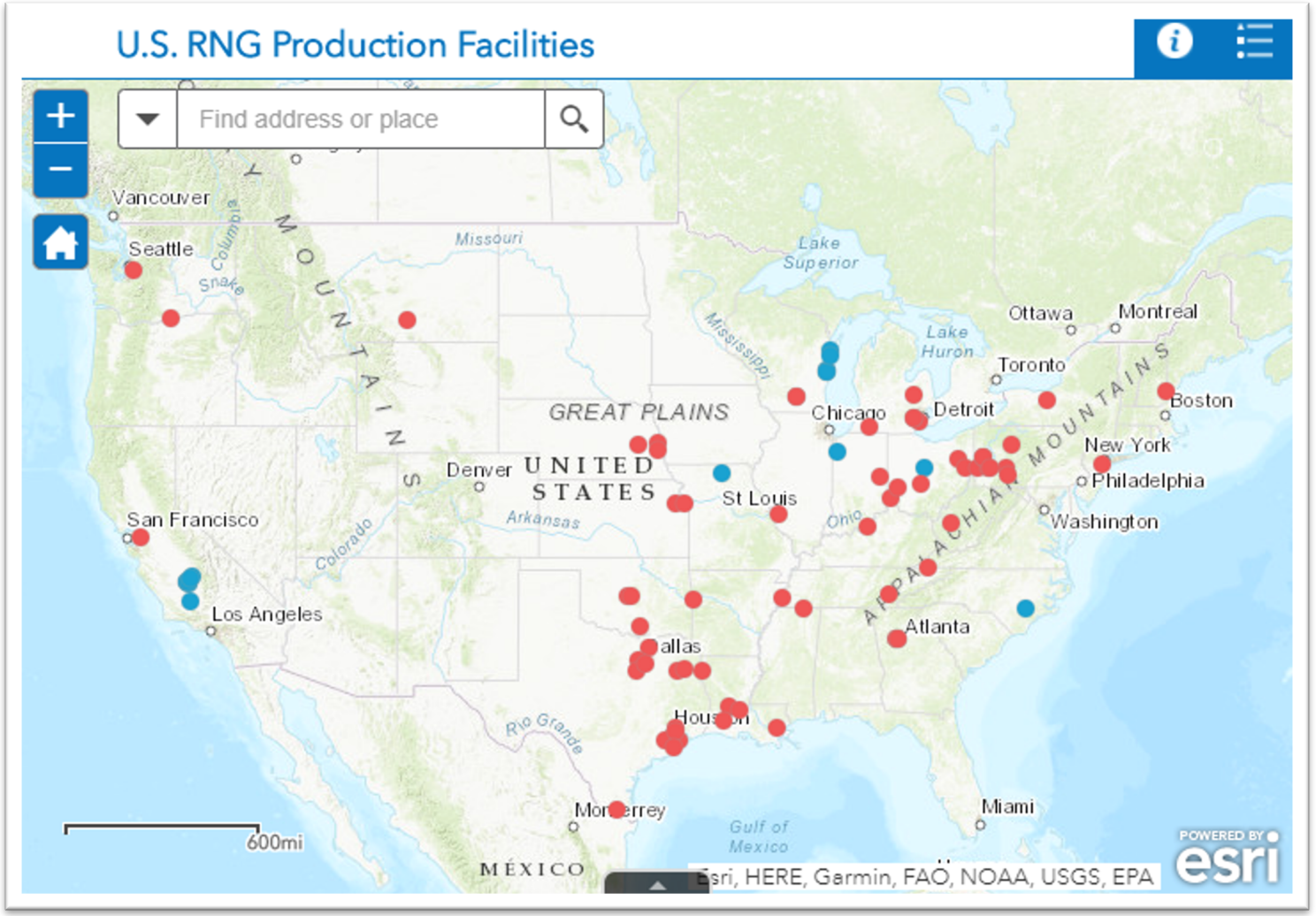
Sources: LMOP's Landfill and Landfill Gas Energy Database as of August 2020, AgSTAR Digester Database March 2020.

