



IEA Bioenergy
Technology Collaboration Programme



Task 33 Country report The Netherlands

October 2022

Berend

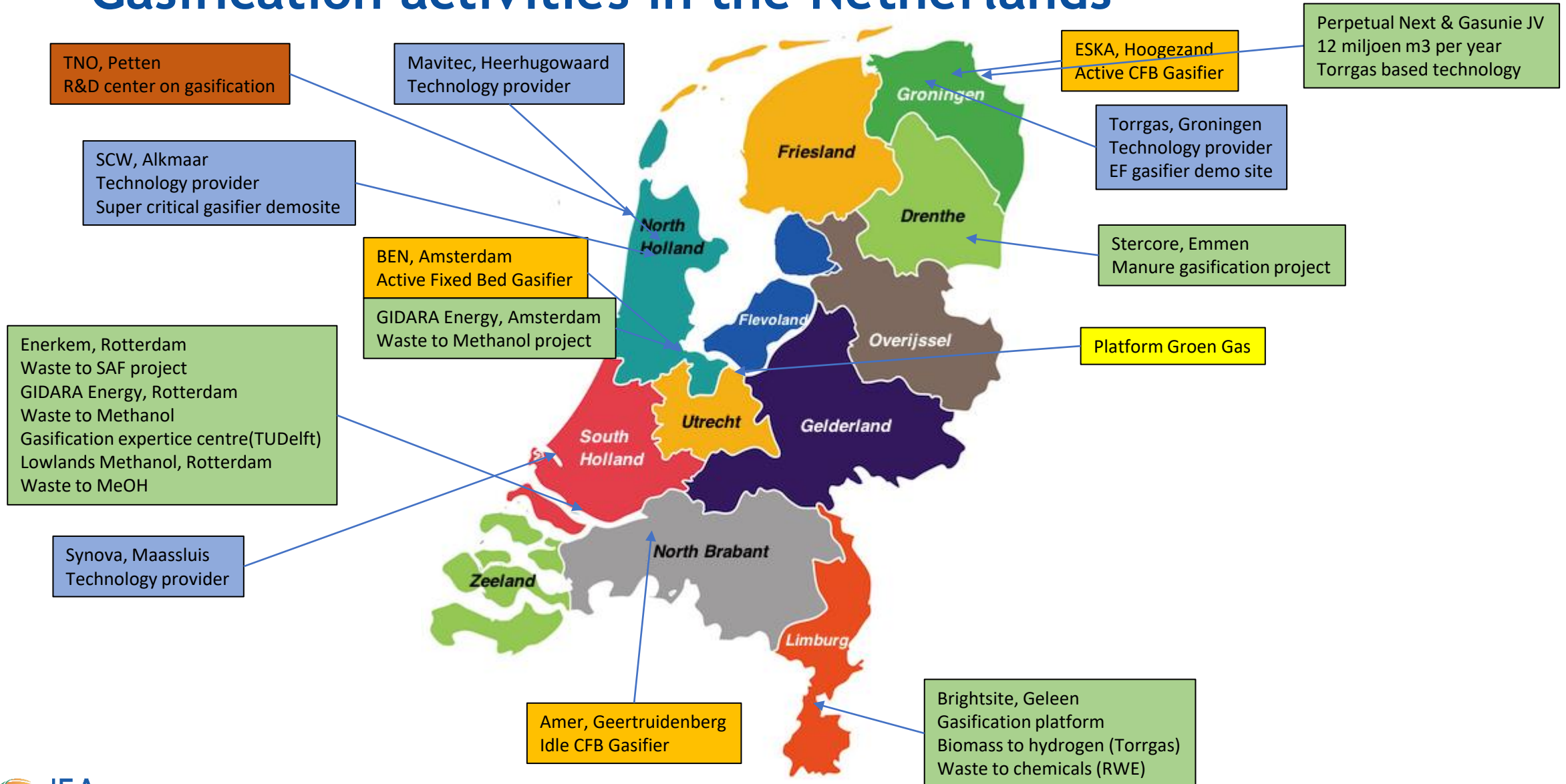
Online via Teams

The IEA Bioenergy Technology Collaboration Programme (TCP) is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the IEA Bioenergy TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

