



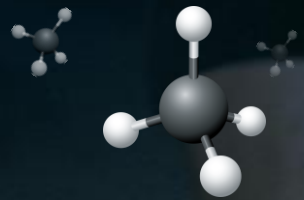
WAGA  
ENERGY

# RENEWABLE NATURAL GAS PROJECTS IN NEW YORK STATE

Leveraging the RNG Potential of  
Small Landfills

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NYSASWM 2023



Methane concentration in the atmosphere is at its highest level in the last **800,000 years.**

If methane emissions are not reduced, it could **undermine the goals of the Paris Agreement.**

*2021 IPCC Report*



All over the world, landfills are a **major source of methane emissions** as well as an immediately available gas



Leveraging 15+ years of R&D, **Waga Energy transforms landfill methane emissions into pure biomethane**

**Our Mission :**

Curb pollution by delivering biomethane for all



**Our Ambition :**

To partner with landfill operators to reduce methane emissions by producing biomethane around the world



Waga Energy, a **unique energy transition solution** to fight against climate change

# WHO IS WAGA ENERGY?



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



**17** WAGABOX® facilities in operation, **16** projects in execution



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



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



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



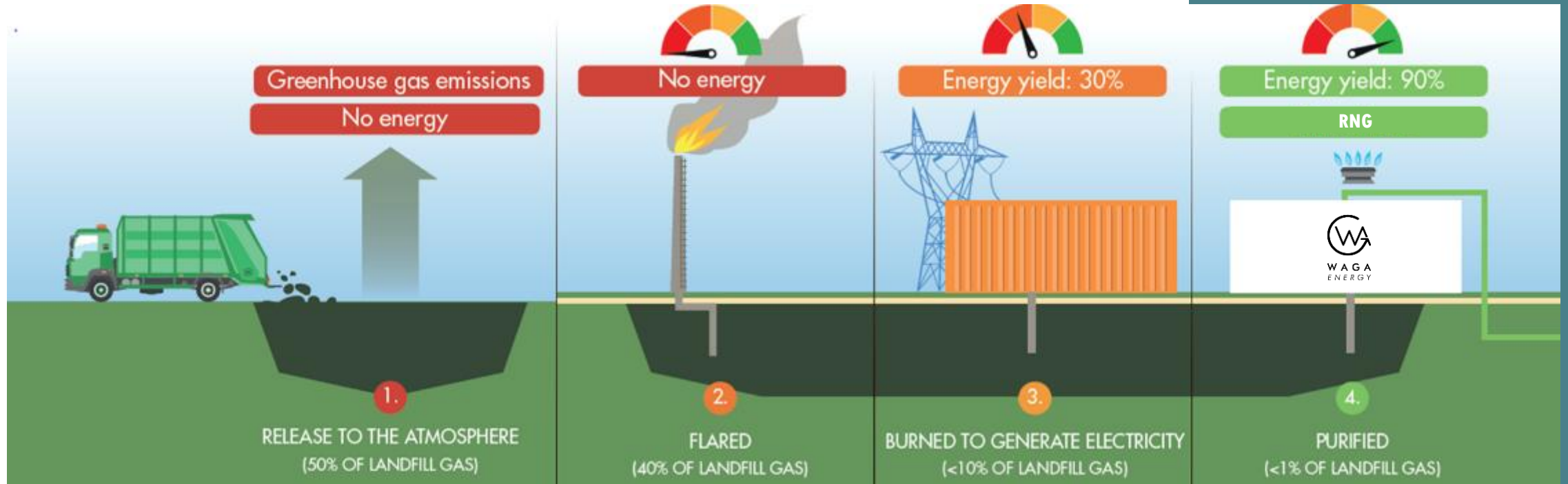
Active participants in the RNG community, and **proud members** of SWANA, RNG Coalition, and American Biogas Council



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



# LANDFILLS, WHERE RNG POTENTIAL IS STILL LARGELY UNEXPLOITED



**+90%**

**More than 90% of landfill gas is unused**

**<10%**

**Less than 10% is burned with low energy yield**

**<1%**

**Less than 1% is recovered and purified for grid injection**

Source: Waga Energy

# RNG POTENTIAL FROM NEW YORK STATE LANDFILLS

Landfill Gas to RNG projects in New York could reduce CO2 emissions more than **700,000 tons CO2e**  
**724 tons/1000 scfm**

