



# **RNG Alternative Fuel**

John Welch, P. E.

Director

Department of Waste & Renewables

# Dane County Waste & Renewables



## Mission Statement:

To provide an efficient and cost effective solid waste management program which protects the environment and conserves natural resources.

# Waste & Renewables Operations

- ❑ 1 Active landfill & 2 closed landfills
  - 250,000 tons/yr
- ❑ 2 landfill gas facilities
  - LFGTE, CHP, CO2, RNG
- ❑ C&D MRF
- ❑ Clean Sweep
- ❑ Brush/logs program
- ❑ Tours, recycling events, needles program, etc



# We've Been Busy!

## Since 2012

- ❑ Rapid Landfill Expansion Permitting
- ❑ New HHW Facility
- ❑ C&D Transfer Station
- ❑ New C&D MRF
- ❑ Constructed 4 Cells
- ❑ Capped 40 Acres
- ❑ 100 acres of Prairie
- ❑ Biogas Projects





# C&D MRF / Clean Sweep





# C&D MRF



# C&D MRF





# Liner Construction





# Cap Construction



# Dane County Biogas History

- ❑ Landfill Gas to Energy (LFGTE)
- ❑ Waste heat – multiple buildings
- ❑ Manure digester projects
- ❑ Evaluated food waste digester
- ❑ RNG fueling station – Pilot system & expansion
- ❑ High BTU pipeline grade gas
- ❑ CO2 Sequestration Pilot Project





# Landfill Biogas Basics



# Decomposing Waste Produces Landfill Gas

## ❑ Landfill Gas Components

- Methane – 55% ← Energy!!!
- Carbon Dioxide – 40% }
- Nitrogen – 5% } Added Value?
- Oxygen – Less than 0.5%
- VOCs, H<sub>2</sub>S, Siloxanes, H<sub>2</sub>O, etc

## ❑ Gas Temperature 80-120 F





# Gas Collection

Gas extracted via wells





# Gas Collection

## Collection Pipes

- Header Pipe
- Condensate
- Clean Outs





# Options for Biogas Use

- ❑ Medium BTU – Direct Use
- ❑ LFGTE – Electric Production
- ❑ High BTU / Pipeline Grade Gas/RNG
- ❑ Other Technologies
  - Waste Heat
  - Syngas / biodiesel
  - CO<sub>2</sub>, N<sub>2</sub> Capture
    - EOR, dry ice, methanization

# Use of Biogas as a Resource



## What is CNG?

- ❑ CNG - Compressed Natural Gas (methane)
- ❑ Compressed to 3600 psi
- ❑ Used as vehicle fuel



## What is RNG?

- CNG derived from biogas
- WWTP, digesters, landfills, etc



# Why RNG?

- ❑ Financial
  - Less than \$2.00/gallon
  - Less price fluctuation
  - Revenue source for landfills
- ❑ Domestic Fuel Source
  - Security
  - Local jobs
- ❑ Noise – 80-90% reduction
- ❑ Safe
- ❑ Environmental Benefits



# Environmental Benefits

## Burns Cleaner

- Vehicle maintenance
- 60–90% less smog-producing pollutants
- 30–40% less GHG emissions
- Lower carbon intensity



# Environmental Benefits

<b>Fuel</b>	<b>Carbon Intensity</b> (gCO <sub>2</sub> e/MJ)
Gasoline	95.86
CNG from Pipeline	68.00
CNG from Digester	13.45
CNG from Landfill	11.26

[http://www.arb.ca.gov/fuels/lcfs/121409lcfs\\_lutables.pdf](http://www.arb.ca.gov/fuels/lcfs/121409lcfs_lutables.pdf)



# Vehicles

## □ 85+ vehicles in fleet

- Some dedicated
- F150s, F250s, F350s, Ford Fusion, Transit Connect, Plow Truck
- 10 Departments





An aerial photograph of a biogas project development site. The facility includes several large white spherical storage tanks, numerous smaller white cylindrical tanks, and two tall vertical grey storage silos. A complex network of pipes and walkways connects these components. In the foreground, there are several grey and yellow shipping containers, some with equipment on top, and a few small buildings. The site is bordered by a dirt road on the top and right, and a dense forest of bare trees on the bottom left. A semi-transparent white banner with red text is overlaid across the middle of the image.

# RNG Biogas Project Development



# Dane County's Future – RNG

- ❑ Biogas from landfill and off-site biogas sources
- ❑ Gas is cleaned up
- ❑ Pipeline injection
- ❑ Off-load station – clean lakes
- ❑ Started project January 2017
- ❑ Completion expected July 2019
  - already injecting gas today





# Dane County's Future – RNG

- ❑ County ownership
- ❑ Private O&M for first 3 years
- ❑ \$29M capital
- ❑ ~4 year pay back – RIN markets fluctuate
- ❑ Revenue streams
  - Gas – compared to frac gas
  - RINs (Renewable Identification Number)
    - Federal program: Renewable Fuels Standard (RFS)
  - ~~LCFS (Low Carbon Fuels Standard)~~
    - ~~- California program~~

# Financial Pro Forma - RINS and LCFS

## RINs

- ❑ Renewable Identification Number
- ❑ EPA Renewable Fuel Standard (RFS) Program
- ❑ Energy Policy Act of 2005 & Energy Independence and Security Act of 2007 – 2022 “sunset”
- ❑ Requires a percentage of fuels sold in US to be renewable
- ❑ Very complex program for beginners
  - D3 v D5, nesting, cellulosic waiver credit, annual targets
  - Registration process, contracting process
- ❑ How it works on a project

# Financial Pro Forma - RINS and LCFS

## LCFS

- ❑ Low Carbon Fuel Standard
- ❑ California Program
- ❑ Reduce carbon intensity (CI) of transportation fuels
- ❑ Credits based on amount of carbon reduction
- ❑ CI score
- ❑ Market becoming flooded
- ❑ How it works on a project



# RNG Facility Development





# RNG Facility Development





# RNG Facility Development





# RNG Facility Development





# RNG Facility Development





# RNG Facility Development









An aerial photograph of a large industrial facility, likely a waste management or recycling plant. The facility features several large, white, spherical storage tanks, numerous smaller cylindrical tanks, and various industrial buildings and structures. The site is surrounded by a dirt road and some vegetation. The text is overlaid on the center of the image.

# Questions?

John Welch, P.E.

Director

Dane County Dept of Waste & Renewables

1919 Alliant Energy Center Way

Madison, WI 53713

608-516-4154

[welch@countyofdane.com](mailto:welch@countyofdane.com)