Technology Collaboration Programme

by **iea**

Gasification activities in the Netherlands



Stercore

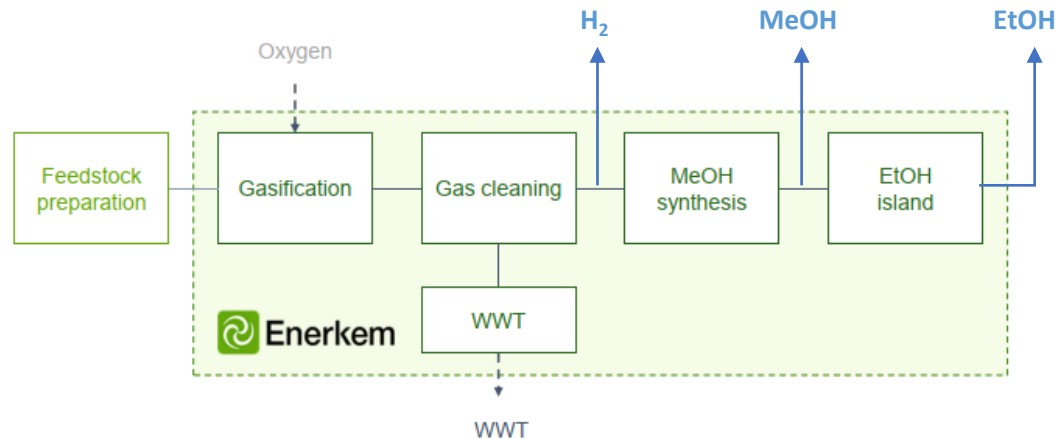


- NGO keeps blocking the construction - main reason because it enables Dutch farmers to keep livestock and produce manure



Technology Status:

- TRL9, commercial roll out
- > 25,000 hours of operation
- Feedstocks:
 - Pure plastics
 - Construction & Demolition (C&D)
 - RDF
 - Industrial, Commercial, and Institutional (ICI)
 - Biomass
 - Agricultural and forestry residues
- Commercial plant in Edmonton, Canada
 - 90 MWth producing IMPCA methanol and ASTM Ethanol
- Best of class carbon intensity
 - **Lowest carbon intensity on BC LCFS regime**
- Commercial syngas, hydrogen, methanol, and ethanol platforms



Rotterdam, Netherlands: project undergoing a review

- 400,000 tons of non-recyclable municipal solid waste
- Original project was a 220,000 tons of methanol per year
- Project under-review to determine feasibility of drop-in fuels production; i.e. coupling syngas to drop-in fuels technology package

Other Project Status:

Varenes Montreal, Canada: project in construction

- Partners: Shell, Suncor, Proman
- 200,000 tonnes per year of non-recyclable residual waste and wood waste
- annual production of nearly 125 million litres of low carbon fuels
- <https://www.shell.com/energy-and-innovation/new-energies/new-energies-media-releases/shell-invests-in-quebecs-first-waste-to-low-carbon-fuels-plant.html>

Tarragona Spain : project in engineering design

- Partners: Repsol, Suez
- 400,000 tons of non-recyclable municipal solid waste from its surrounding regions
- 220,000 tons of methanol, contributing to avoid 200,000 tons of CO2 and reducing the waste that ends up in the landfill
- <https://www.bioplasticsmagazine.com/en/news/meldungen/20210430-Repsol-to-join-Enerkem-and-Agbar-on-waste-to-chemicals-plant-project-in-Tarragona.php>



WASTE-TO-JET ROTTERDAM

- Type: Commercial facility with two production lines
- Input: ~360,000 metric tons per year (2x standard Enerkem system)
- Feedstock: reject fractions from waste recycling plants
- Benefits: 70% reduction in GHG emissions
- Output: Up to 80,000 tons of renewable products
- Product: Sustainable Aviation Fuel (75%), Naptha