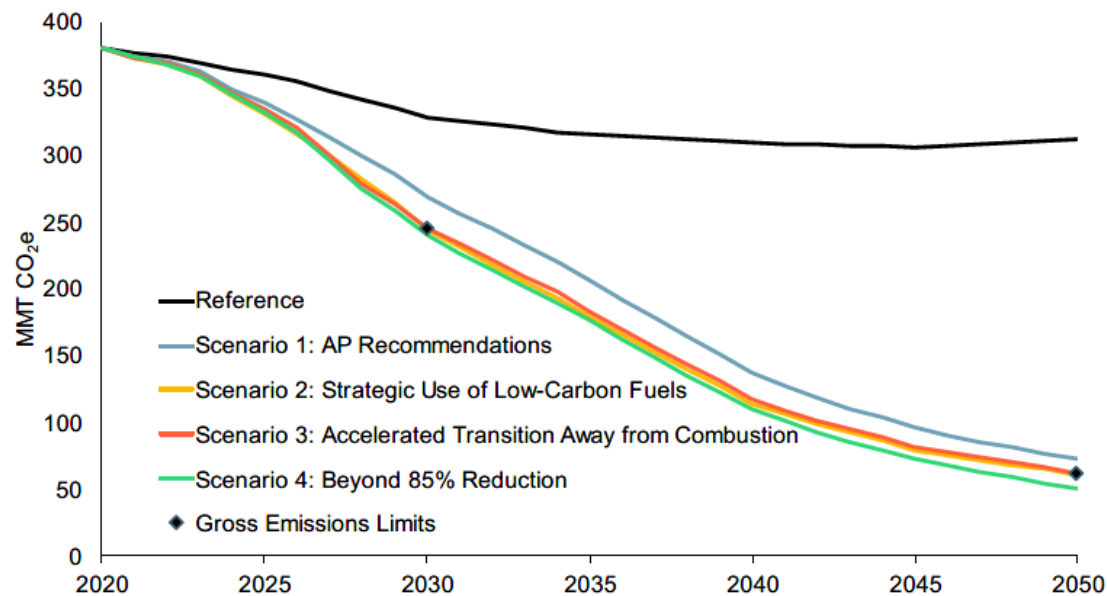
**700,000+**  
**CO2 avoided**

**53,000**  
**SCFM**  
**of landfill gas**

52,794  
scfm

**20**  
**landfills, with**  
**RNG potential**

Figure 4. Greenhouse Gas Emissions by Mitigation Scenario



Source: Climate Action Council Dec-2022, NY

# 02

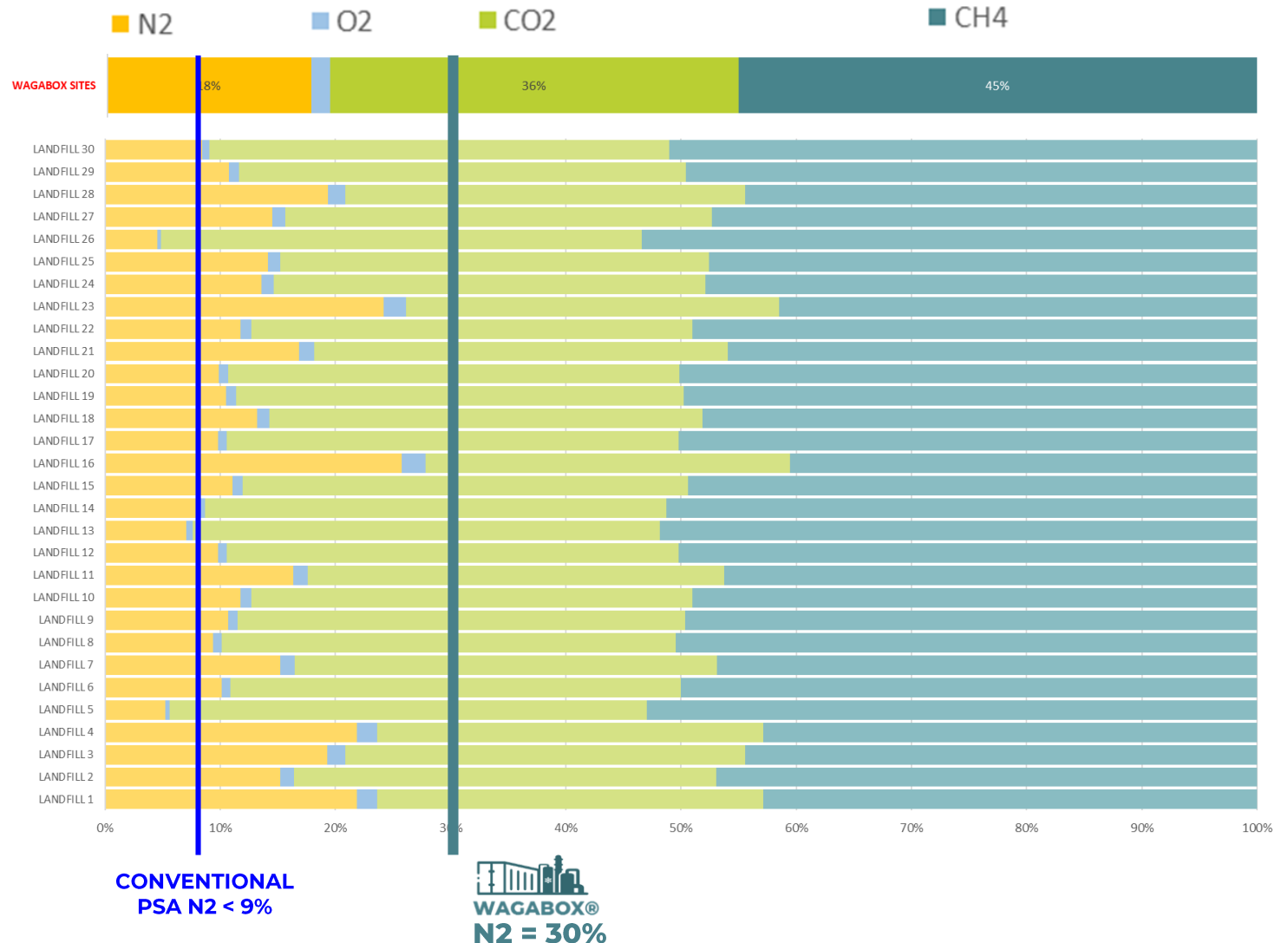
## Common challenges encountered with RNG project development



