



Torrgas

End-to-End Solution for Scalable Bio - Methanol Production

PBE

31st October 2025
Rotterdam, The Netherlands

torrgas

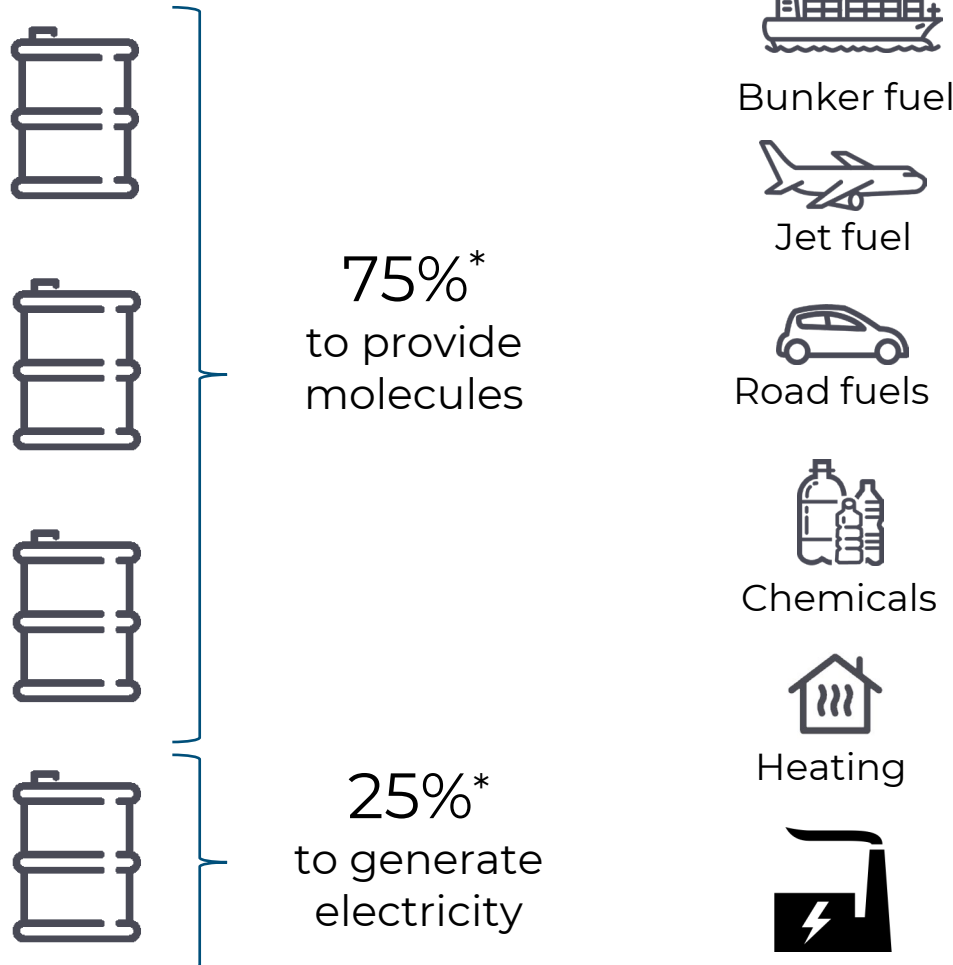


Our purpose is to ...

Accelerate the transition to a fossil-free future
by producing affordable bio-methanol

