
# LMOP Webinar

# New Renewable Natural Gas (RNG) Projects by LMOP Partners in Texas and New York

**November 12, 2024**

# Agenda

***Introduction to LMOP and RNG***
Lauren Aepli, LMOP

***Cefe Valenzuela Landfill RNG Project***
Philip Aldridge, City of Corpus Christi, TX; and Paul Morrow and Peter Smith, Morrow Energy

***Case Study for a 1,000 scfm WAGABOX® Project at the Steuben County Landfill in New York***
Steve Orcutt, Steuben County, NY; and Jason Pennypacker, Waga Energy

**Questions and Answers**

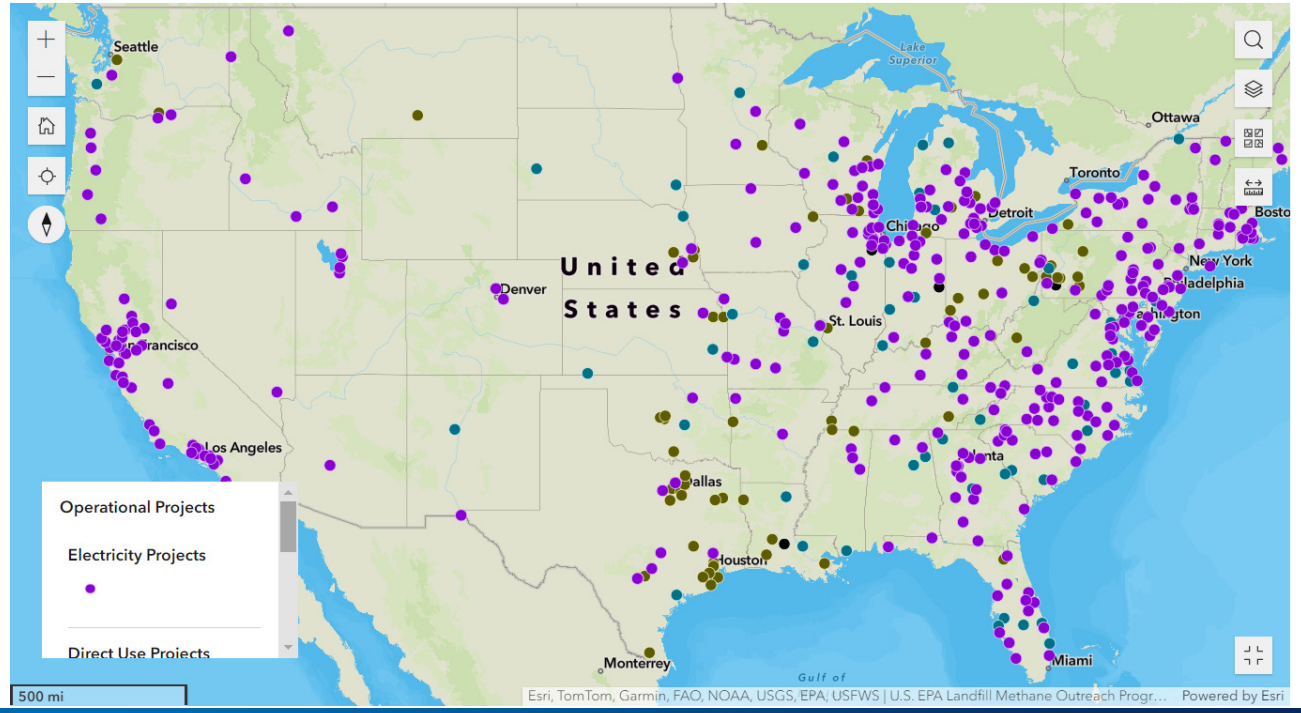
**Wrap Up**

**Mention of any company, association, or product in this presentation is for information purposes only and does not constitute a recommendation of any such company, association, or product, either express or implied, by the EPA.**

# About LMOP

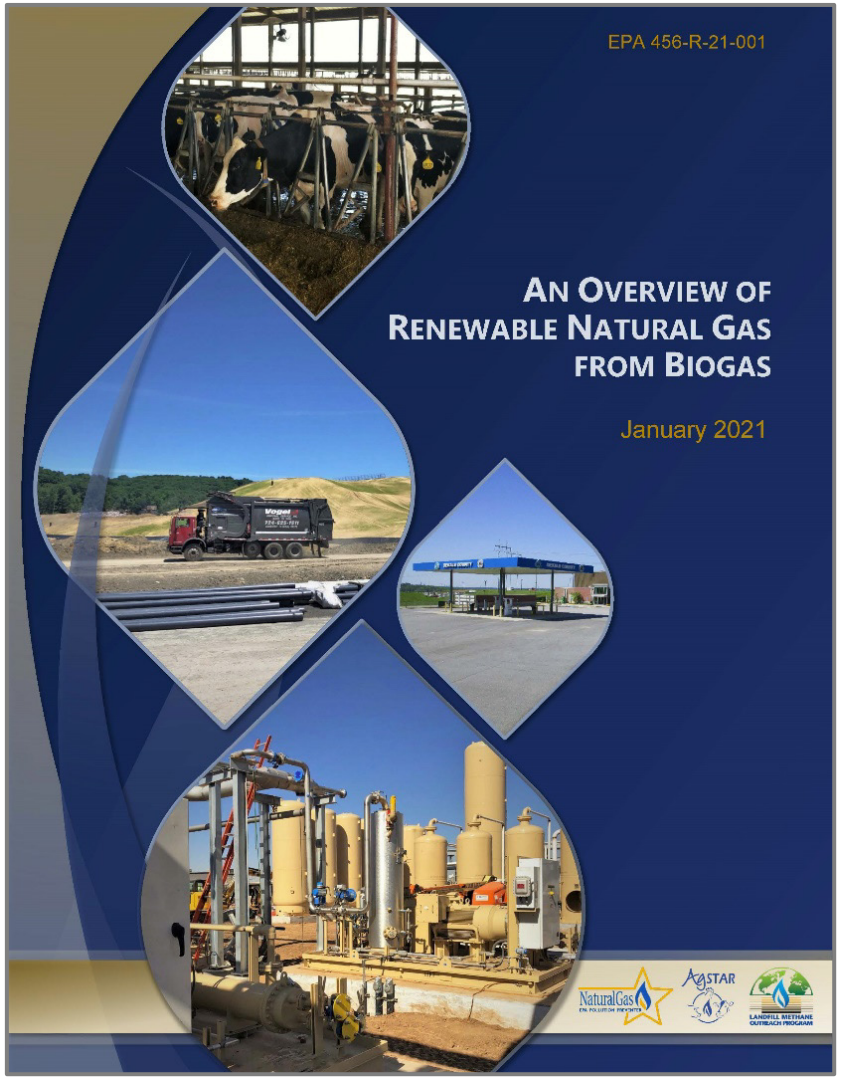
- Established in December 1994
  - 30 years next month!
- Voluntary program that creates partnerships among states, energy users/providers, the landfill gas (LFG) industry and communities
  - ~1,000 Partners currently
- Offers data, tools and resources, technical assistance and information sharing via webinars and listserv

***Mission: Work cooperatively with industry & waste officials to reduce or avoid landfill methane emissions by encouraging the recovery & beneficial use of biogas generated from organic municipal solid waste.***



# About RNG

- EPA voluntary programs' description of RNG: Biogas that has been upgraded (treated) for use in place of fossil natural gas
- Treatment includes removing moisture, $CO_2$, $H_2S$, $N_2$, $O_2$, siloxanes and VOCs
- Multiple feedstocks for the biogas and multiple end uses for the RNG
- Incentives include RINs under EPA's Renewable Fuel Standard, state-level low-carbon fuel standards and Section 45 tax credits (implemented by IRS)
- More information: [epa.gov/lmop/renewable-natural-gas](epa.gov/lmop/renewable-natural-gas)



