



**IEA Bioenergy**  
Technology Collaboration Programme



## Task 33 Country report The Netherlands

November 2020

Berend

Online via Teams

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**Technology Collaboration Programme**

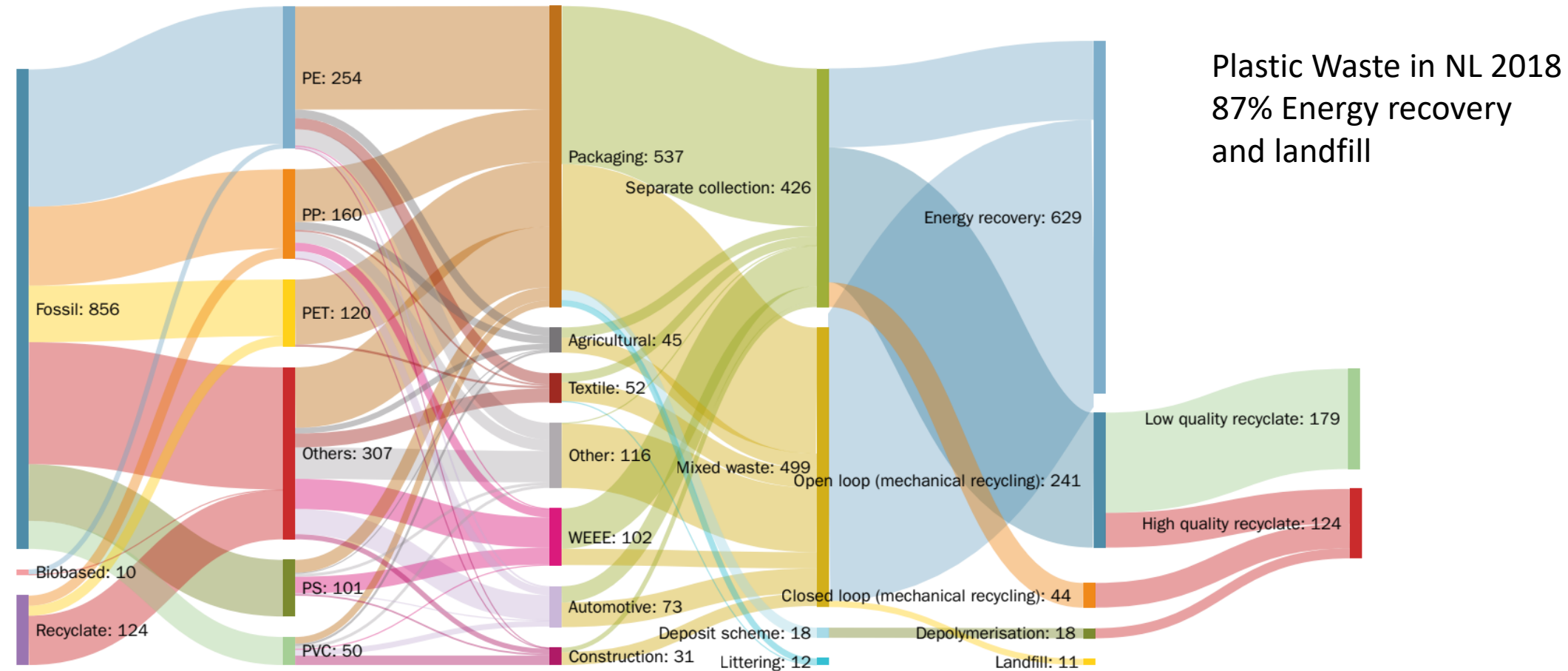
by **iea**

# Opportunities for gasification

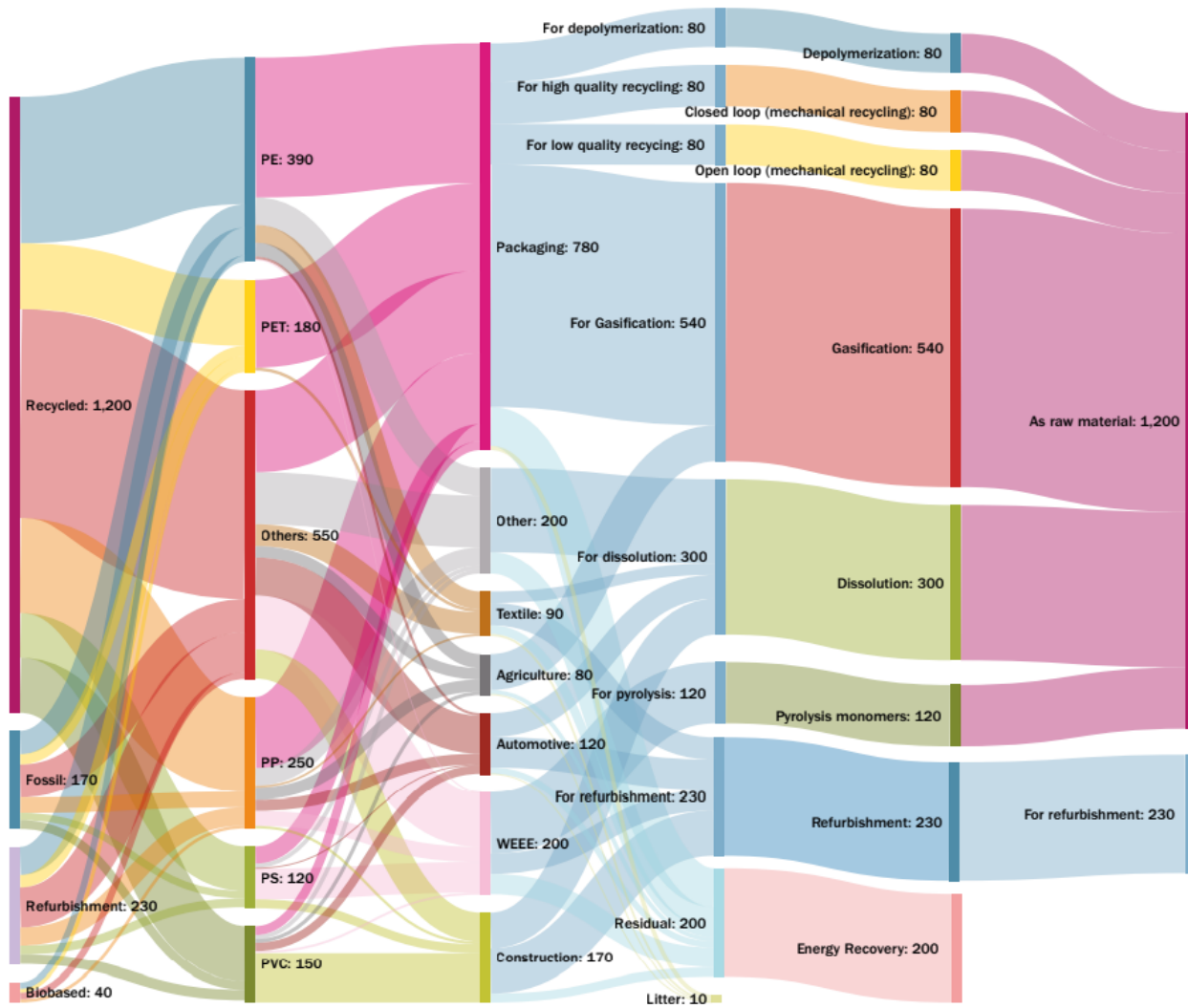
- The Netherlands is steering away from use of biomass for heat and power, but has identified it as crucial for the production of fuels and chemicals
- Horizon Europe has a clear theme on biofuels and biochemicals
- Circularity will depend heavily on gasification based technologies

# Whitepaper from TNO

<http://publications.tno.nl/publication/34637387/hCNlhm/TNO-2020-circular-plastics.pdf>



