

A photograph of an industrial facility at night, illuminated by warm lights. A large white sign with the Enerkem logo and name is visible in the foreground. The background shows complex piping, scaffolding, and structures against a dark blue sky.

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Conversion Technologies and Best Practices Throughout the World



Enerkem at a glance

- MSW-based biofuels and renewable chemicals producer
- World's first full-scale commercial MSW biorefinery beginning operations in Edmonton, Alberta
- \$400M invested to date to move from R&D to commercial stage
- 200 employees
- New alternative to landfilling and incineration

50
Hottest
Companies
in the
Advanced
Bioeconomy
2016



Large market potential

MSW IN NORTH AMERICA



282 MILLION
METRIC TONS OF MSW
GENERATED PER YEAR

84 MILLION
METRIC TONS OF MSW
SUITABLE FOR ENERKEM'S
TECHNOLOGY PLATFORM

THE POTENTIAL:
35 BILLION
LITRES USING
ENERKEM
(9 B GALLONS)

¹ Tonnage based on a weighted average

Source: World Bank, 2012

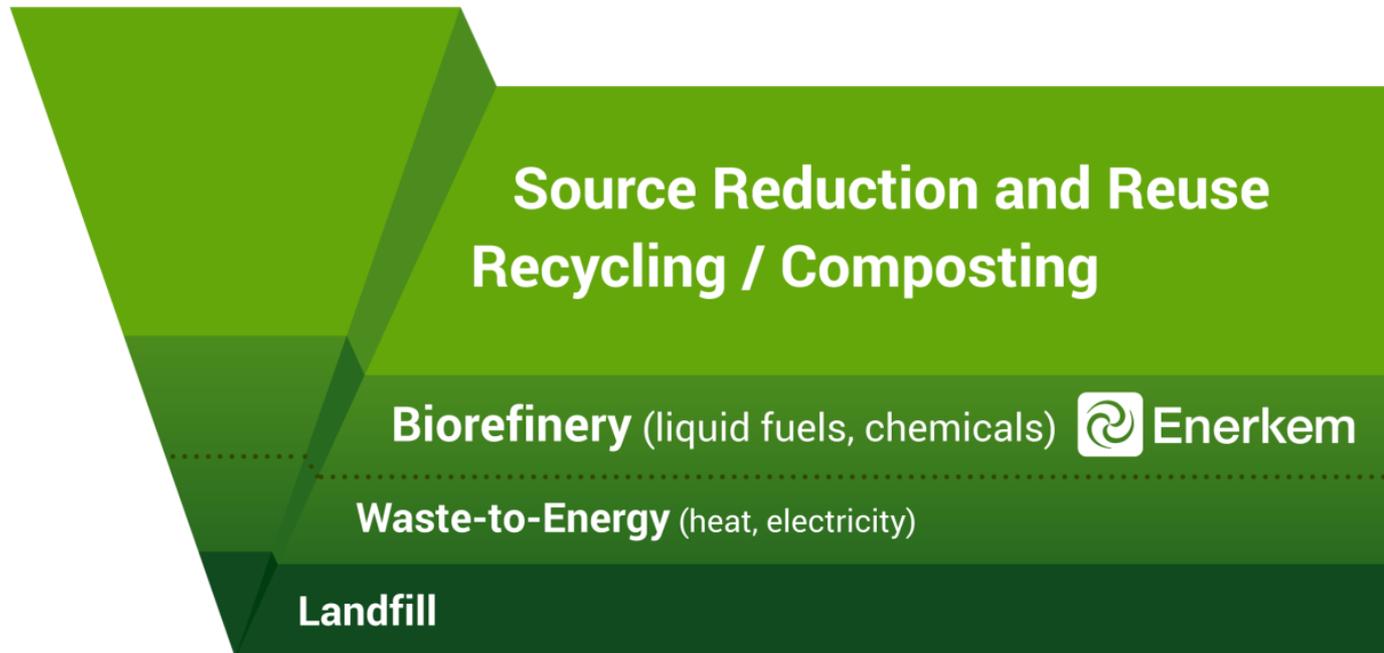
Sustainable waste management solution

Complementary to recycling and composting



Alternative to landfilling and traditional waste to energy

Helping increase waste diversion to 90%



A large industrial facility, the Enerkem Alberta Biofuels plant, featuring complex metal structures, pipes, and a prominent sign with the Enerkem logo. The facility is set against a clear blue sky with some clouds. In the foreground, a large crowd of people is gathered on a dirt area, and a white tent is visible on the right side. A green semi-transparent box is overlaid on the top right of the image, containing text.

