TORRCOAL

Bio-Carbon Solutions

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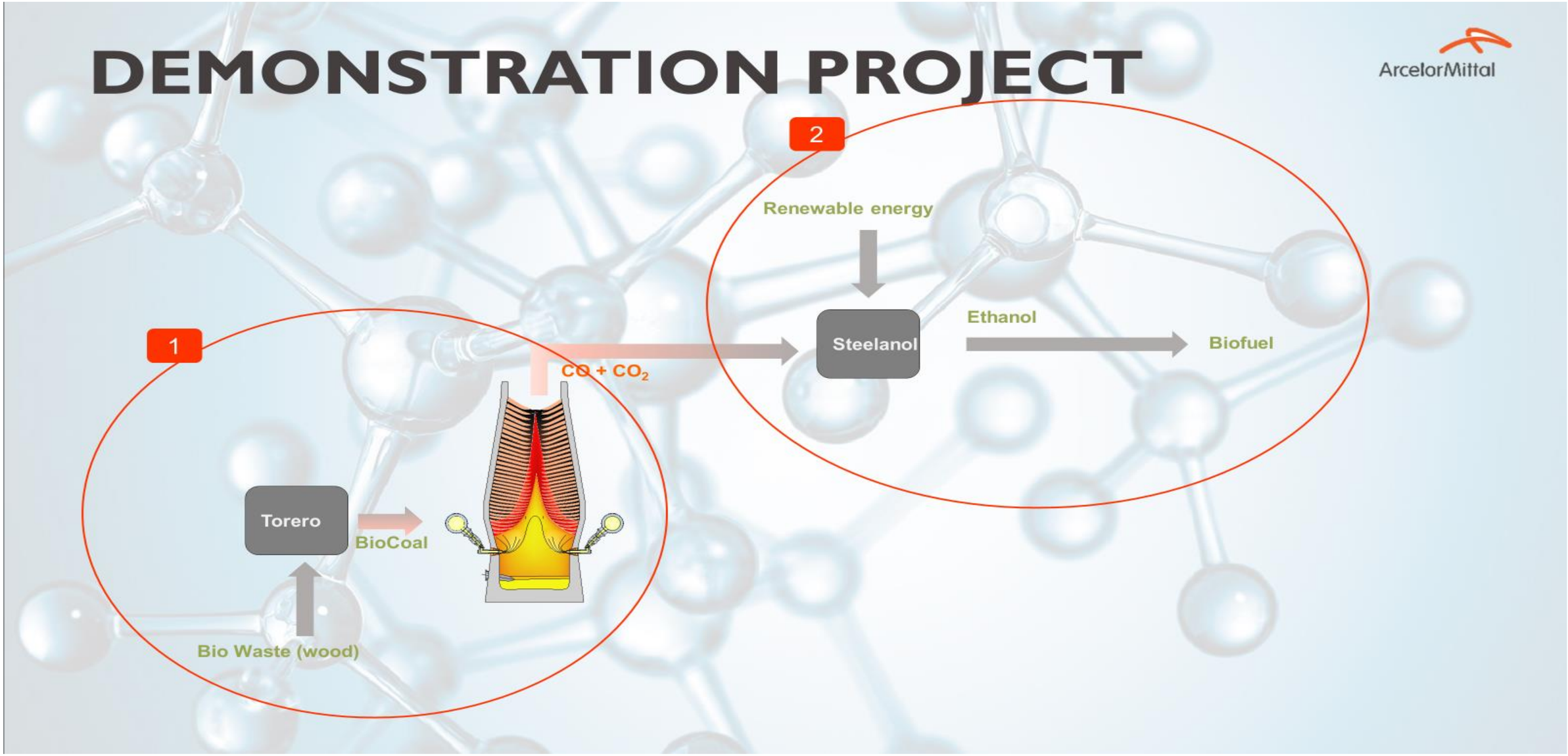
TORERO