# WHY IS UPGRADING LANDFILL GAS INTO RNG A CHALLENGE?

## Key Notes

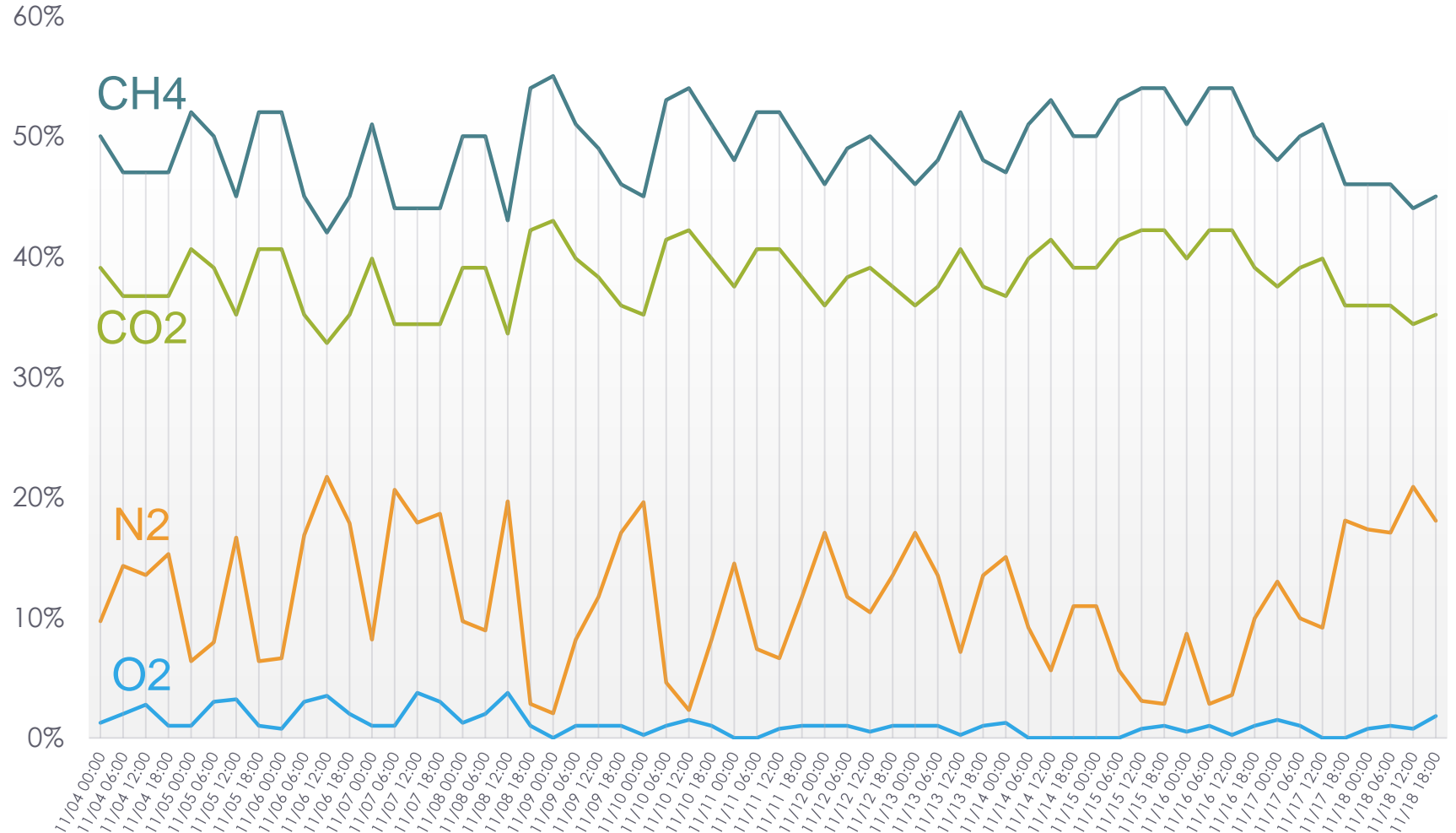
- Landfill gas is mainly composed of CH<sub>4</sub>, CO<sub>2</sub>, N<sub>2</sub> and O<sub>2</sub>.
- Landfill gas composition varies and is unique to every site.
- Existing technologies are highly sensitive to air gases (N<sub>2</sub>+O<sub>2</sub>).
- Low pressure cryogenic distillation technology revolutionizes how nitrogen and oxygen are removed from landfill gases.



