



***Making Investments In Biofuel Capacity Based  
Upon Policy Objectives  
Building On Our Core Alcohols Business  
Barry Wortzman, VP Business Development***

---

**BioCleantech Conference – Ottawa – November 3, 2016**



*driven by nature*

- We are Canada's leading producer of Gen1 ethanol and high purity industrial and beverage alcohols
- We own and operate 4 dry mill corn plants in Ontario and Quebec, and 3 downstream industrial alcohol processing and packaging facilities in Ontario, Connecticut and Kentucky
- Our Statistics:
  - a private company
  - employ a staff of over 400
  - annual sales in range of ~\$800 million
  - 'grind' ~62 million bushels per year to produce a combined 675 MLPY (500/175)

## Gen1 Corn Alcohol Plants

Varenes, QC



Chatham, ON



Tiverton, ON



Johnstown, ON



## Downstream Packaging Plants

Shelbyville, KY



Brampton, ON



Brookfield, CT



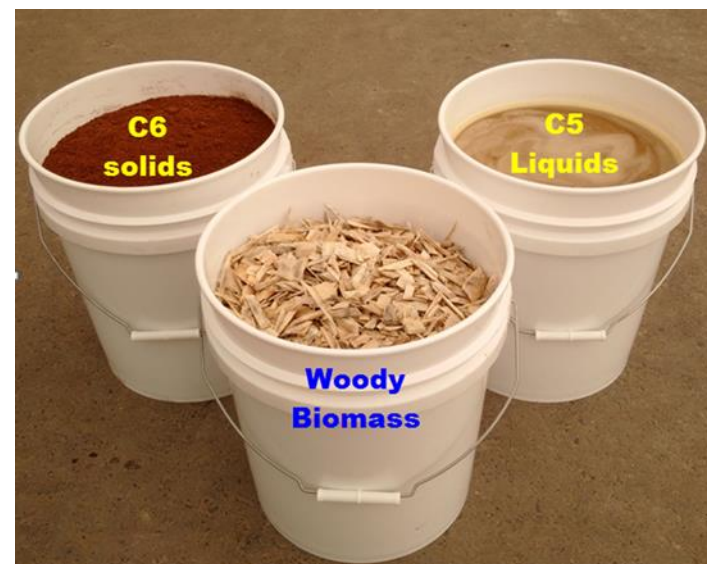


- **Government policy enabled the establishment of the Gen1 ethanol industry**
- **That industry is now mature and self-sustaining**
- **Federal:**
  - Renewable Fuels Standard – 5% renewable content in gasoline, implemented in 2008 (provides assurance of market access)
  - Ethanol Expansion Program – provided capital support through repayable grants
  - ecoEnergy for Biofuels Program – provided declining production incentives for 7 years for approved domestic biofuels facilities (ethanol and biodiesel)
- **Ontario:**
  - Ontario Renewable Fuels Standard – 5% renewable content in gasoline, implemented in 2007
  - Ontario Ethanol Growth Fund – a 10-year variable-rate production incentive for approved Ontario ethanol facilities; incentive rate formula tied to prevailing corn/oil/ethanol/fx values
- **Quebec:**
  - Reimbursable Tax Credit Program – a 10-year, variable rate production incentive based on prevailing crude oil values
  - Energy Efficiency Support – administered by Quebec Ministry of Natural Resources – grant support for eligible energy-reducing projects within biofuels production facilities

- **Doyletech Corporation – Total Economic Impact Assessment of Biofuels Plants in Canada (2013 Report)**
  - **Construction Phase**
    - 26 renewable fuels plants constructed at aggregate investment of \$2.7B
    - Capacity build-out of 1.8 billion litres of ethanol and 0.7 billion litres of biodiesel annual production
    - Total net economic activity from build-out was \$4.4B; creating >20K direct and indirect jobs
  - **Operations Phase**
    - Gross annual economic benefits of >\$3.0 billion to Canadian economy
    - Operations supporting 1,078 direct and indirect jobs
  - **Cost effectiveness of Government Support Programs**
    - **Federal**
      - Direct annual benefits from corporate, income and sales taxes from plant operations of \$139.1 million
      - Excise taxes collected on biofuels \$205.9 million
      - 2:1 payback on federal support
    - **Ontario**
      - Direct annual benefits from corporate, income and sales taxes from plants operations of \$105.7 million
      - Excise taxes collected on biofuels \$206.3 million
      - 4:1 payback on provincial support

- We are committed to a biorefinery strategy, built on our core business success:
  - corn oil extraction (Chatham, Varennes, Johnstown)
  - anaerobic digestion to displace NG (Varennes)
  - CO2 and waste heat supplied to a greenhouse operation (Chatham)
  - CO2 clean-up and compression (Chatham, Varennes, Johnstown)
  - CNG (Tiverton)
  - steam supply (Tiverton)
- Importantly, we are also fully committed to developing and adopting Gen2 technologies for our own and 3<sup>rd</sup> party use, including:
  - Pretreatment of Lignocellulosic Biomass
  - Advanced High Rate Two Stage Anaerobic Digestion
  - Conversion of distillers corn oil into drop-in renewable fuels and bio-lubricants

- A mechanical, acid and caustic free continuous hydrothermal system using our patented twin screw extruder technology to pretreat the biomass ("TSE") and prepare it for anaerobic digestion and to effect C5 sugar separation and recovery.
  - A two-stage steam cooking, mechanical shear and compressive solid-liquid separation/liquid extraction capability using proprietary TSE components (filters and specialized elements) and confidential operating knowhow.
  - Simple equipment train - Steaming Bin, Extruder #1, Cooker #1, Extruder #2, Cooker #2.
  - Mechanically produces separate clean streams of C5/C6 sugars with removal of toxins/inhibitory compounds without the addition of chemicals.
  - Is feedstock agnostic.
  - The TSE has been operating at 5 TPD demonstration scale since late 2014; and 24/7 for ~a year.



# Patented 2-Stage AD System

- A novel, patented biological 2-stage anaerobic digestion system to produce clean hydrogen, methane and CO2 bio-gases using organic material including lignocellulosic biomass pretreated in the TSE.
  - Stage 1 generates Hydrogen and Stage 2 generates Methane.
  - The novelty of decoupling the activity of a single-stage, conventional methane AD in this way results in a significantly enhanced biogas conversion efficiency.
  - Enables enhanced solids digestibility, increased organic loading rates, with lower residence times, requiring less capital.
  - Hydrogen efficient, conversion process utilizes over 90% of the hydrogen in the biomass.
  - Non-specialized naturally occurring optimized bacterial cultures efficiently convert all types of sugars and organics into biogas in contrast with yeast or single strain organisms which are finicky and only convert one type of organic molecule.
  - Has been operational since late 2015; lined out on stillage; currently processing TSE pretreated poplar and stover with expected hydrogen yields.

