Outline

- Overview of the Edmonton Waste Management Centre (EWMC)
- Edmonton’s Journey to Biofuels Production
- The Edmonton Waste to Biofuels Project
  - The Partnership (COE, EAB & AIEES)
  - The 3 Components
    - Integrated Processing and Transfer Facility (IPTF)
    - Waste to Biofuels Facility
    - Advanced Energy Research Facility (AERF)
Edmonton Waste Management Centre

- 550 acres
  - Twelve waste processing facilities
  - Two major research facilities
  - Closed Landfill
  - Sewage biosolids storage/recycling lagoons

- Nine contractors, partners, tenants
- Over 400 employed today and
- 500 by end of 2014
Community Relations / Events

- School Grade 4 Tours / engaging the community
- Presentations to over 13,000 Students & 3,000 adults per year
- EWMC Visitors
Edmonton Waste-to-Biofuels Project

Materials Recovery Facility (MRF) for recyclables
Edmonton Waste-to-Biofuels Project

Co-Composting Facility (for MSW & Biosolids)
Edmonton Waste-to-Biofuels Project

Edmonton Composting Facility

High Solids Anaerobic Digestion Facility

Integrated Process and Transfer Facility
The City knew the landfill would be closing and that it would have to be hauling waste offsite (at higher costs!)

City did establish recycling and composting programs, so it had maximized the 3-Rs - currently diverting 60% of the residential waste

Specific targets included:
- Increase Edmonton’s landfill diversion rate for residential waste from 60% to 90%
- Reduce Edmonton’s need for landfills, without going to traditional combustion systems
The Journey to Biofuels Production

- Starting Premise - There is a better solution than landfill
- Enerkem was chosen:
  - Flexible and innovative technology platform (low temp fluidized bed)
  - Demonstrated ability to produce clean syngas from waste feedstocks
  - Ready for commercialization
- Research / Pilot Project – confirmed initial key performance parameters (2004-2006); Grant from AERI (1st Pelletization of RDF and then 2nd RDF fluff feeding system re-design)

- Grant Support (Alberta Innovates) (2006)

Project Officially Announced
The Journey Continues…

- 2007/08 - Contractual Agreements & Environmental Permitting
- 2009 - Regulatory Approval
- August 2010 – Start of Construction
- 2014 – Mechanical Completion & Commissioning
## Overview of the New Project – Three Components, Three Partners

<table>
<thead>
<tr>
<th>Facility</th>
<th>Primary Operator</th>
<th>Role</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Processing and Transfer Facility (IPTF)</td>
<td><strong>City</strong> owns and operates</td>
<td>§ Produces RDF (Feedstock)</td>
<td>$90 M</td>
</tr>
<tr>
<td>Waste-to-Biofuels Production Facility</td>
<td><strong>Enerkem</strong> owns and operates</td>
<td>§ Produces 38M litres of biofuels/year from provided feedstock</td>
<td>Approximately $105 M (construction)</td>
</tr>
<tr>
<td>Advanced Energy Research Facility (AERF)</td>
<td>City owns. City &amp; <strong>AIEES</strong> will direct activities</td>
<td>§ Ongoing R&amp;D activities § Higher value products § Process optimization</td>
<td>$12.5 M</td>
</tr>
</tbody>
</table>

**AIEES = Alberta Innovates Energy and Environment Solutions**
INTEGRATED PROCESS AND TRANSFER FACILITY (IPTF)

Designed to optimize and enhance waste processing through mechanical and manual sorting:

- Waste transfer station
- Waste Pre-processing system
- Refuse Derived Fuel (RDF) plant

Owner/Operator: City of Edmonton
Pre-Processing Stage Process
Organics to Composting and AD Facility

[Image of a process flow diagram with labels for pre-processing stages]
Refuse Derived Fuel (RDF)
Process for Waste to Biofuel
ENERKEM OVERVIEW:
WASTE-TO-BIOFUELS PROJECT
Edmonton Waste-to-Biofuels Project

<table>
<thead>
<tr>
<th>Feedstock preparation</th>
<th>Gasification</th>
<th>Cleaning and conditioning process</th>
<th>Catalytic synthesis and product purification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorting, shredding, drying (if required) and feeding</td>
<td>Conversion of carbon-rich residues into synthetic gas</td>
<td>Primary syngas purification</td>
<td>Conversion of chemical-grade syngas into final renewable products</td>
</tr>
</tbody>
</table>

* Municipal solid waste

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Edmonton Waste-to-Biofuels Project
Edmonton Waste-to-Biofuels Project

90% Diversion of Residential Waste Stream

- MRF & Depots
  - 1st t
  - 60k t
  - 220k t

- Pre-Processing & Composting Facilities
  - 30k t Feedstock
  - 80k t Feedstock
  - 30k t Non-Recoverable
  - 40k t Biosolids

- RDF Prep & Gasifier
  - 55k t Commodities to Market
  - 35M L of Ethanol (35k t)
  - CO₂ Capture
  - 15k t Ash & Rejects

- Landfill
  - 28k t
  - 15k t

Legend:
- Input Stream:
  - MSW Municipal Solid Waste
  - Biosolids (wet)
- Output Stream:
  - Compost
  - Recycling
  - Gasifier Output
- Symbols:
  - Residential Waste
  - Commercial Waste

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ADVANCED ENERGY RESEARCH FACILITY (AERF)

To develop and demonstrate innovative technologies converting residual biomass or waste feedstock into clean energy and products.

- Uses Enerkem’s proprietary technology
- Joint steering and technical committee
- Government of Alberta support

Owner/Operator: COE
## Edmonton Waste-to-Biofuels Project

<table>
<thead>
<tr>
<th>Type:</th>
<th>300 kg per hour throughput pilot facility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Partnership:</strong></td>
<td>- City of Edmonton</td>
</tr>
<tr>
<td></td>
<td>- Alberta Innovates – Energy and</td>
</tr>
<tr>
<td></td>
<td>Environment Solutions (AIEES)</td>
</tr>
<tr>
<td></td>
<td>- Enerkem (*provides its proprietary</td>
</tr>
<tr>
<td></td>
<td>technology*)</td>
</tr>
<tr>
<td><strong>Status:</strong></td>
<td>Mechanical complete. In operation.</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Edmonton, Alberta, Canada</td>
</tr>
<tr>
<td></td>
<td><em>Adjacent to Enerkem’s Commercial facility</em></td>
</tr>
<tr>
<td><strong>System:</strong></td>
<td>Fully integrated for gasification, gas conditioning and alcohol production</td>
</tr>
<tr>
<td><strong>Focus:</strong></td>
<td>- Feedstock Variety</td>
</tr>
<tr>
<td></td>
<td>- ACC Plastic Trials</td>
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<tr>
<td></td>
<td>- Reforming optimization</td>
</tr>
<tr>
<td></td>
<td>- ATR, DMC, Membranes</td>
</tr>
</tbody>
</table>
Edmonton Waste-to-Biofuels Project

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

90% Waste Diversion
Thank you!

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