# WHY IS UPGRADING LANDFILL GAS INTO RNG A CHALLENGE?

## Key Notes

- Unpredictable variations in gas flow and composition.
- Reducing air intake in the wellfield is costly
- Limiting wellfield vacuum exposes the landfill operator to compliance and odor issues.
- Accepting air gases in Landfill Gas increases the total amount of energy recovered.



**Low pressure cryogenic distillation can accept a wide range of landfill gas quality and still achieve pipeline quality requirements.**

# WELLFIELD TUNING: A PARADIGM SHIFT

- **Improved Odor Management**

As more gas is collected, the odors associated with landfill gas leakage are also collected and appropriately treated.

- **Decreased OPEX**

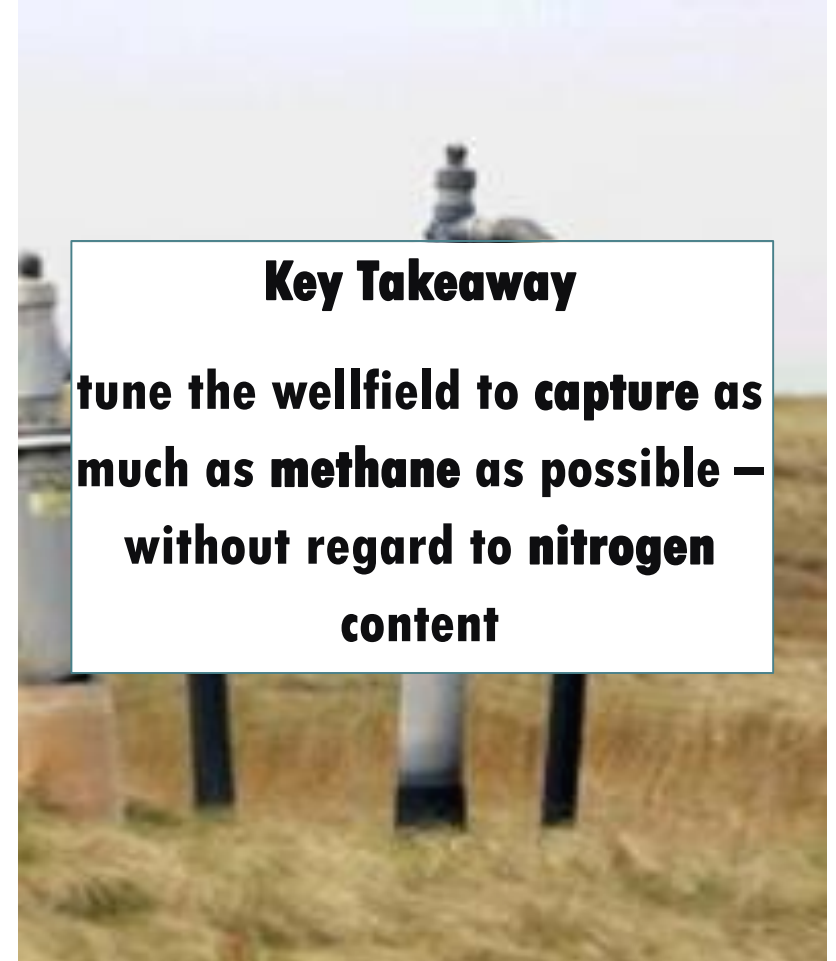
With new LFG upgrading technologies, wellfields don't require constant tuning for the removal of nitrogen to improve methane concentrations.