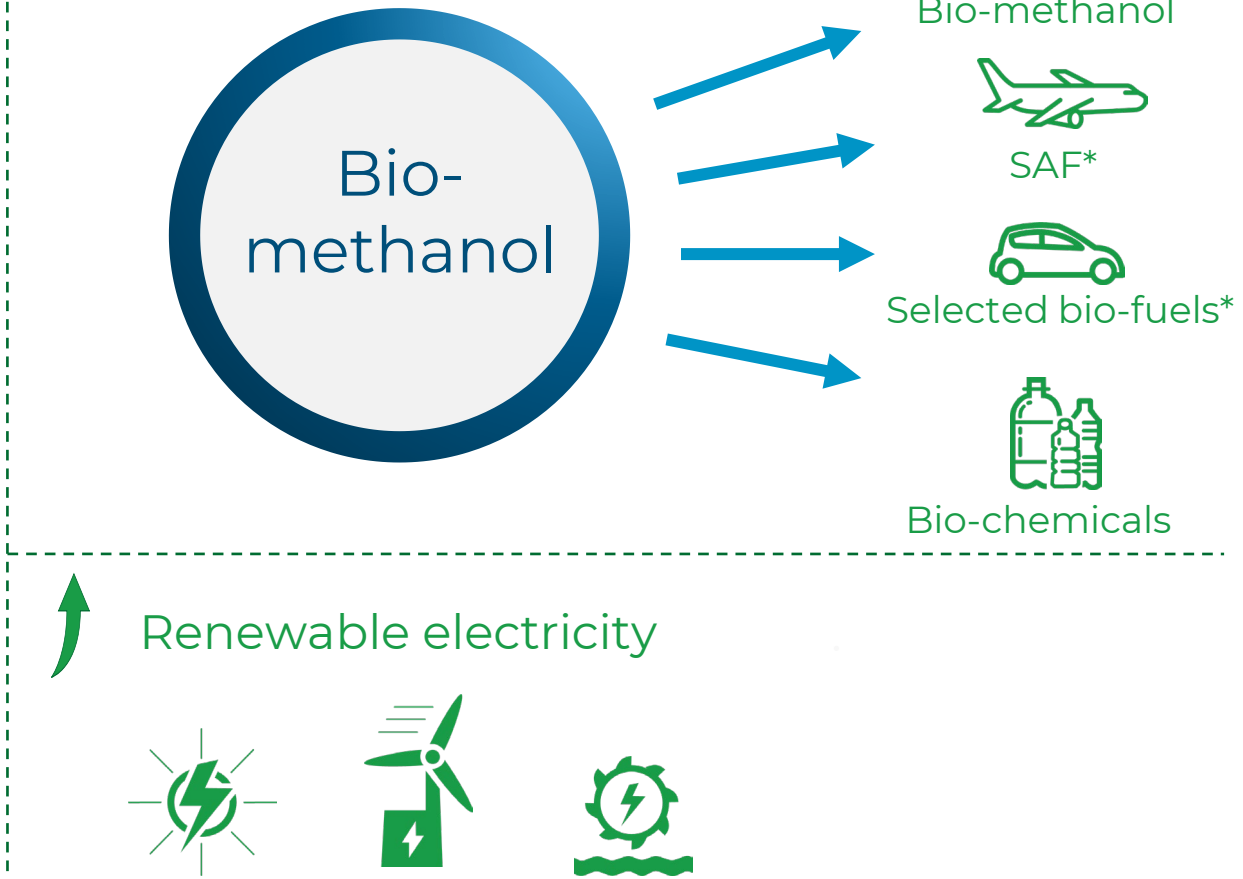
We focus on bio-methanol due to its pivotal role as sustainable molecule for biofuels and biochemistry

Current fossil situation



*Source: International Energy Agency (IEA)

Fossil-free molecules



(*) SAF: Sustainable Aviation Fuel
Bio-fuels: renewable LPG, gasoline, diesel

The options to make methanol are limited

Carbon & hydrogen sources

From the air

- Extract CO₂ from air (412 ppm)
- Electrolyze water to obtain H₂



Recycle

- Municipal Solid Waste (MSW)



From the surface

- Bio-residue
- Forestry residue



Under the ground

- Coal, oil, gas



Pathway

- Renewable electricity
- Direct air capture (for CO₂)
- Electrolyzers (for H₂)

- MSW pyrolysis
- MSW gasification
- MSW plasmafication

- Residue gasification

- Steam reforming

Requirements

To be of impact, the selected pathway needs to be:

- Affordable
- Sustainable
- Scalable

torrgas^o

We have the **affordable** solution

Carbon & hydrogen sources

From the air

- Extract CO₂ from air (412 ppm)
- Electrolyze water to obtain H₂



Recycle

- Municipal Solid Waste (MSW)



