

A photograph of an industrial facility, likely a waste-to-energy plant, featuring various pieces of machinery, pipes, and a robotic arm. The scene is dimly lit, with a blue light source visible in the background. A semi-transparent white box is overlaid on the center of the image, containing text.

VALORISING WASTE, DECARBONISING INDUSTRIES

Pyrolysis Technologies, Biochar and New Industrial Projects

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VP Innovation

Bellona Webinar 21012020

vow
VOW

ABOUT US

- › Provider of world leading technologies to **eliminate pollution**, enhance **circular economy** and mitigate **climate change**
- › Offering **patented unique solutions** that turn waste and biomass into **CO2 neutral** energy, **decarbonised** energy, **low-carbon** fuels and **biocarbon**
- › Our **technology is ready**, it integrates easily into industrial processes and does not depend on large and complicated infrastructure to be effective
- › **Proven and scalable** delivery model, **record high backlog** of orders and **large installed base** for leading players in a wide range of industries, providing **recurring business**
- › **International footprint**, headquartered in Norway with subsidiaries in US, France and Poland

Our brands

VOW

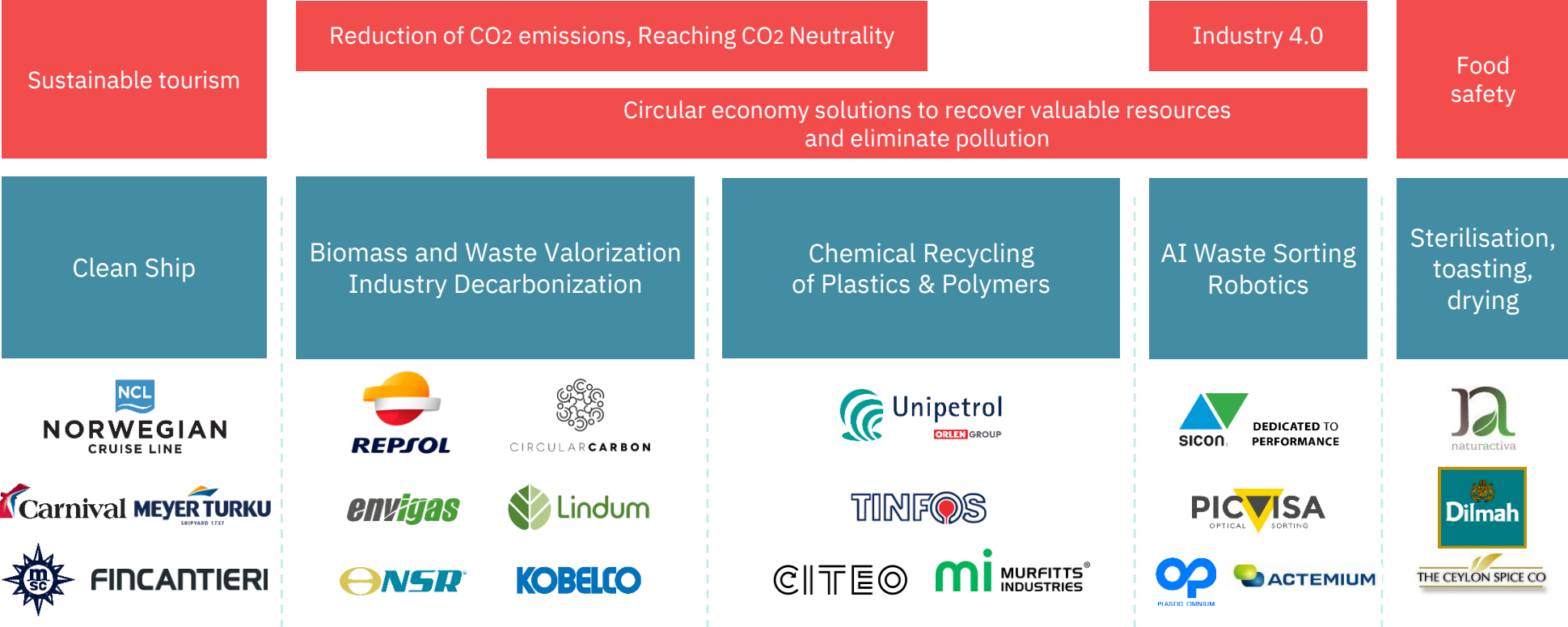
 **SCANSHIP**
for cleaner oceans


E T I A
ECOTECHNOLOGIES

 **Biogreen®**

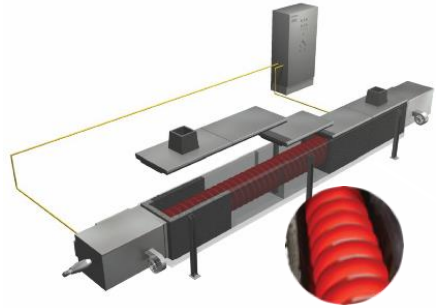