# *Cefe Valenzuela Landfill RNG Project*

# City of Corpus Christi

Cefe Valenzuela Landfill
RNG Project

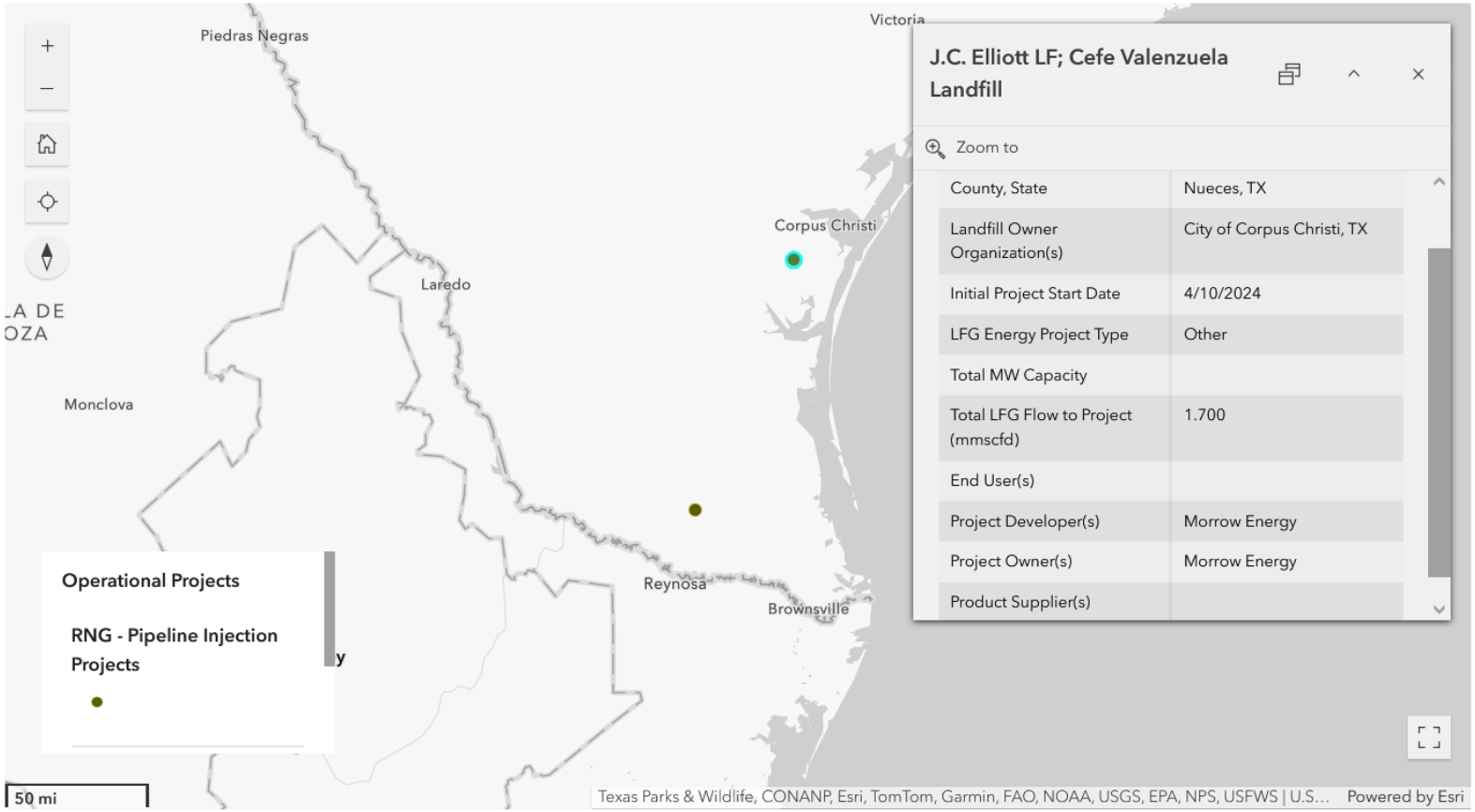
Procurement to Completion

# Landfill Gas (LFG) Energy Projects and Municipal Solid Waste (MSW) Landfills

LMOP's National Map is a visual tool that accompanies the LMOP database of landfills in the United States and associated energy projects.

The map below incorporates Tribal lands and environmental justice (EJ) demographic data, which can be viewed when zoomed in to the state level. LMOP is displaying these data so that anyone can identify areas where LFG energy projects may warrant additional consideration, analysis or outreach to surrounding communities. LMOP provides instructions for how the map could be used to help consider potential EJ concerns during LFG energy project planning and development.

See below for additional information on data sources.




Information in the LMOP database is compiled from a variety of sources by voluntary submittal, is updated periodically and can change. LMOP cannot guarantee the validity of the data.

LMOP National Map | US EPA

# Introduction

Objective – Provide an overview of the process undertaken by the City of Corpus Christi to select a partner for managing the landfill gas collection and control system.

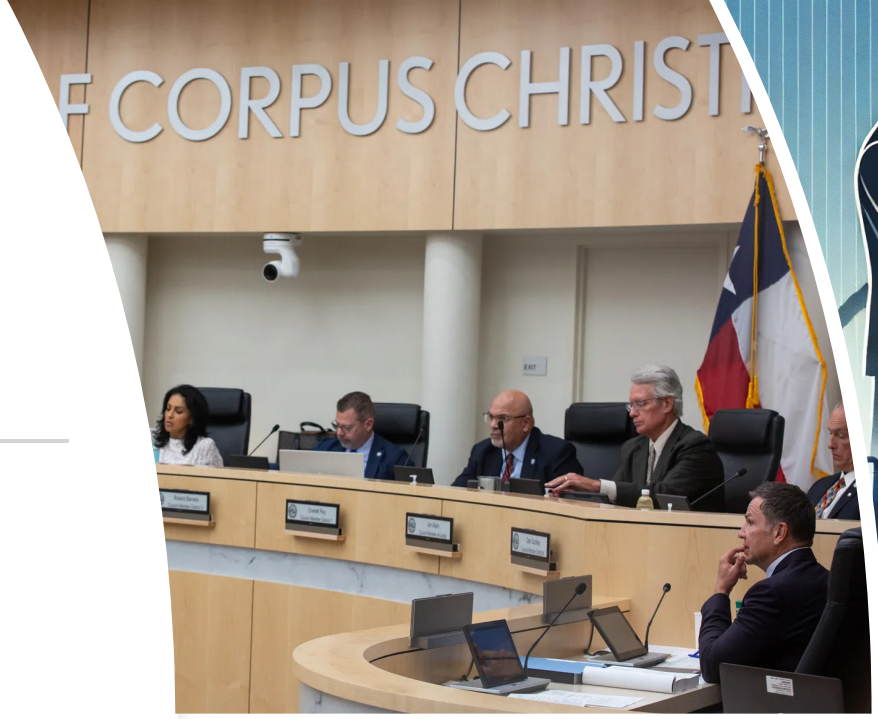
- Project Overview
- Procurement
- Contract Highlights
- Construction
- Operation
- After-Action Review

# Project Overview

Form a Partnership to redirect the flow of landfill gas from a candlestick flare to a Landfill Gas Energy facility.

Key Stakeholders in Process:

- City of Corpus Christi Citizens
- Gas Contractor
- Landfill Push and Pack Contractor
- City Executive Leadership
- City Political Leadership




# Procurement Process

Electricity Generation?

Renewable Natural Gas?

Direct Use of Medium-Btu Gas?

Objective: Secure a qualified contractor to Design, Construct, and Manage the landfill gas energy plant on a long-term land lease.

