

# How Recovered Methane is Converted to Pipeline Quality at Niagara RNG Plant



A Landfill Gas Utilization Company

# Integrated Gas Recovery Services

## The Partnership – 20+ years



### Comcor Environmental Ltd.

- LFG Specialists
- Design & Engineering
- Plant & Wellfield Operations

### Walker Environmental Group

- General Contractor
- Project Management
- Contract Management



# Niagara LFG-to-RNG Facility



- 4,000 scfm LFG in, 1,900 scfm RNG out
- Equivalent nearly 1 million GJs of renewable energy per year
- Enough to heat 8,750 homes annually
- On-line December 2023
- Largest project of its kind in Province of Ontario

# What's in the Gas?

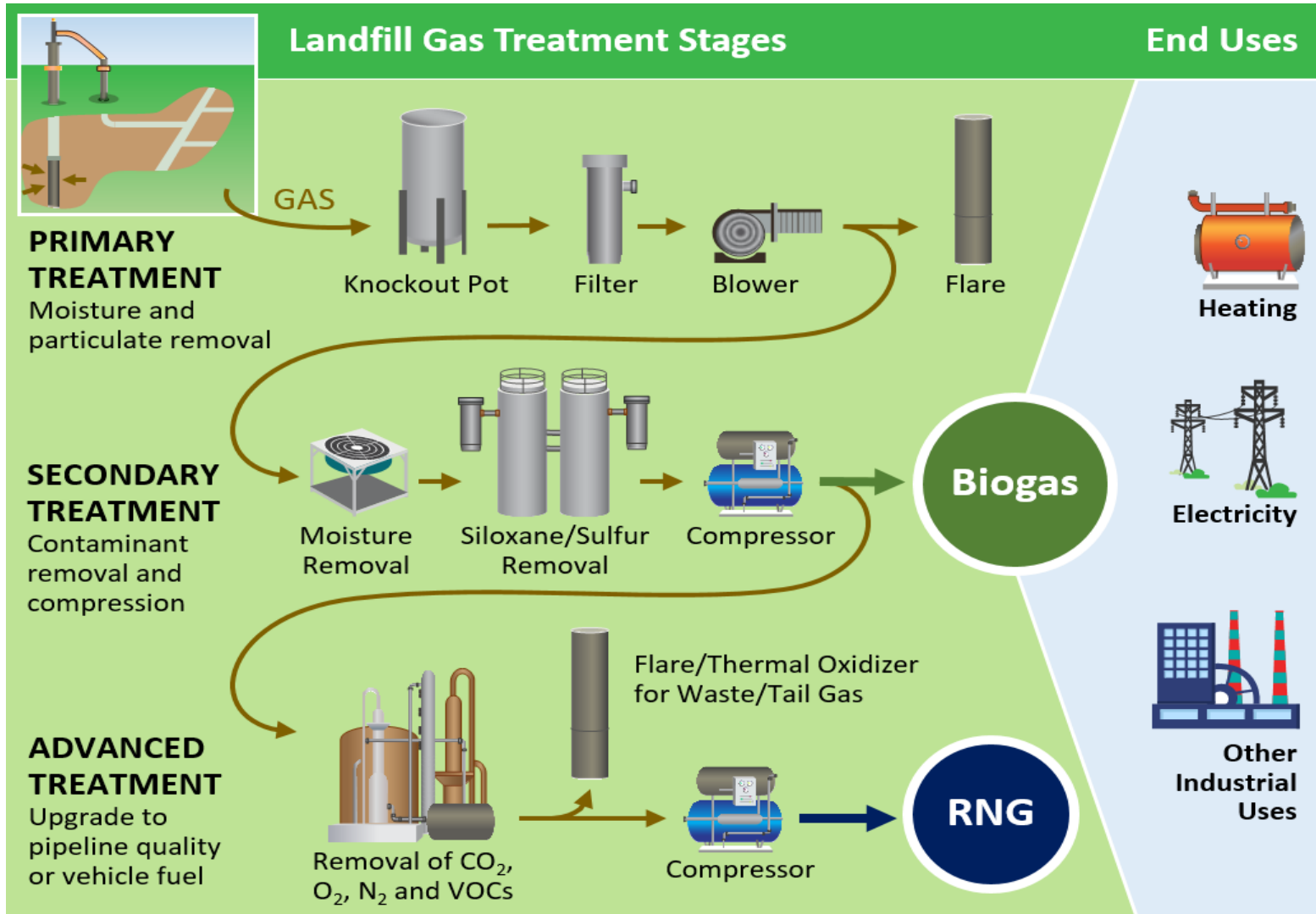
## LFG Composition

- Saturated
- Methane (CH<sub>4</sub>)
- Carbon Dioxide (CO<sub>2</sub>)
- Nitrogen (N<sub>2</sub>)
- Oxygen (O<sub>2</sub>)
- Trace elements (hydrogen sulphide, siloxanes, volatile organic compounds, etc.)
- Varies on waste stream

