Waste-to-methanol: a commercial reality with Enerkem
Enerkem at a glance

- Biofuels and renewable chemicals from garbage
- Proprietary clean technology developed in-house
- Private company founded in 2000; 200 employees
- First full-scale commercial biorefinery beginning operations in Edmonton
  - 2 facilities in Québec (pilot and demonstration)
- Developing similar facilities in North America and abroad
  - Several MOUs in China and EU
Key market drivers for waste as feedstock

• Increased scarcity of urban landfill airspace and societal desire for waste diversion
• Circular economy or “cradle-to-cradle” approach
• Low cost unconventional feedstocks
• Renewable fuels mandates around the world
• Consumer pull for renewable and biobased products
• Focus on carbon footprint and GHG emissions reduction
Enerkem’s biorefinery process

Methanol as end-product & chemical intermediate
Bringing the model to reality

Rigorous path to commercialization
Production of biomethanol at the demonstration facility in Westbury, Canada
Ethanol production in Westbury, Canada
Large market potential

**MSW IN THE EU**

- **Recycling / Composting**
- **Landfill / Incineration and Others**

---

**75 MILLION METRIC TONS OF MSW SUITABLE FOR ENERKEM’S TECHNOLOGY PLATFORM**

**254 MILLION METRIC TONS OF MSW GENERATED PER YEAR**

**The potential: 28.3 BILLION LITRES USING ENERKEM’S TARGET YIELD**

---

1 375 litres of cellulosic ethanol per metric ton
Source: Eurostat (European Commission), 2011
Methanol as a fuel in Europe

- Methanol is blended with gasoline in some countries (UK, Netherlands, Iceland)
- EU mandates 10% minimum target for the share of biofuels in transport petrol and diesel consumption by 2020. Biofuels must provide a 35% GHG emissions savings compared to fossil fuels, 50% in 2017, and 60% in 2018 for new plants
- As of April 2015:
  - Biofuels from food crops are limited to 7% of all transport energy, 3% must come from advanced biofuels such as Enerkem waste-based biofuels
  - Double counting is confirmed for biofuels from waste feedstocks such as MSW (member states are responsible for implementing this measure)
Cost-competitive and sustainable solution

Municipality:
- Supplies between 100,000 to 400,000 tons of MSW per year (as available)
- Long-term contract
- Pays tipping fee – attractive compared to status quo
- Suggests sites

Enerkem:
- Investor, technology provider and/or joint venture partner in project
- Converts RDF into biofuels and renewable chemicals up to 4x scale of Edmonton
- Works with waste and municipal partners to optimize MSW sorting and for site selection
- Manages business risks incl. sale of final product
- Creates high-quality jobs
- Generates $C65 M/year in net economic benefits in the region (for 1 X standard Enerkem system of 100,000 tons / year)

Ethanol
- 38-152mm LPY

Methanol
- 50-200mm LPY
City of Edmonton’s Integrated Waste Management Centre

Recycled ➔ 20%
Composted ➔ 40%
Biofuels ➔ 30%
Landfill ➔ 10%

Waste diversion = 90%
EN ERKEM ALBERTA BIOFUELS

Capacity: 38 million litres per year (10 MGY) (i.e. 1 X standard Enerkem system)
Feedstock: 25-year agreement with City of Edmonton for 100,000 dry tonnes of MSW per year
Products: Biomethanol, cellulosic ethanol

World’s first commercial MSW-to-biofuels and chemicals facility
Manufacturing for growth

• Moving beyond Build-Own-Operate model → licensing and equipment supply
• Modular manufacturing approach with pre-fabricated modules enabling global expansion
Target growth areas for global partnerships

- Strategic partnerships with leading industrial groups
- Selection based on market attractiveness:
  - public policies, tipping fees, proximity to petrochemical infrastructure, population and growth
Using waste as feedstock for the chemical industry

Fourteen partners have joined forces to assess the use of waste for the production of chemicals in the Netherlands.

The public-private partnership will study the options for setting up Europe’s first plant, either in Rotterdam or Delfzijl.

Other partners involved in the initiative:
Thank you

For more information:

Marie-Hélène Labrie
Senior Vice President, Government Affairs and Communications
mlabrie@enerkem.com
www.enerkem.com