- **Reduction in Pollution:**

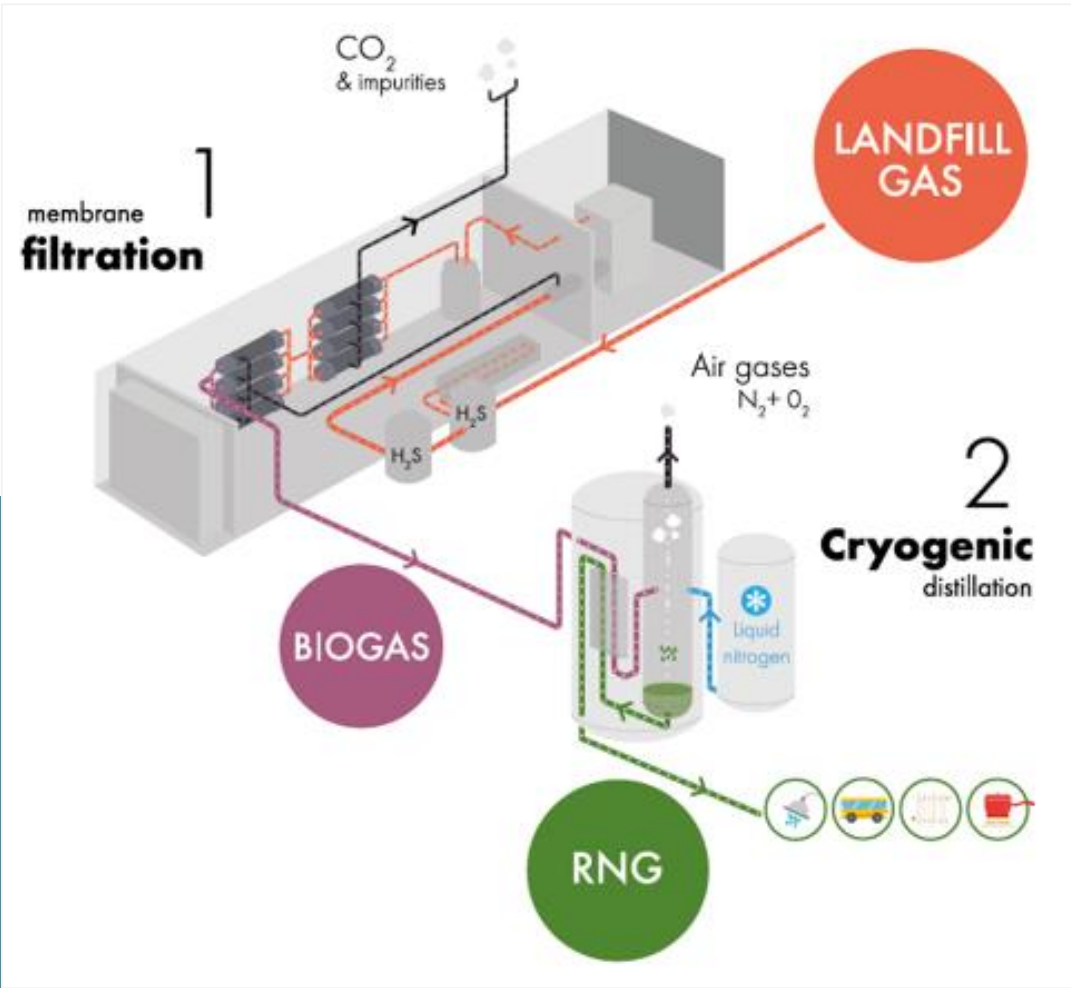
Approximately 5% of the world's GHG emissions come from waste.

- **Increased Revenues**

Through converting pollutants into a profit stream, you are transforming methane from a liability to a significant source of revenue, supporting the circular economy and fueling the local community.