TORrefying wood with Ethanol as a Renewable Outcome



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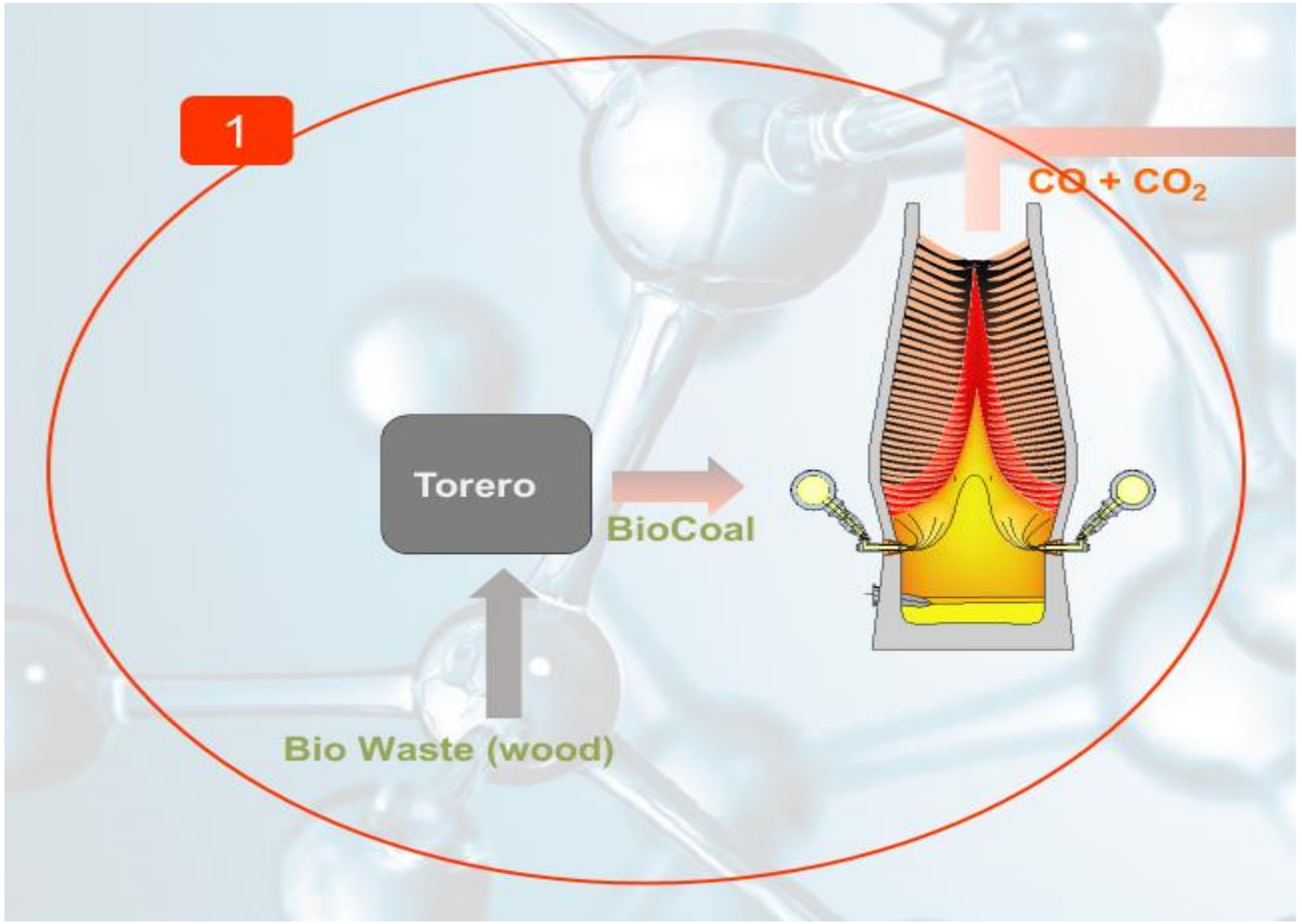

TorrCoal (Perpetual Next) is the technology provider for the torrefaction technology used in Torero.