Request for Proposal (RFP):

- RFP Process and Scope of Project
- Pre-bid Meetings and Evaluation

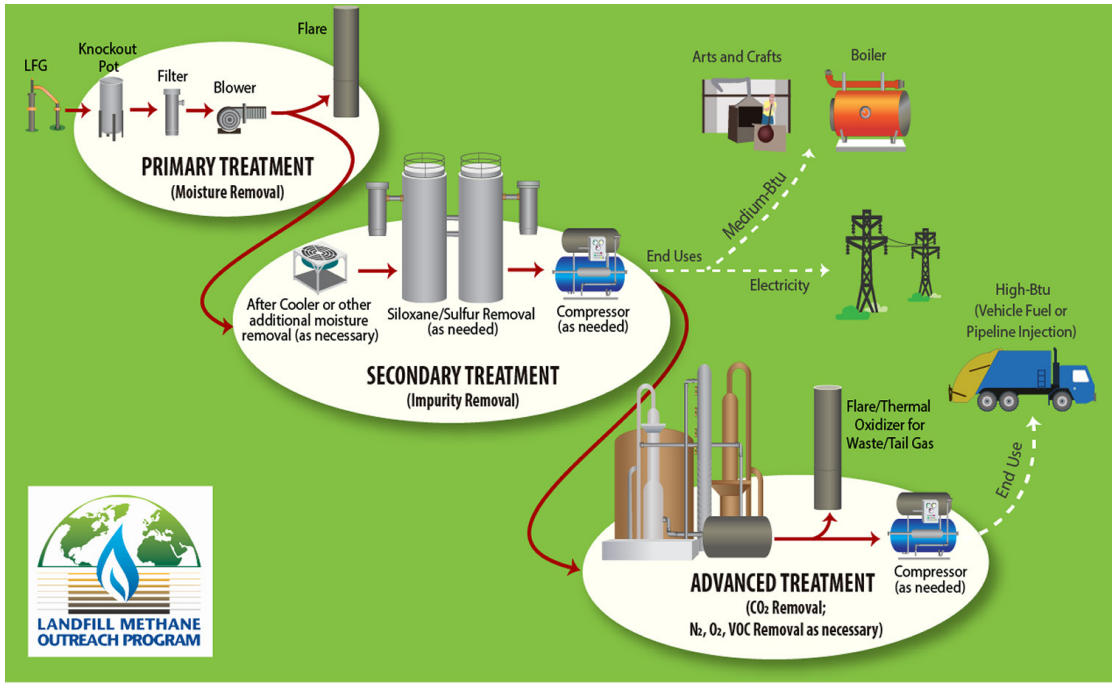
*Selection Criteria:*

- Firm Experience: Track record in landfill gas energy projects

- Team Experience: Expertise of individuals managing the project

- Understanding Project Scope

- Pricing/Royalty Structure



# Contract Design

Contract Type: Lump-sum, cost-plus, revenue share or other contract structures

Performance guarantees

Penalties for non-compliance or delays

Payment schedule

Contract duration

Expected timeline for construction and commissioning

# Permitting and Construction Phase

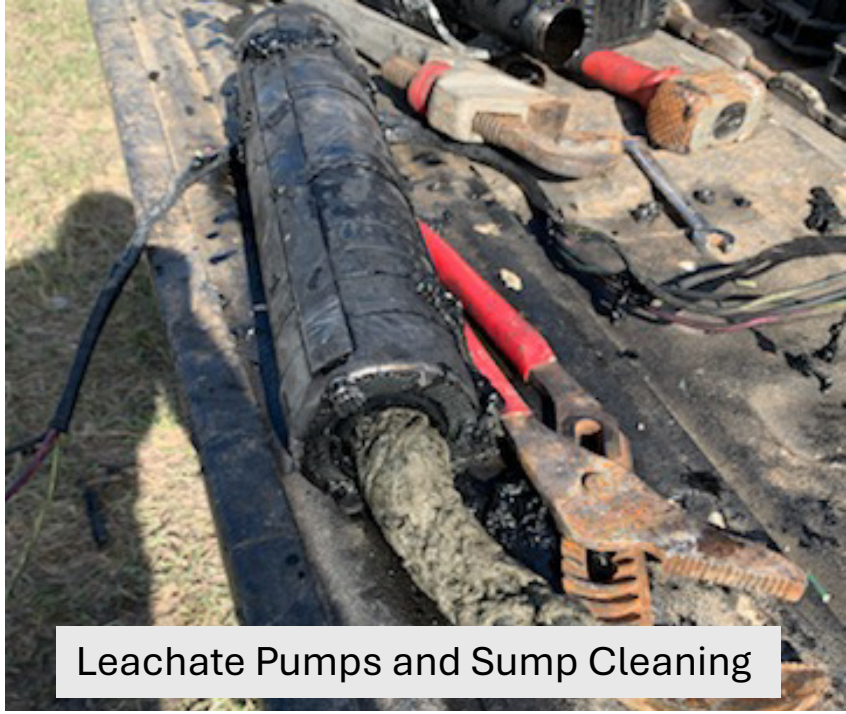
- Timeline
- Key construction milestones
- Permit approval
- Site preparation and site access
- Coordination with subcontractors

# Operations Phase

- Initial Start-Up: Selling gas – generating RINs
- Daily Operations: Gas collection, processing, and pipeline injection
- Operations & Maintenance impact on the City
- Wellfield improvements
- Flare system
- Reporting and data management


New VFDs for Blower System Control

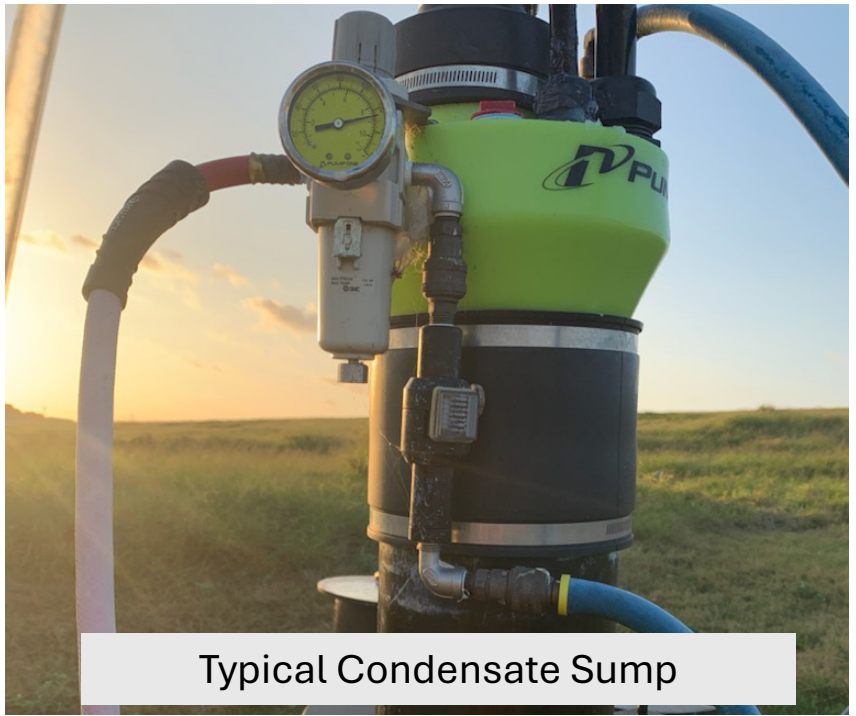

Control Panel for Leachate Sump



Leachate Pumps and Sump Cleaning



Upgraded Blowers



Typical Condensate Sump

New Air Compressor and Dryer

# After-Action Review & Lessons Learned

Successes

- On-time completion
- Efficiency
- Revenue and cost savings
- Popular green project

Challenges

- Permitting hurdles
- Data and records management
- Stakeholder education

Lessons Learned

- Flare and leachate system condition

# Environmental & Financial Impact

Environmental Benefits

- Reduction of greenhouse gas emissions
- Clean energy production (RNG output)

Financial Impact

- Cost savings or revenue generation from RNG sales
- Long-term return on investment

# Conclusion

**Cefe Valenzuela Landfill RNG Project**

**Procurement to Completion**

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# Corpus Christi Renewables – Developer Perspective