 **ASCODERO**
PRODUCTIQUE

STRONG PULL FOR OUR SOLUTIONS

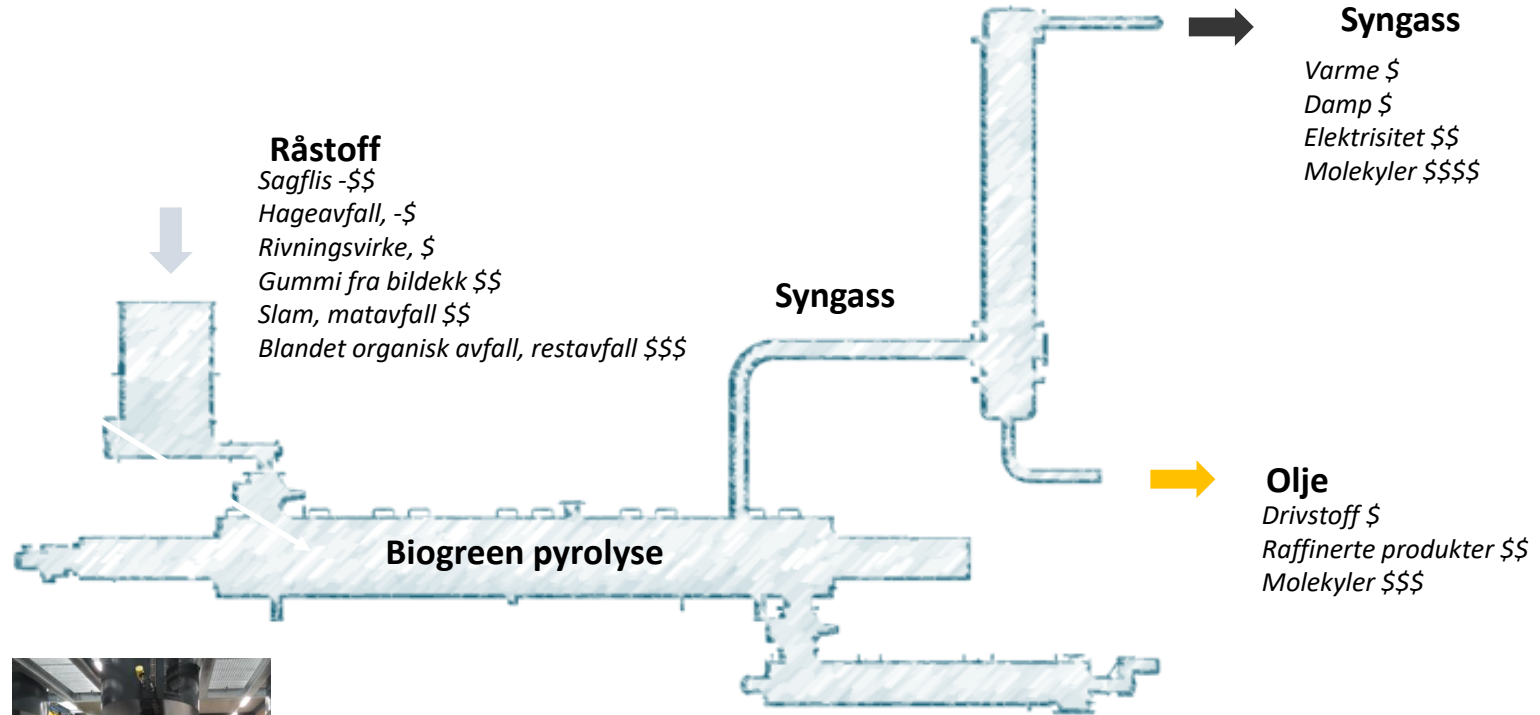


Ongoing projects and cooperation 2H2020

Forretningsmodell og lønnsomhetspotensiale



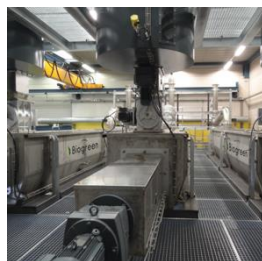
Multi-patentert
Elektrisk varmeskrue



FoU piloter
scanship.no

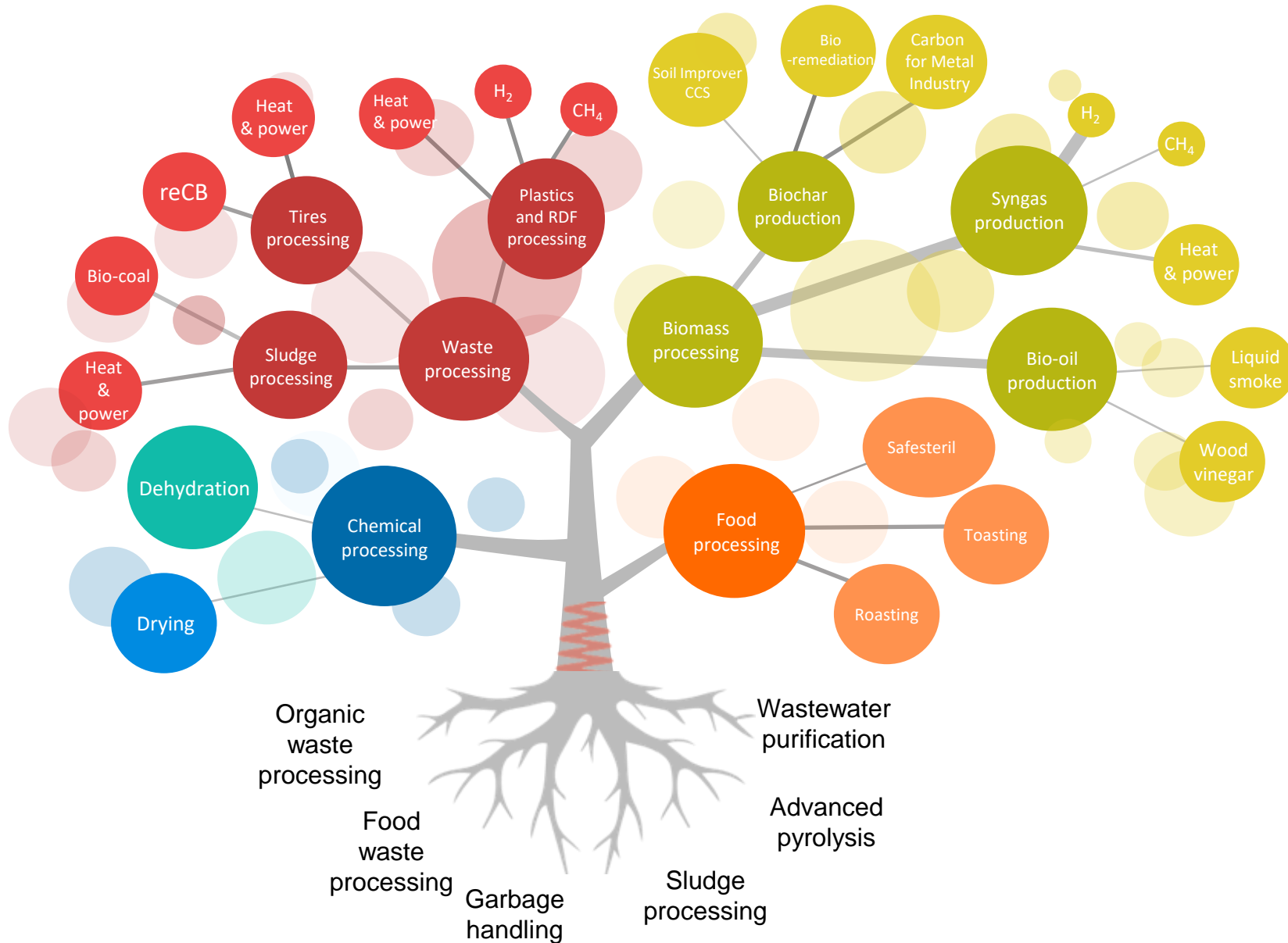


Enheter i
konteiner

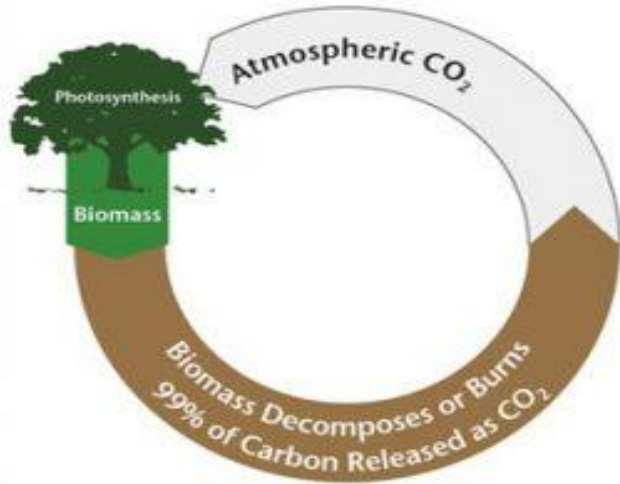


Stasjonære
anlegg

Kapasitet 5kg/h – 3t/h

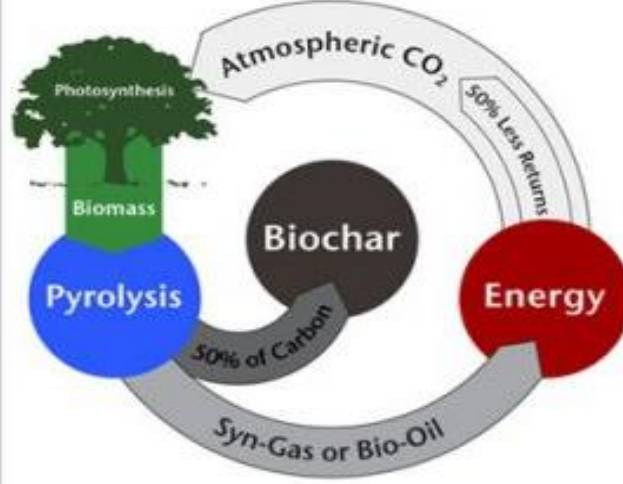