# UNIQUE PATENTED TECHNOLOGY COMBINING MEMBRANE FILTRATION AND LOW-PRESSURE CRYOGENIC DISTILLATION



## A 2-step process

1

**Membrane unit**  
for CO<sub>2</sub> & VOC removal

2

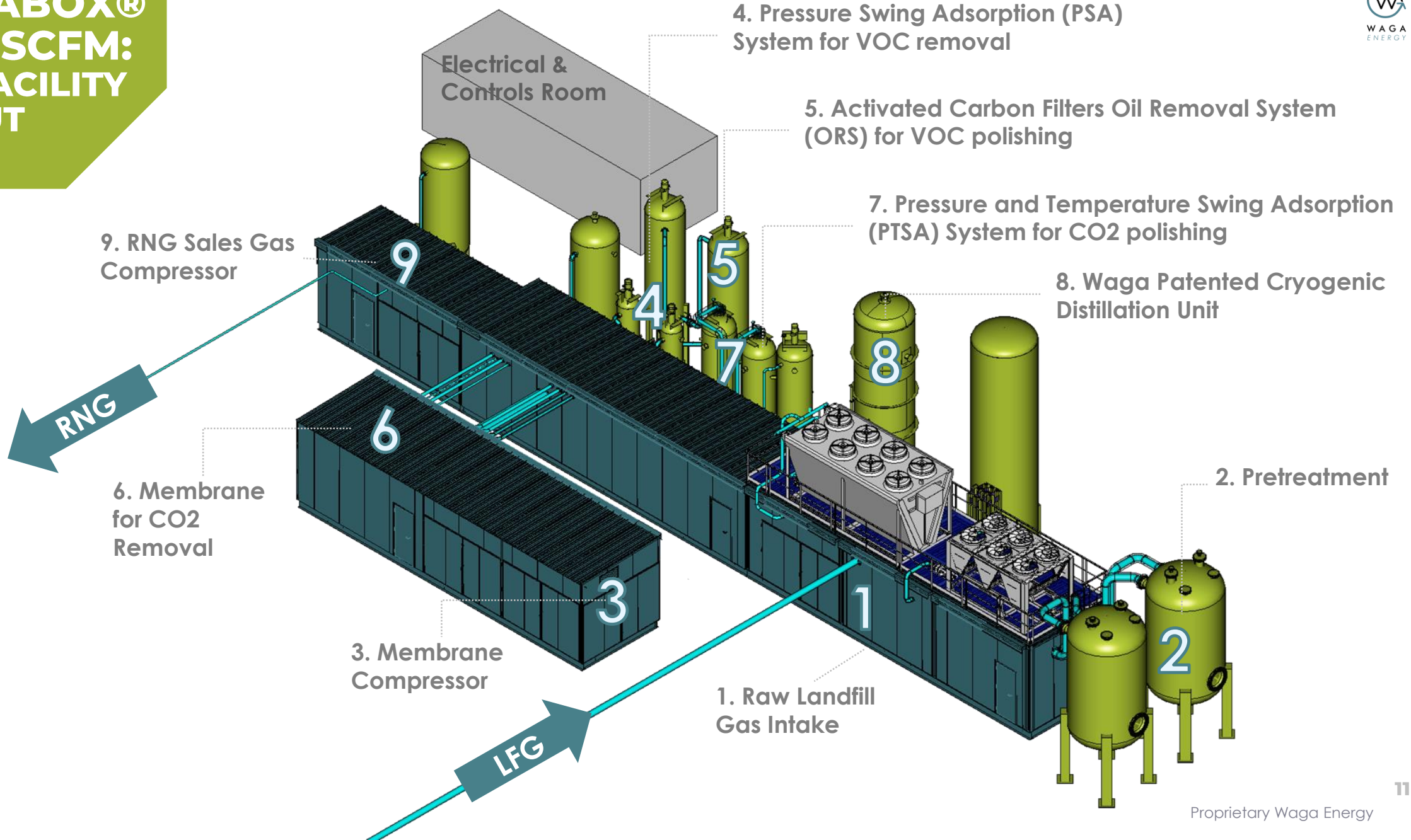
**Cryogenic distillation**  
for N<sub>2</sub> & O<sub>2</sub> removal

**6 patents worldwide**  
including 2 main patents

Process for the production of RNG from the purification of landfill biogas

Cryogenic process for the separation of a feed gas containing methane and air gases

# WAGABOX® 1,000 SCFM: RNG FACILITY LAYOUT



# 04

## Small Site Development: A Case Study of Steuben County



# STEBEN COUNTY – NEW BATH LANDFILL



## Stakeholders:

- Steuben County
  - Citizens of Steuben County
  - Commissioner of Public Works
  - Assistant Commissioner of Landfill
  - New Bath Landfill
- Corning Natural Gas, the smallest publicly traded utility in the US
- Barton & Loguidice administered RFP, consulting & permitting for the county, long time local partner in NY state
- Environmental Attributes Advisors, LLC, financial consultant

# STEUBEN COUNTY – NEW BATH LANDFILL

## Challenges:

- Low gas flows >650 SCFM at time of RFP
- High nitrogen, excess of 19%
- Complex gas interconnect
  - Distant interstate pipeline
  - Local utility lacked demand for all available RNG



# STEBEN COUNTY – LFG TO ELECTRICITY PROJECT



- In 2009, the County entered into an agreement with Steuben Rural Electric Cooperative (SREC) to develop a LFG-E Facility at the landfill site.
- Steuben County received royalties from the sale of electric power

# STEUBEN COUNTY – THE TRANSITION



## Previous Project

- Market conditions for the LFGTE facility didn't support continued operations
  - Low prices of electricity
  - Limited geographic footprint
- Underperforming asset created lack of funding/incentives available for wellfield improvements
- Project was decommissioned in 2019
- The County began discussions with Barton & Loguidice to prepare a RFP for a replacement beneficial use project