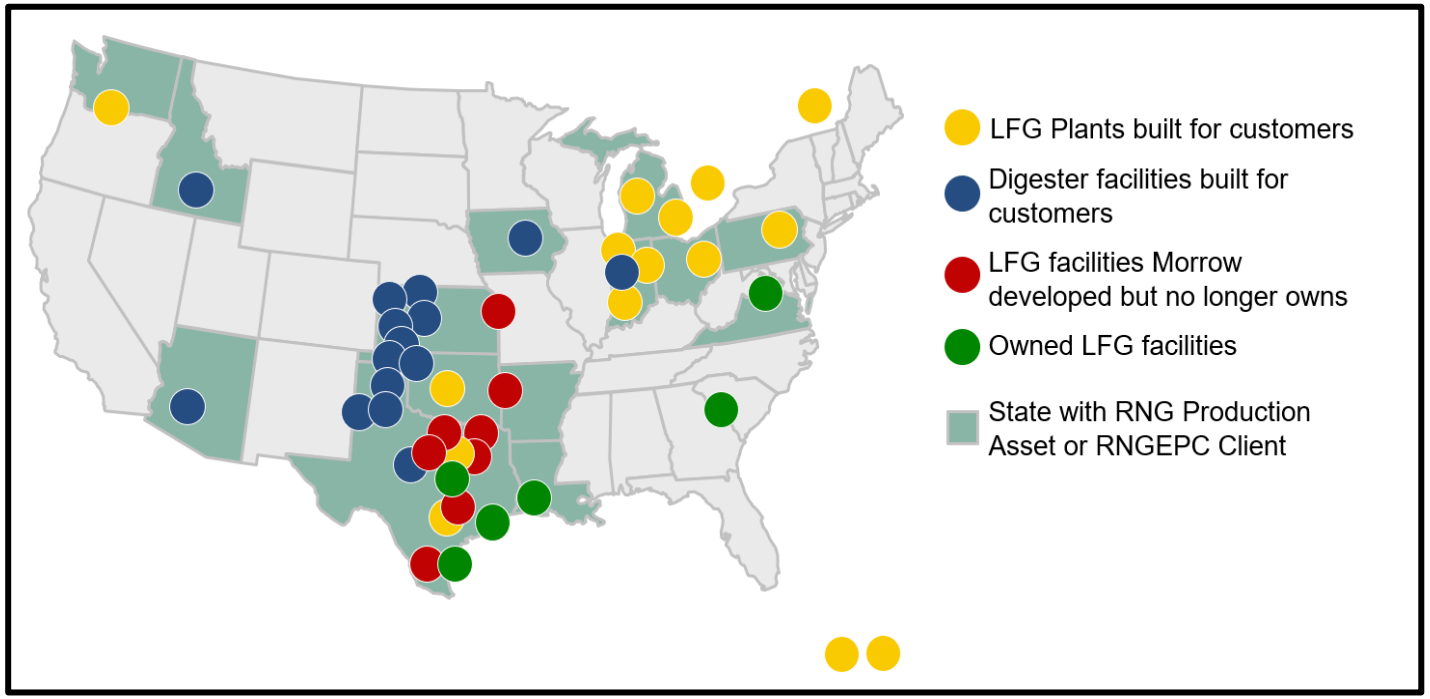
**Background**

Morrow Energy is an RNG Developer and Equipment Fabricator based in Midland, Texas.

Morrow Energy has built 45 RNG plants in our 25 years in the RNG industry.

**Stages of Project**

- Evaluating Project
- Contract Negotiation/Design
- Construction
- Operation



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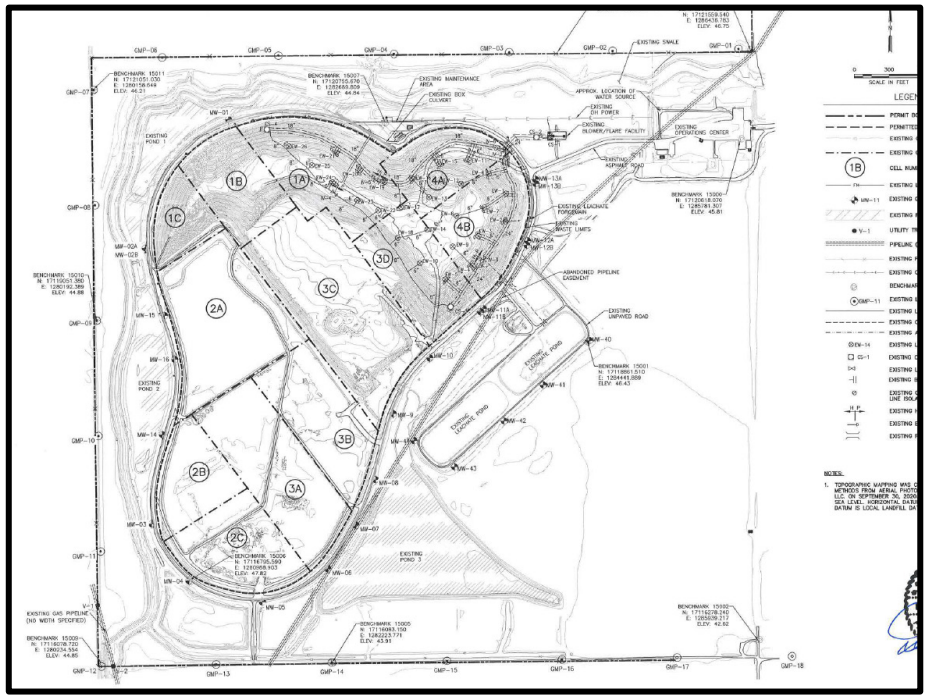
# Evaluating RNG Project Opportunity

- Understand Landfill History
- Evaluate Landfill Potential
  - Tons in place, waste mix, annual tons, site life
  - Collection system condition and expansion opportunities
  - Historical flow to flare and well readings
- Evaluate Site
  - Siting for RNG facility
  - Available pipeline interconnects
  - Electricity to site
  - Utilities (water/sewer/internet)
- Make site visit



**These factors were taken into consideration to determine plant sizing and gas production potential and produce a proposal for the City.**



MORROW ENERGY

# Awarded Project – Detailed Engineering and Design

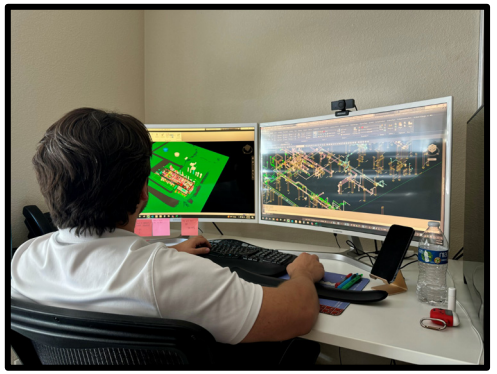
**Negotiate Contract with City**

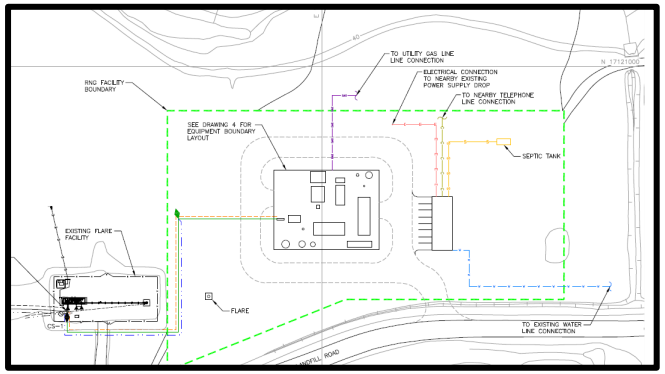
**Plant Site**

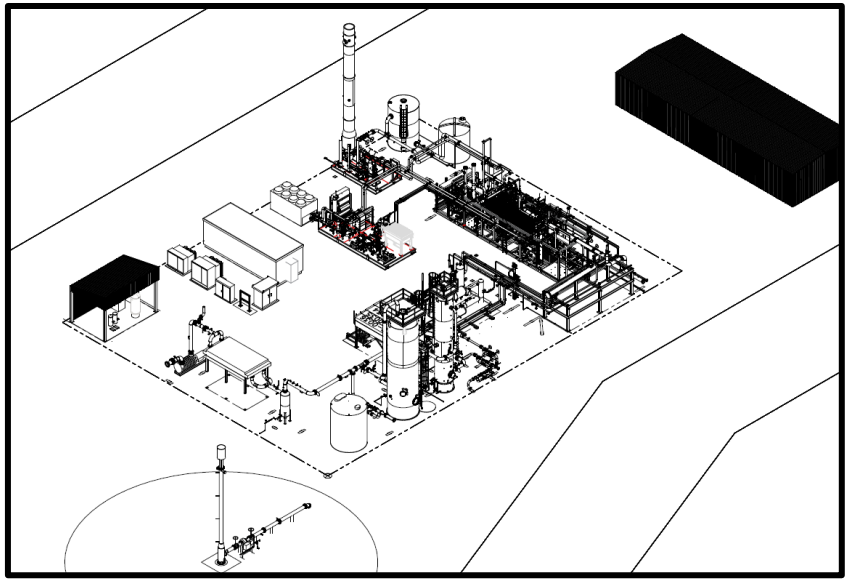
- Finalize design point for RNG facility
- Develop civil, mechanical, and electrical scope
- Begin permitting process – air permit, state permitting, solid waste permit modification
- Submit pathway to EPA to generate RINs
- Initiate interconnects with pipeline and electrical utilities
- Purchase long lead equipment

