

Platform Duurzame Biobrandstoffen

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SYNGAS FROM BIOMASS OR WASTE, FOR CIRCULAR FUELS & CHEMICALS

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DISCLAIMER

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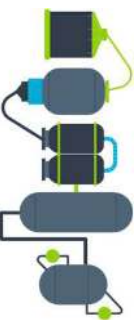


ENERKEM AT A GLANCE

Transforming waste or biomass into biofuels and renewable chemicals



200+ employees



Exclusive feedstock-flexible multi-product technology



Commercial-size facility in operation



Advanced biofuels and renewable chemicals



Smart waste management solution displacing landfilling and incineration



International projects backed by >1B EUR in investments

VARENNES ANNOUNCEMENT

VARENNES CARBON RECYCLING

NEWS RELEASE

CAD\$875 million biofuel plant in Varennes, Québec - Enerkem proposed partnership with Shell, Suncor and Proman with the leadership of the Québec government and support from the Canadian government

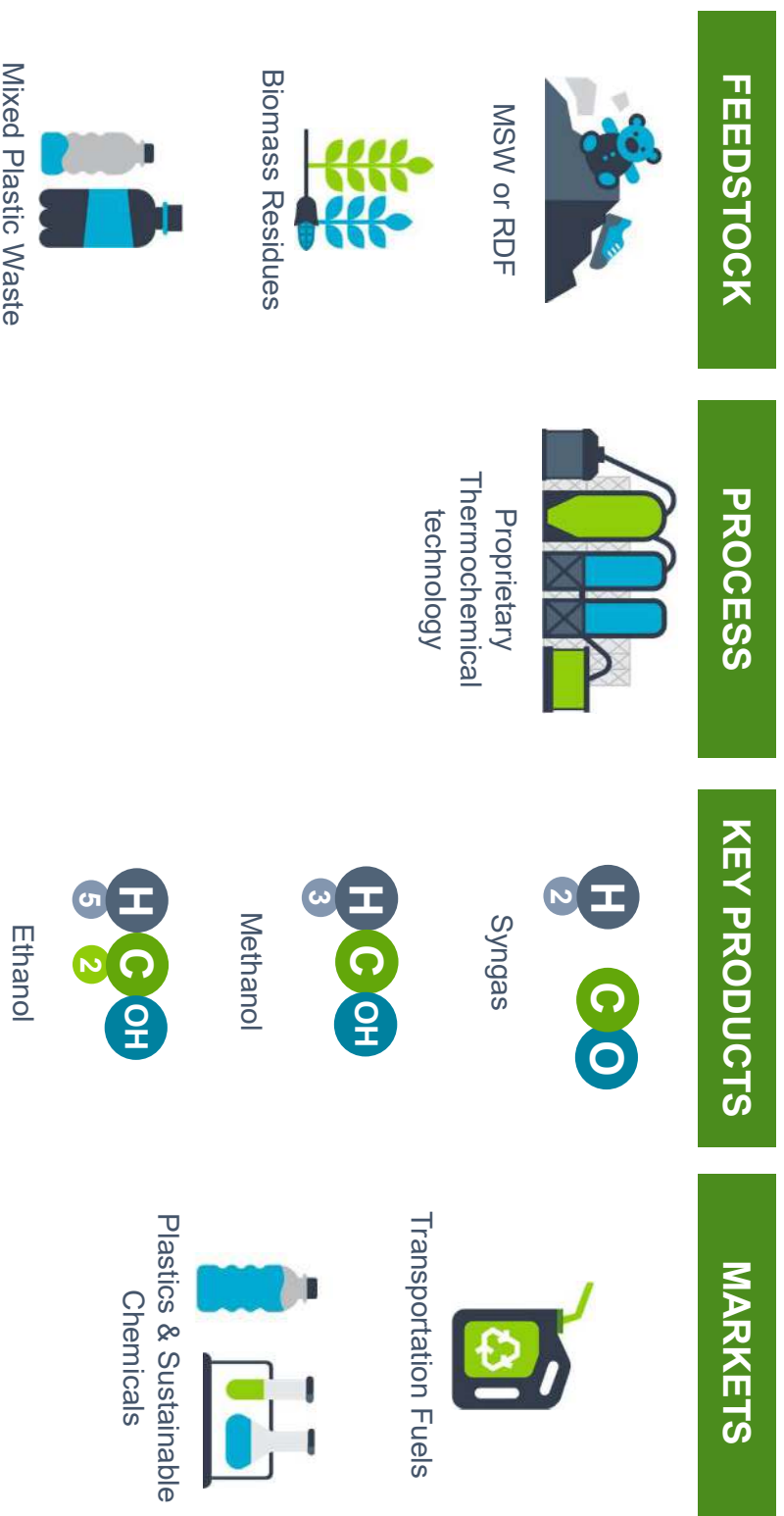
Highlights

