



LEADERS IN MAXIMIZING THE VALUE OF ORGANIC WASTE



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**StormFisher Environmental Ltd.**  
**The Energy Challenge**  
**May 17, 2016**

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CONFIDENTIAL

# Introduction to StormFisher



- **Clean, Baseload Renewable Energy:** StormFisher owns and operates a 2.8MW biogas plant in London, Ontario
  - **Landfill/Land Application Diversion:** The biogas facility processes upwards of 80,000mt of food waste from local Ontario food processors
- **Value Nutrients:** The facility generates 4,000mt of organic fertilizer (with 5-4-2 NPK @ 80% organic matter content)

## In the next 10 years, StormFisher's 2.8MW biogas plant will...



Avoid releasing  
CO<sub>2</sub>e equivalent to  
**taking 7,500 cars  
off the road**



**Save Ontario food  
processors over  
\$50 million** in food  
waste disposal  
fees



Deliver sufficient  
**clean energy to  
power over  
10,000 Canadians**

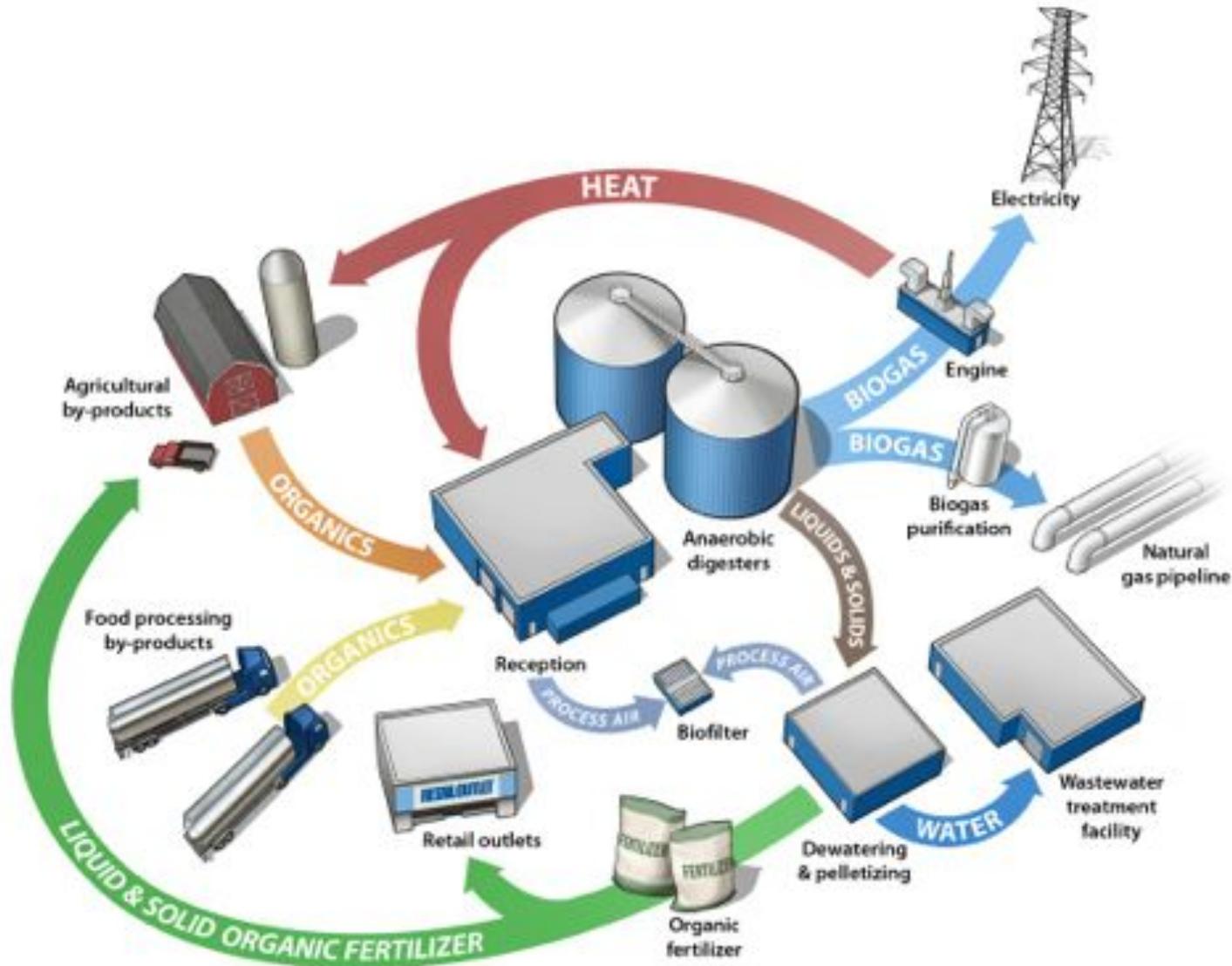
## Biogas plants haven't had it easy...