The Carbon Cycle

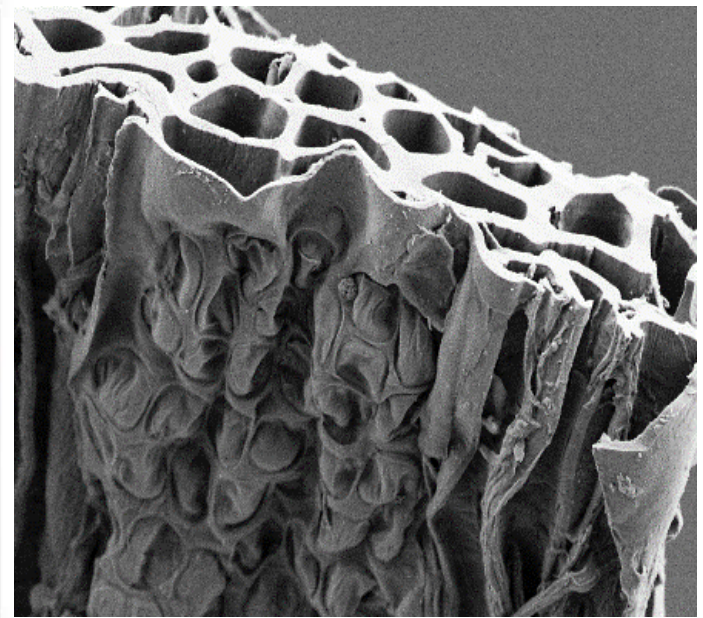


Almost all of the carbon returns to the air

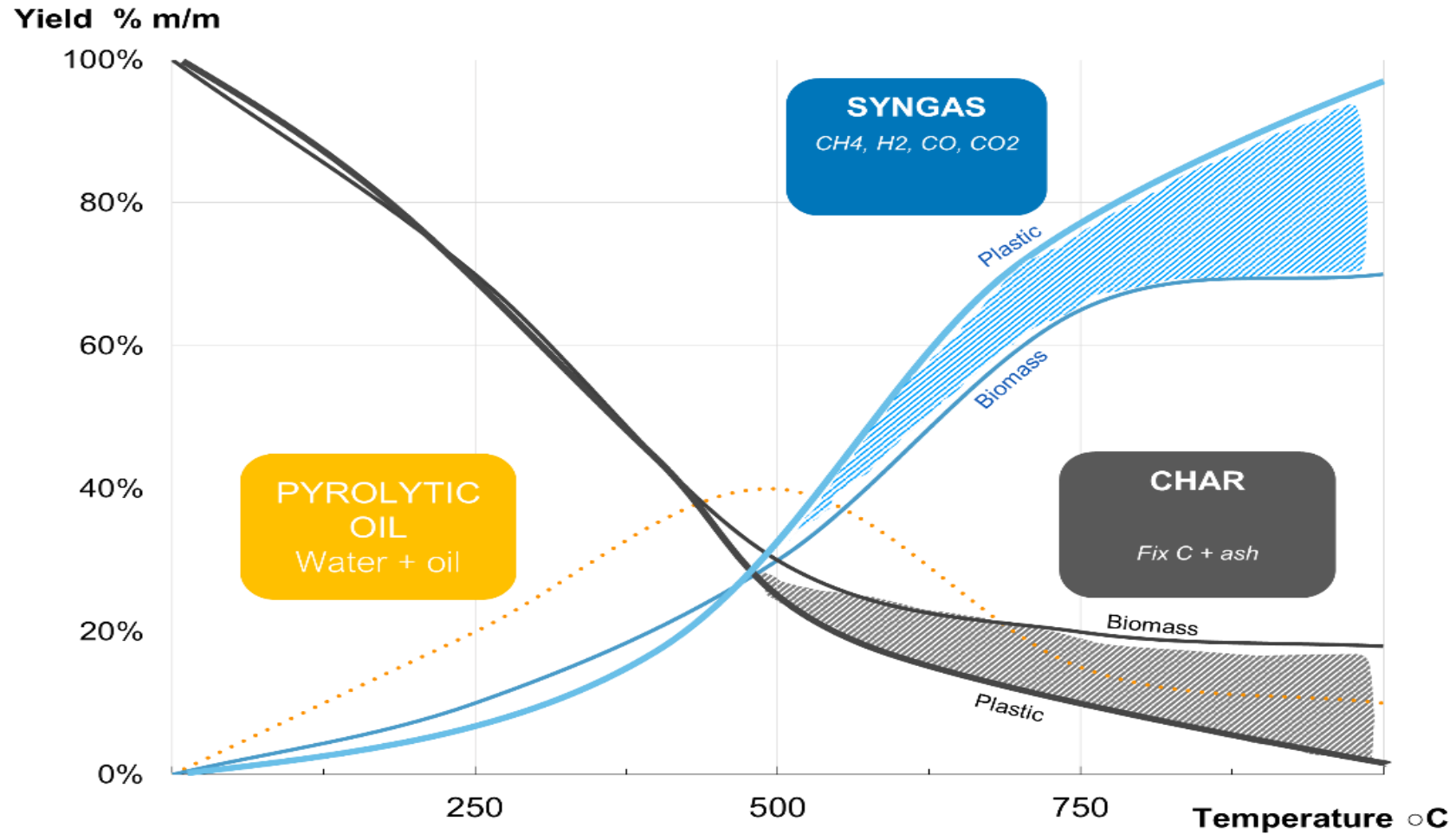
The Biochar Cycle



Up to half of the carbon is sequestered



Produktkurver for pyrolyse



Different types of solid products

Technology to optimise your product characteristics



Torrefied bagasse

Solid fuel replacement
Density 0.8 (800 kg/m³)
LHV 16 MJ/kg (vs. 13 MJ/kg raw material)

400 °C / 10 min.