World's first commercial
MSW-to-biofuels and
chemicals facility

ENERKEM ALBERTA BIOFUELS

- Capacity: 38 million litres per year
(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

Bringing the model to reality

Rigorous path to commercialization

UNIVERSITY OF
SHERBROOKE
PILOT



SHERBROOKE



WESTBURY FACILITY



MODULAR COMMERCIAL BIOREFINERIES



Laboratory

Pilot

Syngas
Demo

Methanol
Demo

Ethanol
Demo

Full-scale commercial
production



Unique partnership with the City of Edmonton

- Leader in waste management practices
- Edmonton Waste Management Centre
 - North America's largest collection of modern, sustainable waste processing and research facilities
 - 233-hectare site
- Enerkem selected as part of a thorough selection process involving over 100 technology providers



City of Edmonton's Integrated Waste Management Centre

Edmonton

| | | |
|-----------|---|-----|
| Recycled | ↻ | 20% |
| Composted | ↻ | 40% |
| Biofuels | ↻ | 30% |
| Landfill | ↻ | 10% |

Waste diversion = 90%



- 1 Integrated Processing and Transfer Facility
- 2 Recycling center
- 3 Composting center
- 4 ENERKEM biorefinery

 Alberta
Innovates
Energy and
Environment Solutions



Benefits of the Enerkem Alberta Biofuels facility

Environmental/Social

- Solves a waste problem and avoids methane emissions
- Reduces GHG emissions by 60% when compared to gasoline
- Can become a model for municipalities around the world



Trends towards Low Carbon Transportation Fuels

| Gasoline, Gasoline Blendstock or Replacement | Definition | Carbon Intensity (including land use effect) |
|--|--|--|
| CARBOB | CARBOB | 99.78 |
| Corn ethanol* | Derived from corn | 75.97 |
| Cellulosic Ethanol* | Derived from corn stover | 41.05 |
| Sugarcane Ethanol* | Derived from Brazilian sugarcane | 56.66 |
| Electricity | CA grid electricity | 105.16 |
| Hydrogen | Compressed H2 from central reforming of NG | 151.01 |

* California Air Resources Board temporary CIs for fuels with indeterminate CIs

Source: California ARB, July 31, 2015 (Proposed re-adoption of the LCFS: Third 15-Day Modified Regulation Order, Table 6. Tier 2 Lookup Table for Gasoline and Diesel and Fuels that Substitute for Gasoline and Diesel and Table 7. Temporary FPCs for Fuels with Indeterminate CIs)

Next facility: VANERCO

First advanced biofuels facility in Canada to be co-located with a conventional biofuels production facility