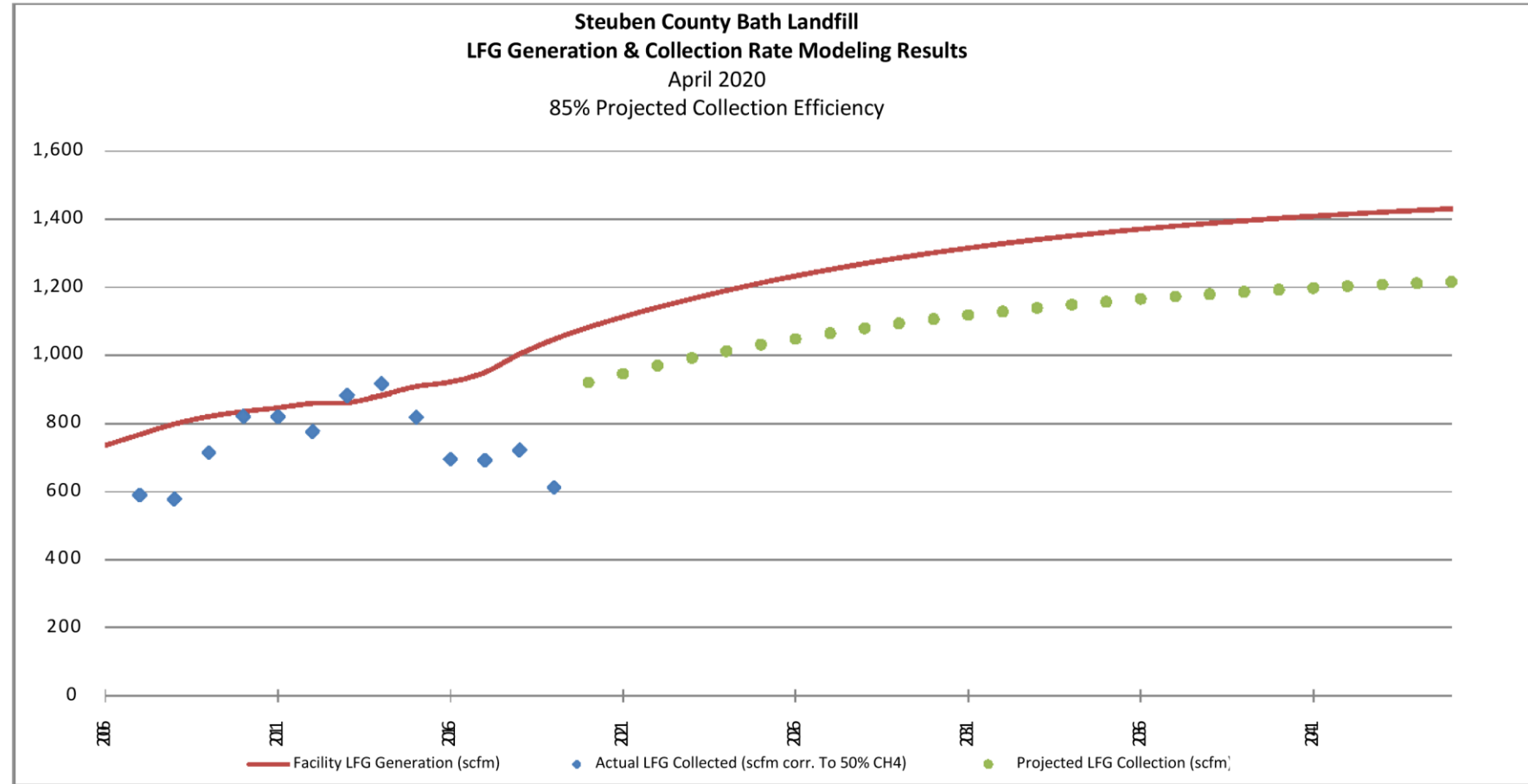
## The RFP Process

- The County organized a RFP team including County Staff, Barton & Loguidice, and Environmental Attributes Advisors to administer a RFP
- The County Initiated an RFP in 2020 (mid Covid)
- Site Visit
  - Virtual site visit – pandemic response
  - Onsite – NYS travel restrictions



# STEUBEN COUNTY – CASE STUDY

- Active in managing gas collection system to maintain compliance
- Underperforming landfill gas to electricity project impacted LFG collection prior to decommissioning
- The County purchased the LFG-E Facility, along with the rights to the LFG, from SREC in 2019.



# STEUBEN COUNTY – CASE STUDY

## The Selection Process



### **Long-term Partnership Mindset**



### **Minimal Risk**

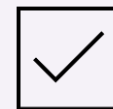


### **Gas Interconnection Solution**

- Local gas distribution



### **Rigorous Due Diligence to Confirm**



### **Technology**

- Proven technology and operations
- Consistent and reliable operations
- Capability to gas quality



### **Financial**

- Benefits to the County
- Resilient value proposition in variable market conditions
- Stable revenue sharing