From 2017 all Torero partners worked together to realise the torrefaction installation at AM Ghent.

The IP gained at TPC Dilsen Belgium (est. 2010) was used as reference for the design.

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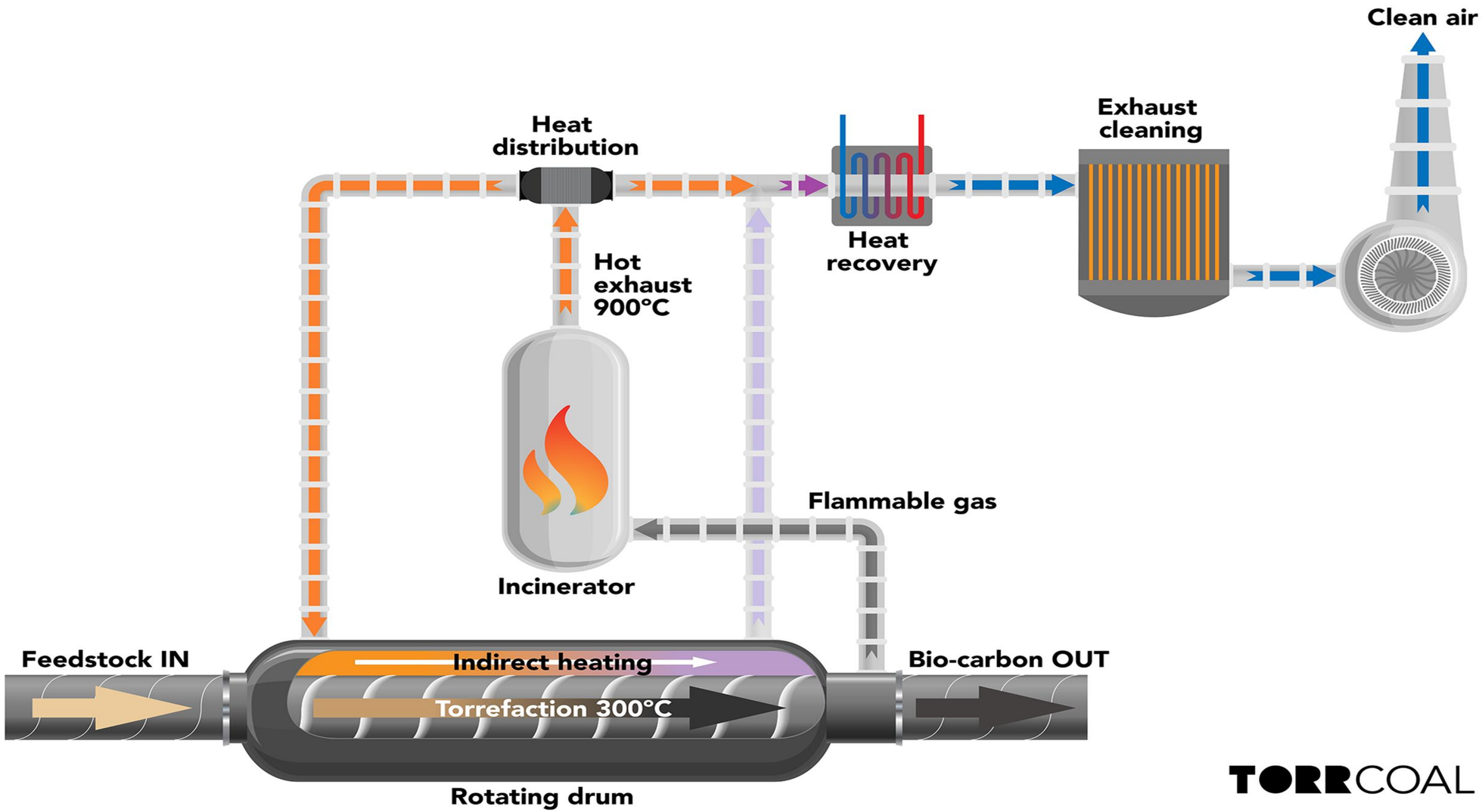
TORRCOAL Torrefaction Process