**Wellfield**

- Visit site to gather information on current conditions
- Develop plans for optimization and expansion





**Many tasks require close coordination and cooperation between Developer and City.**



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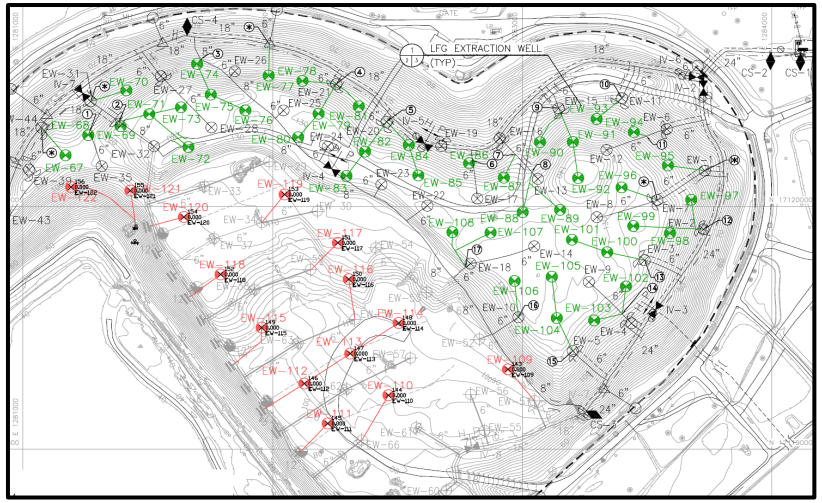
# Construction

**Plant Site**

- Execute Civil Scope
- Ship equipment from fabrication shop to site
- Mechanical and Electrical Scope

**Wellfield**

- Take over wellfield O&M responsibly
- Upgrade existing infrastructure as necessary
- Drill new wells to maximize gas collection

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# Operations

**Enter Long-Term Operations**

- 5 full-time jobs to operate RNG plant and wellfield
- Environmental benefits
  - Natural gas to power 10,000 homes
  - Annual carbon reduction is equivalent to:
    - 450,000 acres of forest
    - Avoiding use of 39MM gallons of gasoline

- Royalty payments to City to be used to benefit landfill and local citizens



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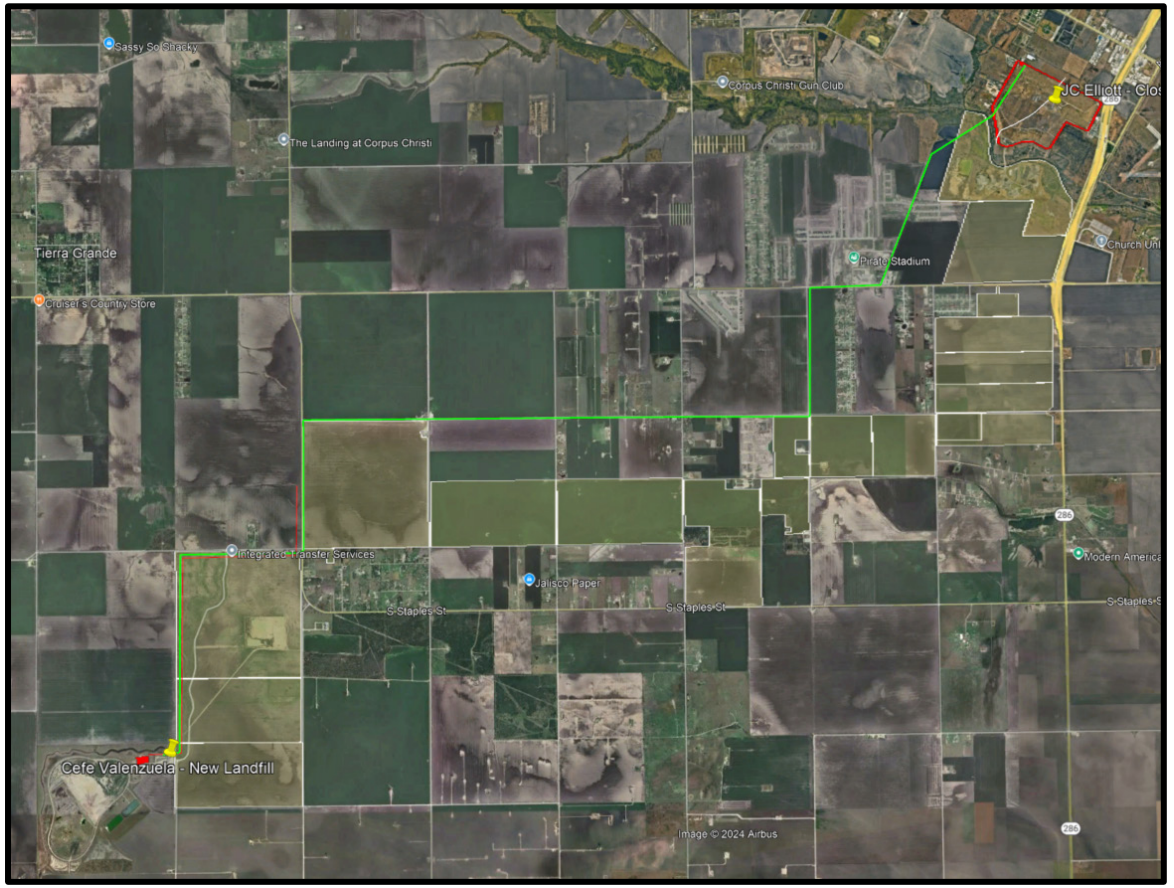
# Additional Opportunity – Connect Satellite Landfill

In addition to gas from the main landfill, Morrow and the City are working together to connect gas from a closed landfill to the RNG facility.

The closed landfill has not received trash in more than 10 years but is still producing a significant amount of gas.

Morrow paid the City's Gas Department to install and operate the 12-mile pipeline between the two sites.

This expansion will bring benefit to the City, community, and RNG project.






MORROW ENERGY

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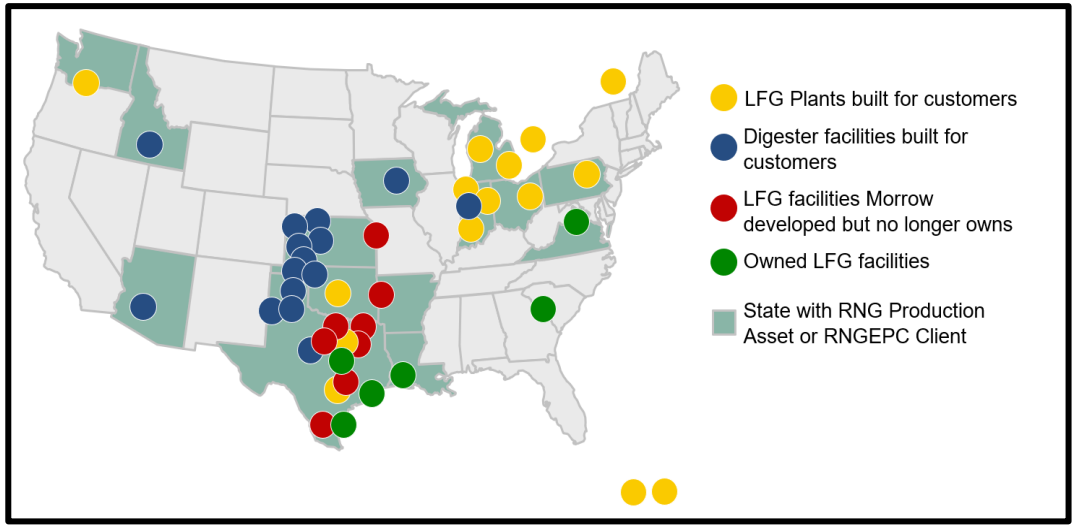


https://morrowenergy.com/contact-us/



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# *Case Study for a 1,000 scfm WAGABOX® Project at the Steuben County Landfill in New York*

# Case Study for a 1,000 scfm WAGABOX® Project at the Steuben County Landfill in New York

EPA LMOP Webinar


USA | November 2024

# Agenda

- Background on Project Partners
- Case Study: Steuben County Landfill (NY)
- Focus on WAGABOX® technology and nitrogen management

# Who is Waga Energy?

Headquartered in France with subsidiaries in the **USA**, Canada, Spain, UK, and Italy