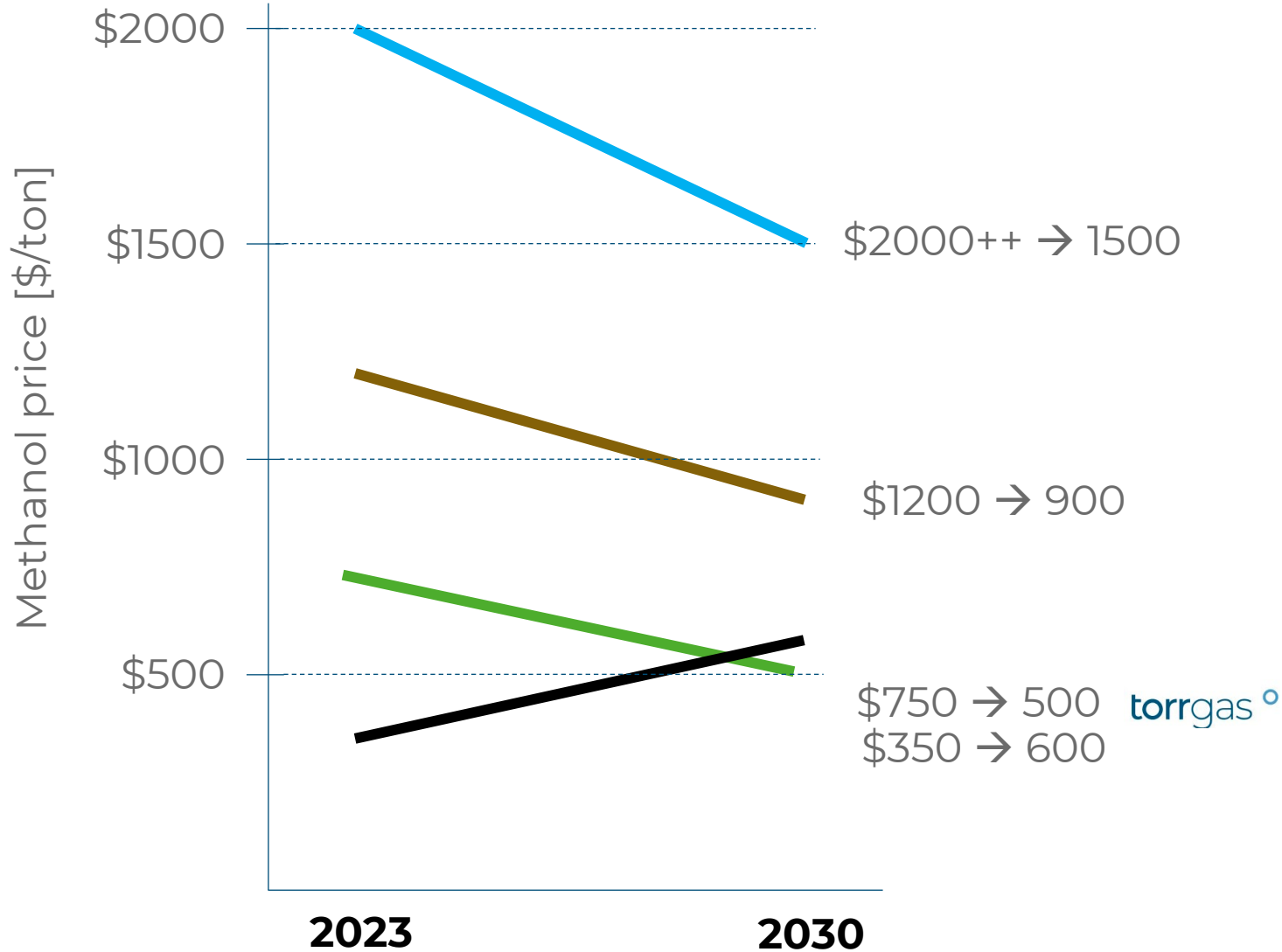
From the surface

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- Forestry residue



Under the ground

- Coal, oil, gas



We have the **sustainable** solution

Carbon & hydrogen sources

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Recycle

- Municipal Solid Waste (MSW)



