



Implementing New Technologies

by

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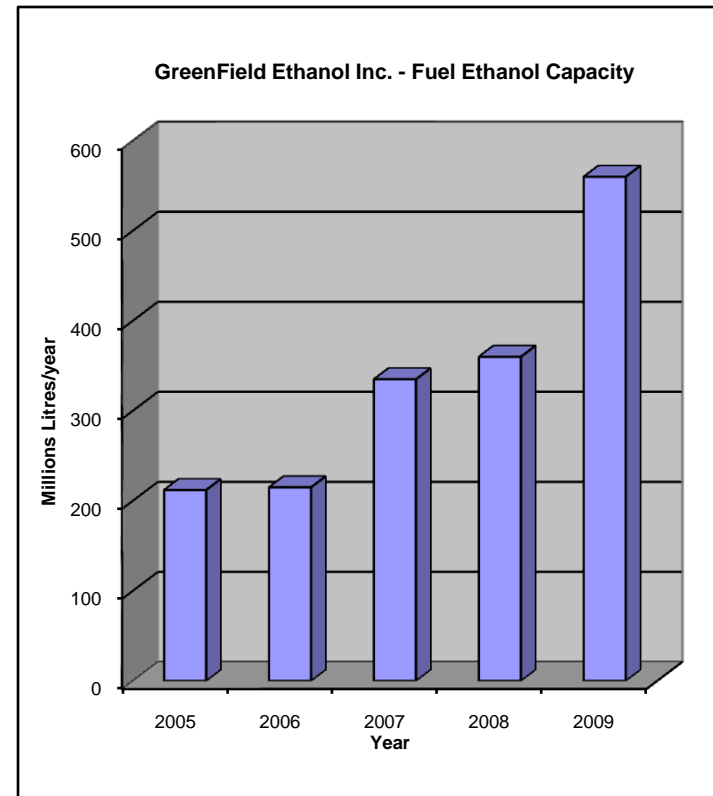
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Policy and Priorities**

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University of Western Ontario**

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Who Is GreenField Ethanol ?

- Private company
- Canada's largest ethanol producer
- 550 mpy from 4 plants
- Sold in 1300 gas stations
- Long term supply contracts for output
- Leading industrial and beverage supplier in North America
- Supplier of animal feed (DDG)
439,000 tons per year
- Sales \$400 m/year



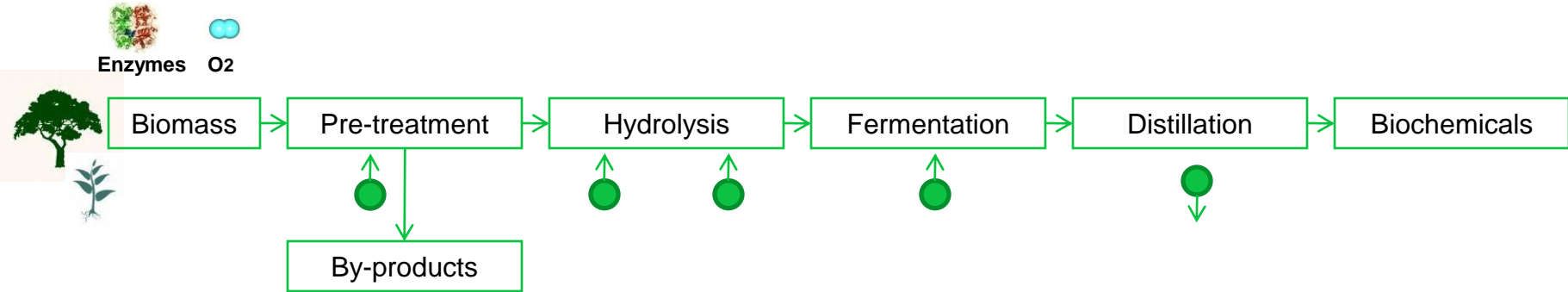
GreenField Strategy

- Remain Canadian leader in ethanol production
- Maximize cash flow from existing corn-based ethanol
 - Specialty value added products
 - Efficient low cost production units
 - New technologies
- Grow business via innovation and generation 2 biofuels and chemicals
 - Pursuing two parallel paths: biochemical and thermochemical
 - Unique approach – must be sustainable and viable economically – not theoretical