## What is Renewable Natural Gas?

Biogas that has been upgraded to pipeline quality natural gas used in place of fossil fuel derived natural gas

# Typical LFG Uses



Source: [Renewable Natural Gas / US EPA](#)

# History of LFG Utilization at Site

**1996**  
Candlestick  
Flare

**2002**  
Direct use  
at Resolute

**2007**  
1 MW  
engine  
IESO  
RESOP

**2019**  
1 MW  
engine  
Offsets  
parasitic

**2021**  
Cogen GM

**2023**  
LFG to  
RNG

- ✓ Currently collecting over 6,000 cfm
- ✓ >300 LFG extraction wells / points

# Project Development

## The Paper Trail

- Agreements, Agreements and more Agreements
- Permits / Approvals

## Technology Selection

- Lots of Options, Choose wisely
- Reference Facilities

## On-Site Construction

- Team to manage
- Scope creep to control
- Schedule to keep

## Commissioning

- How long
- Setting Expectations



# The Paper Trail

## Agreements

- Are you setting up a new company (SPV) for the project?
  - Articles of Incorporation
  - Shareholder Agreement
  - Officers and Directors
- Off-taking Agreements
- Injection Agreements
- Gas Brokerage / Storage / Transportation Agreements
- Project Registry (CFR / RIN)
- Creditor / Finance Agreements
- Land Lease Agreements
- Gas Rights Agreements
- Feedstock Agreements

## Permits / Approvals

- Current Permits on site
- Amendments or New? Air / Noise / Water / Leachate
- Zoning Requirements
- Municipal Building Permits
- Conservation Authority Permits
- Development Permit / Site Plan Agreement
- TSSA / ESA



# Technology Selection

## Lots of Options

- Evaluate current *and* future state
  - What works now, will it work +15 years?
  - Gas composition – is it stable, will I need different / more tech later?
  - Redundancy – how much, weak link
  - Readily available parts, used somewhere else?

## Reference Facilities

- Go and visit, ask the operator “would you purchase this again?”
- What kind of support can technology vendor provide? Remote? Local reps? On-site service?
- Understand the complexity and interrelation of equipment



# On-Site Construction



## Team

- You can't do it alone
  - A single PM may not be enough
  - You need specialist – this is different
  - This will take more effort than you think
- Have a full-time Site Manager, even if you sub out project to a General Contractor



## Scope

- Scope creep happens fast, design as much as you can before tendering construction
- The project boundaries will change, be ready financially and have slack in the schedule



## Schedule

- S#!t happens!
  - Covid
  - Global Supply Chain
  - 68 weeks for transformer!

# Commissioning

## How Long?

- Whatever you think – double it
- Develop a *really* good PCN
- Systems Integration takes a long time – start early
  - Specialized skill
  - Usually just a single individual

