



CO₂ Liquefaction

Bright Renewables

Content

- 🌿 **Bright Renewables**
- 🌿 **CO₂ liquefaction technology**
- 🌿 **Product Range**
- 🌿 **References**



Bright Renewables



**>150 employees
in 2023**



**Close to 200
installations globally**



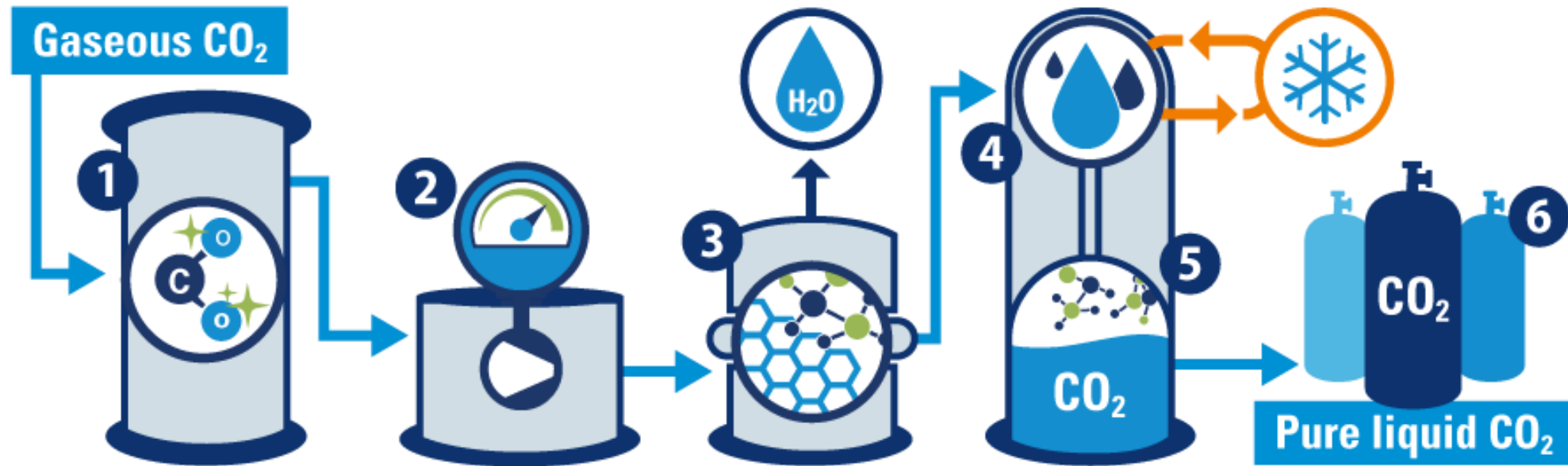
**>60M\$ order intake
in 2023**



**HQ in NL. Local offices in
US, France, Latvia, Italy.**

LCO₂ technology – Flowchart

1. Filtration
2. Compression
3. Drying
4. Liquefaction
5. Stripping
6. Storage



LCO₂ technology – USP's

- 🌿 **Purification and liquefaction** enabling an additional revenue stream by producing food grade quality liquid CO₂ for horticulture-, food-, concrete-, refrigeration-industry. Future utilizations are, for instance, Sustainable Aviation Fuels (SAFs), e-methanol and e-methane.
- 🌿 **Proprietary Bright technology** developed in-house and tested at own facility. Unique by using CO₂ as a natural refrigerant, thus no Freon or Ammonia. Market introduction in 2022.
- 🌿 **Improvement of the carbon intensity (CI) score** of the facility by reduction of CH₄ loss (methane slip) in upgrading.
- 🌿 **Containerized solution** for plug & play installation on-site with quick start up.

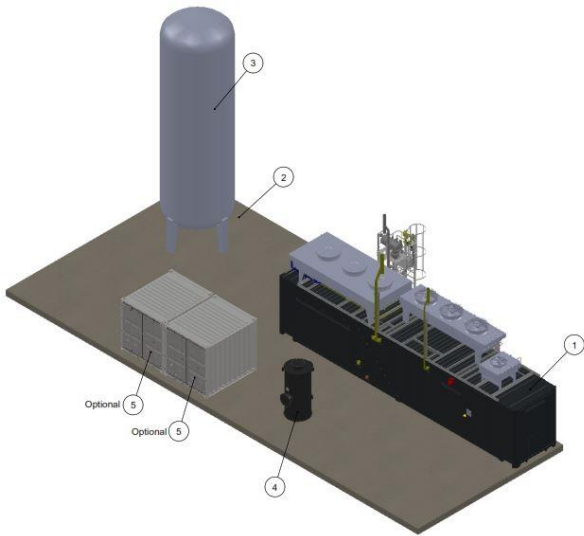


LCO₂ technology – Advantages

- 🌿 **Improvement CI-score:** Lower environmental impact and better methane pricing.
- 🌿 **Reduction methane slip:** CO₂ Liquefaction enables to recover almost all methane slip in stripping process.
- 🌿 **Removes necessity RTO:** By recovery nearly all methane in the off-gas, no methane will be emitted into the air.
- 🌿 **Extra sources of income:** Sales of LCO₂ provides additional revenue.