- Conversion of more than 200,000 tonnes of non-recyclable waste and wood waste into an annual production of nearly 125 million litres of biofuels.
- Contribution to greenhouse gas (GHG) reduction equivalent to taking close to 50,000 vehicles off the road annually.
- Construction of one of the world's largest renewable hydrogen and oxygen production facilities with an 87-megawatt electrolyzer leveraging Québec's green electricity.
- Creation of more than 500 jobs during construction and about 100 permanent direct skilled jobs during operations.
- Annual recurring economic benefits of \$85 million for Québec.
- Investment of \$60 million since August 2019 to develop the project, prepare the site and obtain the required permits.
- The proposed partnership is subject to finalization of commercial agreements.

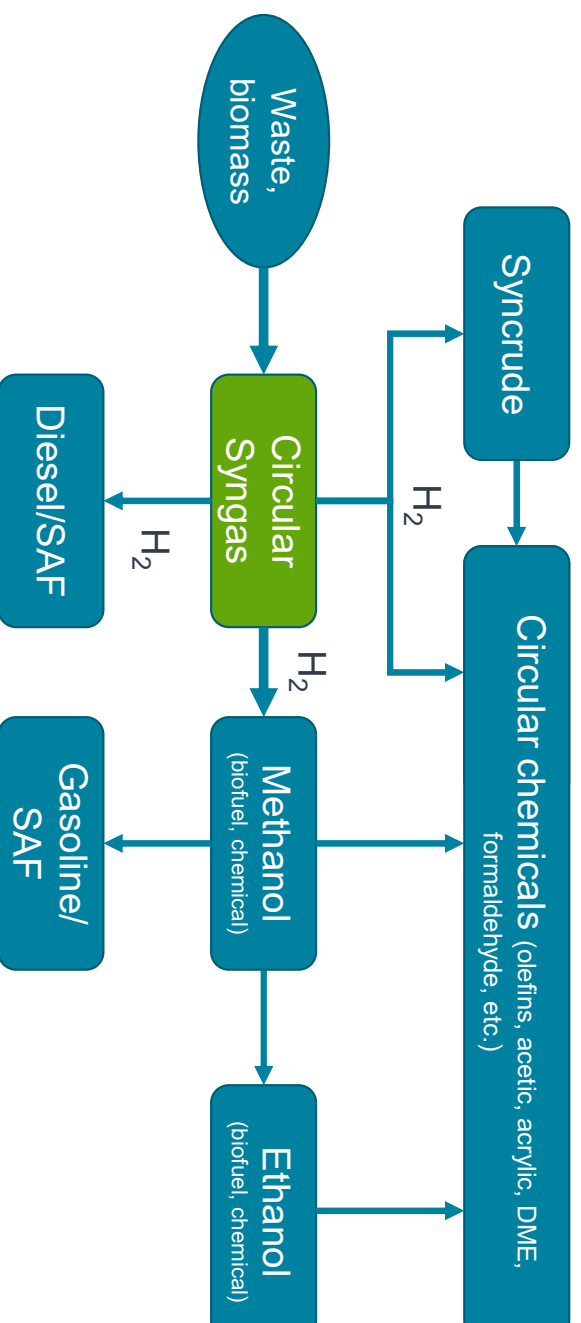


THE ENERKEM SOLUTION

Holistic platform for carbon recycling

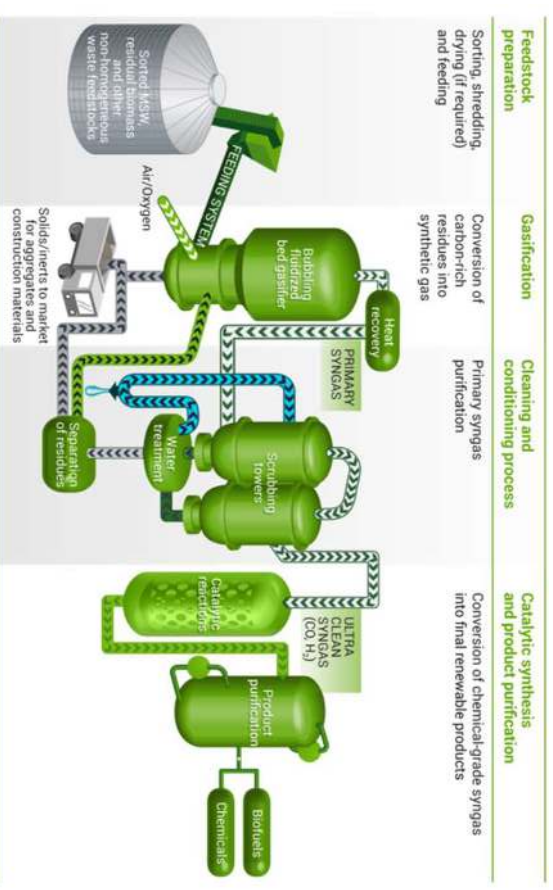


Enerkem have a platform to make circular fuels and chemicals, leveraging green hydrogen



