



Transforming GHG Emissions into Marketable Products *A COMMERCIAL SCALE DEMONSTRATION OF NEUTRALIZING NATURAL GAS CO₂ EMISSIONS FROM A DISTRICT ENERGY FACILITY*

BRUCE ANDER *PRESIDENT & CEO MARKHAM DISTRICT ENERGY INC.*

PETER HOWARD *VICE PRESIDENT CORPORATE SUSTAINABILITY, POND TECHNOLOGIES INC.*



March 7, 2018

Presentation Topics

Markham District Energy

Pond Technologies

NRG COSIA Carbon XPrize

The Technology

Project Overview

Environmental Benefits

Why is this technology important?

Why is this important to the District Energy Sector?

Markham District Energy

Created in 1999, MDE is an award winning thermal energy utility owned by the City of Markham.

We operates two district energy systems serving the City's growing downtown core (Markham Centre) and a second urban area, Cornell Centre.

MDE produces thermal energy for heating and cooling customer buildings (hot water and chilled water); and produces electricity for the local grid with our fleet of combined heat and power assets.



Pond Technologies

We turn GHG emissions into revenue.

Markham based clean-tech company created in 2007.

Designer of proprietary technology – enclosed photo-bioreactors to rapidly grow algae from CO₂ emissions using an LED illumination system.

25,000 L demonstration site at St Marys Cement plant

Trading on TSXV, ticker POND.



\$20 million global competition to develop breakthrough technologies that will convert CO₂ emissions from power plants and industrial facilities into valuable products like building materials, alternative fuels and other items that we use every day. Teams will be scored on how much CO₂ they convert and the net value of their products.

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Reimagine CO₂
Inspiring the brightest minds around the world to
help solve climate change

July 15, 2016: X-Prize received 47 entries from around the world.

October 17, 2016: Markham Team advances to the Semi-Final round joining 26 other entries from Canada, US, UK, Switzerland, China and India.

October 10, 2017: Semi-Finals performance results submitted for evaluation by the X-Prize scientific experts.

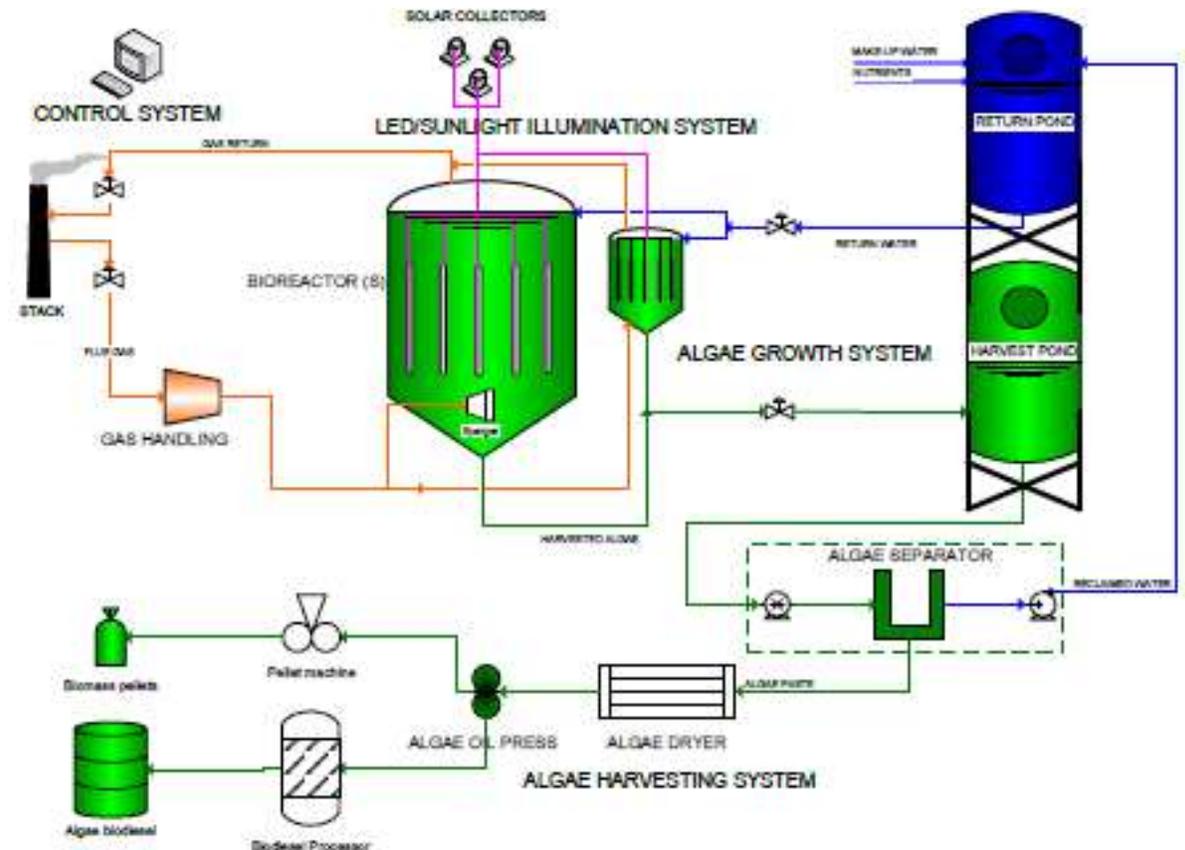
March 2018: Team is anxiously waiting for an announcement of the competition finalists. The winning team will be selected in late 2019!!

The Technology

- Strong Intellectual property; Pond has files 16 patents with the US Patent and Trademark Office; 4 granted.

Major systems include:

- Gas handling
- LED/Sunlight illumination in bioreactor
- Algae harvesting
- Nutrient dosing system
- Overall control system



Core Feature of the Technology



Illumination System:

- Inside a photo-bioreactor, algae growth is generally light limited.
- Photosynthesis is most efficient when utilizing red light in the 680 – 700 nanometer wavelength range.
- Pond has spent in excess of \$10M over a decade developing and refining the illumination system to optimize algae growth.

Project Overview: First Phase

Construction of three (3) photo-bioreactors that will biologically remove 715 tonnes of CO₂ emissions from the Warden Energy Centre (WEC)'s combustion of natural gas from the hot water boiler & CHP operations.

The facility will manufacture, dry and ship algae.

Purpose:

To demonstrate the commercial “scale-up” of this proven technology.

Site Overview



Warden Energy Centre (WEC)



5 MW CHP Facility

Markets for Algae

Nutraceutical Markets

Examples include chlorella powder, spirulina powder, astaxanthin, omega-3.
Huge value, exponential growth, lower volume.

Animal Feed Markets

Aquaculture feed, animal feeds.
High value, strong growth, big volumes.

Biofuel Markets

Biodiesel, biomass pellets.
Lower value, moderate growth, huge volumes.

Environmental Benefits

GHG pre-project: 20,909 tonnes CO₂ annually at the WEC (2016 data)

GHG post-project: 20,909 tonnes + 45.7 tonnes generated by electricity in the process – 715 tonnes absorbed by process = 20,239.7 tonnes

Net Reduction:

$20,909 - 20,239.7 = 669.3$ tonnes annually

Next Steps

Carbon capture and utilization technology will be expanded until 80% of WEC GHG emissions are sequestered (~15,500 tonnes annually).

Plus an additional 25 tonnes of NO_x, a criteria air contaminant.

Goal

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 transform 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 the Pond technology and our sector.

More Information

www.markhamdistrictenergy.com

www.pondtechnologiesinc.com

www.carbon.xprize.com

Questions & Discussion



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