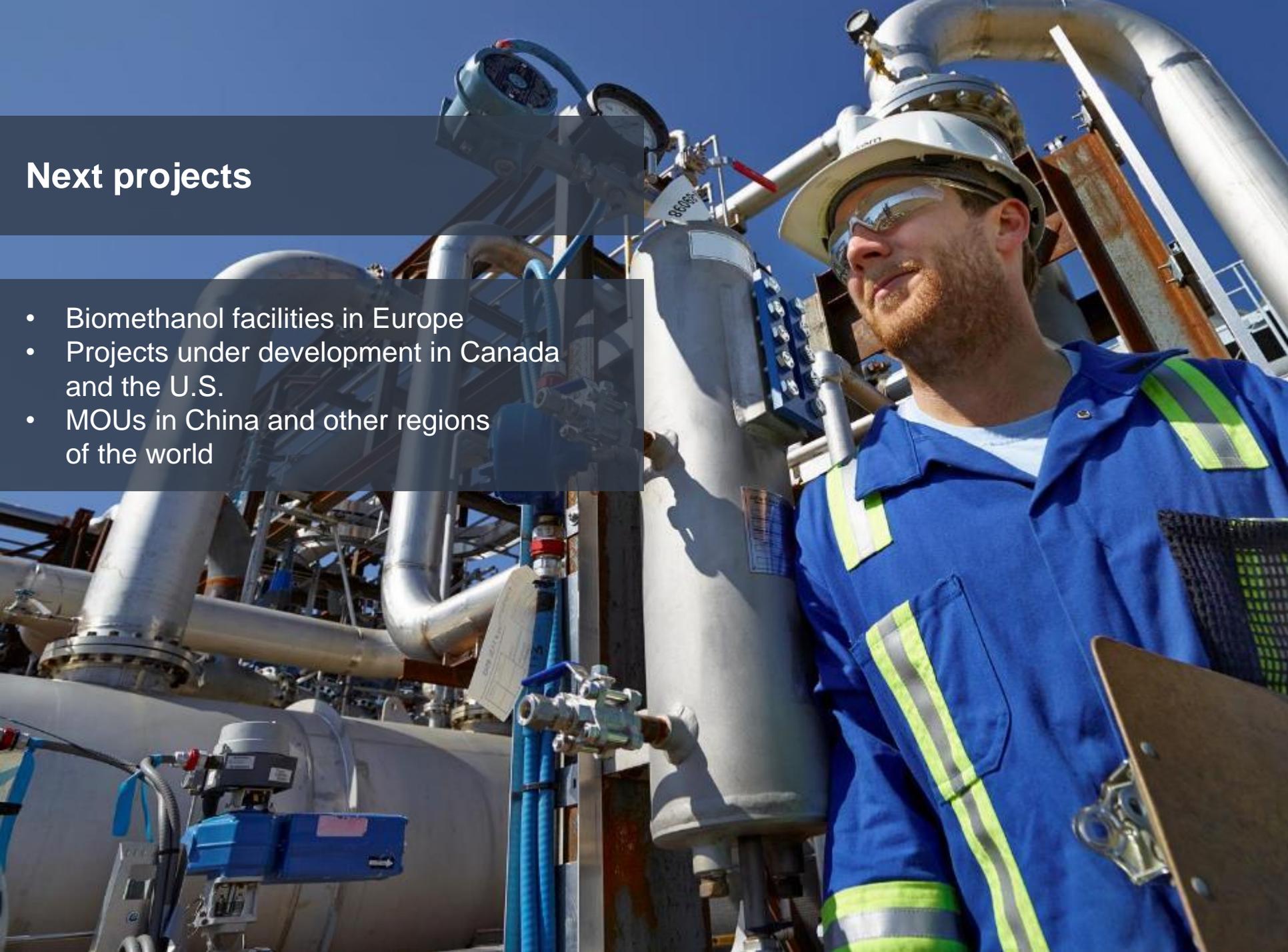
Capacity: 38 million litres
(1 standard Enerkem system → possibility to add more systems)

Feedstock: Non-recyclable/non-compostable urban waste
(industrial, commercial, institutional, construction, etc.)



Next projects

- Biomethanol facilities in Europe
- Projects under development in Canada and the U.S.
- MOUs in China and other regions of the world



Renewable chemicals from waste
help transition to a circular economy



Renewable chemicals for everyday products

Chemical building blocks in our syngas

Product Family

Applications



Renewable Methanol

Alcohols

Acrylates

- Transportation fuels
- Solvents for pesticides and coatings
- Pharmaceuticals
- Polymers
- Cosmetic products
- Plastics
- Textiles