Stand-alone biogas sites require **\$0.11-\$0.20/kwh** to be economical, depending on infrastructure, tip fee market and fertilizer sales

Continued drop in solar and wind auction pricing globally in 2016:  
**\$0.04/kwh** for solar in U.A.E.  
**\$0.05/kwh** for wind in Mexico



# BUT! Biogas offers a solution no other energy can...



# Biogas as a source for natural gas vehicle fuel (CNG, RNG)



- Lowest Carbon Transportation providing GHG carbon sink
- Cost competitive with traditional diesel fuel
- Proven technology with operational RNG and CNG projects across North America

# How does Renewable Natural Gas (RNG) stack up?

CARBON INTENSITY OF VARIOUS FUELS



Data Source: Carbon Intensity Control Table for Diesel and Fuels that Substitute for Diesel  
California Air Resources Board, 2012

**RNG from food waste and WWTP is currently the leading low-carbon fuel source available**

Source: Canadian Biogas Association's "Closing the Loop" Report 2015

# Potential of Biogas Production in California...

## California

22 million tonnes of food waste  
landfilled, 500 WWTP, 1,600  
dairy farms

300 billion cubic feet of biogas  
per year from organic wastes,  
WWTP and landfills

2.4 billion gallons of fuel

**Sufficient fuel to replace 75%  
of diesel used in CA vehicles  
with lowest LCFS fuel**



Source: Julia Levin, Biogas Energy California

# How much RNG could Ontario produce?

**In 2014, Ontario used approximately 5 billion litres of diesel for road motor vehicles....**

Source	Millions m3 RNG	Millions of litres of diesel fuel Equiv.
Wastewater WWTP	119	123
IC&I Food Waste	122	126
Animal Manure	637	657
Residential SSO	72	74
Landfill Gas	654	675
Subtotal	1,604	1,655

**Based on organics, biosolids and LFG production, Ontario could transition 33% of its entire diesel fuel use to C-RNG and provide the lowest LCFS fuel source and support the mitigation of SLCPs**

Source: Statscan 2014CANSIM, table [405-0002](#); Canadian Biogas Association Kelleher Robins Study Dec 2013

## How much will it cost?

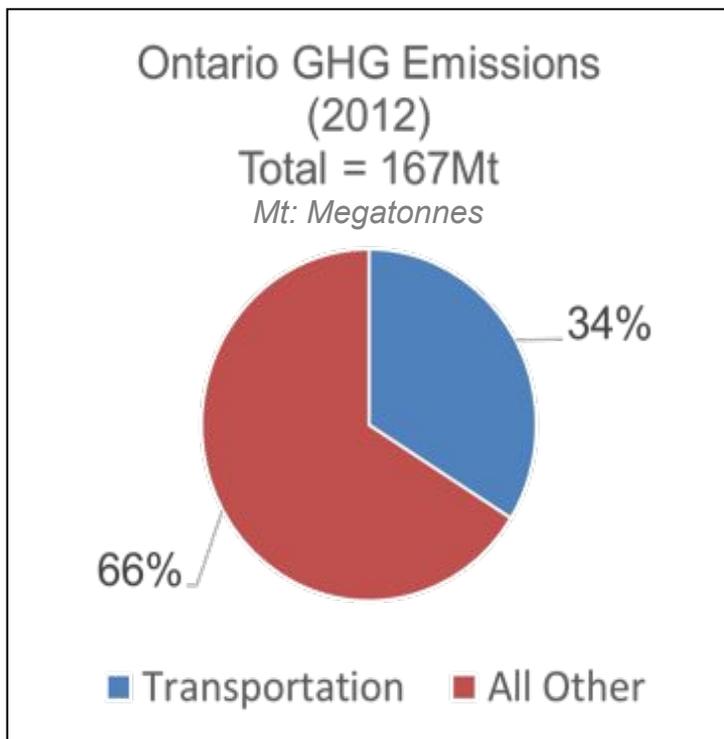
	100% CNG	100% C-RNG		
Gas Price Assumption	\$4/GJ + delivery	\$6/GJ	\$11/GJ	\$16/GJ
Gas Cost	\$0.18	\$0.26	\$0.48	\$0.69
O&M + capex recovery	\$0.36	\$0.36	\$0.36	\$0.36
Taxes	\$0.07	\$0.08	\$0.08	\$0.08
<b>Total (in \$ DLE)</b>	<b>\$0.62</b>	<b>\$0.70</b>	<b>\$0.92</b>	<b>\$1.13</b>