Two Processes

Biochemical Process (Sugar)

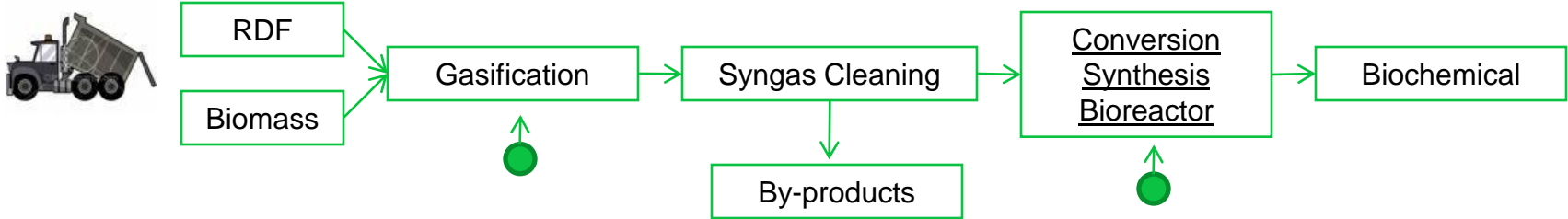
- Pretreatment, hydrolysis, fermentation of biomass feedstocks into biofuels and biochemicals



Two Processes

Thermochemical Process (Syngas)

- Gasification of biomass and refuse derived fuel (RDF) from municipal waste and conversion to biofuels and biochemicals



Biochemical

- GreenField Centre of Excellence
- Major R&D effort at \$3 m/year
- Pilot plant – 1 ½ T/day
- Developing our own technology
- Major breakthrough by R&D
- Believe we lead development of economically viable process



BIOCHEMICAL LIGNOCELLULOSIC PILOT PLANT, Chatham



Biochemical

Objective: Convert cellulosic biomass from agricultural, forestry and municipal waste into biofuels via biochemical technology.

■ Biomass

- Corn cobs, corn residue
- Grasses
- Woodchips and wood residues
- Pulp and paper liquors

■ Process

- Preparation of feedstock
- Thermochemical pretreatment
- Hydrolysis
- Fermentation
- Distillation

Biochemical

■ Next Steps

- Optimize process
- Evaluate new feedstocks
- Build demo plant 2009/10
- Build commercial/ sell technology 2012

Thermochemical

- GreenField has joined forces with Enerkem to commercialize production of cellulosic ethanol from solid municipal waste
- Enerkem specializes in a thermochemical process called gasification
- Advantages
 - Converts solid urban wastes, which can't be recycled or reused, into biofuels instead of sending them to a landfill (85% reduction of volume)
 - Can use wide variety of biomass feedstocks

Thermochemical

■ The process

- Preparation of residues - sorting, recycling, drying and shredding
- Gasification - convert carbon rich residues into syngas
- Scrubs clean syngas
- Convert syngas to biofuels via reforming and catalytic conversion

■ One tonne of material produces 350 litres of ethanol

Thermochemical

- Pilot plant in Sherbrooke - started up in 2003
- Demo plant in Westbury 10 t/d - started up January 2009

Thermochemical

■ Enerkem's pilot plant in Sherbrooke



Feeding System



Gasifier



Cleaning &
Conditioning
Systems



Catalysis conversion

Going Forward

These technologies are

- Highly technical
- Capital intensive
- And as a consequence high risk

They need significant government support during initial phases

- R&D
- Pilot demo plants
- First commercial

Why Support These Projects

- Reduce greenhouse gas emissions
- Use waste, non-food feedstocks
- Create local jobs
- Create highly skilled engineers and scientists

Why Support These Projects

- Improves/diversifies energy/feedstock supplies
- Creates value-added products
- Forestry development
- Agricultural development

Government's Role

Governments need to

- Expedite approval process
- Understand and support projects and technologies providing lowest cost solutions
- Streamline government support programs
- Carbon tax fund?
- Do we really believe GHG is a problem? If so, let's act.
- Take a leadership role

Conclusion

- High risk like all new technologies
- Expensive, but economics will evolve and improve (cell phone)
- Pleased with government for our R&D and demo projects
- GreenField will be a major Canadian player in this evolving sector

Conclusion

Thank you