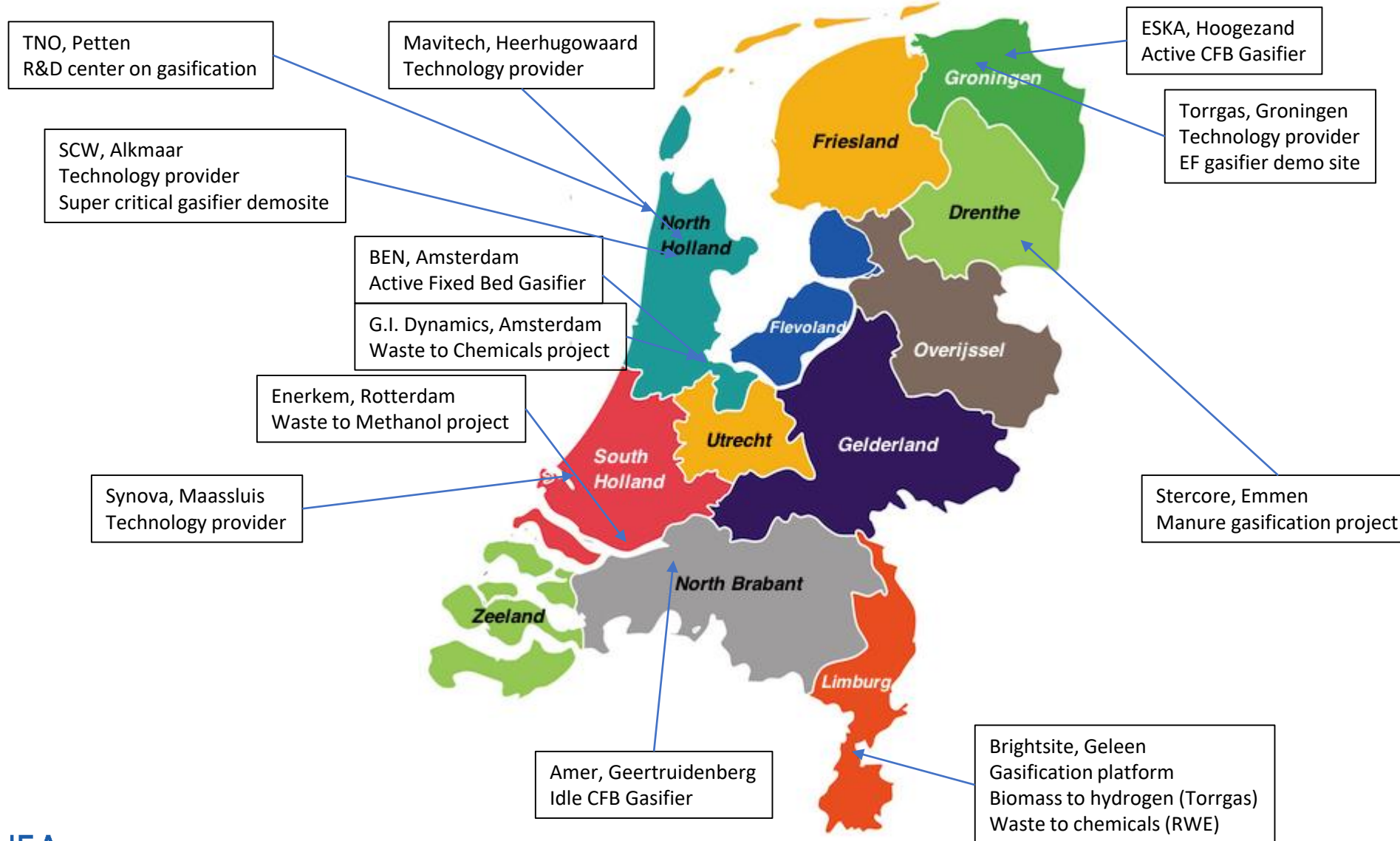
# Solution towards 2050



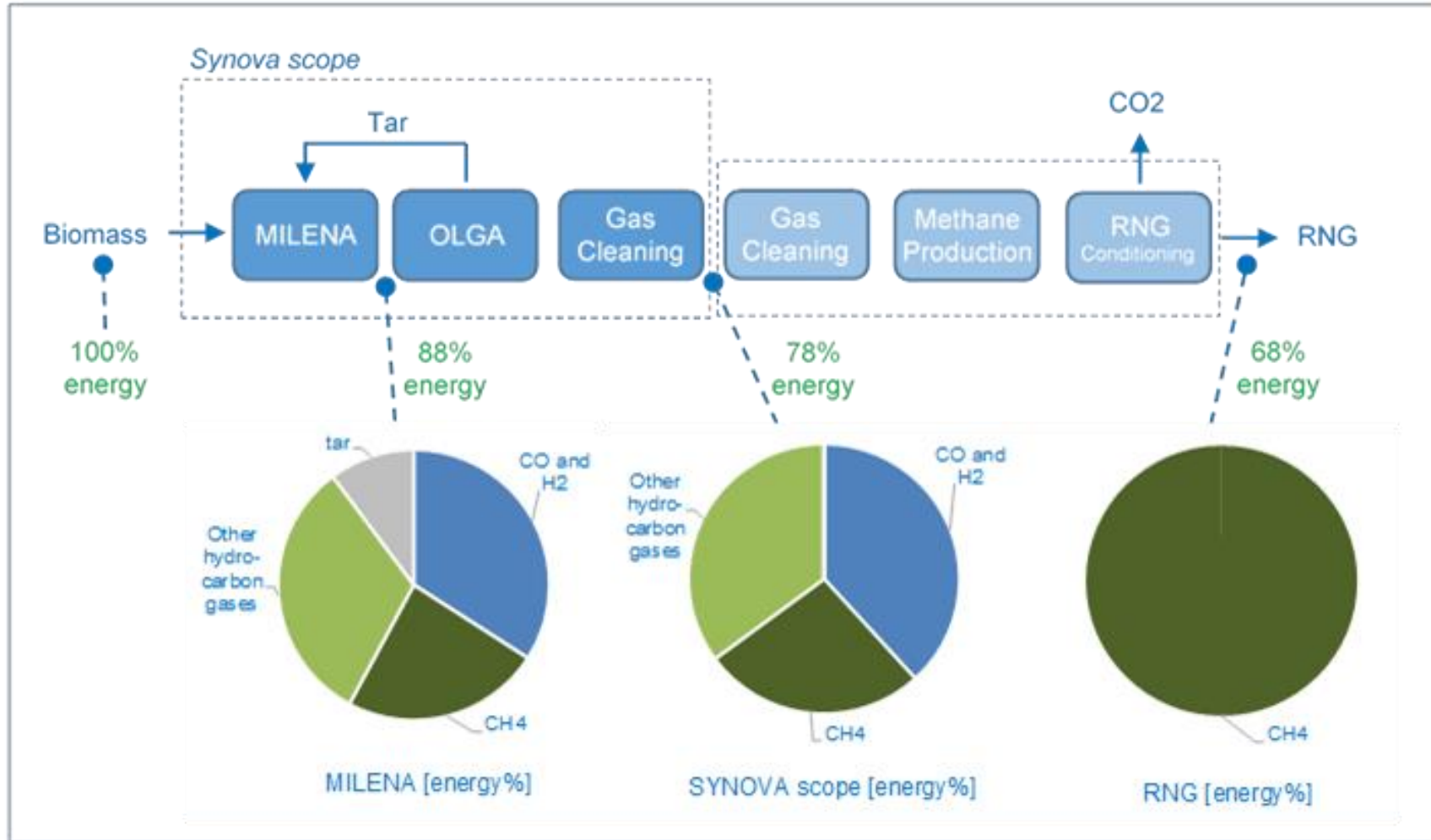
In order to have 87% circular the system needs to change  
Important roles for:

- Gasification
- Dissolution
- Pyrolysis

# Gasification locations in the Netherlands



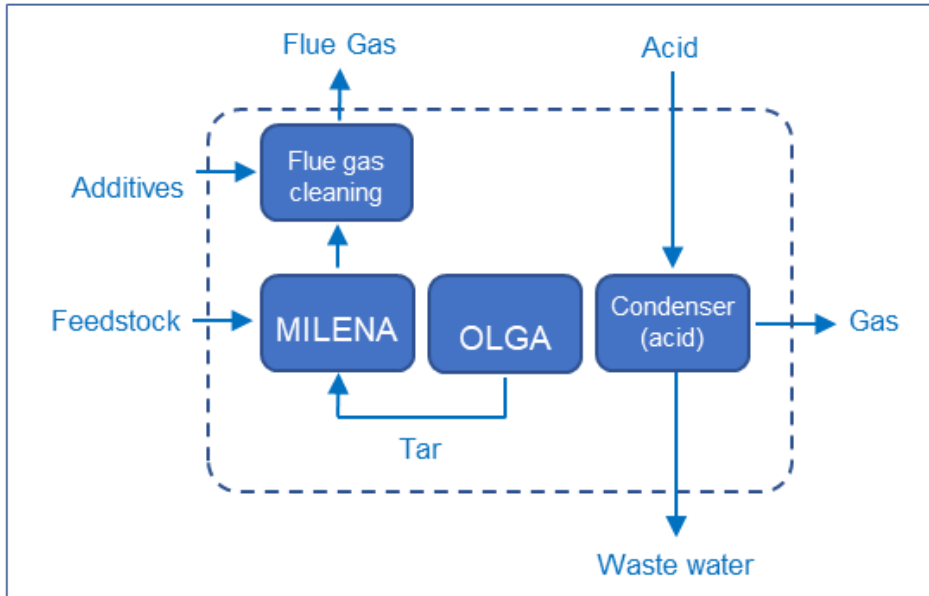
# SYNOVA process



## Opportunities

1. Plastic cracking and connecting to industry
2. Biomass gasification towards SNG
3. Waste to electricity

# SYNOVA process

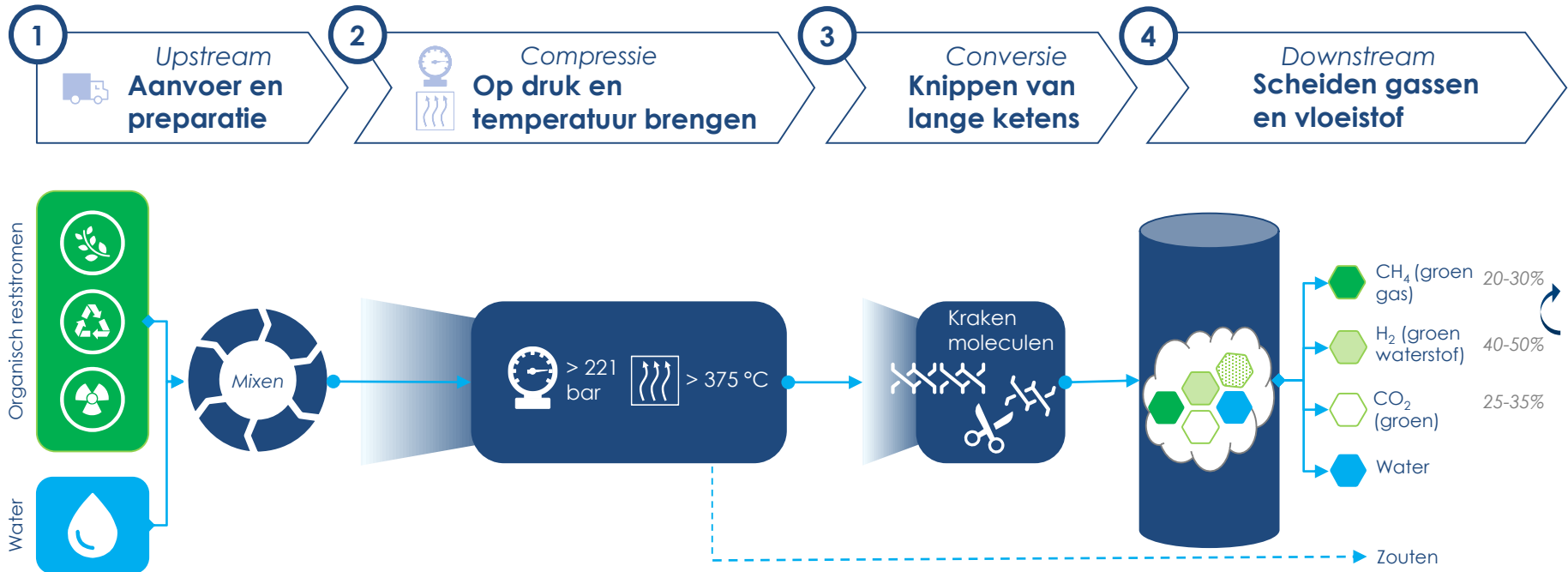


## MILENA en OLGA

- 30 - 60 kW<sub>th</sub> lab unit including OLGA extensively tested
- 1 MW<sub>th</sub> pilot/demo unit including OLGA extensively tested
- 4 MW<sub>th</sub> demo/commercial unit including OLGA , tested
- 6 MW<sub>th</sub> en 30 MW<sub>th</sub> detailed engineering available