**Publicly listed** on the Euronext Stock Exchange with a strong financial backing

Inventors of the **WAGABOX®**, a breakthrough technology in landfill gas upgrading

**27** WAGABOX® facilities in operation, **11** more under construction

**250+** landfill gas to energy experts worldwide

Driven by an absolute **dedication** to the **safety** of our employees and partners

**We are engineers, entrepreneurs, and environmentalists committed to mitigating climate change for future generations.**

# wagaBOX®

waga energy

## 27 Units in Operation and 11 More Under Construction















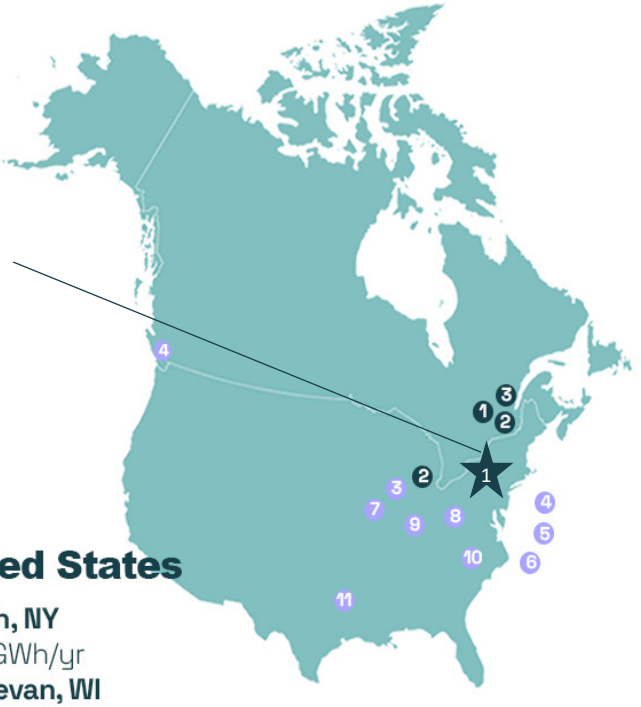
Your WAGABOX® Here!

# Introduction to Steuben County, NY

Established in March 1796, Steuben County covers **1,397 square miles** with a population of **approximately 94,000 people** living in rural agricultural areas, quaint small towns, and small city communities.

New Bath Landfill features six cells, employs 26 people, and includes advanced technology like the **WAGABOX® unit**.

**WAGABOX®**
Steuben County, NY




## United States

1. **Bath, NY**
   60 GWh/yr
2. **Delevan, WI**
   Air Liquide
3. **Winnebago, IL**
   Air Liquide
4. **Casella Waste Systems ***
5. **Casella Waste Systems ***
6. **Casella Waste Systems ***
7. **Scott County, IA**
   60 GWh/yr
8. **Chester County, PA**
   130 GWh/yr
9. **Decatur Hills, IN**
   55 GWh/yr
10. **Rockingham, NC**
    60 GWh/yr
11. **OCI, Beaumont, TX**
    100 GWh/yr

* total capacity 380 GWh/yr

## Canada

1. **Saint-Etienne-des-Gres**
   130 GWh/yr
2. **Cowansville**
   30 GWh/yr
3. **Chicoutimi**
   16 GWh/yr
4. **Hartland**
   130 GWh/yr

● Operational
● Under Construction

### PROJECT DETAILS

LOCATION
**Bath, New York, USA**

LANDFILL OPERATOR
**Steuben County, NY**

COMMISSIONING
**Q1-2024**

WAGABOX® CAPACITY
**1000 scfm**

RNG PRODUCTION
**220,000 MMBtu/y**

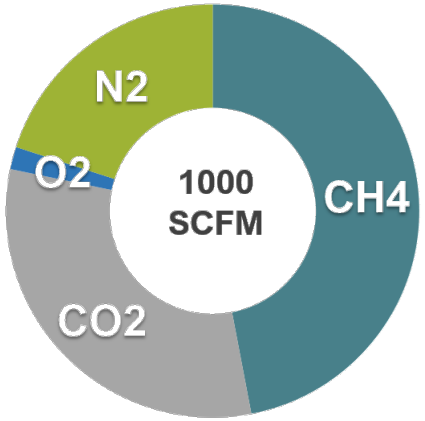
DISTANCE OF THE GAS GRID:
**3 miles**

HOUSEHOLDS SERVED:
**4,000**

CO2 AVOIDED:
**13,500 Tons of CO2/YR**

### BIOGAS PARAMETERS

CH4: **39-55%**
O2: **0-3.5%**
N2: **19%**
H2S: **1,300 ppm**



# Case Study: Steuben County Landfill (NY)

## Previous landfill gas to electricity project

**Once upon a time,**

**15 years BG (Before Gas) there was…**

# Case Study: Steuben County Landfill (NY)

## Previous landfill gas to electricity project

- Operations began in 2009
- Retired electricity project after 10 years
- Facility was preserved in 2019
- The County then purchased the electric plant
  - Including the building, the equipment, and the gas rights
- The Steuben County Board authorized County staff to look at other uses
- Worked with Barton & Loguidice and Environmental Attribute Advisors **to develop an RFP**

# Case Study: Steuben County Landfill (NY)

## Pre-Bid Site Visit

**Problem:**

- COVID
- Remote Work
- Travel Bans

**Solution:**

- Prepare a drone video
- Narrate the video
- Present the video in a zoom meeting

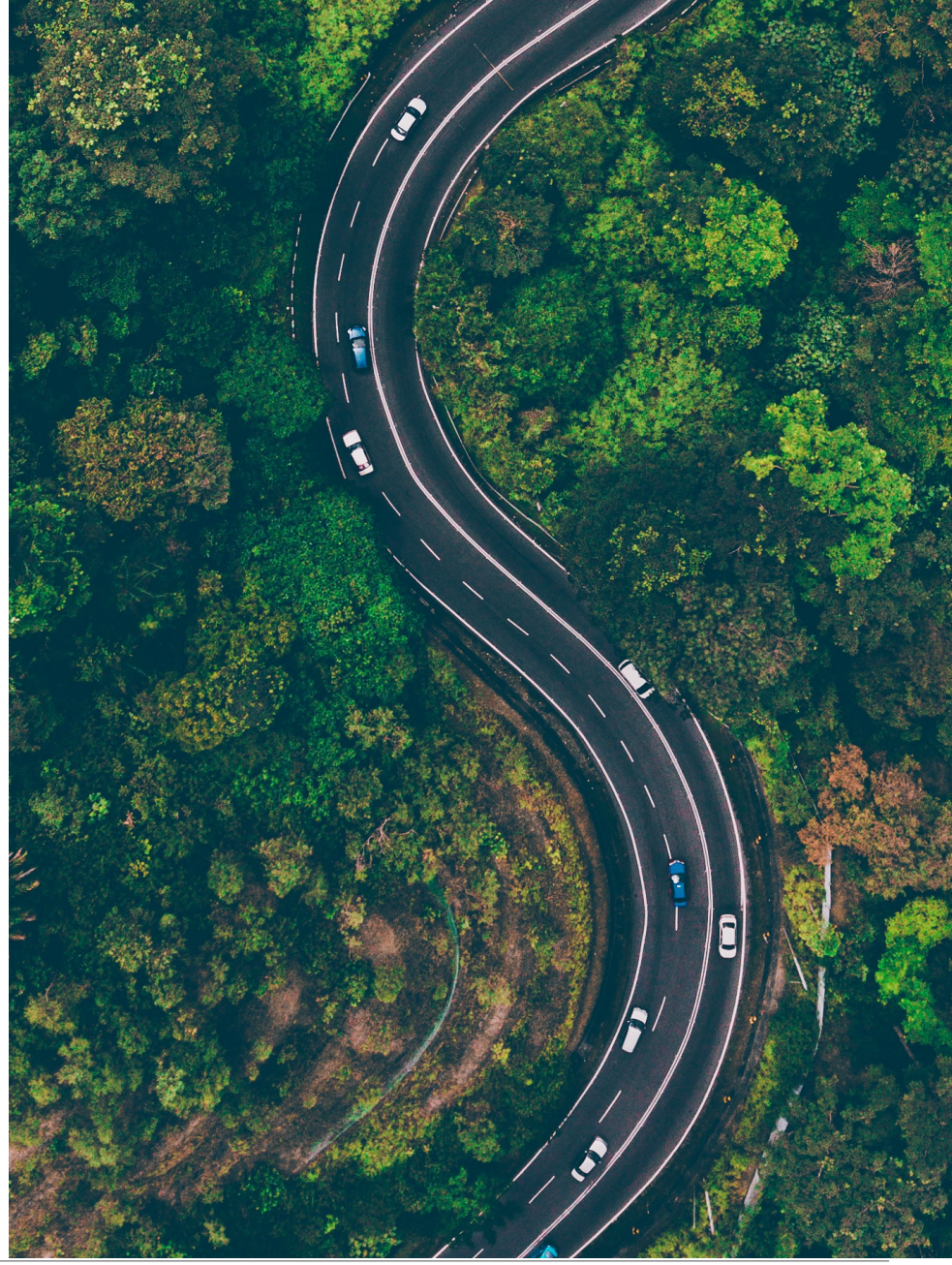
# Case Study: Steuben County Landfill (NY)

## Contracting Phase

Steuben received multiple bids with several different project approaches.