Resources: RNG webpage

- Centralized information from all voluntary methane programs
- Webinars and presentations
- Data files and RNG projects map

Available at:

https://www.epa.gov/lmop/renewable-natural-gas

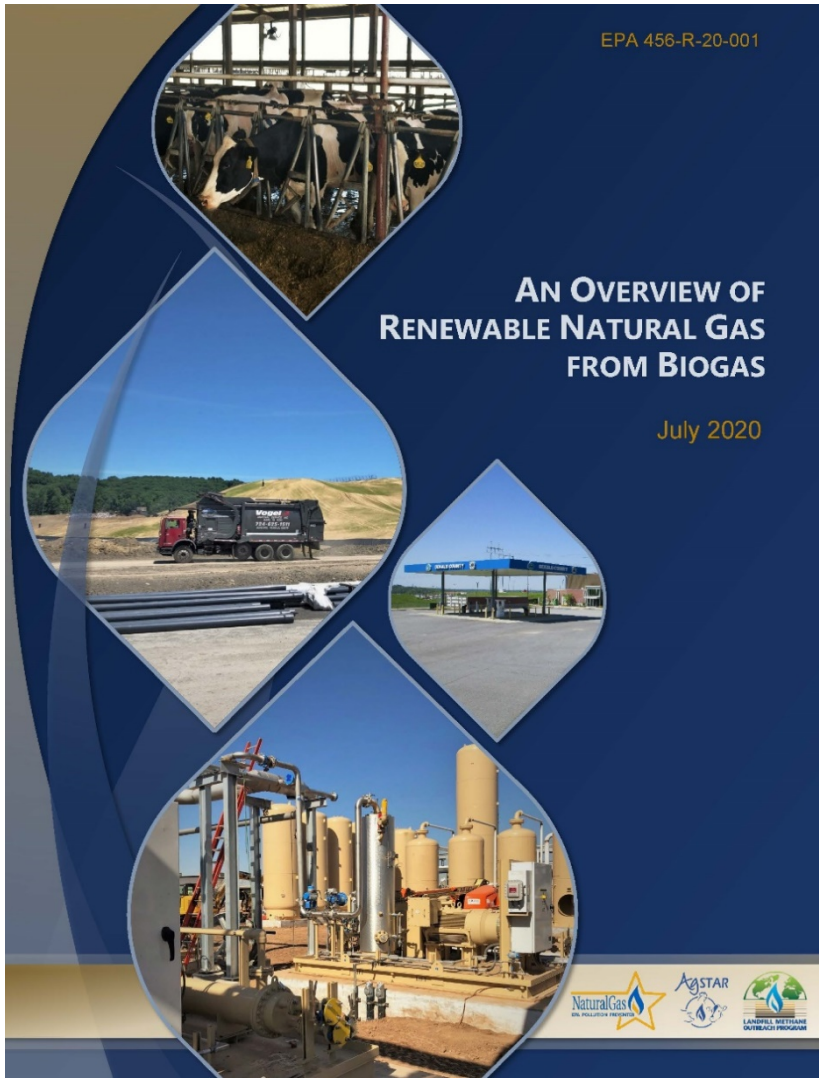


RNG Overview Paper

- **Resource paper** intended to promote and potentially assist in the development of RNG projects
  - Developed by AgSTAR, LMOP, & Natural Gas STAR
  - Includes appendix of NG companies that have accepted RNG interconnections

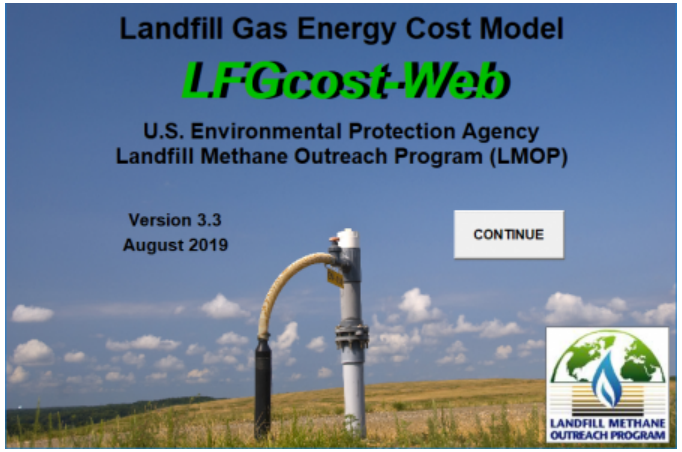
Available at:

https://www.epa.gov/lmop/overview-renewable-natural-gas-biogas



LFG Energy Project Feasibility Tool

- LFGcost-Web is an Excel based model for initial feasibility analysis of 12 types of LFG energy projects
  - Start with known LFG flow rate or have model calculate based on landfill parameters
  - Option to include incentive prices, e.g., renewable fuel credits
  - Outputs include installed capital cost & O&M, internal rate of return, and years to payback
- RNG (High Btu) module update **coming soon** with refreshed and updated price data
- Available at: https://www.epa.gov/lmop/lfgcost-web-landfill-gas-energy-cost-model