Carbonised olive pomace

Solid fuel replacement
Density 0.7 (700 kg/m³)
LHV 26 MJ/kg (vs. 18 MJ/kg raw material)

550 °C / 10 min.



Hydrochar WB10

Soil amendment
Water retention 85%
Total carbon > 65%
Granulometry 0.125 - 4 mm

550 °C / 15 min.



Biochar from HT pyrolysis

Activated carbon precursor
Total carbon 92%
ash 4%
LHV 33.03 MJ/kg (vs. 19 MJ/kg raw material)

800 °C / 15 min.

An aerial photograph of a large industrial facility, likely a sawmill or wood processing plant. The facility features several large, interconnected buildings with grey roofs. A prominent feature is a long, elevated conveyor system that runs diagonally across the upper right portion of the image. In the lower left, there is a large, organized stack of lumber or wood products. The facility is surrounded by dense green forest. The text "OUR NEXT STEP" is overlaid in large, white, bold, sans-serif capital letters in the center of the image. Below it, the text "Introducing VOW Industries" is overlaid in a smaller, white, sans-serif font. The entire image is framed by a white L-shaped graphic element on the left and bottom edges.

OUR NEXT STEP

Introducing VOW Industries

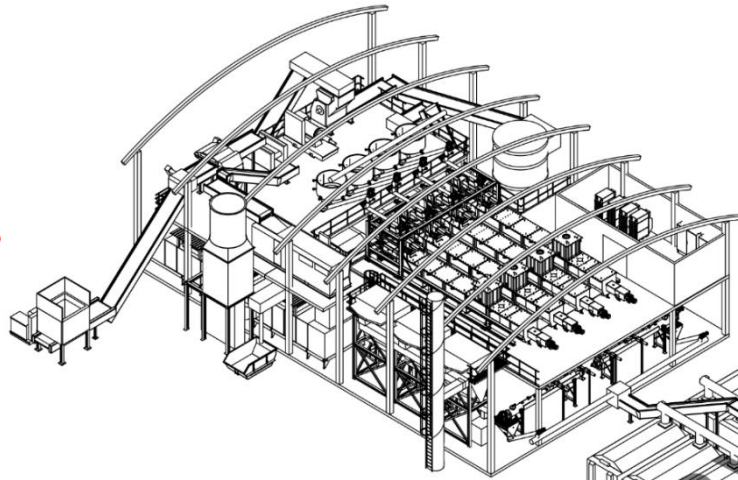
VALUE PROPOSITION

Valorising waste | Decarbonising industry

Intake (examples)

Organic waste
and biomass

Plastics and
polymers



Offtake (examples)

Biocarbon (biocoke, biochar,
biocoal)

Carbon products (graphite,
graphene and recycled carbon
black)

CO₂ neutral gas and hydrogen
(decarbonised energy)

Low-carbon fuels

CO₂ removal certificates

Vow Industries business idea
Build, own and operate plants
and an incubator that can establish more
companies based on Vow's technology

VOW INDUSTRIES

The Follum plant



- **Business idea** | Build, own and operate full scale demo plant based on Vow's process technology
- **Production** | biocarbon to replace fossil coke as a reducing agent in the metallurgical industry in Norway, as well as providing CO₂ neutral gas for district heating and low-carbon fuels
 - Woody biomass 50 000 t/yr
 - Biochar 10 000 t/yr
 - Syngas 150 GWh/yr
- **Setup** | Base for development of fully standardized and replicable facilities
 - Aiming for easy and flexible scale-up to higher capacities
- **Financing** | Through Enova grants, debt and equity

LOCAL PARTNERSHIPS IN PLACE



VIKEN
SKOG

*Forest owners
association providing
biomass*



Lindum

*Demolition wood,
waste wood*



vardar
GREEN ENERGY

*Municipal energy company,
using CO2 neutral gas
for district heating*

*Biocarbon for the
metallurgical industry*

*Low-carbon fuel and
raw materials for the
petrochemical industry*





VOW



VOW



VOW Industries Follum

VOW

THANK YOU FOR YOUR ATTENTION

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