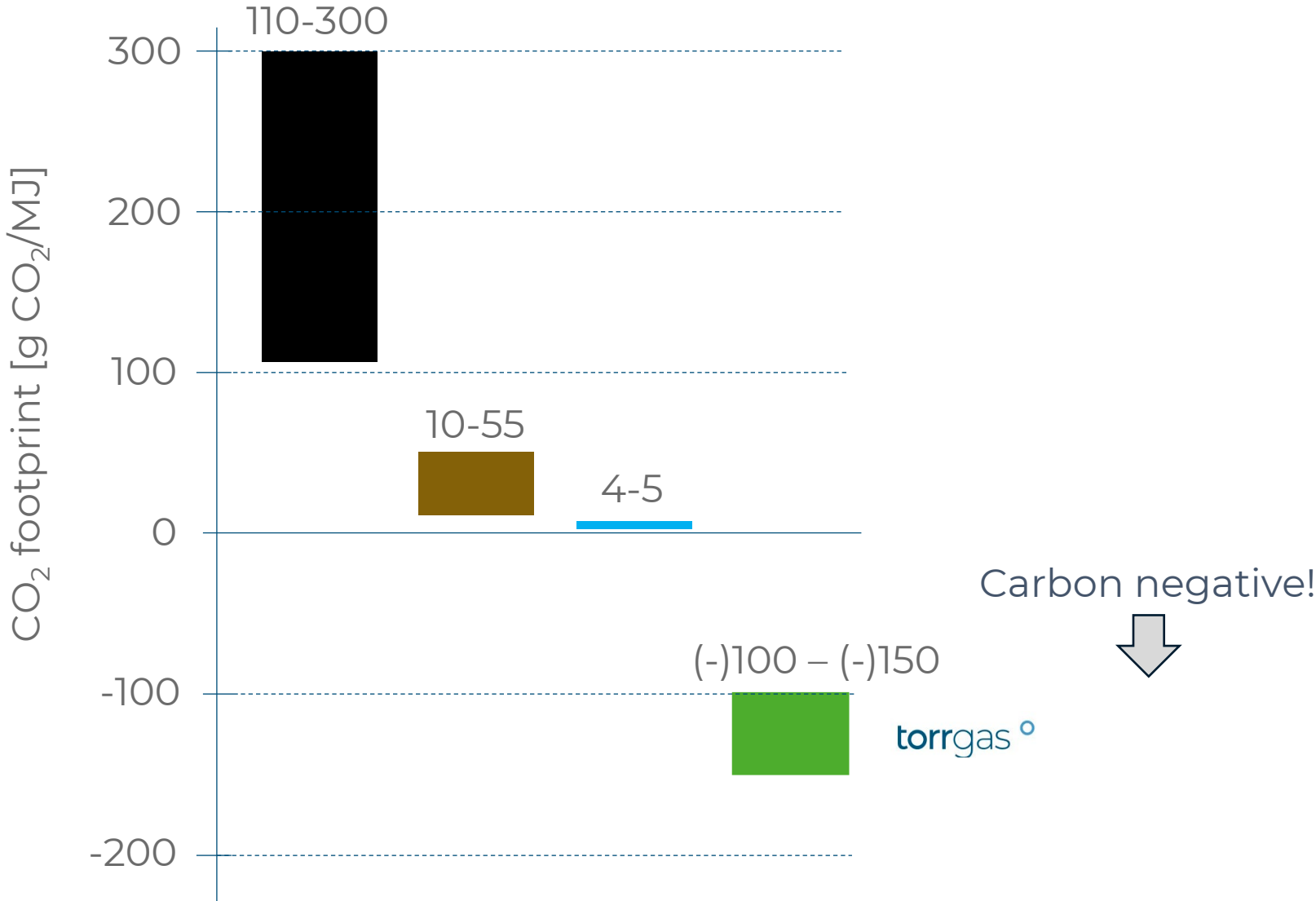
From the surface

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Under the ground

- Coal, oil, gas



Source: Methanol Institute

Affordable, Scalable, Carbon Negative Methanol

carbon & hydrogen sources

Under the ground

- Coal, oil, gas



From the air

- Extract CO₂ from air
- Electrolyze water to obtain H₂



Recycle

- Municipal Solid Waste (MSW)
- Biogas

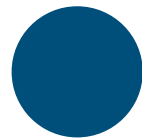
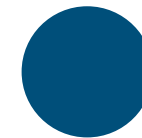
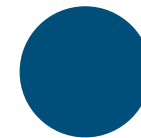
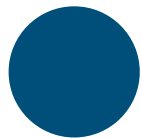
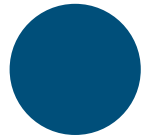
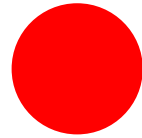
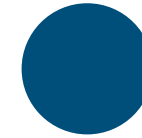
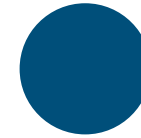


From the surface

- Bio-residue
- Forestry residue



Affordable Requirements Scalable Sustainable

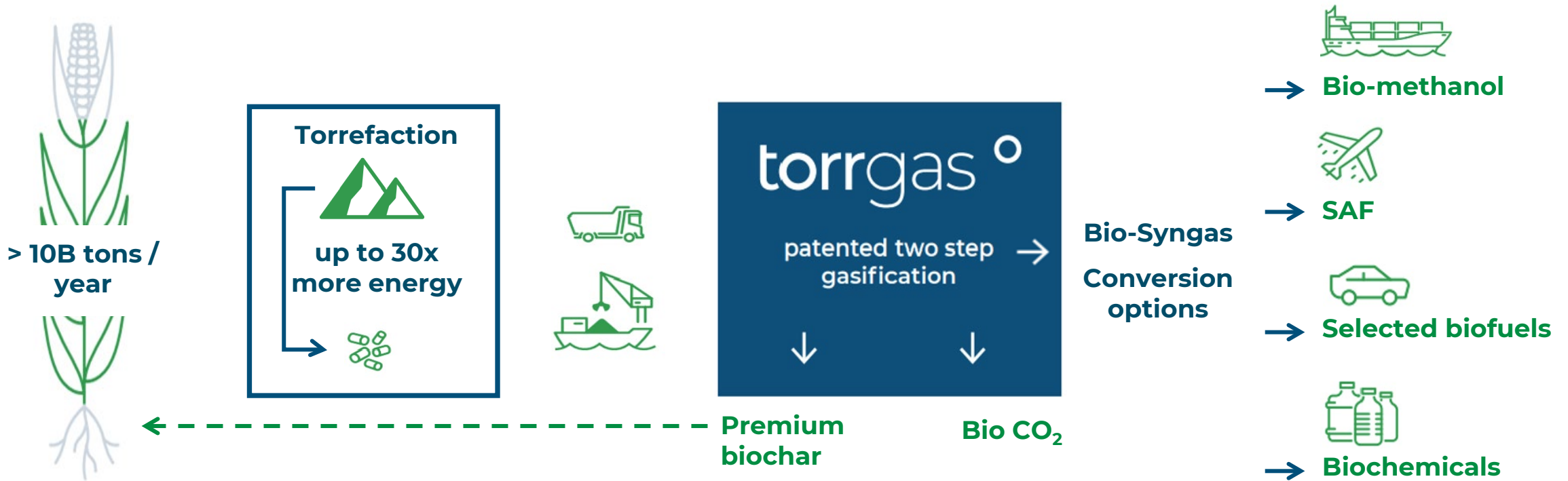


Our

SOLUTION

Two step gasification is the key technology at the heart of the 'Torr-value-chain'

