Confidential





# SWANA FL 2022 WINTER CONFERENCE

Leveraging the RNG Potential of Small to Medium Size Landfills in Florida

Safety Harbor, FL | February 22, 2022



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

WAGA ENERGY

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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 : From a pioneer to a global

leading producer of biomethane



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



### Tanguy Largeau

### Corina Sheridan





Business Development and Commercial VP



Project Development Director



## Introduction to RNG from landfill gas

WAGABOX®, A disruptive solution for purifying landfill gas

Integrated business-model bringing value to landfill operators and gas utilities

## RENEWABLE NATURAL GAS : THE BEST IMMEDIATE SOLUTION TO REPLACE FOSSIL FUELS

### Renewable energy

The production of RNG reduces GHG emissions and replaces fossil fuels

Methane is 80xmore potent for global warming than  $CO_2$  over 20 years

### Abundant and available

Significant potential to produce biomethane from landfills is largely untapped:

**20,000** landfills worldwide

### Existing infrastructure

3

Transport and consumption supported by the existing infrastructure

Can be directly injected in the existing grid

# Equally distributed **worldwide**

Helps developing countries to improve waste management

**Reduces energy** imports and geopolitical dependance

## RENEWABLE NATURAL GAS AS READILY AVAILABLE RESOURCE TO DECARBONIZE USAGES

## Residential

Mobility

## Road Freight

Mantime

## LANDFILLS, WHERE RNG POTENTIAL IS STILL LARGELY UNEXPLOITED





## WAGABOX®, A DISRUPTIVE TECHNOLOGY TO TRANSFORM LANDFILL GAS INTO GRID-QUALITY RENEWABLE NATURAL GAS



## **US LANDFILL GAS POTENTIAL**

2,500+ Landfills in the USA

48% are active

2M+ scfm of Landfill gas available

481 Landfill gas to Energy operational projects (61 RNG)

66 projects under construction (52 RNG)

![](_page_8_Figure_7.jpeg)

01. In roduction to RNG from landfill gas

# FL LANDFILL GAS POTENTIAL

75 Landfills in Florida

51% are active

70,000+ scfm of Landfill gas available

19 Landfill Gas to Energy operational projects

1 RNG projects under construction

![](_page_9_Figure_7.jpeg)

![](_page_10_Picture_0.jpeg)

Introduction to RNG from landfill gas

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### K G A ERGY

## WHY IS UPGRADING LANDFILL GAS INTO RNG A CHALLENGE?

![](_page_11_Figure_3.jpeg)

**Key Notes** 

• Unpredictable variations in gas

exposes the landfill operator to

compliance and odor issues.

Accepting air gases in Landfill

amount of energy recovered.

flow and composition.

• Reducing air intake in the

Limiting wellfield vacuum

Gas increases the total

wellfield is costly

## WHY IS UPGRADING LANDFILL GAS INTO RNG A CHALLENGE?

![](_page_12_Picture_2.jpeg)

![](_page_12_Figure_3.jpeg)

■ N2 ■ O2 ■ CO2 ■ CH4

The WAGABOX® produces pipeline-quality Renewable Natural Gas regardless of the composition of the Landfill Gas

### WAGA ENERGY

### UNIQUE PATENTED TECHNOLOGY COMBINING MEMBRANE FILTRATION AND CRYOGENIC DISTILLATION

![](_page_13_Figure_3.jpeg)

# A closer look at the WAGABOX Wagabox #8, SUEZ landfill, France (2020)

1. H2S removal

4. CO2 polisher 2. VOC removal WAGA ENERG

5. N2&02 removal

3. CO2 separation

6. Offgas destruction

![](_page_15_Picture_0.jpeg)

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WAGABOX®, A disruptive solution for purifying landfill gas

Integrated business-model bringing value to landfill operators and gas utilities

![](_page_16_Figure_0.jpeg)

# **Key Success Factors of a High BTU Project**

### Landfill

Predictability of the landfill resources is key to the long-term success of the project.

- Sufficient flow for economic equilibrium
- Landfill gas accurate qualification and quantification

### Technology

The technology choice will impact the success of the project.

- Flexibility in the quality of gas accepted
- Proven uptime and recovery performance
- Capital Investment adapted to the project size

#### **Gas Grid**

Gas Grid Operators are key partners to succeed in developing RNG project

- Proximity to the landfill
- Gas interconnect cost of capital
- Sensible gas quality specifications

03. Integrated business-model bringing value to landfills operators and gas utilities

### **UNIQUE POSITIONING** AS A RNG PRODUCER WITH A PROPRIETARY TECHNOLOGY

![](_page_17_Figure_2.jpeg)

Integrated business model

Benefit for the landfill: Revenue sharing of the RNG sale backed by 10 to 20-year gas offtake agreements

## **DEVELOPER AND OWNER OF RNG PRODUCTION PLANTS**

![](_page_18_Figure_2.jpeg)

#### W A G A ENERGY

## **10 WAGABOX® IN OPERATIONS**

![](_page_19_Picture_3.jpeg)

February 2017

![](_page_19_Picture_5.jpeg)

November 2018

![](_page_19_Picture_7.jpeg)

November 2019

![](_page_19_Picture_9.jpeg)

September 2020

![](_page_19_Picture_11.jpeg)

June 2017

![](_page_19_Picture_13.jpeg)

November 2018

![](_page_19_Picture_15.jpeg)

January 2020

![](_page_19_Picture_17.jpeg)

![](_page_19_Picture_18.jpeg)

May 2018

![](_page_19_Picture_20.jpeg)

December 2018

![](_page_19_Picture_22.jpeg)

Your WAGABOX® here!

January 2019

## **US PROJECT REFERENCES**

![](_page_20_Picture_2.jpeg)

• Delavan, WI

### 🖸 Air Liquide

- HIL
- 2000 scfmN2: 9%
- Will begin operation in March 2022

"...our largest biomethane production unit in the world illustrates Air Liquide's determination to accompany its customers in the industrial and transportation sectors throughout the energy transition, but also to actively contribute to the emergence of a lowcarbon society."

#### - Emilie Mouren-Renouard, **Air Liquide** Executive Committee

![](_page_20_Picture_10.jpeg)

### **BATH LANDFILL**

- Steuben County, NY
- 1000 scfm
- N2: 25%
- 220,000 MMBtu/y
- 13,500t of CO2 avoided per year
- Will begin operation in March 2023

"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 years to come."

![](_page_20_Picture_19.jpeg)

### WINNEBAGO LANDFILL

- Rockford, IL
- 6000 scfm
- N2: 24%
- Will begin operation in Dec 2023

"We are thrilled to be supporting the development of RNG with Air Liquide. An effective alternative to fossil-based natural gas, RNG can help transition our energy systems toward greater sustainability."

- Mathieu Lefebvre, **Waga Energy CEO** 

![](_page_20_Picture_27.jpeg)

![](_page_20_Picture_28.jpeg)

**Air Liquide** 

Conclusion

## HOW DO WAGA ENERGY SOLUTIONS BENEFIT THE LANDFILL OWNER?

**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.

## Thank You!

![](_page_22_Picture_1.jpeg)

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