- Torrefaction = Thermochemical conversion of biomass ("mild pyrolysis")
- Torrefaction temperatures typically range between 270°C and 350°C
- Oxygen-free environment

TORRCOAL Torrefaction Process

Features	Benefits
Reactor that is a rotating drum and is indirectly heated	Optimal heat transfer at maximum safety
Reactor with 4 separate heating zones	Optimal conversion, precisely controlling ratio of solids and gases
Post-combustion chamber to burn the process gas	Self-sustaining process, requiring no external energy sources
Exhaust cleaning system to secure safe emissions	Ability to process low grade recycled wood and SRF
Input of various grades and sizes of feedstock possible	Minimal risk on feedstock shortages and cost increases

TORRCOAL Torrefaction Process



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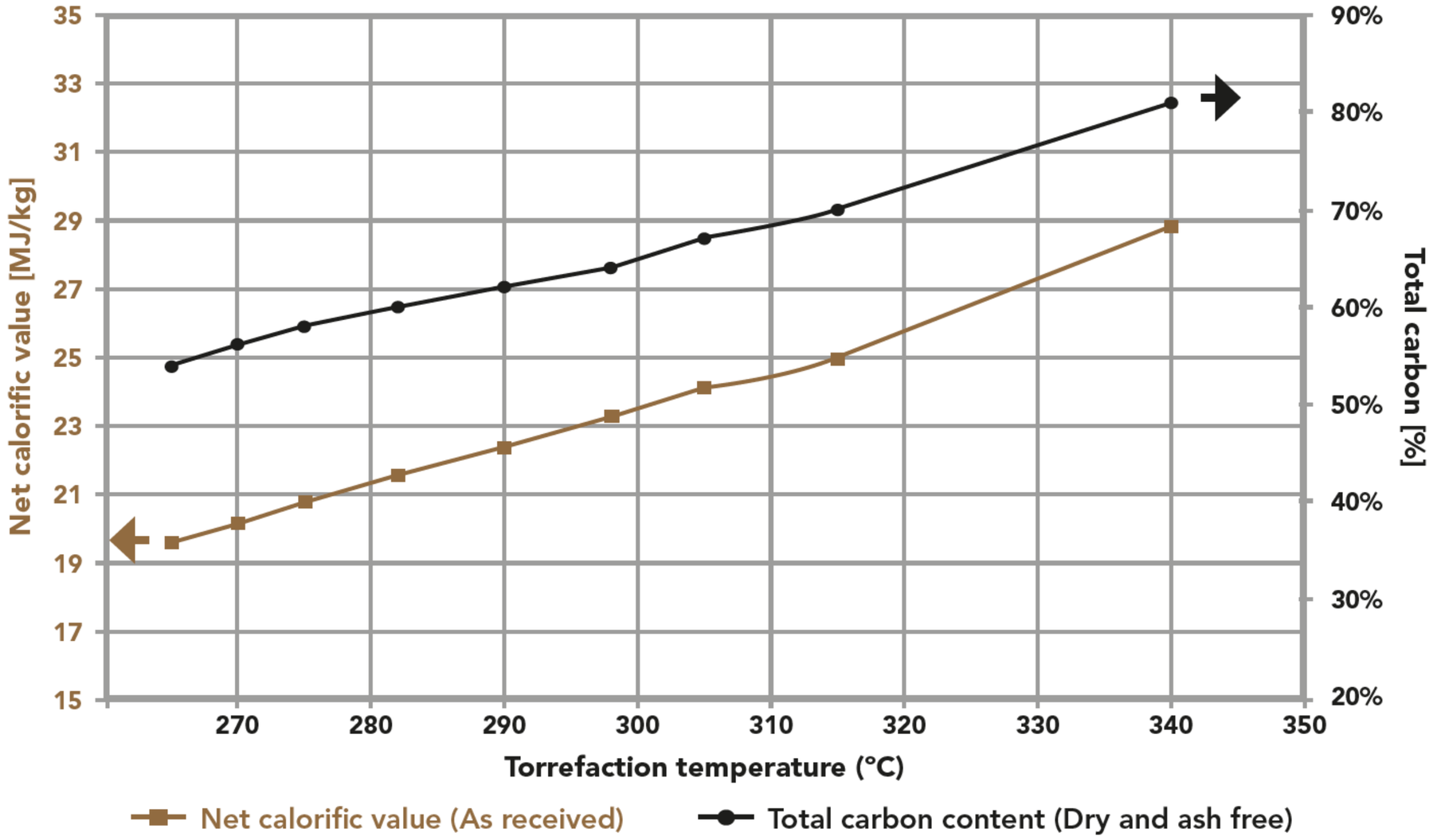
TORRCOAL Torrefaction Process