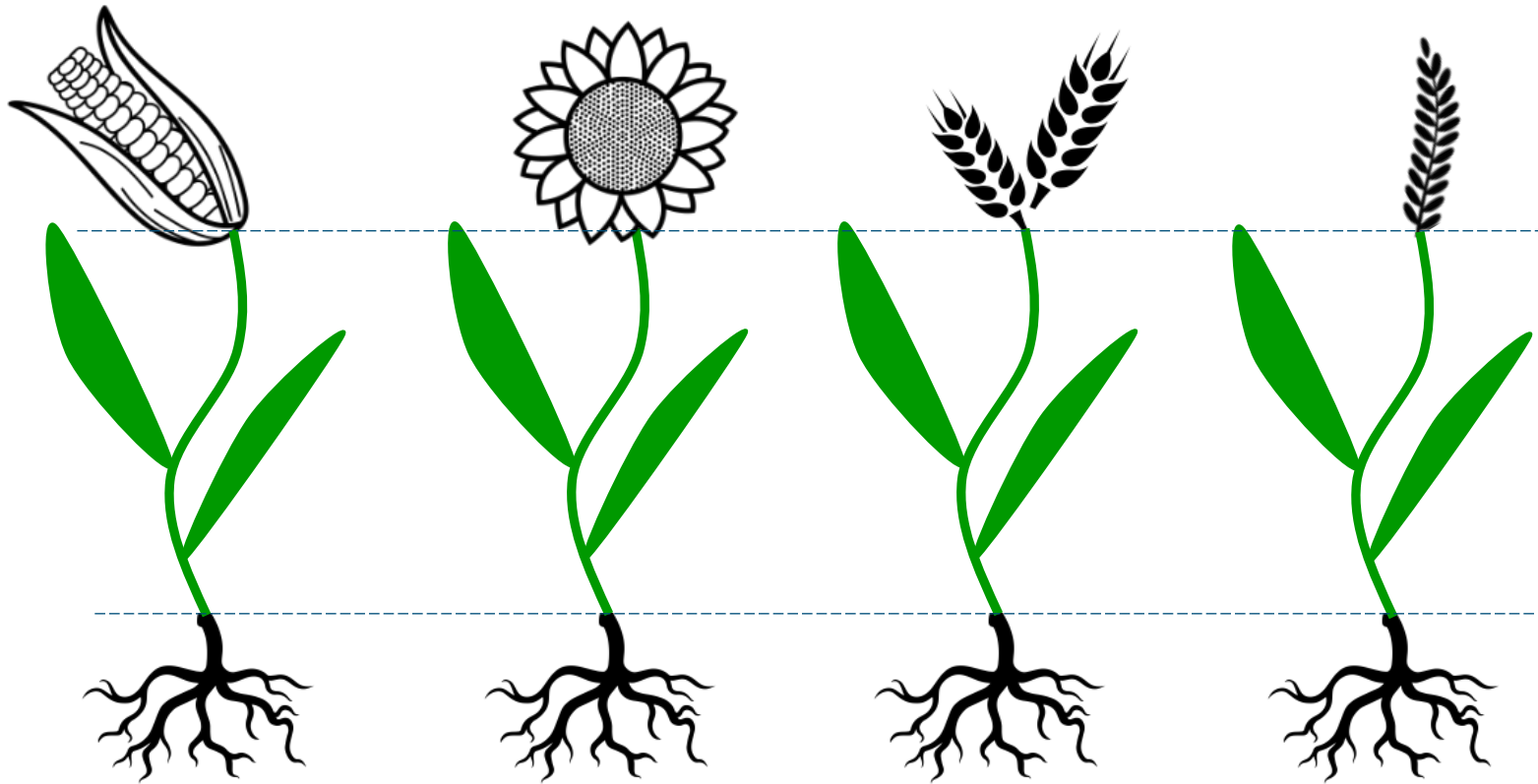
Huge unused quantities → Compact pellets → Existing infrastructure → Carbon negative → Existing technology → Large, lucrative markets



*Source International Energy Agency(IEA)

Bio-route: Crop residue; an abundant source of carbon & hydrogen atoms

~20% goes into the food chain



~60% is commonly set on fire
to make the field ready for the next crop

5.000 million tons / year
Excluding invasive vegetation, recycled wood and other sources of biomass that don't compete with food production

~20% remains on the land
Minerals & nutrients for the next crop

Torrgas' torrefaction is a double-edged sword: avoidance of harmful crop burning and providing a substitute for fossil

