Transforming GHG Emissions into Marketable Products

ONE YEAR LATER:
UPDATING OUR JOURNEY WITH POND TECHNOLOGIES

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MARKHAM DISTRICT ENERGY INC.

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Markham District Energy
City of Markham
Net Zero
Pond Technology
Project Status
Created in 1999
Owned by the City of Markham
Two (2) District Energy Systems
Customers: 11 million sq. ft.
61 MWth Hot Water/Steam
14,000 tons Chilled Water
15 MWe CHP
CITY OF MARKHAM

350,000 Residents
Canada's Fastest Growing City
Canada's Most Diverse City
Canada's High Tech Capital
Award Winning Development Strategies & Sustainability Planning
Codes and Standards – New Build
Retrofits – Existing Build
Renewable Energy Generation – On-Site
Low Carbon Community Energy

Electrify Transit
Renewable Natural Gas
Energy Storage
Behaviour & Education

ktCO2e  % reduction from 2011
2011  1,556  100%
2016  1,500  97.2%
2020  1,400  97.8%
2030  900  96.8%
2040  300  97.4%
2050  160  98.0%

MARKHAM
~50,000 tonnes CO$_2$ in 2018
(customer base = 11 million square feet)

BAU ~100,000 tonnes CO$_2$ in 2030
(projected customer base = 20 million square feet)
Ground Source  Biomass  Solar
**CO₂** THE OVERLOOKED RESOURCE
CO₂ is the most abundant, yet underutilized resource in our economy

**INDUSTRIALIZATION**
GHGs are rising steadily as developing countries industrialize their economies.

**POPULATION GROWTH**
Globally, a growing middle-class places a higher demand on a more nutritious and protein-rich diet while arable land is lost to degradation and urbanization.

**PROGRESS DRIVES HIGHER GHG LEVELS**
Industrialization and population growth combine to boost emissions of CO₂, NOₓ, SOₓ & VOCs, all of which contribute to climate change and the related severity of weather patterns.
Illumination System: Core Feature of the Technology

- Algae growth is generally light limited.
- Photosynthesis is most efficient when utilizing red light in the 680 – 700 nanometer wavelength range.
- Pond has spent over a decade developing and refining the illumination system to optimize algae growth.
Markets for Algae

Nutraceuticals
Chlorella powder, spirulina powder, astaxanthin, omega-3.

Animal Feed
Aquaculture feed, animal feeds.

Biofuel
Biodiesel, biomass pellets.
Project Overview
First Phase

Biologically remove up to 2000 tonnes of CO\textsubscript{2} emissions from the combustion of natural gas (hot water boiler & CHP operations). The facility will manufacture, dry and ship algae.

Start Construction: Q2 2019
Operational: Q1 2020
Energy Services Lease Agreement

MDE will finance the process building - Pond is the tenant
MDE will sell electricity and chilled water to Pond
DE will provide 24/7 operational support
Value of emissions abatement will be shared
Pond is responsible for algae off-take agreements
Revenue sharing agreement
Future Phases

Expand carbon capture and utilization
Target 50% (10,000 CO2 tonnes annually)

Longer Term

Apply the Pond technology at similar DE installations in Canada, the US and around the world.
Why is this technology important?

Algae grown from natural gas combustion emissions can be sold into higher value nutraceutical and animal feed markets.

Carbon emitter continues to operate with natural gas as its primary fuel while reducing its carbon footprint.

Broad market application for any natural gas consumer.

Natural gas can be “transformed” to a zero-carbon fuel with this technology.
Why is this important to the District Energy Sector?

Our sector is being driven to low carbon.
Our options are limited.
This is an end-of-pipe solution.
Our primary fuel supply remains unchanged.
This technology is more than carbon abatement; it creates a revenue opportunity.
Pond’s technology requires scale and continuous operation.

There is a natural synergy between Pond and our sector