- RFP was issued in July 2020
- Interview February 2021
- Due Diligence begins May 2021
- Under contract December 2021

***The County reviewed the different proposals, and selected Waga Energy and agreed on a 20-year contract.***



# Case Study: Steuben County Landfill (NY)

## Permitting for the WAGABOX® facility

The County negotiated with DEC to **transfer existing gas to energy facility air permit into the name of the County.**

- This included maintaining a separate permit for the electric plant and not converting the permit to common control.
- This provided flexibility to the County so that potential bidders could assume ownership of the air permit if awarded the contract.

The County was designated Lead Agent for the State Environmental Quality Review process.

- **Waga Energy was responsible for their own permits**: used a familiar company, separated permits, and County included in permit development process.

# Case Study: Steuben County Landfill (NY)

## Construction of the WAGABOX® facility

**Site Grading**

- Performed by the County
- Quality control by Barton & Loguidice
- Low cost
- Reduced Waga Energy's time on site
- 100% cut site
- Net benefit to the project and to the County

**Air Permit**

- Received in October 2022
- Allowed rough grading to be complete in December 2022

**Once full construction started, Waga Energy took over site control and the County moved into an advisory and assistance role.**


Construction of the WAGABOX® Unit in Steuben County

Construction of the WAGABOX® Unit in Steuben County


Construction of the WAGABOX® Unit in Steuben County

# Construction
## of the WAGABOX® facility

**Modular approach** – compared to traditional construction

- Much smaller crews
- Less material deliveries
- Less time on site

**Separate gate entrance**

- Separated RNG construction from landfill operations
- Isolated from cell construction

The County **was very involved in coordinating the location** of the Corning Natural Gas pipeline route on the landfill property.


wagaBOX®
*Steuben County, NY*

# Commissioning
## of the WAGABOX® facility

- Commissioning phase began once the project **achieved mechanical completion** (when Waga Energy turned on equipment and brought LFG to the WAGABOX®)
- Normal starts and stops occurred and were addressed; the WAGABOX® came **online relatively fast**
- LFG introduced into the WAGABOX® in Feb 2024, and was **injecting RNG** into the Corning Natural Gas system by March 2024

# Current Operations

**Compared to the gas to electricity project:**

- The WAGABOX® provides more stable vacuum and less fluctuations
- The WAGABOX® can handle higher nitrogen levels: **up to 30%**
- The WAGABOX® accepts a wide range of gas quality – less than 40% methane
- Consistent and reliable operations

wagaBOX®
*Steuben County, NY*

# Current Operations

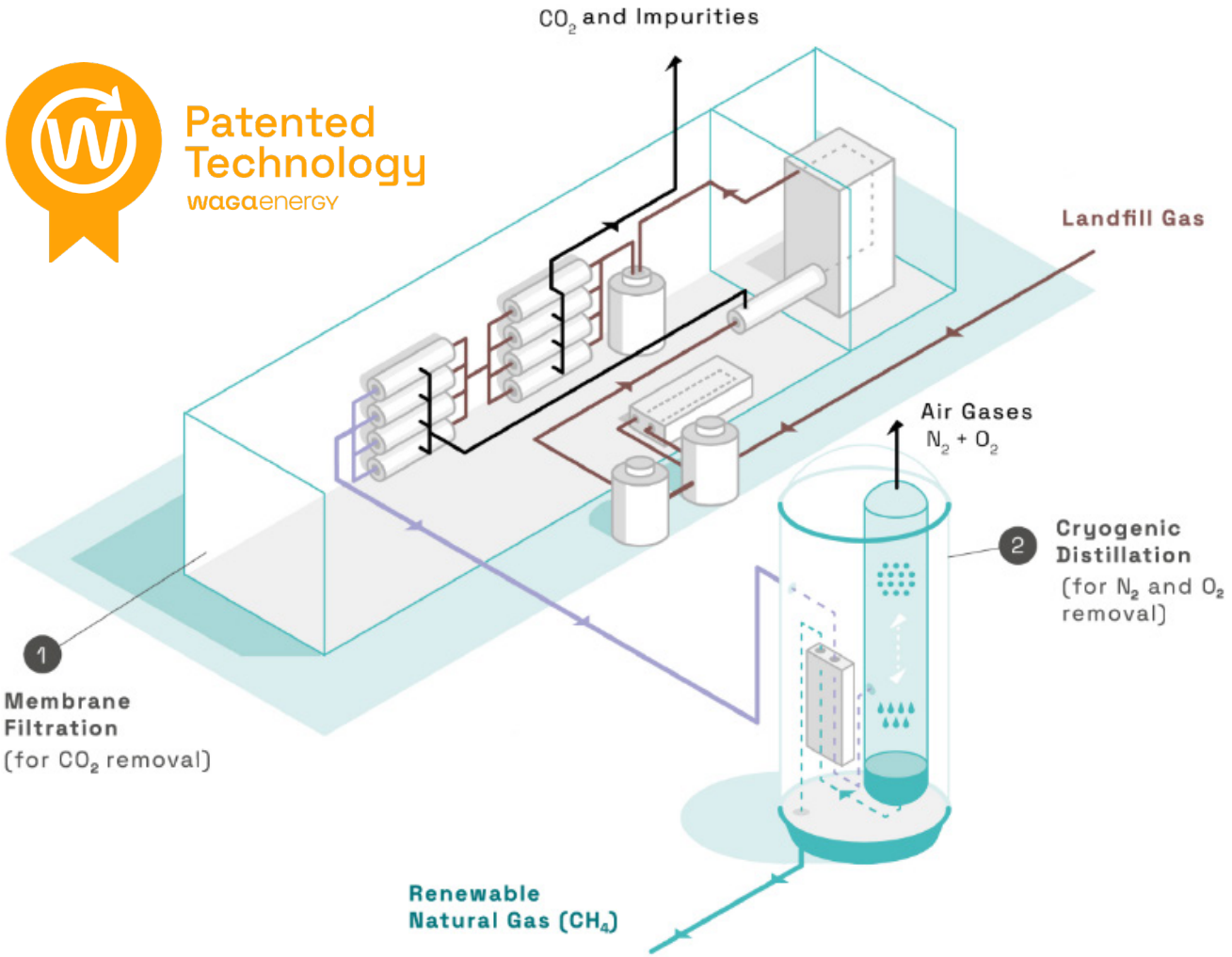
## Impact on Wellfield Operations

The County **maintains control of the wellfield** and Waga Energy provides **annual payments** to the County for wellfield operations.

