How Many Ways Can Landfill Gas be Utilized at One Site and Hit it Out of the Park?

A Landfill Gas Utilization Case Study at the WEG Landfill in Niagara Falls, Ontario

Denise Burgess, P.Eng. – Director of Engineering

COMCOR
ENVIRONMENTAL LIMITED
Consulting Engineers and Landfill Gas Specialists

Presentation Overview

- Comcor Environmental Limited and IGRS
- Introduction to WEG Landfill
- History/Overview of LFG Utilization
- Utilization Project Challenges/Solutions

Comcor Environmental Limited

- Professional Engineers and Landfill Gas Experts
- Projects across Canada over the last 40 years
- Operations and Maintenance of over 25 LFG Facilities






Integrated Gas Recovery Services

COMCOR ENVIRONMENTAL LIMITED
Consulting Engineers and Landfill Gas Specialists

Comcor Environmental Limited
- LFG Specialists
- Design & Engineering
- Plant & Wellfield Operations

INTEGRATED GAS RECOVERY SERVICES
A Landfill Gas Utilization Company

Formed in 2001 to develop landfill gas utilization projects across Canada

walker

Walker Environmental Group
- Landfill Owner/Operator
- Project Management
- Contract Management

Waste Disposal – South Landfill

- 130-acre landfill facility for non-hazardous solid waste
- Disposal Capacity
  - 10,000 tonnes/day
  - 1,100,000 tonnes / year
- Acceptable Materials:
  - Residential Waste
  - Commercial Waste
  - Industrial Residues
  - Demolition Debris
  - Contaminated Soils
  - Railway Ties

What is Landfill Gas and Renewable Natural Gas?

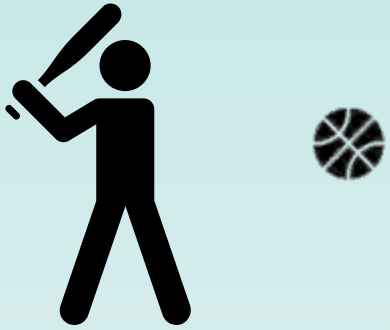
Organics break down in low-oxygen environment

Constituents	% in Landfill Gas
Methane (CH_4)	40-55%
Carbon Dioxide (CO_2)	35-45%
Nitrogen (N_2)	2-16%
Oxygen (O_2)	0.5-4%
H_2S, Siloxanes, NMOCs	Trace

Renewable Natural Gas?