THE ENERKEM PROCESS

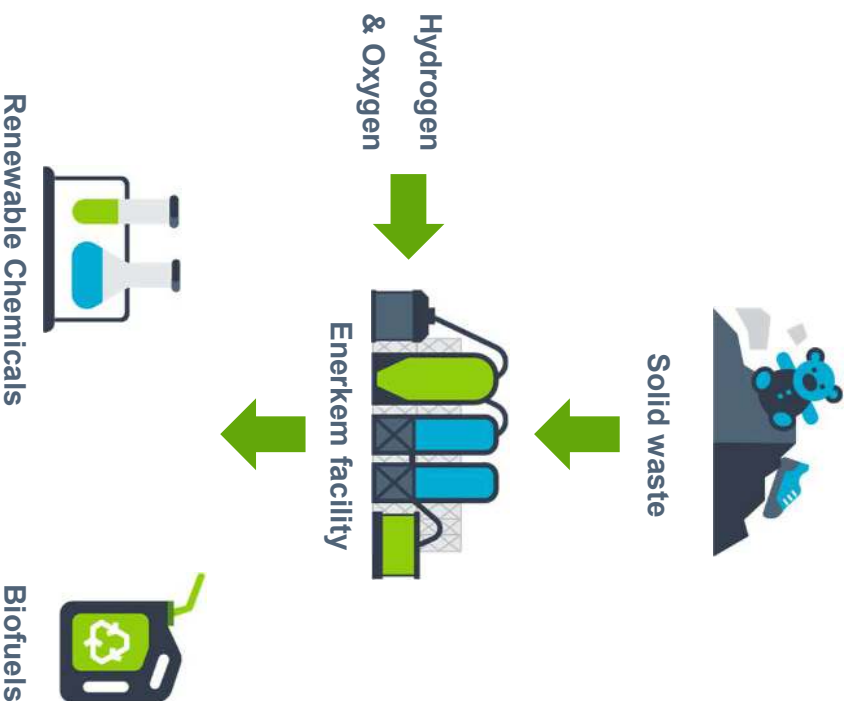
- Feedstock agnostic
 - Target biomass and ‘non-recoverable’ fraction from MSW or plastic recycling
- Fluidized bed gasification system
 - Oxygen/steam mix as fluidizing medium
- Scrubbing system to remove contaminants
 - Pure syngas ready for chemicals conversion to finished products
- Syngas, methanol & ethanol as current products, but also:
 - Drop-in fuels: diesel, gasoline, jet fuel, based on MTG, Fischer-Tropsch, and Alcohol-to-Jet
 - Sustainable chemicals including acetic acid, ethylene/olefins, and acrylic acid



PROJECT PIPELINE



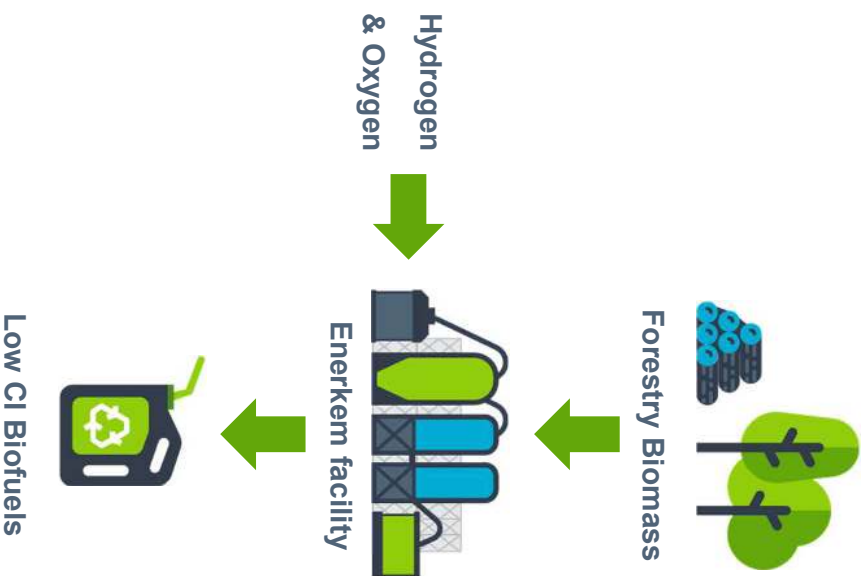
EXAMPLE: WASTE FOR CIRCULAR CHEMICALS



Features

- Two train facility, taking in ~230k BDMT of waste
 - Waste tipping fee is additional income
- Output differs significantly by product
 - E.g. ethylene ~ 100 ktpa, methanol 230 ktpa
- Refinery byproduct hydrogen can be used
 - Carbon Intensity not as essential (initially)
- Mass balancing allows to sell biofuel alongside circular chemicals
 - Waste has ~45% / 55% fossil/bio content