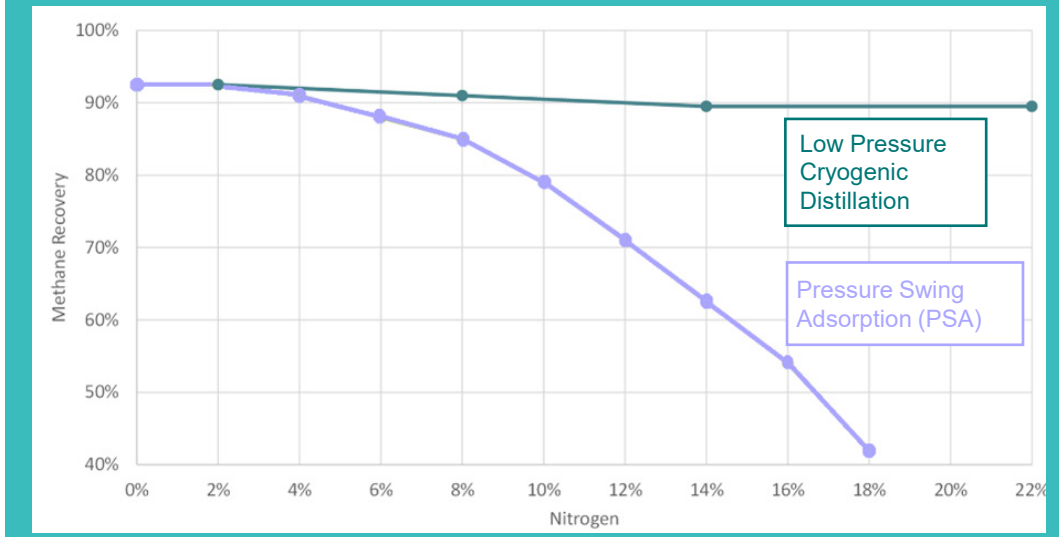
The County hired a 3rd party with the revenue from the RNG project, and that service provider has been **making improvements** to ensure the County is getting the maximum amount of gas out of the system.

Minimal LFG flaring reduces site emissions and **improves local air quality**.

# The WAGABOX® patented technology has revolutionized the landfill gas to RNG industry




## Methane Recovery Performance vs. Nitrogen




- Up to 30% nitrogen in the LFG
- Over 95% availability
- Over 90% methane recovery
- Pipeline-compliant (> 98% methane content)

# WAGABOX® 1000 at the Bath Landfill in Steuben County, NY

# Tuning a landfill gas collection system to reduce nitrogen content in the LFG will result in a loss of energy recovered and could create potential compliance issues

LANDFILL METHANE OUTREACH PROGRAM

## LMOP Renewable Natural Gas (RNG) Flow Rate Estimation Tool

# Summary Report

Landfill using legacy RNG technology

May 21, 2024

| | Initial | Adjusted |
|---|---|---|
| **LFG Constituents** | | |
| Nitrogen ($N_2$) | 15.1% | 8.0% |
| Methane ($CH_4$) | 48.2% | 50.7% |
| Carbon Dioxide ($CO_2$) | 35.1% | 40.5% |
| Oxygen ($O_2$) | 1.6% | 0.8% |
| **Flow Rate (scfm)** | 1,100 | 901 |
| **Heat Rate (MMBtu/hr)** *(HHV basis)* | 32 | 28 |

**Figure 1: Adjusted Gas Quality**

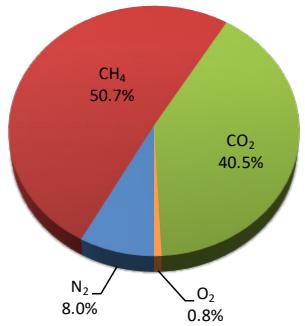



**Figure 2: Comparison of Initial and Adjusted LFG Flow Rate**

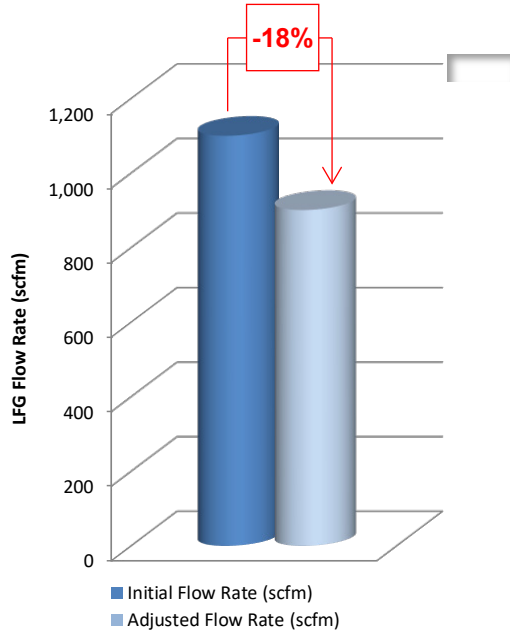
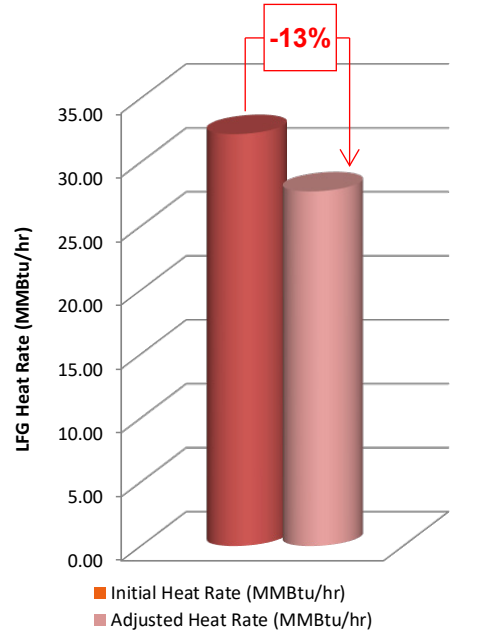



**Figure 3: Comparison of Initial and Adjusted LFG Heat Rate (HHV basis)**



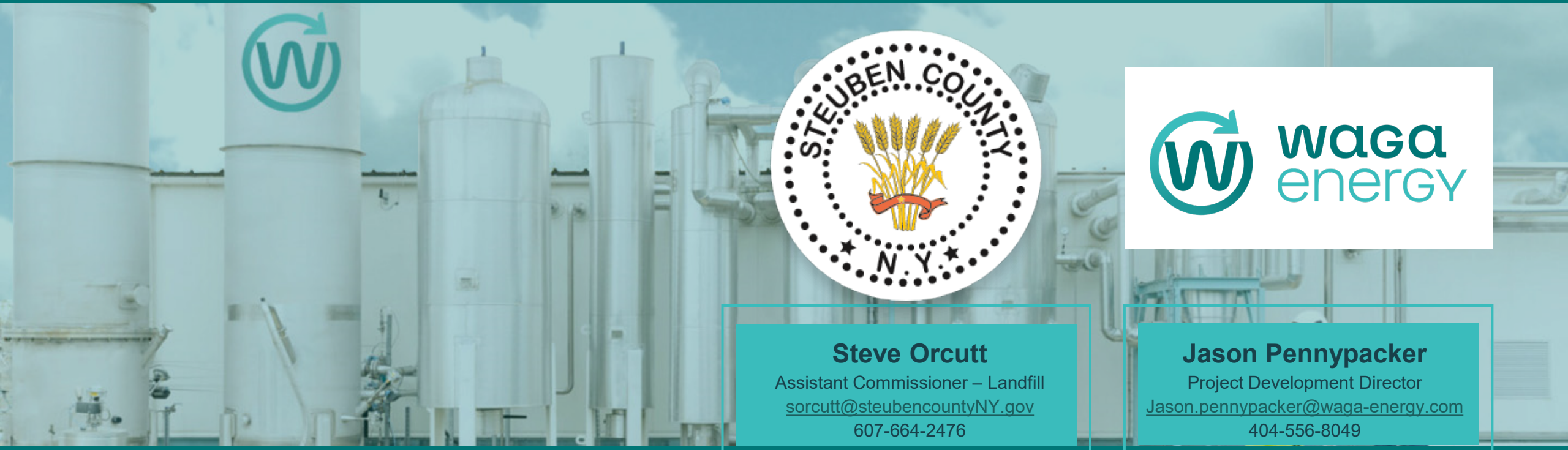

- Lost revenues
- Possible surface emissions
- Risk of odor complaints

Source: EPA LMOP RNG Flow Rate Estimation Tool

# Conclusion

- RNG projects are **possible** and **profitable** on small- to mid-sized landfills
- Up to **30% nitrogen** in the landfill gas can be accepted with the WAGABOX® technology
- Resources like the **LMOP RNG Flow Rate Estimation Tool** can help landfill owners and operators understand energy potential of their landfill gas

# Contact us for more information

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# Questions and Answers

# Wrap Up

- The slides and recording from today's webinar will be posted on the LMOP website
- To learn more about LMOP or LFG energy, visit our website at epa.gov/lmop
- Have a webinar idea? Drop us a note with your email in the Q&A box or email lmop@epa.gov