# SCW Systems process

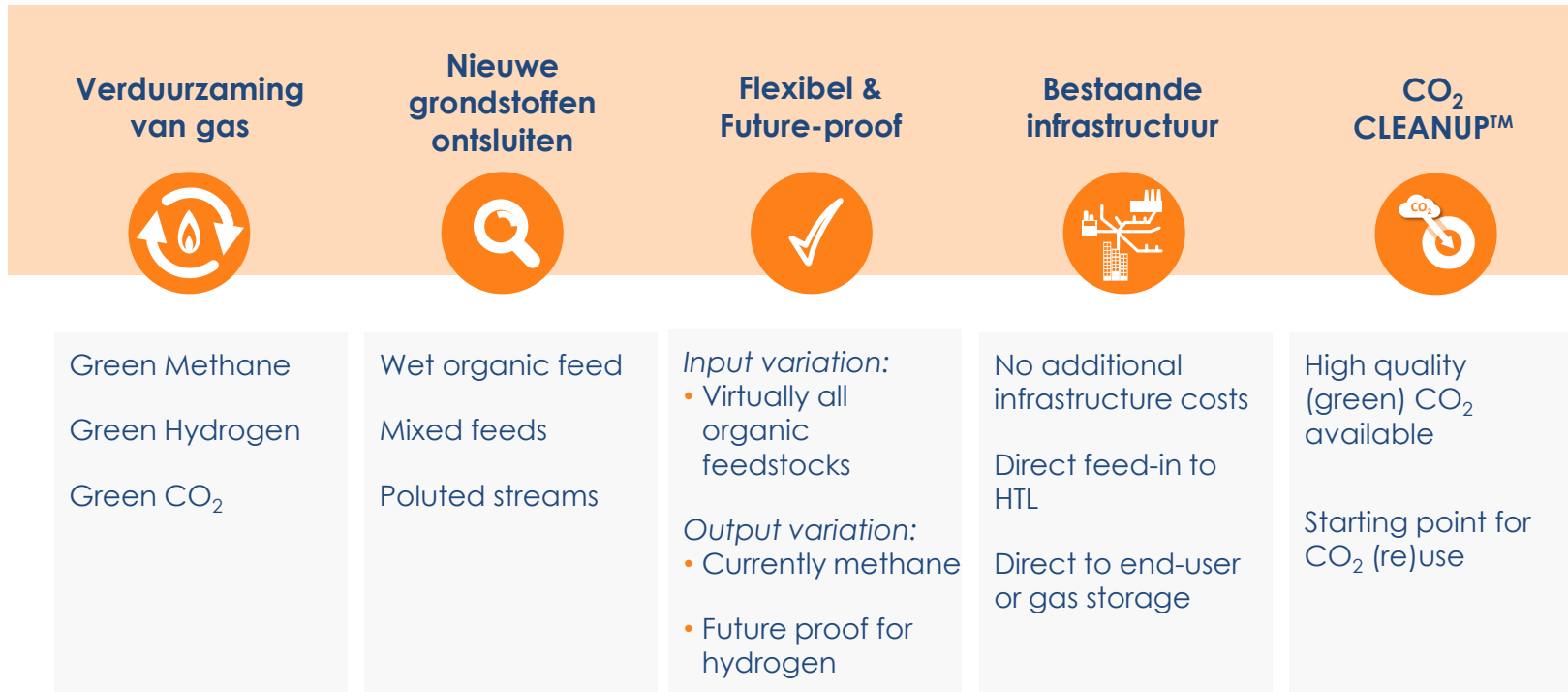


## Unique components:

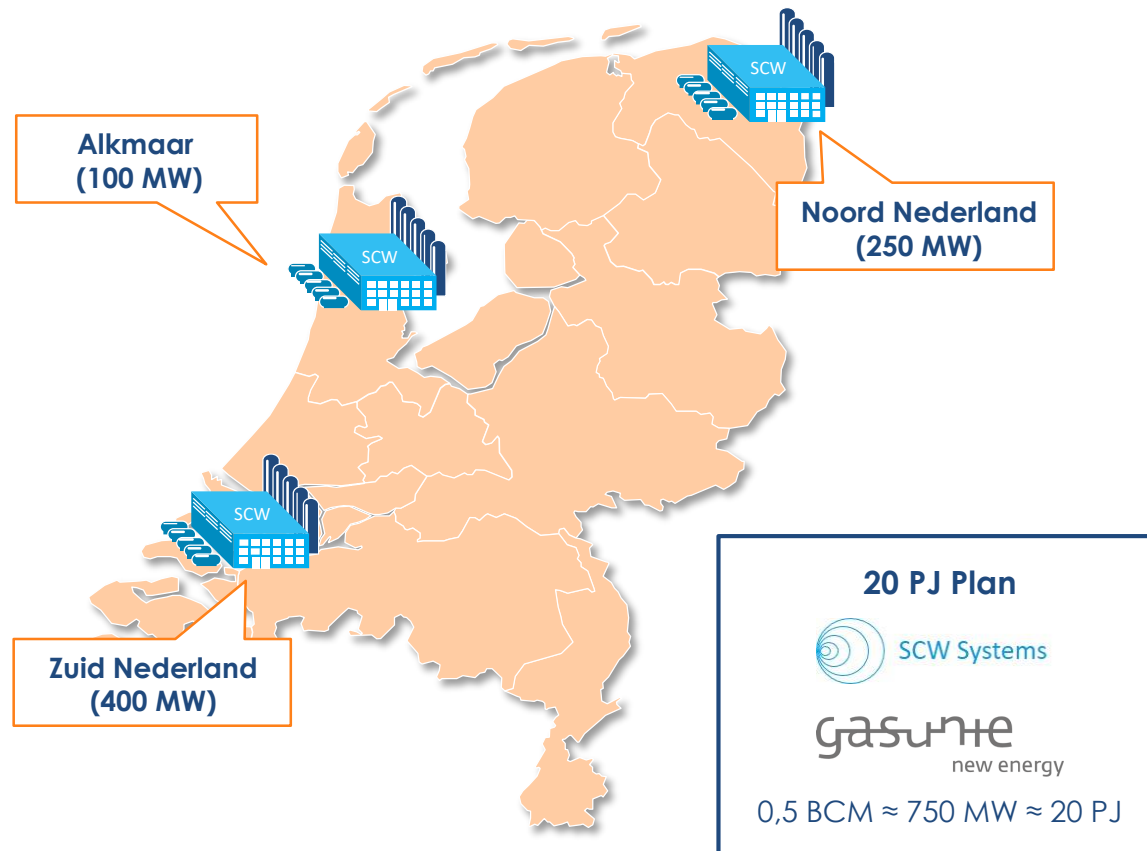
- ✓ Virtually all organic residue streams as possible feed
- ✓  $> 90\%$  conversion of organics to gas
- ✓ Quick,  $< 1$  minute and energy efficient
- ✓ Energie efficient: 10-20% process input from the calorific value of the feedstocks
- ✓ "Hoge pressure cost advantage": feed-in to the (inter-)national HTL-network, possibility for gas storage



# Advantages of Super Critical Gasification



# SCW Ambition → 20 PJ in 2025



# Torrgas process

## Waste streams as feedstock



Scrap wood and wood processing residues



Grass, straw and agricultural residues

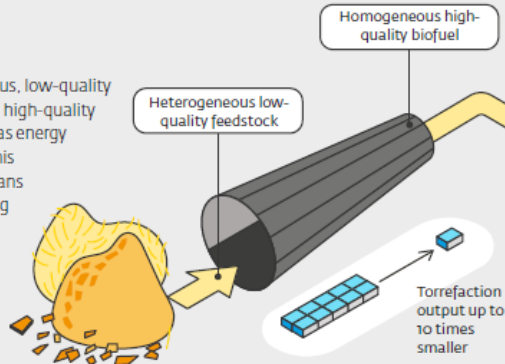


Wet waste streams such as manure and sewage sludge for wet torrefaction

Torrefaction processes use a wide range of waste streams that would otherwise be burned or left to perish. This greatly increases the amount of waste that can be reused.