Avg. Retail Canadian Diesel Prices (\$/l)	
2013	\$1.29
2014	\$1.34
2015	\$1.09
2016 YTD	\$0.92

- **RNG can compete with diesel prices, but is 1.25-2.0x more expensive than fossil-fuel derived CNG**
  - **Natural Gas vehicles are ~15% more expensive than Diesel trucks but have similar operations/maintenance costs**

Source: Union Gas Analysis, NRCAN

# Ontario's emissions savings could have a significant impact



	Gasoline	Diesel
Annual L consumed	16 billion	5 billion
Current GHG equivalent	38 Mega tonne/year	18 Mega tonne/year
Emissions Savings by replacing motor vehicle diesel use with C-RNG from WWTP, SSO and LFG		7 Mt GHG/year

**Over 4% of Ontario's total GHG emissions could be eliminated by adopting C-RNG as a substitute for diesel in motor vehicles and mitigates SLCPs in Ontario**

Source: Ontario's 2014 Climate Change Report

## Examples of early adoption



- Progressive Waste Solution's Terrebonne landfill (QC) transforms landfill gas to pipeline RNG, driving offsetting 350,000 barrels of oil per year or taking 1,500 trucks off the road.
- Surrey, BC is building an organics to C-RNG facility that will fuel Surrey's waste collection vehicles. Commissioning is expected to be in 2016-2017.



Source: Canadian Biogas Association's "Closing the Loop" Report 2015

## Examples of early adoption (continued...)

- Saint-Hyacinthe, QC, is selling 13 million m<sup>3</sup>/yr RNG to Gaz Metro from a co-digestion stream of waste organics and wastewater sludge. AD digesters are currently being upgraded.



**FAIR OAKS**  
F A R M S™

- Fair Oaks produces C-RNG from its dairy manure which powers the company's fleet of 42 milk trucks, offsetting up to 40,000t CO<sub>2</sub>e/yr and savings upwards of \$0.3M in fuel costs per year