Average values collected from torrefaction of waste wood (forest maintenance waste streams) at industrial scale.

TORRCOAL Torrefaction Process

Present day
TorrCoal has evolved from an *IP-provider* to an *Equipment provider*.
The value proposition has changed from the Torrcoal IP-licence offer to the C-Vertr offer.

C-vertr: Torrefaction technology & equipment

C-Vertr is TorrCoal's core technology. It provides the process technology and actual supply of the reactor equipment.

C-Vertr includes the services:

- General pre-feasibility studies, including general heat and mass balance simulations.
- Customized feasibility studies, taking into account client feedstocks, target capacities and specific requirements.
- Licensing the TorrCoal intellectual property, as part of a Basic Engineering Package (BEP).
- Supply of the entire C-Vertr equipment package, consisting of feeding hopper, reactor, postcombustion, hot gas distribution and bio-coal cooling.

TORRCOAL Present day: The Energy Transition

BioCoal Applications: Heating industrial processes

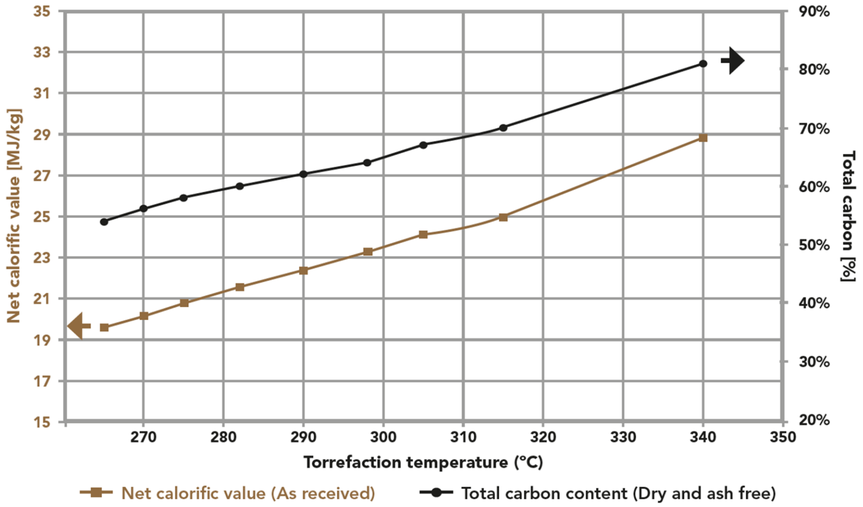
To aid the energy transition, companies can use our bio-carbon or integrate our torrefaction technology into their existing production plant. This for the purpose to heat furnaces in production processes.