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

History of LFG Control/Utilization



1996
Candlestick Flare

2001
Enclosed Flare

2002
Direct use at Resolute

2007
1 MW engine
IESO RESOP

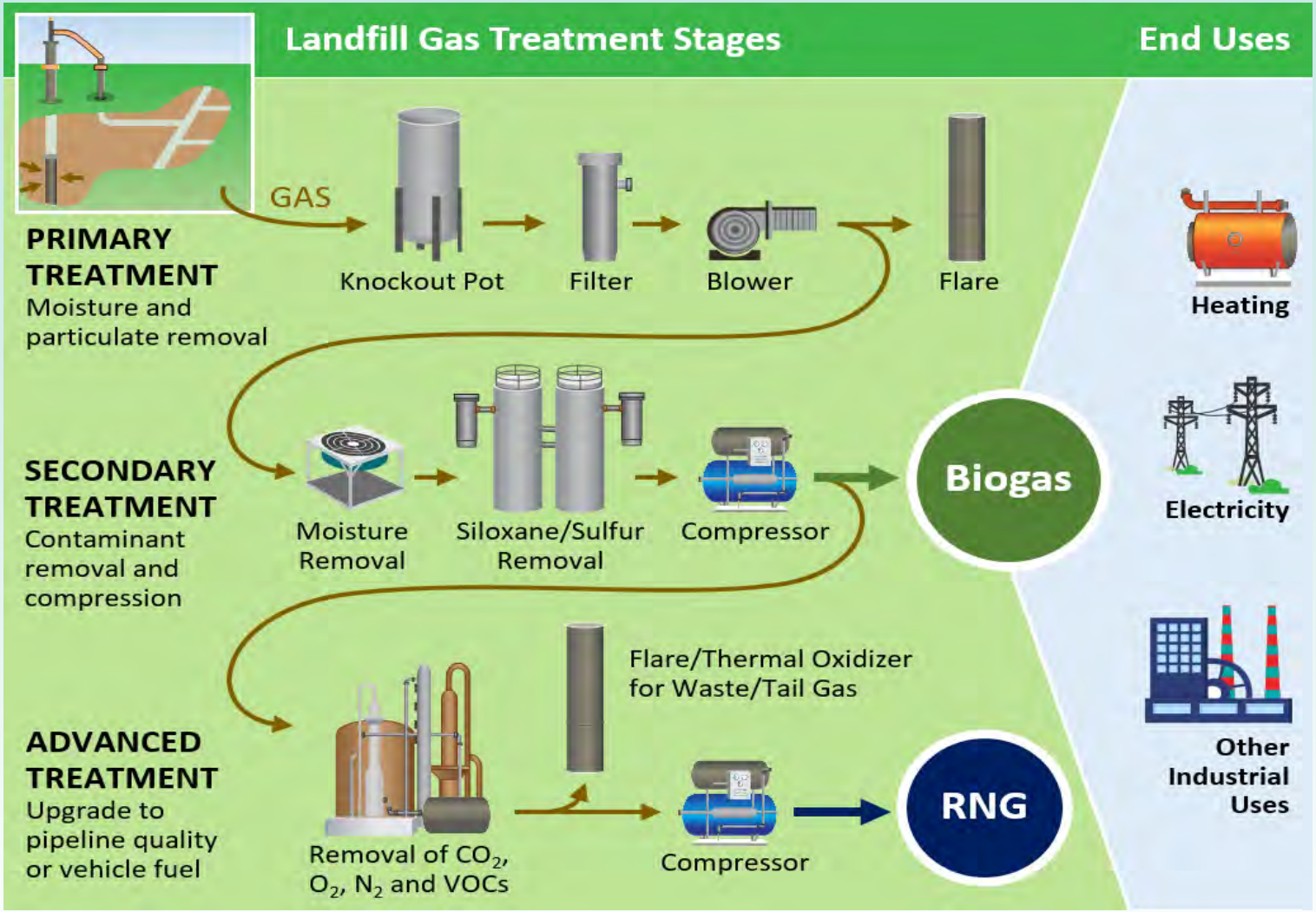
2019
1 MW engine
Offsets parasitic

2021
Cogen GM

2023
LFG to RNG

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

Typical LFG Uses



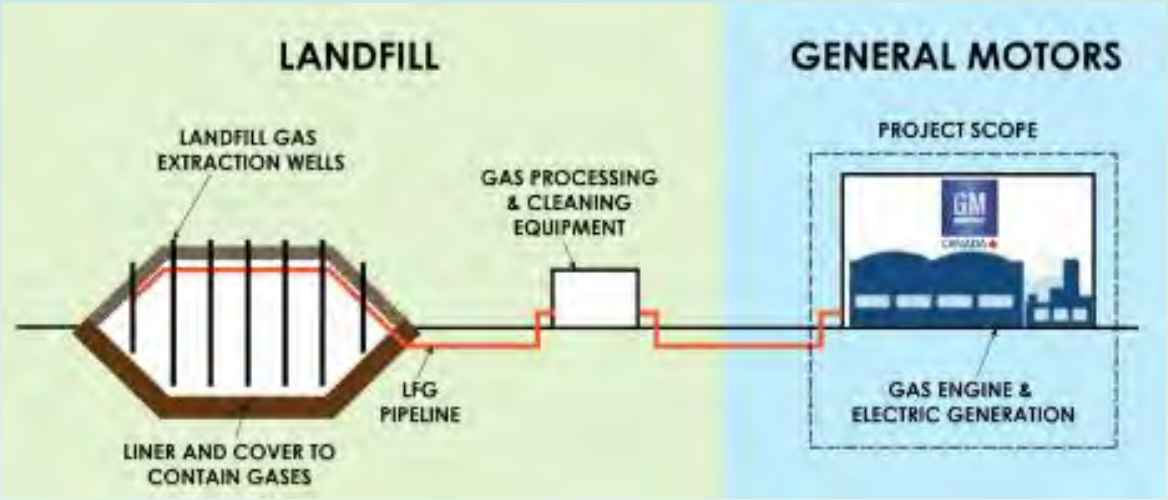
Source: https://www.epa.gov/lmop/renewable-natural-gas

1. Electricity Generation

- 1 MW to the electrical grid, powering our community
- 1 MW “behind the meter” powering our landfill gas plant