Source: Canadian Biogas Association's "Closing the Loop" Report 2015

## How to deploy the infrastructure?

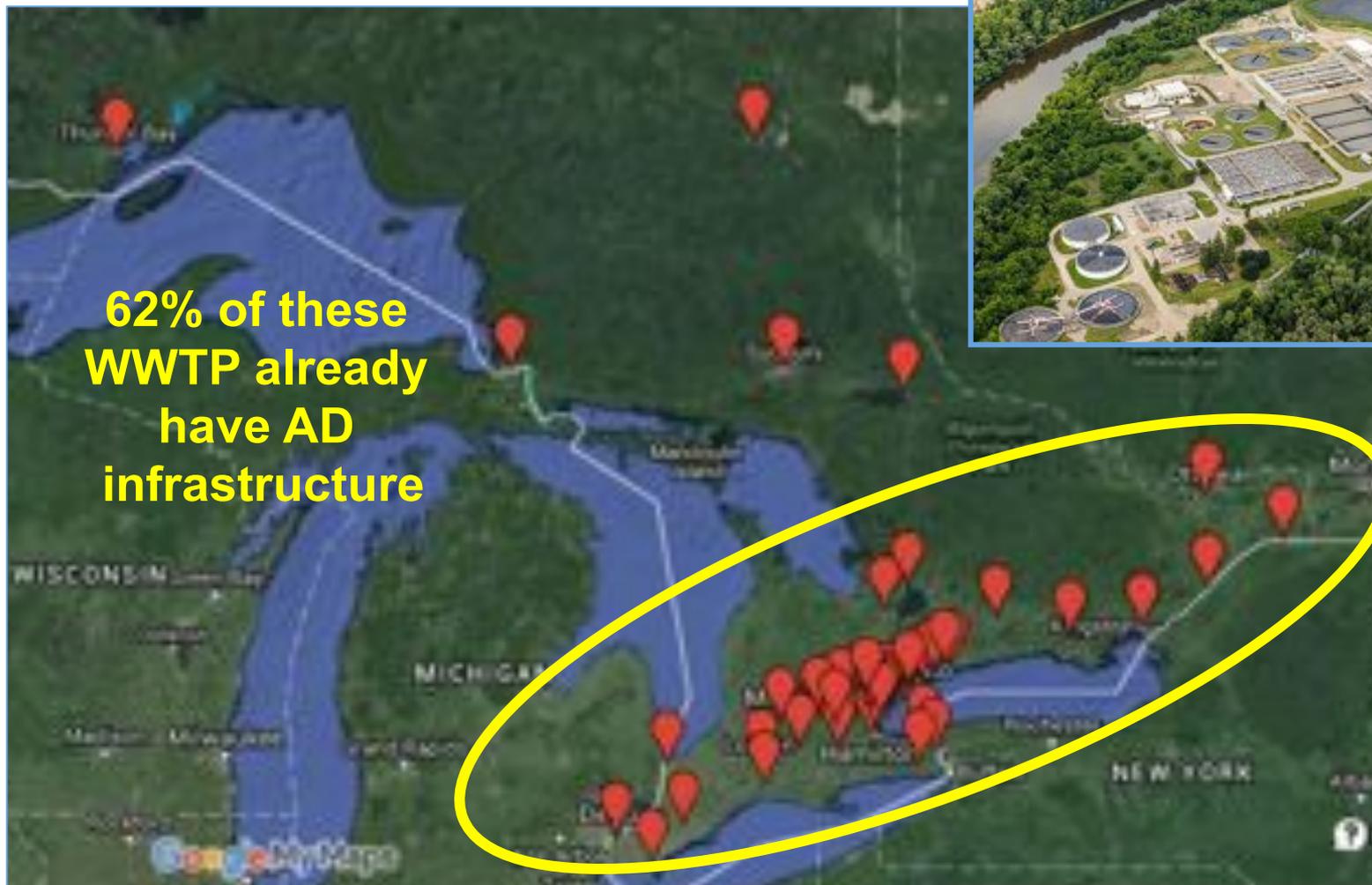
- Stand-alone biogas/AD infrastructure is expensive and often located far away from food waste sources
- Biogas “scrubbing” to hit gas pipeline specs can be expensive
- CNG stations are few and far between, and double-up on infrastructure costs for C-RNG (RNG injection + CNG)
- Further assessment of fleets in Ontario needs to occur to assess ability to slowly fill the fleets



**So....how do we keep costs down?**

Image Source: Angi Energy (N.A. CNG station manufacturer)

# Top 50 Wastewater Treatment Plants (WWTP) in Ontario



# Utilize WWTP infrastructure to deliver the low-carbon fuel plan

**Biosolids, SSO and Food Waste Co-Digestion with on-site CNG fuelling @ WWTP or feeding to NG infrastructure and redistribute the gas**



**Network of distributed CNG fuelling stations**

**+**

**Negative carbon intensity motor fuel**

**+**

**Local food waste disposal options**

## Industry Enablers: Policy Needs

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- Create an equivalent to US EPA's *Renewable Gas Standard* for low-carbon biogas to C-RNG
- Waste accountability: Organics bans from landfills and land application with actionable audits and controls
- Targeted incentives for natural gas vehicles similar to those of electric vehicles
- Masterplan for the role of Ontario's 466 Wastewater Treatment Plants, Ontario's biogas plants and its landfill gas plants

# Summary

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- There is a unique opportunity for biogas is to offset carbon intense diesel fuels with cost-effective RNG/CNG
- Estimated methane generation from biogas in Ontario can meet one third of Ontario's entire motor vehicle diesel needs
- Savings of 4% of Ontario's total GHG emissions
- Biogas infrastructure for mass deployment is partially in place via Ontario's 466 WWTP plants, AD plants and LFG facilities
- Additional benefits include continued downward pressure on tip fees for food waste, local food waste disposal, and significant job creation via economical and long-term fuels infrastructure investments

# The Energy Challenge solved....

- ✓ Efficient electric cars to offset gasoline use
- ✓ C-RNG trucking fleet to offset diesel
- ✓ Cost-effective and low-carbon electrical grid



## Contact Information



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