High Potentials:

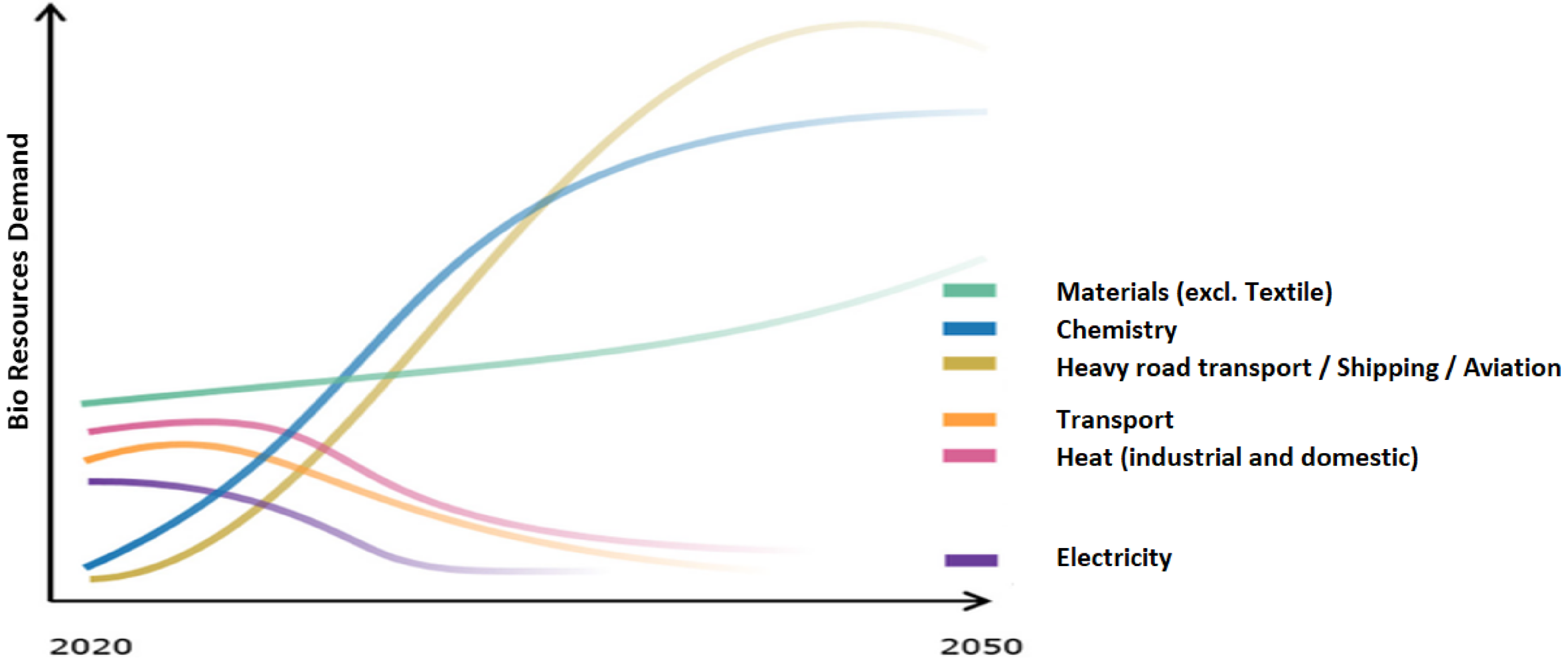
- Lime and Cement Industry
- Steel Industry

Challenges:

- Feedsctock Prices & Logistics
- Product Quality BioCoal “not same as”



TORRCOAL Trending: The Materials Transition



(source: Dutch Social Economic Board (SER) "Biomass in Balans" -2020)

BioCoal is in fact a Bio-Carbon

Carbon sink and products

Bio-carbon can be a ready-to-use material for applications to create renewable products.

Bio-carbon improves the product properties and at the same time preserves carbon atoms (carbon sink). Known applications are for instance composites in construction, soil improvement in agriculture and the (bio-) plastic industry (fillers and fibers).

Raw material for chemical processes

Bio-carbon can provide sustainable carbon atoms as an alternative for fossil resources.

Torrefaction enables the production of a highly homogeneous material of a constant quality, which is used as raw material for chemical processes, like bio-refinery, gasification and pyrolysis. In the steel industry it can also act as a fossil-free reducing agent.

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