Enerkem



VCR

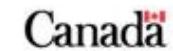
Varenes
Carbon
Recycling

VARENNES CARBON RECYCLING (VCR)

Capacity: 125 million litres of MeOH per year
(1x standard Enerkem system with H2 import)
includes 87 Mwe electrolyser supplying H2 and O2

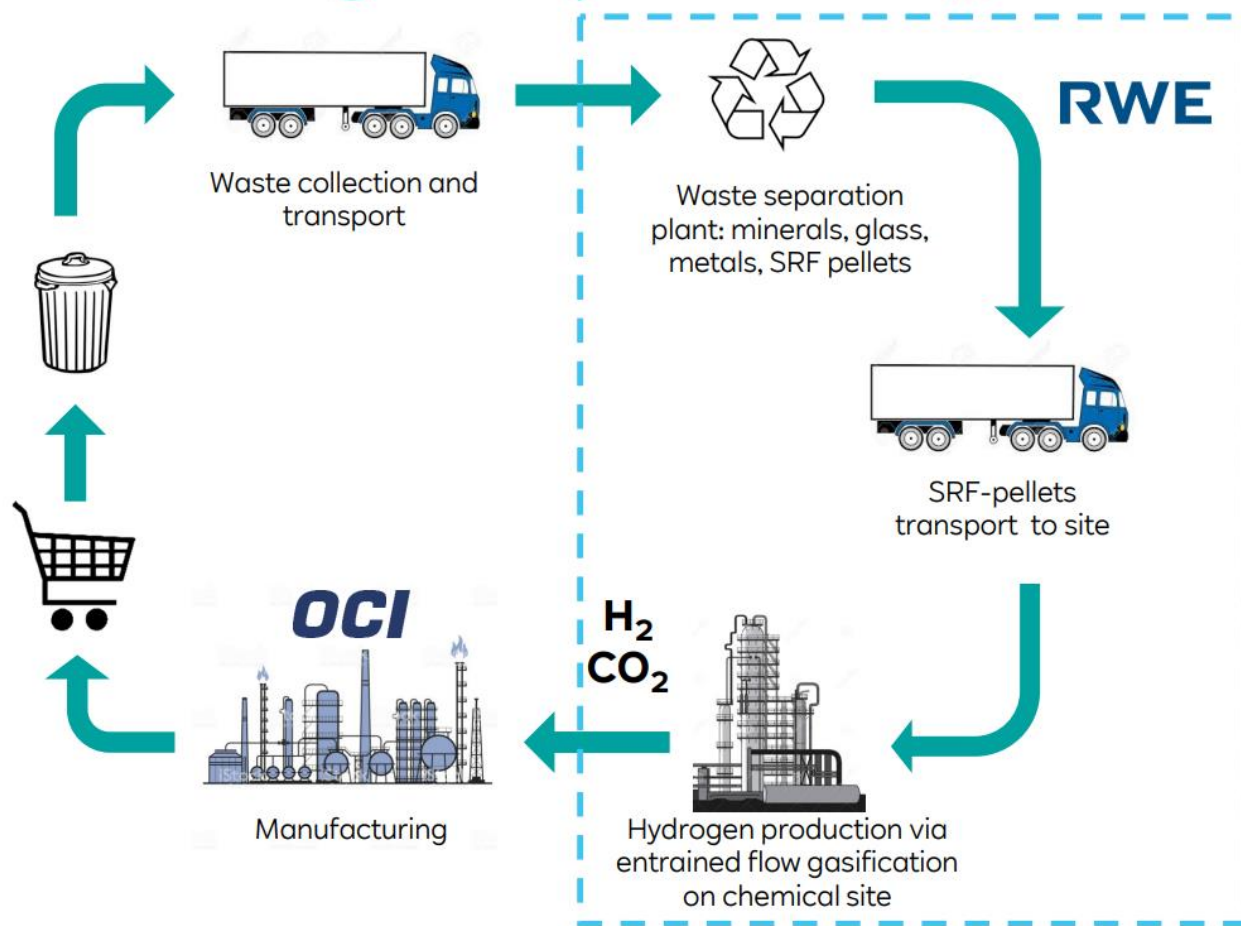
Feedstock: 200,000 dry tonnes of non-recyclable waste