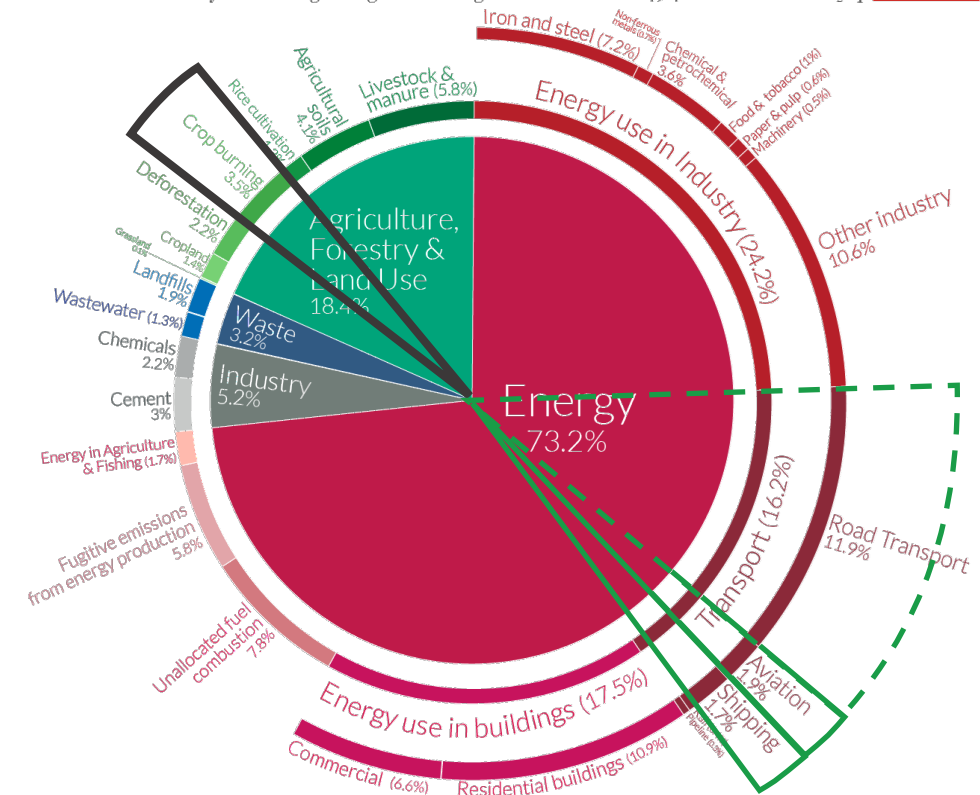
Crop (residue) burning

- accounts for 3.5% of global greenhouse gas emissions
- which equals the sum-total from global aviation and shipping combined
- and has significant negative impact on the environment*

* Hazards include:

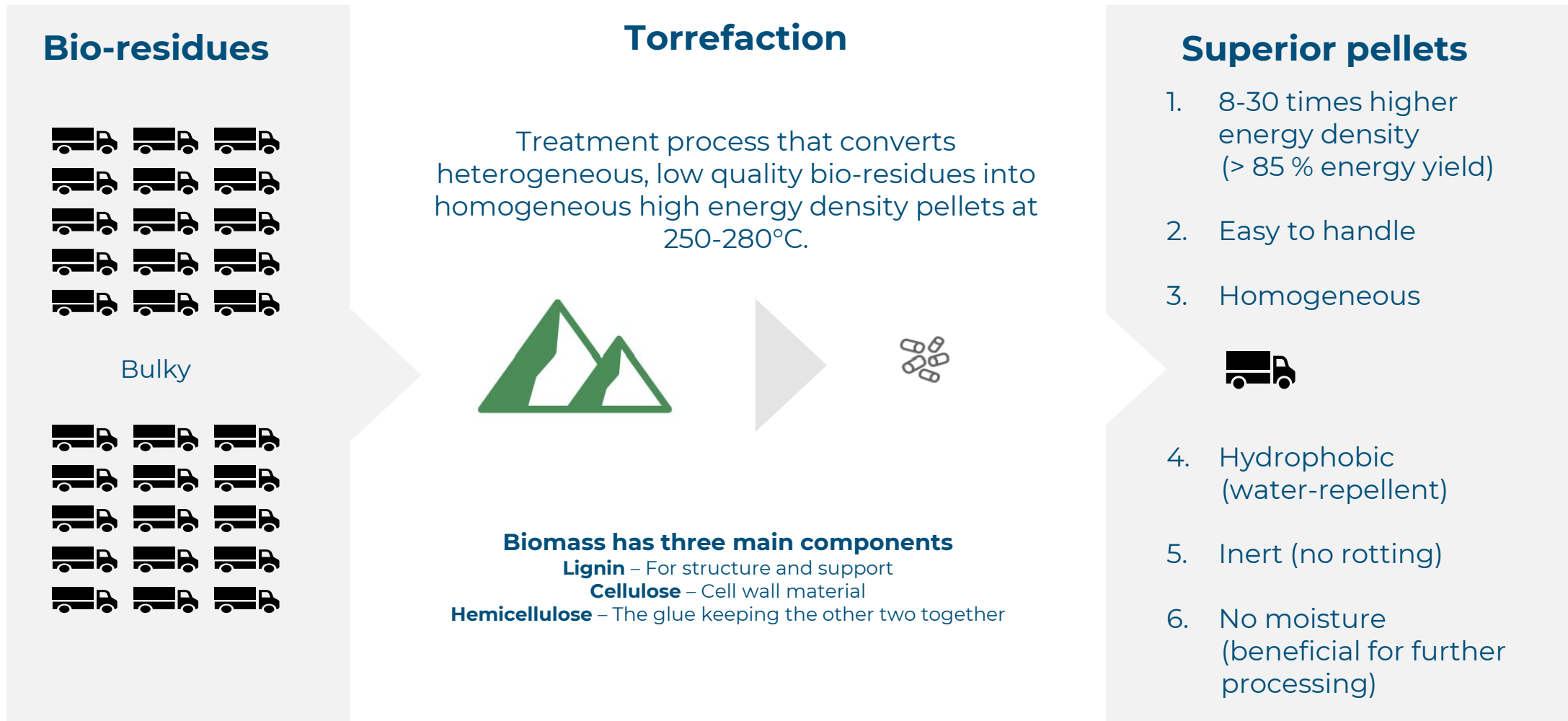
1. Air Pollution and Health Hazards
2. Contribution to Climate Change
3. Soil Degradation
4. Loss of Biodiversity
5. Impact on Climate and Weather Patterns
6. Economic Costs