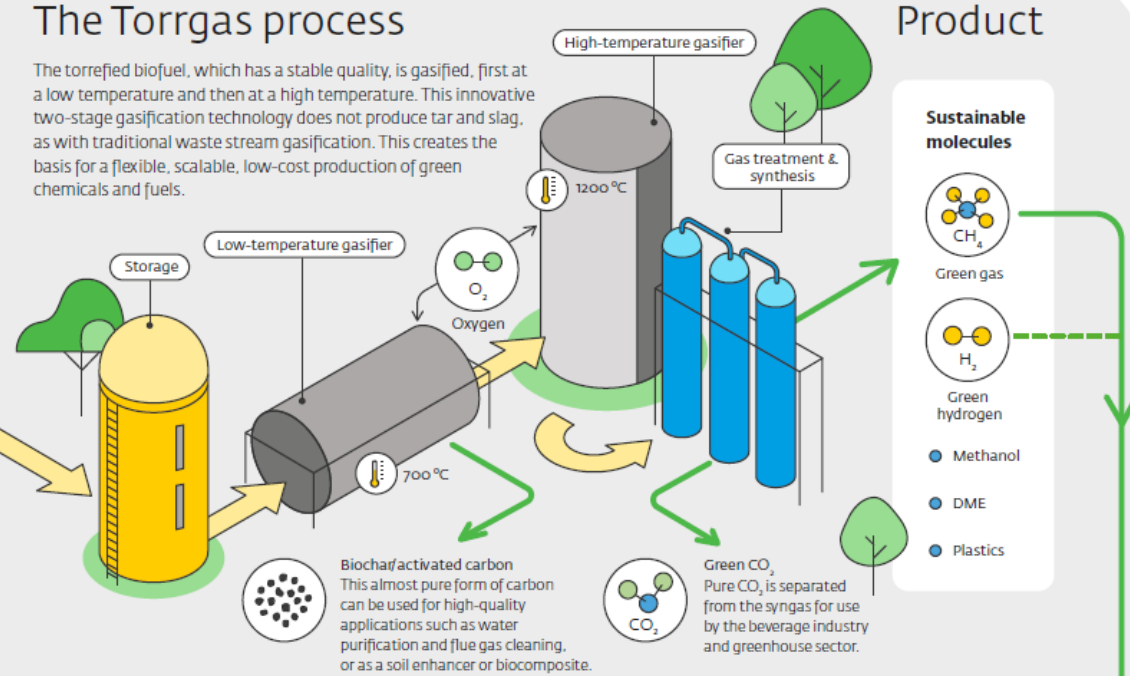
## Torrefaction

Torrefaction converts heterogeneous, low-quality waste streams into homogeneous, high-quality biofuels that are around ten times as energy dense as the original feedstocks. This enables efficient transport and means torrefaction is a vital link in enabling large-scale reuse of problematic waste streams.



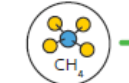
## The Torrgas process

The torrefied biofuel, which has a stable quality, is gasified, first at a low temperature and then at a high temperature. This innovative two-stage gasification technology does not produce tar and slag, as with traditional waste stream gasification. This creates the basis for a flexible, scalable, low-cost production of green chemicals and fuels.



## Product

### Sustainable molecules



Methanol

DME

Plastics

## Uses of green gas

The Torrgas process produces green gas from syngas. This gas is transported through gas infrastructure to users in the industrial domain (for use as a feedstock and for process heating) and to the built environment.



Industry & chemistry



Built environment



Transport & mobility

## Benefits of the Torrgas process



### Scalable

A Torrgas plant can be scaled up to 100 MW.



### Affordable

Activities such as the scaling up and marketing of biochar and green CO<sub>2</sub> make it increasingly cheaper to produce syngas. So much so, in fact, that it can even compete with fossil alternatives on price.



### Fully circular

Low-quality waste streams are fully converted into high-value molecules (syngas and green CO<sub>2</sub>) and products (biochar).



### CO<sub>2</sub> reduction

Waste streams are converted into usable products. This prevents combustion and carbon emissions, effectively removing CO<sub>2</sub> from the atmosphere.

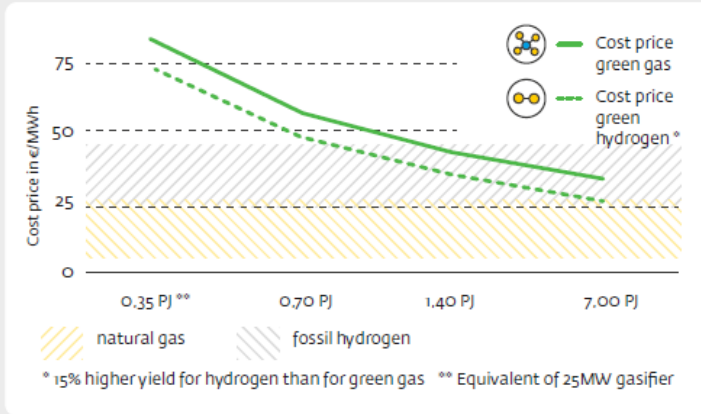
torrgas

gasumne  
crossing borders in energy

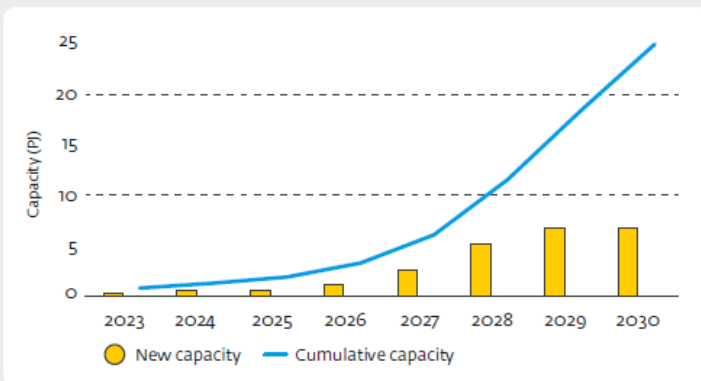
# Torrgas ambition → 25 PJ in 2030

## Scale up and lower costs

Torrgas technology can be scaled up to 100MW per gasifier.



Scaling up results in dramatic cost reductions in both Capex and Opex, allowing green gas and hydrogen to be produced at competitive price levels compared to fossil by 2030.



Torrgas plants are aimed to scale up to 3 PJ+ per location by building plants with multiple gasifiers.