Other benefits: 500 jobs during construction
100 permanent direct skilled operational roles
CAD \$85m of annual benefits for Québec



Furec - RWE

Waste-to-hydrogen produces green and circular hydrogen Contributing to Project FUREC („Fuse Reuse Recycle“)



Project typicals

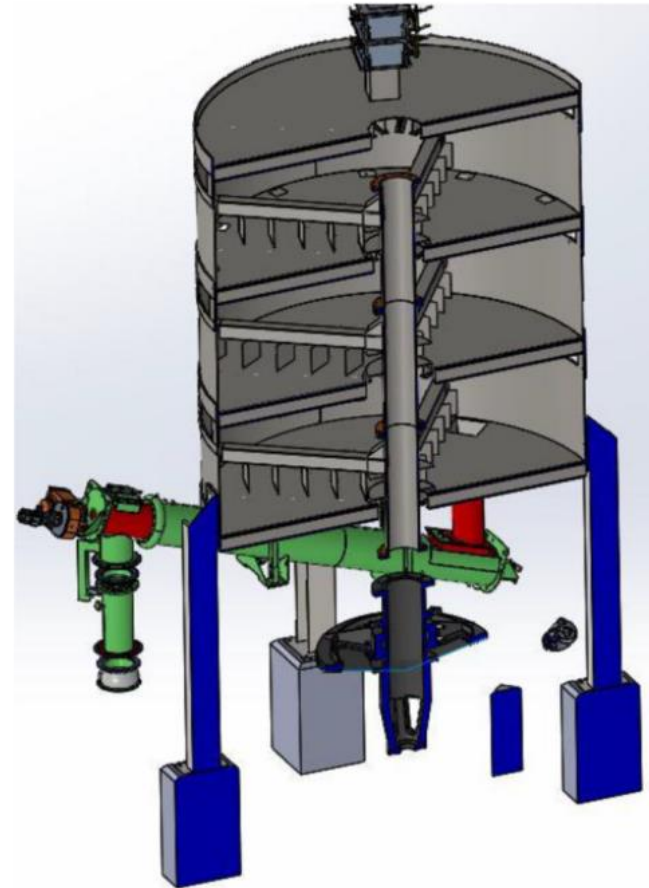
- Processing of Municipal Solid Waste and dried sewage sludge (700.000 t/a)
- Production of hydrogen (≈ 50.000 t/a)
- CO_2 reduction:
 - 475.000 t/a @ 0 kg/MWh Power
 - 330.000 t/a @ 180 kg/MWh Power
- 800.000 t/a of CO_2 pure, ready for CCS/CCU
- Estimated investment: >500 M€
- Other positive value products: minerals / glass / metals / slag / sulfur / salt
- Commissioning: 2026

Permitting in progress
Planning on track
Engineering started
Pilot MHF
construction started

Furec - RWE

Multiple Hearth Furnace Pilot Plant Design Basics and next steps

- Low Temperature Pyrolysis (Torrefaction) of lumpy Feedstock @ 260-320 °C in order to enable grinding of fuels like
 - Biomass or
 - Pelletized RDF
- for Entrained Flow Gasification (FUREC, MFC-Plant)
- Size: $D_o = 4 \text{ m} \mid H_t = 9 \text{ m}$
- Input: 240 kg/h
- Output: ca. 140 kg/h char
- Heating: Indirect via Thermal Oil
- Schedule: 09/21 – Order placed at John Cockerill SA
11/22 – Start of assembly on site
04/23 – trial run



Berend

berend.vreugdenhil@tno.nl



www.ieabioenergy.com