RNG Project Profile

Ruckman Farm Digester

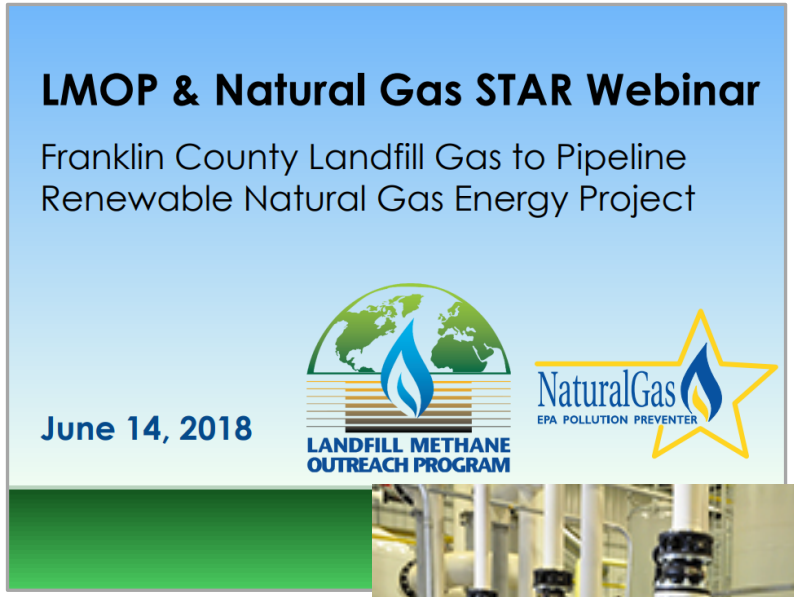
- Nation's first project that converts biogas derived from hog manure into pipeline-quality renewable natural gas (RNG)
- Largest manure-to-energy project of its kind
- Restores native prairie grasses that are harvested to double biogas production

Learn more: https://www.epa.gov/agstar/project-profile-ruckman-farm

RNG Project Profile

SWACO Renewable Natural Gas Project

- Public-private partnership between the Solid Waste Authority of Central Ohio and Aria Energy
- Landfill gas to RNG project at the Franklin County Landfill in Grove City, Ohio.
- The RNG is injected into a Columbia Gas of Ohio (a NiSource company) pipeline for sale in the vehicle fuel markets.



Learn more: https://www.epa.gov/lmop/landfill-gas-energy-project-data#swaco

Webinar recording: https://www.epa.gov/lmop/webinar-franklin-county-landfill-gas-pipeline-renewable-natural-gas-energy-project

EPA Biogas Toolkit

- A web-based toolkit with over 30 tools and resources to facilitate biogas project development
- Roadmap for planning and implementing biogas projects and quantifying economic and environmental impacts
- Audience: Project implementers, developers, financiers, and policymakers

Helps answer project development questions:

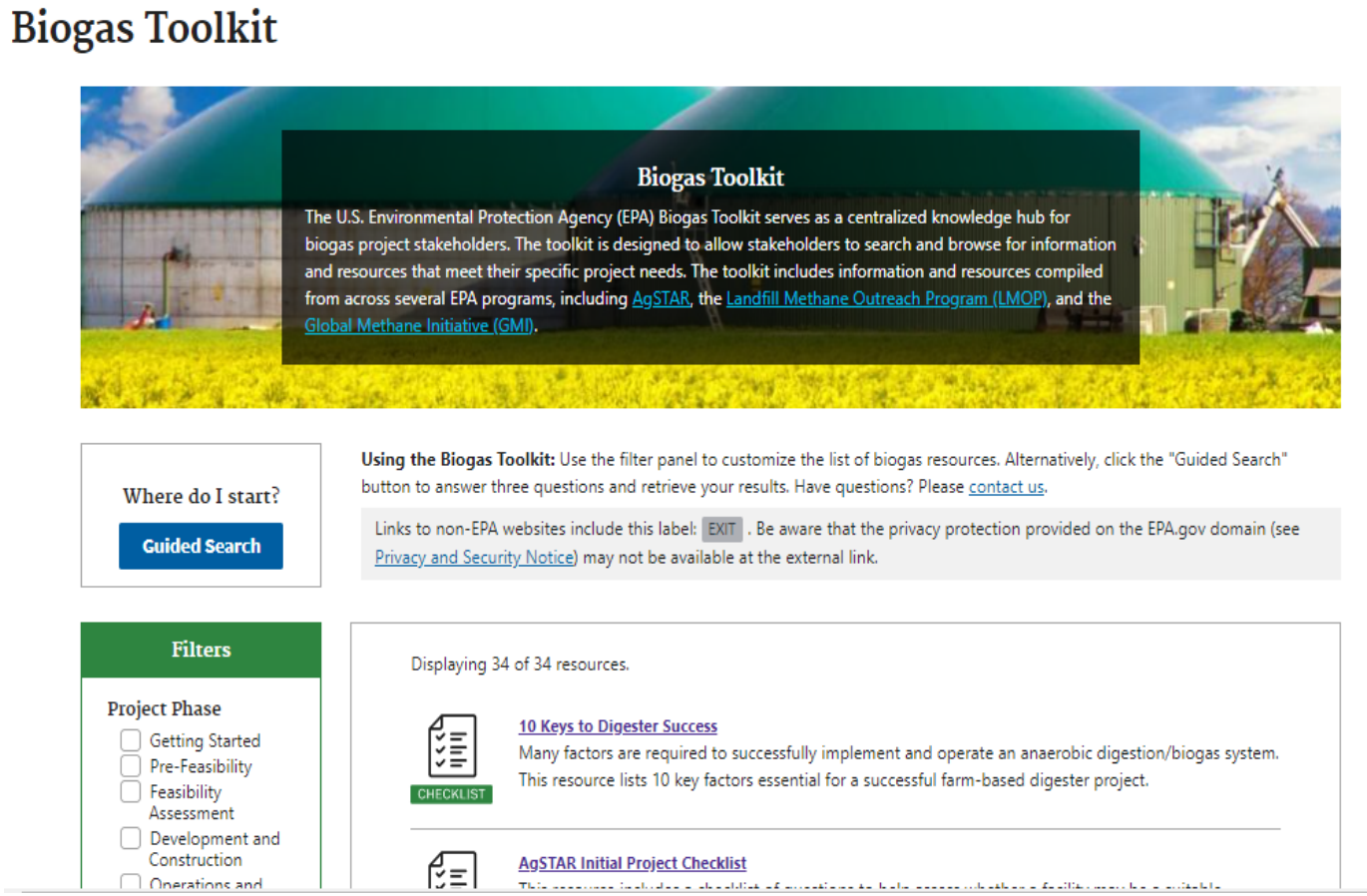
- Where do I start?
- Is my city or firm a good candidate for biogas systems?
- Can I afford to build the system?
- How much biogas can I produce?
- What incentives are available?
- What about permitting and regulations?
- How do I maintain the system?
- What business relationships do I need to make?
- What environmental improvement will my project achieve?

www.epa.gov/biogastoolkit

EPA Biogas Toolkit Makes It Easier to Develop Successful Projects

Highlights of Toolkit:

- Centralized location for all EPA biogas tools
- Filter categories help users find exactly what they need
- Intended for U.S. and international audience
- Usable by all knowledge levels (getting started to advanced)
- Cross-agency collaboration (AgSTAR, LMOP, GMI, OLEM, OW)



www.epa.gov/biogastoolkit

What can you do now?

Browse our websites

- LMOP
- AgSTAR
- Natural Gas STAR

Contact us with questions

- LMOP
- AgSTAR
- Natural Gas STAR

Become a Partner

- LMOP
- AgSTAR
- Natural Gas STAR

Join our listservs

- Indicate you'd like to receive our emails via the "contact us" form

Contact Us

- LMOP: lmop@epa.gov
- AgSTAR: agstar@epa.gov
- Natural Gas STAR: gasstar@epa.gov