## Status Torrgas

- 1 MW Demo DNV-GL (TRL 7)
- Scaleable to 100 MW
- 30 MW SNG Delfzijl in Basic Engineering fase
- 50 MW green hydrogen permitting, FEED fase
- Business model is the sale of licenses

## Input streams (key is torrefaction)

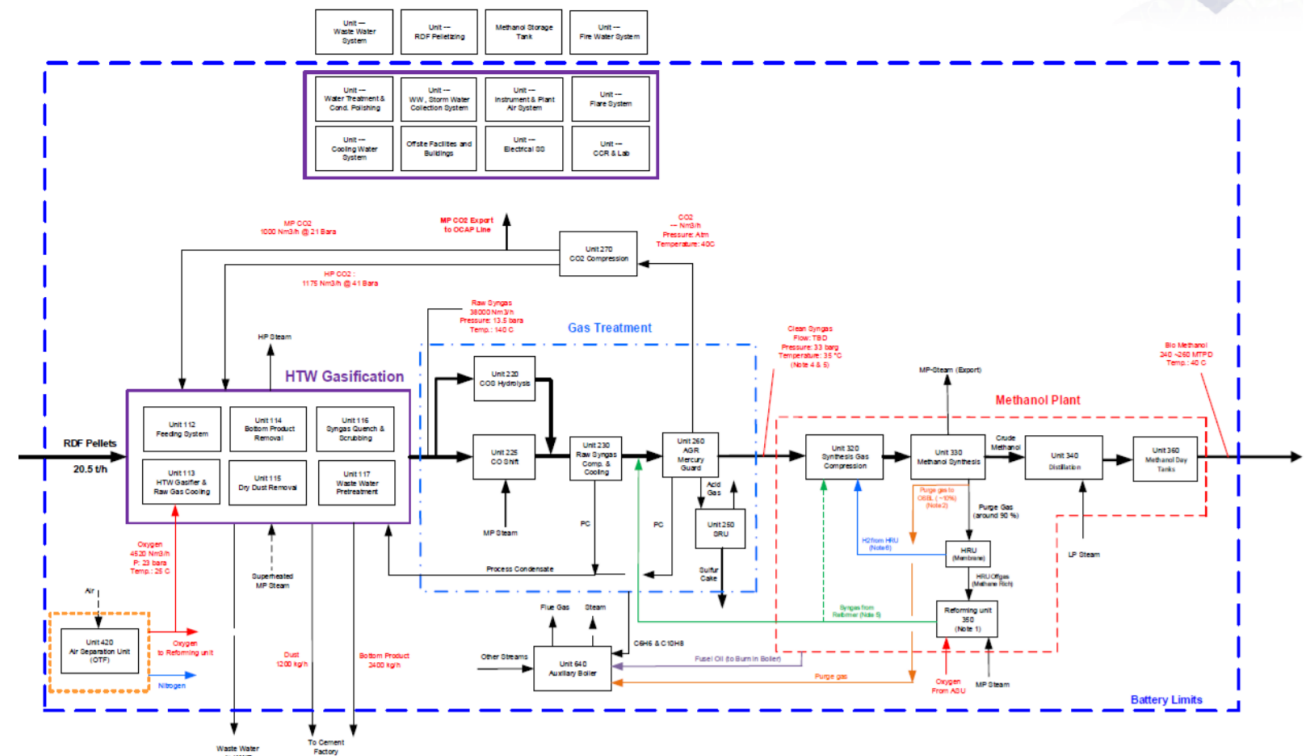
- Woody residues
- Agricultural residues
- Grass streams
- Manure waste streams

## Output possibilities

- SNG/LNG/CNG
- Hydrogen
- MeOH and DME
- Biokatalysis(syngas fermentation)
- Connect to the steel industry

# G.I. Dynamics - Advanced Methanol Amsterdam

- RDF gasification using HTW technology.
- Gidara acquired the HTW technology
- Goal is to convert 175 kton per year into 90 kton MeOH
- Connect the CO<sub>2</sub> to the OCAP



# Stercore



Sustainable Energy  
&  
Bio-Based Carbon



[www.stercore.nl](http://www.stercore.nl)

## FACTSHEET STERCORE MANURE TO GREEN GAS & BIO-BASED CARBON FACTORY *as yearly, per plant*

- **INPUT: > 185,000 Mton. MANURE / DIGESTATE** (as in 80% dry matter)
- **Output: > 30,000,000 M3 GREEN NATURAL GAS** low caloric gas "Groninger gas"  
> **75,000 Mton. BIO-BASED CARBON** as bio fertilizer/soil improver

### 100 % advantage for our environment :

- ✓ Reduction CO2: > 30,000,000 KILO
- ✓ Waste: NO waste, NO by-products, 100 % re-use of process water
- ✓ Bio-based Carbon: organic fertilizer, soil improver: extremely useful in arid soils
- ✓ Local strategy: instead 1 huge plant, several plants in manure available area's
- ✓ Odour: absolutely NO smell issues due proven industrial air cleaning system

**MAIN TECHNOLOGY:**  
-BIOTHERMIC PRE DRYING SYSTEM  
-GASIFICATION (without tar forming)

NGO started a law suit  
Q1 2021 outcome expected  
Project is ready to start  
Several other projects  
in the planning

# Enerkem

Rotterdam project is roughly 450 Meuro for 230 kton

The W2C consortium is currently evaluating drop-in biofuels rather than blend fuels.

# RWE

- Waste to Hydrogen in the planning in the south of the Netherlands
- Capacity will be 40 kton per year of hydrogen (1000 tpd of waste)
- Invest in the complete chain.
  - Taking in waste, separating minerals, metals and drying
  - Torrefaction of waste to a uniform pellet
  - Siemens gasification technology (EF) to produce syngas
  - Produce hydrogen and CO<sub>2</sub>
- Process tested in Freiberg



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[www.ieabioenergy.com](http://www.ieabioenergy.com)