## Setting Expectations

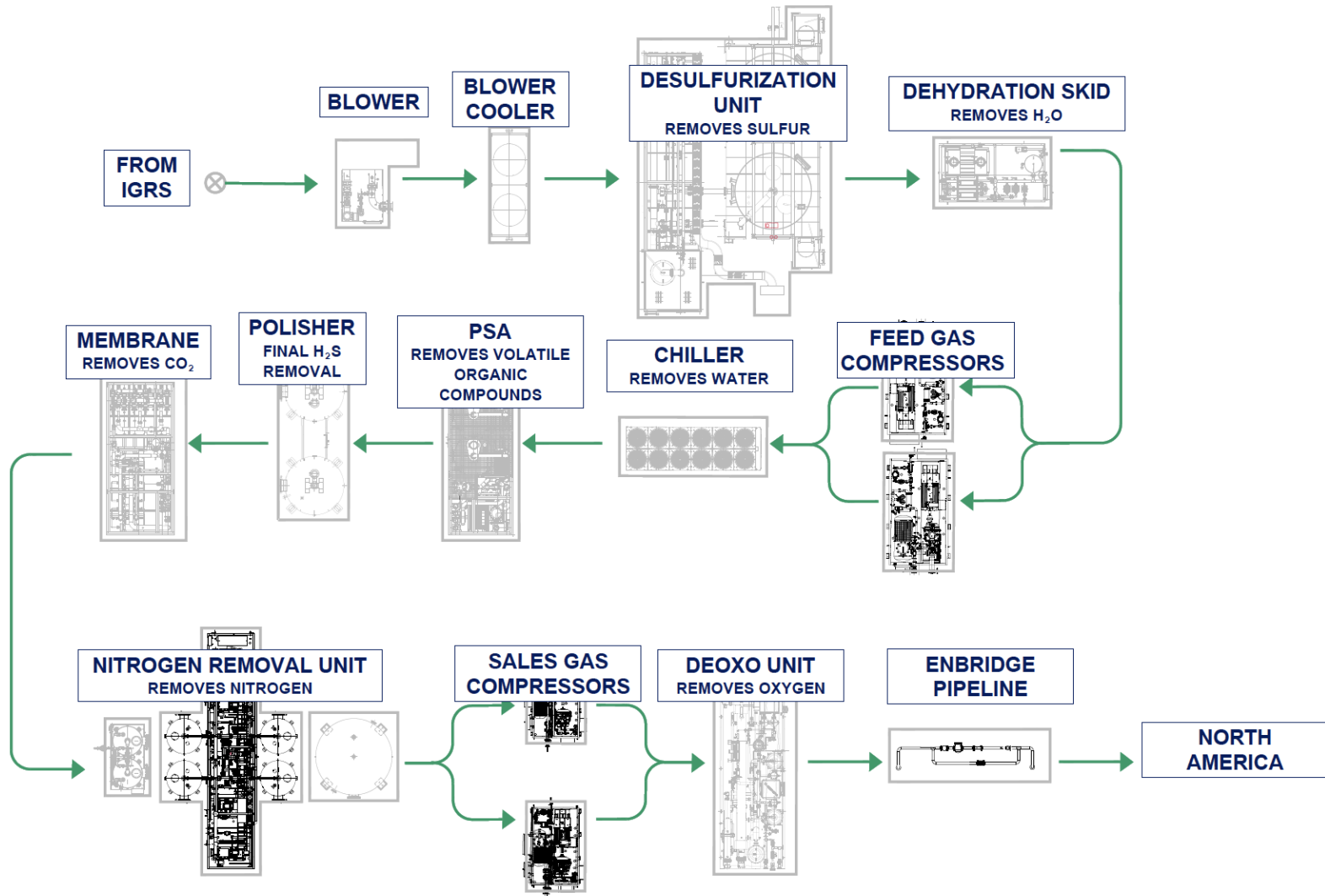
- There will be glitches
  - 15,000+ nodes in the program
  - They all talk to something
  - It will not be right immediately
- It will not be right immediately
- BOP Impacts
  - What else is on your site?

# The Big Picture

- RNG upgrading equipment is basically a series of filters to remove unwanted gas constituents and leave almost pure CH<sub>4</sub>
- Enbridge is our utility partner and provides the gas specifications required to inject into their NG pipeline
- To meet the Enbridge spec, moisture, H<sub>2</sub>S, siloxanes, VOCs, CO<sub>2</sub>, N<sub>2</sub> and O<sub>2</sub> need to be removed from the LFG



# Schematic view of the System



# Process Overview

## Feed Blower

- Boosts raw LFG pressure 11 psig and then cooled

## Low Pressure Dehydration

- Removes moisture

## H<sub>2</sub>S Removal Skid

- Straight pass through filters using activated carbon

## Feed Gas Compressors

- Boosts pressure to 200 psig
- Some heat used to reheat gas between 1<sup>st</sup> and 2<sup>nd</sup> stage membrane

# Process Overview

## High Pressure Dehydration

- Cools gas and removes moisture

## PSA

- Pressure swing adsorption system that captures VOCs and siloxanes and allows remaining gas to pass through
- Uses activated alumina and silica gel
- When media is saturated, it is depressurized releasing those contaminants out of the tail gas (primarily CO<sub>2</sub> from the 1<sup>st</sup> stage membranes) to the RTO

## ACT Vessels

- Polishing vessels to remove residual H<sub>2</sub>S
- Straight pass through using activated carbon



# Process Overview

## Membrane System

- Small hollow tubes that allows  $\text{CO}_2$  to pass through (permeate) and retains the  $\text{CH}_4$ . Looks like spaghetti.
- 2-stage membrane system to achieve higher purity gas
- At this point gas is around 85%  $\text{CH}_4$

## Nitrogen Removal Unit (NRU)

- Inlet dryer vessels uses molecular sieve and is regenerated by NRU tail gas
- NRU system uses PSA technology with activated carbon
- $\text{CH}_4$  is adsorbed and  $\text{N}_2$  passes through the RTO
- When media is saturated, vacuum pumps pull the  $\text{CH}_4$  out of the media

## Sales Gas Compressors

- Boosts pressure to 295 psig

# Process Overview

## Deoxo Skid

- Heated platinum-based catalyst converts  $O_2$  to  $CO_2$  and  $H_2O$
- Includes downstream dryer
- Skid can be bypassed if  $O_2$  already meets spec

## Enbridge Injection Station

- Product gas is injected into the Enbridge pipeline

## Elevated Flare

- Used to combust off-spec gas

## Regenerative Thermal Oxidizer (RTO)

- Used to combust low  $CH_4$  gas from the PSA and NRU

# Questions?

Thank you

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