BIOFUELS AND CHEMICALS FROM MIXED WASTE: THE ENERKEM CONTRIBUTION TO SUSTAINABILITY AND CIRCULAR ECONOMY

Rob Vierhout
Government Relations Advisor
ENERKEM AT A GLANCE
Transforming waste and residues into biofuels and renewable chemicals

- 200+ employees
- Exclusive feedstock-flexible multi-product technology
- Pre-commercial facility in operation
- Low-cost advanced biofuels and renewable chemicals
- Smart waste management solution displacing landfilling and incineration
- International projects backed over US$600M in investments
ENERKEM SOLUTION

**FEEDSTOCK**
- Municipal Solid Waste
- Plastics
- Agricultural Biomass
- Forest Biomass
- Material Recovery Facility Residues

**PRODUCTS**
- Ethanol
- Methanol

**MARKETS**
- Transportation Fuels
- Solvents & Coatings
- Plastics & Renewable Chemicals
MUNICIPAL SOLID WASTE IN THE WORLD

2 BILLION TONS solid waste generated each year

1.4 BILLION TONS unrecoverable solid waste suitable for Enerkem

recycled or composted

600 MILLION TONS

978 BILLION LITERS* of biofuel or renewable chemicals transformed by Enerkem

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* Average volume of production based on a second generation Enerkem facility with thermal reformer and hydrogen technology

Source: World Bank, 2018
MUNICIPAL SOLID WASTE IN EUROPE

- **254 MILLION TONS**
  - Solid waste generated each year

- **132 MILLION TONS**
  - Unrecoverable solid waste suitable for Enerkem

- **92 BILLION LITERS**
  - Of biofuel or renewable chemicals transformed by Enerkem

- **122 MILLION TONS**
  - Recycled or composted

Source: Eurostat, European Commission, 2017
TO A CIRCULAR ECONOMY
ENERKEM ALBERTA BIOFUELS (EAB)

The World’s first pre-commercial waste-to-biofuels facility.

1. **CAPACITY**
   38 million litres per year
   (i.e. 1 X standard Enerkem system)

2. **FEEDSTOCK**
   25-year agreement with City of Edmonton
   for 110,000 dry US tons of waste per year

3. **PRODUCT**
   Cellulosic ethanol
FACILITY SNAPSHOT
EDMONTON ALBERTA BIOFUELS (“EAB”)

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>Edmonton, Alberta, Canada</th>
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<tbody>
<tr>
<td>CAPACITY</td>
<td>14.5 tph of waste feed</td>
</tr>
<tr>
<td>FEEDSTOCK</td>
<td>MSW from City of Edmonton, wood biomass, C&amp;D, waste plastics</td>
</tr>
</tbody>
</table>
| KEY FEATURES      | Proprietary technology transforming the ultimate residue of sorted MSW into clean syngas  
|                   | Syngas is used to produce, thermo-catalytically, and with the option of additional H2, MeOH. The latter is carbonylated and Ethanol produced by hydrogenolysis |

### PHASED CONSTRUCTION FOR SUCCESSFUL SCALE-UP

<table>
<thead>
<tr>
<th>PHASE 1+2 WASTE TO SYNGAS &amp; SYNGAS TO METHANOL</th>
<th>KEY ACHIEVEMENTS</th>
<th>COMPLETION STATUS</th>
</tr>
</thead>
</table>
| 1st Pre-commercial plant to convert heterogeneous waste feedstock to chemical grade syngas| Senior lenders “Bankability / Reliability” test passed (February 2017):  
• IMPCA industry-compliant Bio-Methanol sold | ✓                  |

<table>
<thead>
<tr>
<th>PHASE 3 METHANOL TO ETHANOL</th>
<th>KEY ACHIEVEMENTS</th>
<th>COMPLETION STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of Bio-Methanol to Bio-Ethanol island completed in fall 2017, on time and on budget. Commissioned on 2018.</td>
<td>EtOH production since Q1 2019; ramping-up production in Q2 &amp; Q3</td>
<td>✓</td>
</tr>
</tbody>
</table>
ENERKEM ALBERTA BIOFUELS (EAB)
World's first MSW-to-biofuels facility

International Sustainable Carbon Certification (ISCC)
British Columbia Carbon Intensity certification (in addition to Alberta and Canadian RFS certifications)
U.S. EPA approval to collect RIN's for cellulosic ethanol produced at EAB

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ENERKEM IN VARENNES

1. TYPE
   One production line facility

2. CAPACITY
   Input: 200K US tons of waste
   Output: 95M litres per year

3. FEEDSTOCK
   Non-recyclable waste from the commercial and institutional sectors

4. PRODUCT
   (bio-)Methanol, (bio-)Ethanol

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Input: 400K US tons of waste
Output: 265M litres per year
Non-recyclable waste from the municipal, industrial, commercial and institutional sectors (bio-)Methanol
ENERKEM IN TARRAGONA

1. TYPE
   Two production line facilities

2. CAPACITY
   Input: 440K US tons of waste
   Output: 265M litres per year

3. FEEDSTOCK
   Non-recyclable waste from the municipal, industrial, commercial and institutional sectors

4. PRODUCT
   (bio-)Methanol
PROJECT PIPELINE

OPERATIONAL
UNDER CONSTRUCTION
PERMITTED / IN PERMITTING PROCESS
UNDER DEVELOPMENT
May 29th 2019

**Enerkem is finalist of The Sky's the Limit Challenge led by Natural Resources Canada.**

The Sky's the Limit Challenge is part of a nationwide challenge to Canadians to develop the cleanest, most affordable and sustainable fuel for the aviation sector to further reduce its carbon footprint and fight climate change.

« By expanding the range of biofuels and biochemicals enabled by our technology, Enerkem will be able to set new global standards in waste management, biofuels and renewable chemicals and be at forefront of the circular economy »

**DOMINIQUE BOIES**
Chief Executive Officer
and Chief Financial Officer

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A STRONGER PARTNERSHIP WITH SUNCOR

October 22th 2019

Suncor Energy increases its participation in Enerkem, strengthening their existing relationship

- Closing of a US$38.3 million equity investment from Suncor, Canada’s leading integrated energy company
- The company first participated in the ownership of Enerkem in April 2019 as part of a US$58.4 million equity financing alongside Enerkem’s existing shareholders.
- With this new investment, Suncor becomes a significant, strategic shareholder of Enerkem

Through this additional investment, the confidence Suncor is showing us sends a clear signal that they strongly support and believe in the Enerkem technology, confirming our leadership in the advanced biofuels market

DOMINIQUE BOIES
Chief Executive Officer
and Chief Financial Officer
THANK YOU

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CONTRIBUTING TO MEET WASTE MANAGEMENT CHALLENGES