# Steuben County – Case Study



Shutdown of LFG to energy project and acquired gas rights

Start of RFP development

Virtual site visit and pre-proposal meeting

Interview process

Due diligence begins

**February 2019**

**February 2020**

**August 2020**

**February 2021**

**May 2021**



**March 2019**

**July 2020**

**October 2020**

**May 2021**

Began discussions on a new beneficial use project

Issue RFP

Proposals received 5 bidders

Waga Energy selected



# Steuben County – Case Study



# STEUBEN COUNTY – CASE STUDY



## PROJECT DETAILS

### LOCATION

**Bath, New York, USA**

### LANDFILL OPERATOR

**Steuben County, NY**

### COMMISSIONING

**Q4-2023**

### WAGABOX® CAPACITY

**1000 scfm**

### RNG PRODUCTION

**220,000 MMBtu/y**

### DISTANCE OF THE GAS GRID:

**3 miles**

### HOUSEHOLDS SERVED:

**4,000**

### CO<sub>2</sub> AVOIDED:

**13,500 Tons of CO<sub>2</sub>/YR**

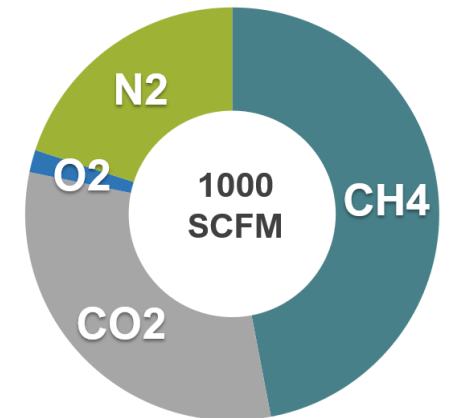
## BIOGAS PARAMETERS

**CH<sub>4</sub>: 39-55%**

**O<sub>2</sub>: 0-3.5%**

**N<sub>2</sub>: 19%**

**H<sub>2</sub>S: 1,300 ppm**



*“Steuben County is thrilled to partner with Waga Energy in leveraging landfill gas in an environmentally conscious and economically advantageous project. Waga Energy has proven to be a highly innovative international firm and bringing this collaboration to fruition will benefit Steuben County and our region for many years to come.”*

Jack Wheeler

Steuben County Manager

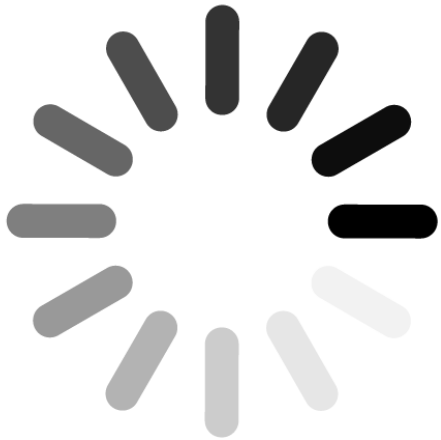


# RESULTS

- The RNG opportunity helped Steuben County secure approval to expand the landfill in a highly regulated market (NY)
- Steuben County made investment commitments for the gas collection system
- Implemented a solution providing attractive royalties for a 20-year term allowing Steuben County to recover the costs from acquiring the gas rights
- Designed a solution that will capture and beneficially use an otherwise detrimental greenhouse gas
- Small landfills can have a big impact on the local community



# WAGABOX® FACILITY CONSTRUCTION PROGRESS



## HOW DO WAGA ENERGY SOLUTIONS BENEFIT THE LANDFILL?



**Emissions reductions:** Our solution converts methane from a liability to a significant revenue source for the landfill.



**Minimal impact on landfill operations:** The modular approach and compact design of the WAGABOX® adapts to your landfill.



**Focus on compliance & reduction of odors:** The WAGABOX® delivers pipeline-quality RNG regardless of landfill gas quality and flowrate.



**Risk-free approach:** Our development approach combined with the performance of our technology generates predictable revenues for your landfill.

# 17 WAGABOX® FACILITIES IN OPERATION



# NORTH AMERICA PROJECT REFERENCES



## MALLARD RIDGE

- Delavan, WI
- 2000 scfm
- N2: 9%
- COD April-2022



## ST ETIENNE DES GRES

- St-Étienne-des-Grès, QC
- 2000 scfm
- N2: 17-25%
- 33,000t of eqCO2 avoided/y
- COD May-2023



## STEBEN

- Bath, NY
- 1000 scfm
- N2: 19%
- 13,500t of eqCO2 avoided/y
- COD Q1-2024



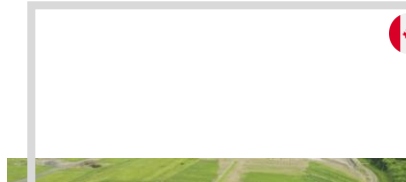
## CONFIDENTIAL

- Location to be informed
- 370 scfm
- COD Q1-2024



## WINNEBAGO

- Rockford, IL
- 6000 scfm
- N2: 24%
- COD Q2-2024



## BROME

- Cowansville, QC
- 600 scfm
- N2: 17-25%
- 6,000t of eqCO2 avoided/y
- COD Q1-2024



## HARTLAND

- Vancouver Island, BC
- 2000 scfm
- N2: 12%
- 18,000t of eqCO2 avoided/y
- COD Q4-2024



## CASELLA

- Location to be informed
- x scfm
- COD 2025



## CASELLA

- Location to be informed
- x scfm
- COD 2025



## CASELLA

- Location to be informed
- x scfm
- COD 2025



## SCOTT AREA

- Davenport, IA
- 1000 scfm
- N2: 15%
- COD 2025



## WHERE IS NEXT?

# Thank You!

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