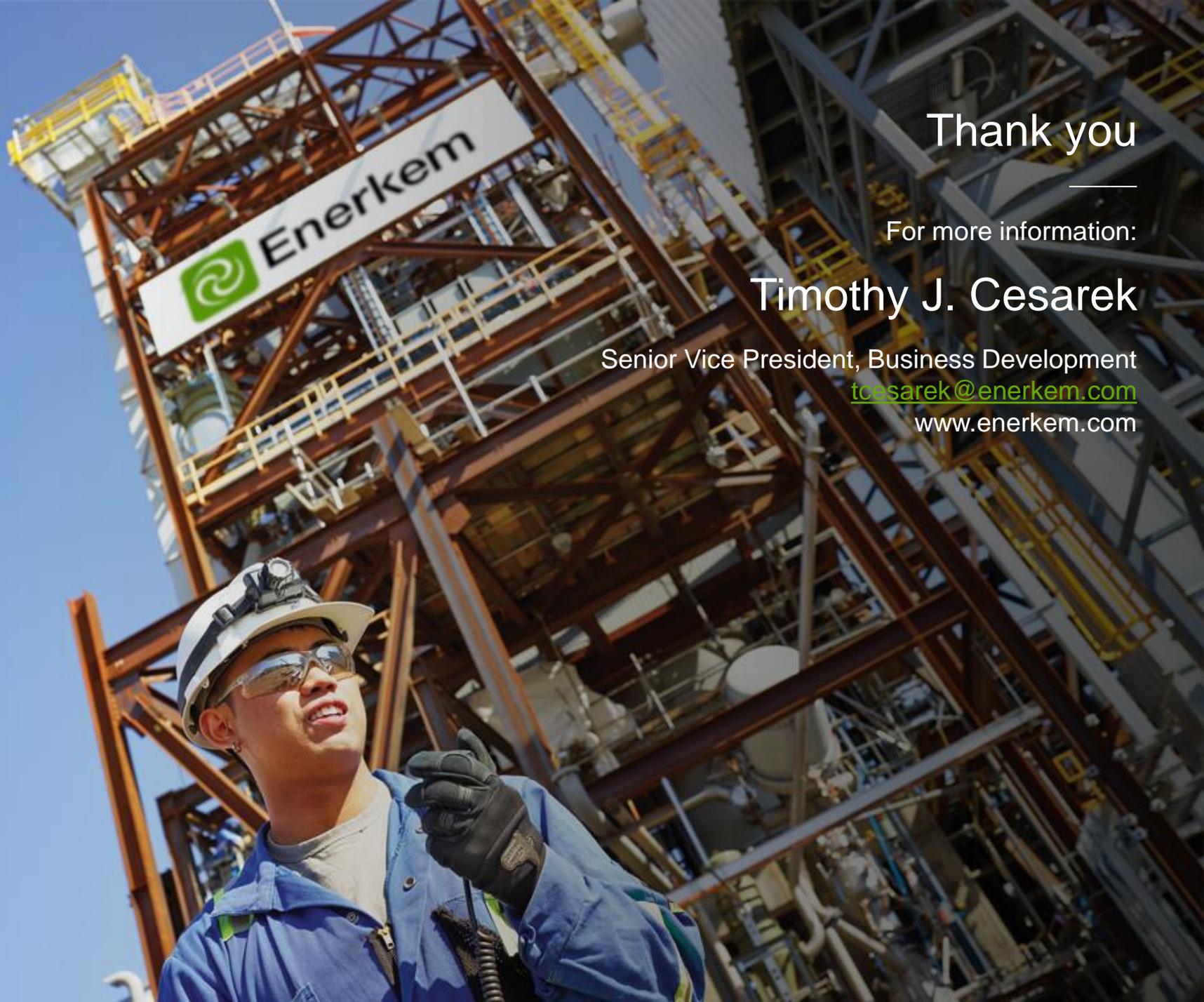
- Architectural and industrial coatings
- Plastics
- Adhesives



Using waste as a feedstock for the chemical industry - “carbon recycling from waste residuals”

Public-private partnership with AkzoNobel in Europe





Thank you

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