Global greenhouse gas emissions by sector Our World in Data
This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.



OurWorldinData.org – Research and data to make progress against the world's largest problems.
Source: Climate Watch, the World Resources Institute (2020).
Licensed under CC-BY by the author Hannah Ritchie (2020).

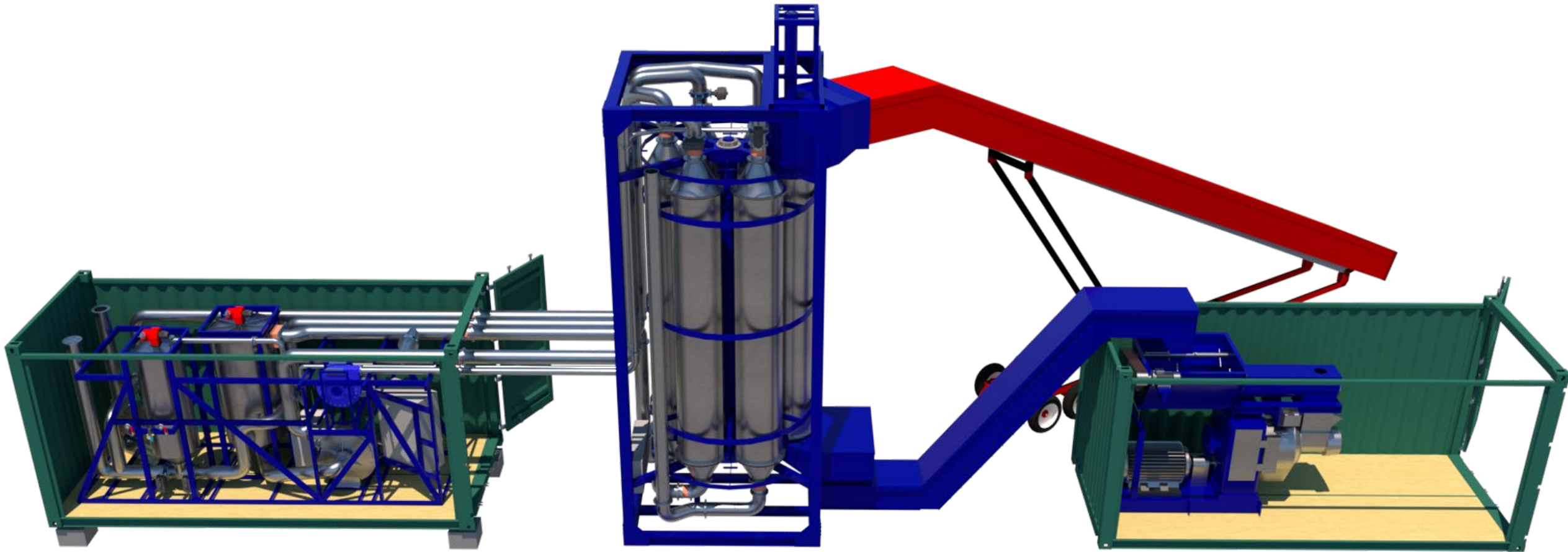
Step 1: energy densification of bio-residues is the essential first step in Torrgas' value chain