EXAMPLE: BIOMASS FOR FUELS

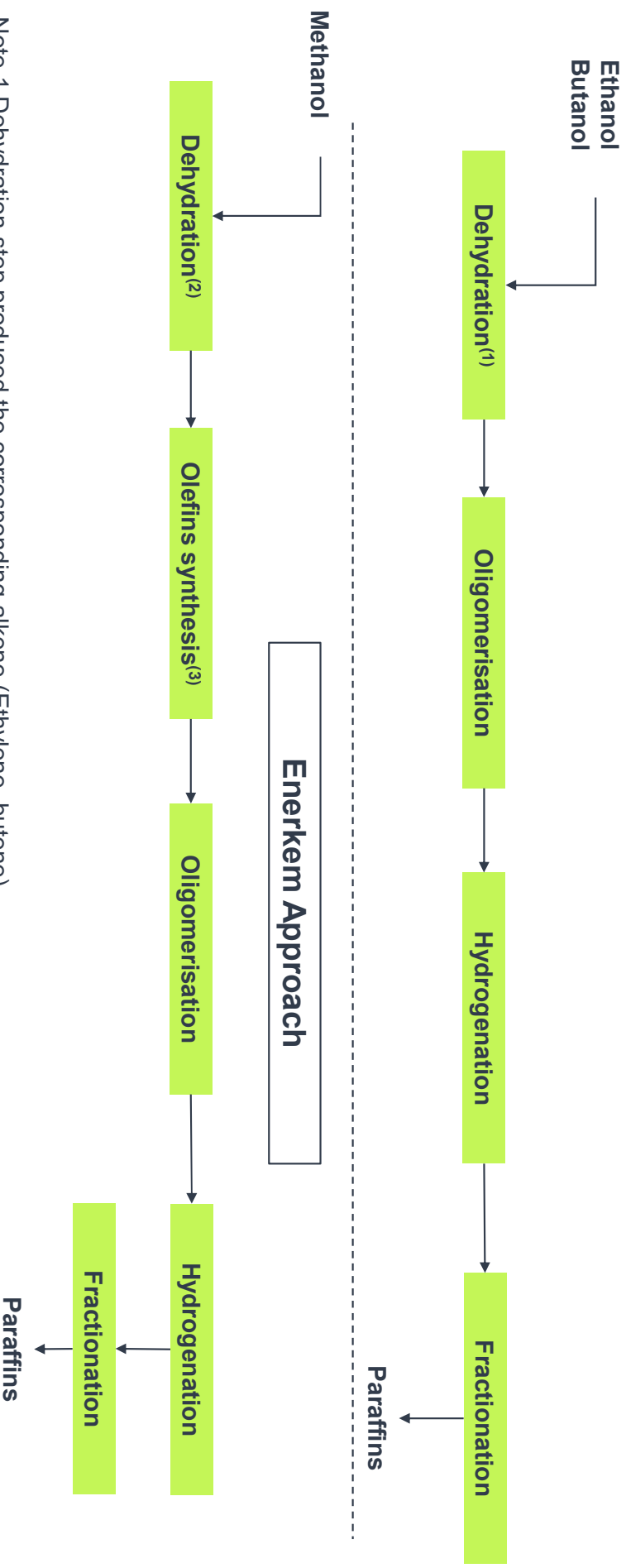


Features

- Two train facility, taking in ~230k BDMT of forest waste
- Approximate output 200-230 ktpa as (m)ethanol
 - ~70% carbon yield to methanol
 - 80-100 ktpa as diesel/jet fuel
- Carbon Intensities in the 10s and 20s
- Low CI supported by hydrogen (and oxygen) from electrolysis of water, with renewable electricity
 - E.g. from hydropower

Alcohol to Jet (ATJ) process

Detailed pathways



Note 1: Dehydration step produced the corresponding alkene (Ethylene, butene)

Note 2: Dehydration step produces an ether (DME)

Note 3: Light olefins (Ethylene, propylene, butenes) synthesis. MTP like process

IN SUMMARY

- Enerkem is bringing to market a proprietary, feedstock agnostic technology to produce circular syngas and follow-on products
 - Converting Biomass, MSW and sorted plastics
- Enerkem clean syngas can be readily converted to methanol, ethanol, drop-in fuels and circular chemicals
 - Validated at commercial scale, with carbon yield to methanol of >70%
 - Developing a methanol-to-SAF route
- Commercially validated; looking to work with more partners to roll out our sustainable platform and create a circular chemicals and fuel industry



**MERCI!
THANK YOU!**

PETER J. NIEUWENHUIZEN

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