Dehydration and Siloxane Removal

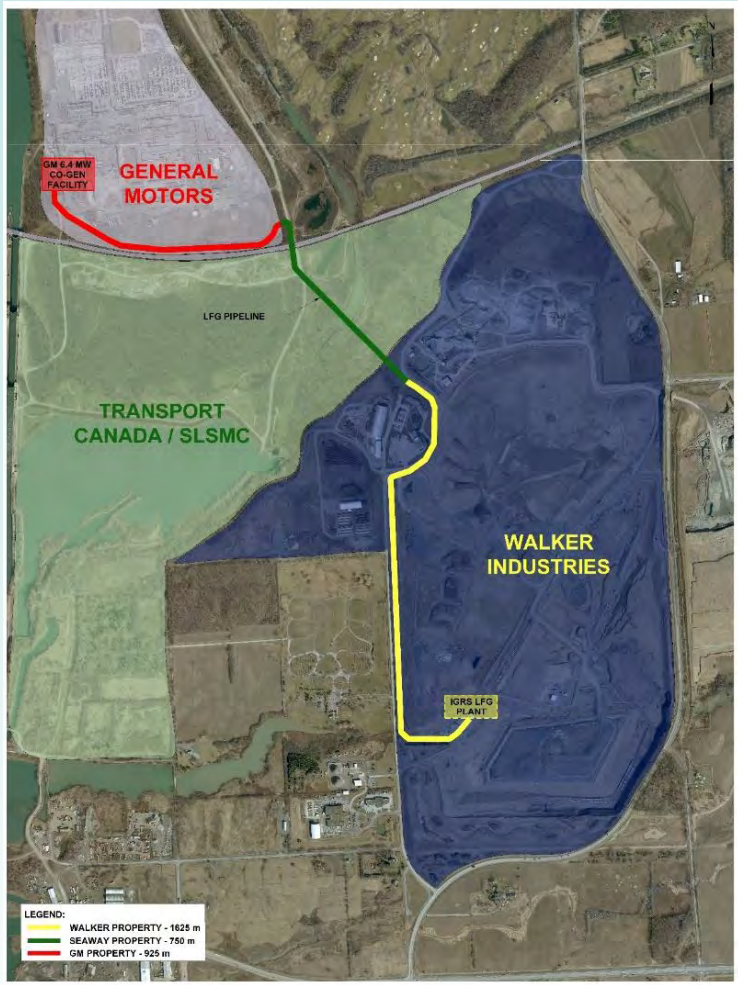
2. Co-generation – General Motors



20-YEAR RENEWABLE ENERGY PROJECT - 3 KEY PARTS

1. Gas Plant Upgrades
2. Landfill Gas Pipeline
3. Co-Generation (Co-Gen) Facility

Landfill Gas Pipeline/Upgrades



- 3.3 km pipeline through Walker, TC and GM property
- Pipeline Approvals *[Niagara Escarpment Commission (NEC), St. Lawrence Seaway & Transport Canada, CN Rail & TSSA]*
- Horizontal Directional Drilling (HDD) & Open Trench Cut
- Installation of new conditioning equipment
- Electrical Service Upgrade