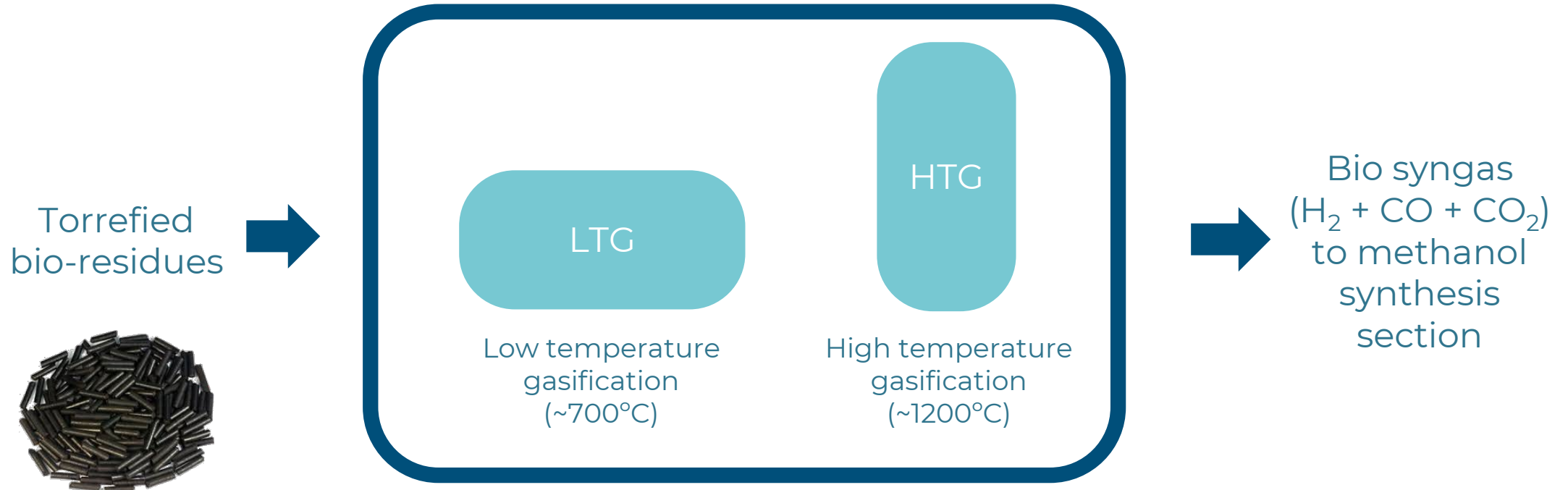
A bit of history: torrefaction 1.0 versus torrefaction 2.0



Torrefaction 2.0: Torrgreen modular torrefaction system



Torrgas' gasification technology is simple, yet unique



Typical gasifier challenges:

Operational issues
due to heterogenous
feedstocks

Avoided!

Slagging / melting ash
at high temperatures

Avoided!

Tar formation
if temperature stays
too low

Avoided!

Our solution will create environmental and socio-economic impact on both local and global scale

Environmental challenge



TorrGas prevents crop burning and thereby eliminates the negative, associated consequences:

- Large scale CO₂ release
- Decreasing air quality
- Direct loss of nutrients
- Loss of bio-diversity as fire also kills bacteria, fungi, etc
- Longer term effects like ground ozone formation, acid rain, and soot deposits

Biodiversity challenge



TorrGas system monetises removal of invasive species

Invasive species are a large problem in certain parts of the world, endangering bio-diversity, soil quality and water availability. TorrGreen enables cost-effective removal of invasives from the land and converts them into a valuable commodity

Social challenge



TorrGas monetises crop waste and evasive bushes

Harvest failures have increased rural poverty and spurred mass urbanisation in developing countries.

The **TorrGas** system can monetise bio residues and invasives, thereby increasing prosperity in rural areas and stemming mass urbanisation, addressing also related issues

Governance challenge



Our end-to-end solution is fully circular and resilient

Converting crop residues into biofuels supports a circular economy model.

This aligns with global sustainability goals and promotes efficient resource use.

Circularity of soil derived minerals accumulated in the biochar results in carbon sequestration and thus a negative carbon footprint of the value chain.

Green molecules challenge



TorrGas pellets are packed with green carbon (C) and hydrogen (H) and can be used in hard-to-abate sectors

Hard-to-abate industries like global shipping, aviation, road transport, and chemicals need green sources of carbon and hydrogen. Torr pellets can be converted into **methanol, sustainable aviation fuel (SAF), and dimethyl ether (bio-LPG)**

The technologies are fundamentally different (re)-designed as compared to competitors. No end-to-end competitor today.



0,4 MW Gaya/Engie demo
Size: 30 * 20 * 15 m(est.)
Gasifier: Fluidized Bed
Status: terminated
Key issues: feedstock and tars



1,0 MW Torrgas demo
Size: 8 * 6 * 5 m
Gasifier: Torrgas
Status: successfull completion TRL7
Key issues: no critical issues

Realization of flagship BrigH2 at Chemelot NL, a commercial demonstration as de-risked step before commercial roll-out

Bio-methanol FOAK creates commercial and technical traction

- BrigH2 is our FOAK project to prove operation at industrial scale with integrated downstream processing
- Torrefied feedstock secured
- 7.500 mta* of bio-methanol and 2.200 mta* Bio-Char
* metric tons per annum



- Location reserved
- Permit in place
- LOI's for loans in place



„The greatest threat
to our planet is the
belief that someone
else will save it“

Robert Swan

The first man in history to walk to both then North and South Poles

torrgas