LCO₂ – Product Range

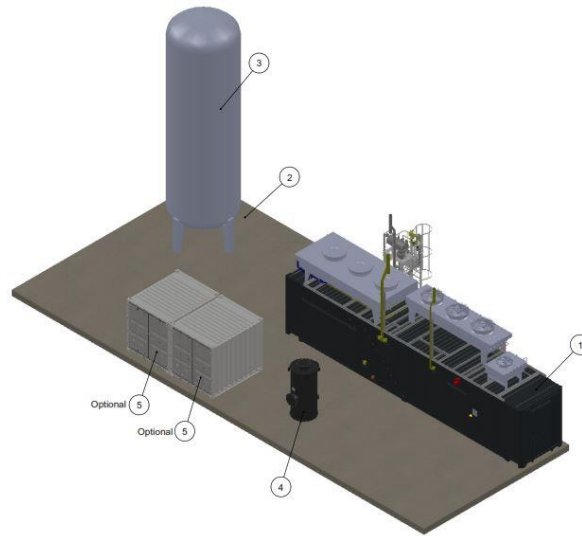
Mini



Capacity: 300 – 600 kg/h
7 – 14 TPD

Parts: 40 ft. container
Reboiler skid

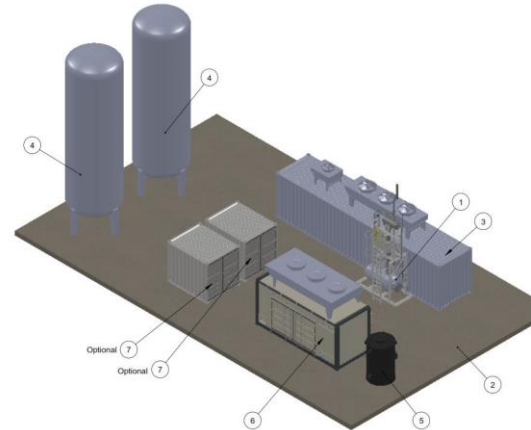
Compact



Capacity: 800 – 1200 kg/h
19 – 29 TPD

Parts: 45 ft. container
Reboiler skid

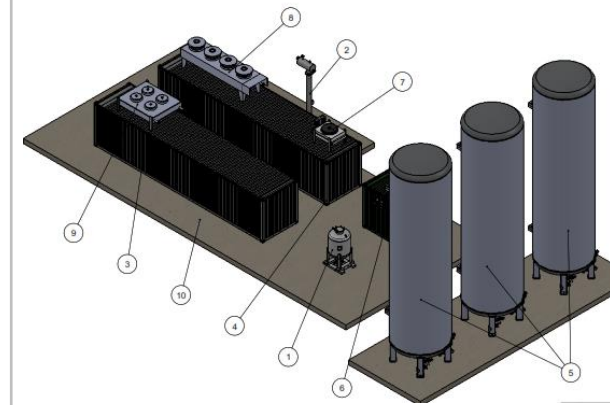
Medium



Capacity: 1500 – 4000 kg/h
36 – 96 TPD

Parts: 40 ft. container
20 ft. container
Reboiler skid

Grand






Capacity: 4500 – 6000 kg/h
108 – 144 TPD




Parts: 40 ft. container
2*20 ft./40 ft. container
Reboiler skid

LCO₂ – References


United Kingdom

-  Hereford – 19 TPD (2016)
-  Scotland – 36 TPD (2023)
-  Winchester – 48 TPD (2024)






Germany

-  Heek – 36 TPD (2023)
-  Helmstedt – 17 TPD (2023)
-  Leipzig – 29 TPD (2024)

USA

-  West Coast – 19 TPD (2024)

The Netherlands

-  Waalwijk – 14 TPD (2016)
-  Almere – 14 TPD (2017)
-  Houtrust – 4 TPD (2020)
-  Tilburg – 29 TPD (2022)
-  Waalwijk – 29 TPD (2023)

Brazil

-  Porto Alegre – 48 TPD (2024)

LCO₂ Reference – Tilburg

UPGRADING

BIOGAS FLOW	1600 Nm ³ /h or 1000 SCFM
RECOVERY RATE	100% (99,5% only upgrading)
BIOGAS SOURCE	AD Water Treatment
PLANT	PurePac Grand

CO₂ LIQUEFACTION

CO₂ FLOW RATE	1200 Kg/h CO ₂ (29 TPD)
CO₂ PURITY	99,9%
PRESSURE	18 bar(g) or 261 psi(g)
REFRIGERANT	R744 (CO ₂)



LCO₂ Reference – Heek

UPGRADING

BIOGASFLOW	1600 Nm ³ /h or 1000 SCFM
RECOVERY RATE	100% (99,5% only upgrading)
BIOGAS SOURCE	AD Agricultural Waste
PLANT	PurePac Grand

CO₂ LIQUEFACTION

CO₂ FLOW RATE	1500 Kg/h CO ₂ or 36 TPD
CO₂ PURITY	99,9%
PRESSURE	18 bar(g) or 261 psi(g)
REFRIGERANT	R744 (CO ₂)



LCO₂ Reference – Helmstedt

UPGRADING

BIOGASFLOW	750 Nm ³ /h or 470 SCFM
RECOVERY RATE	100% (99,5% only upgrading)
BIOGAS SOURCE	AD Agricultural Waste
PLANT	PurePac Compact

CO₂ LIQUEFACTION

CO₂ FLOW RATE	700 kg/h CO ₂ or 17 TPD
CO₂ PURITY	99,9%
PRESSURE	18 bar(g) or 261 psi(g)
REFRIGERANT	R744 (CO ₂)





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