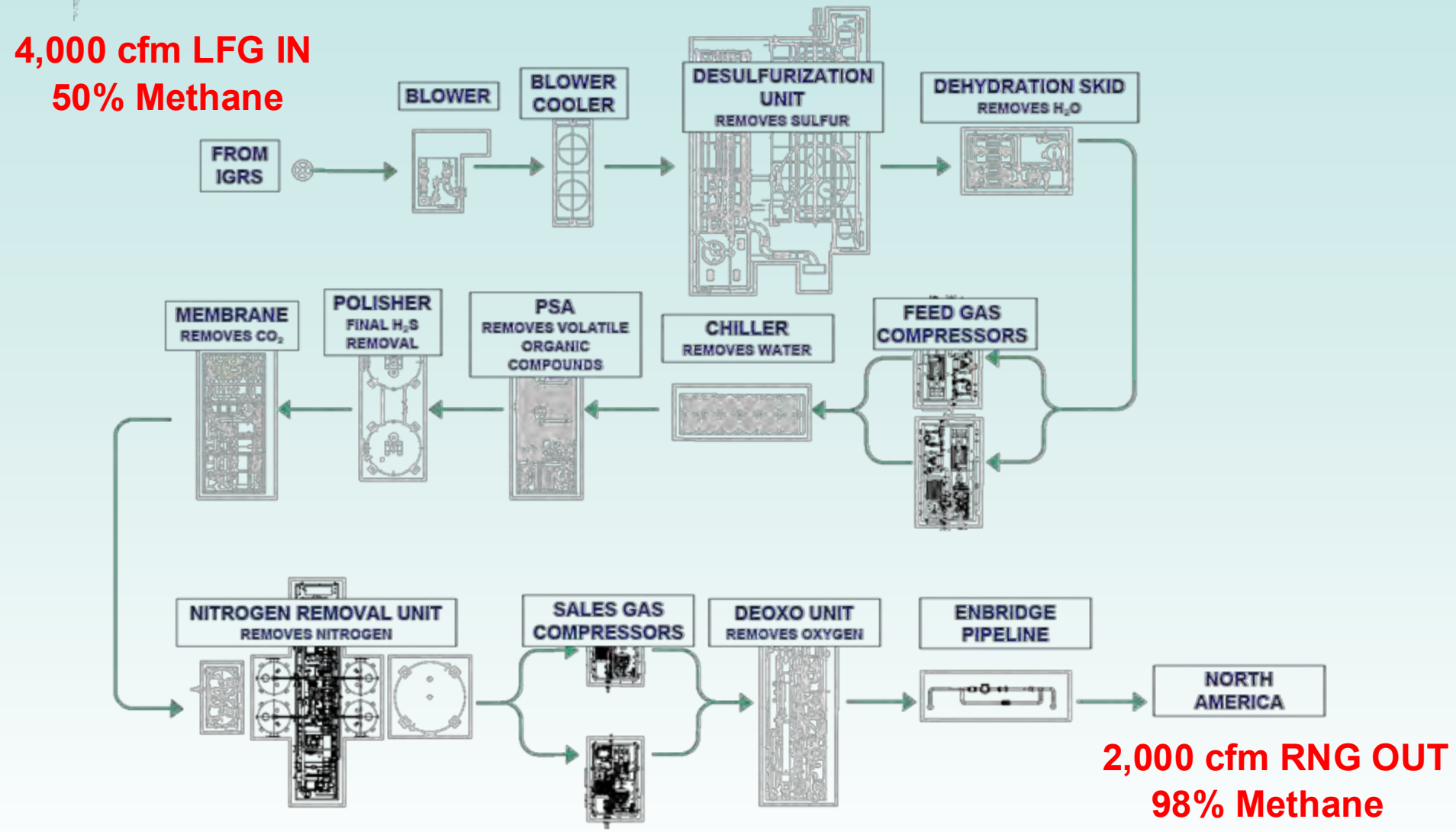
CO-GEN Facility

- Construction start date April 2018
- Four 1.6 MW 20-cylinder CAT engines
- 6.4 MW Electrical & 8.0 MW Thermal
- Waste heat captured, used to heat plant
- Commissioning completed December 2020

3. Renewable Natural Gas (RNG)

- LFG to RNG facility commissioned in December 2023
- Produces nearly 1 million GJs of renewable energy per year
- Enough to heat 8,750 homes annually
- Largest project of its kind in Province of Ontario; Will be the 2nd largest in Canada

LFG to RNG Process Flow



RNG Plant Construction

RNG Plant Construction

Winner - 2025 PROJECT OF THE YEAR

Canadian Biogas Association

Renewable Energy Project Challenges

- Permits/Approvals/Agreements
- Technology Selection
- Construction/Commissioning
- The Gas Supply

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!**

Does the Gas Supply Matter?

Is a wellfield that supports an RNG project different than a wellfield meant to control odours or migration?

Why does ambient air intrusion matter?

O_2

LFG Collection from MHs/LCS

Horizontal Collectors/Vertical Well Spacing

Wellhead Design/Automated Wellheads

Final Cover/O&M

CH_4

LFG Collection Infrastructure

Horizontal Collectors

- **Well planned/timed horizontal collectors very helpful in active landfill areas**

Vertical Well Spacing

- Increase well density to allow for better flow control
- Use surface emission sweeps to determine if additional wells could be added to existing systems

Thank you!

COMCOR

COMCOR
ENVIRONMENTAL LIMITED
Consulting Engineers and Landfill Gas Specialists

Denise Burgess, P.Eng. – Director of Engineering