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# Decarbonization: carbon capture technologies for shipping

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Director B.U. Marine

*First Decarbonization Seminar*

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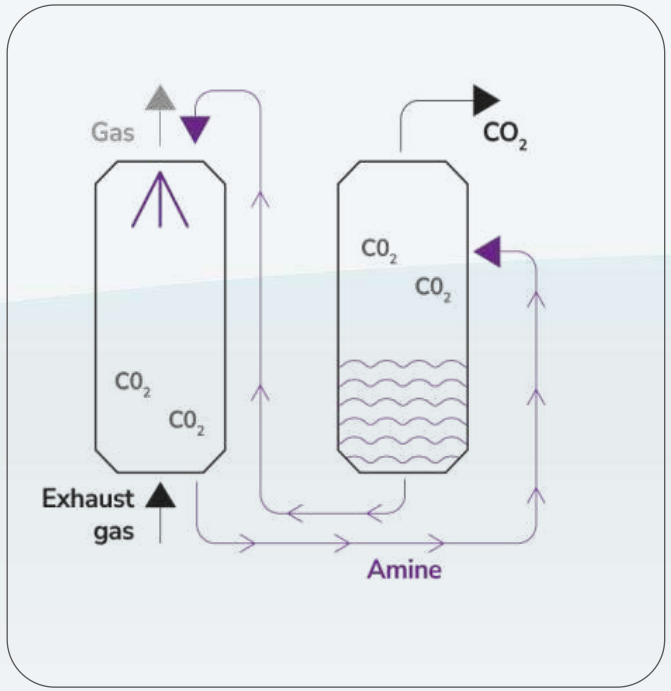
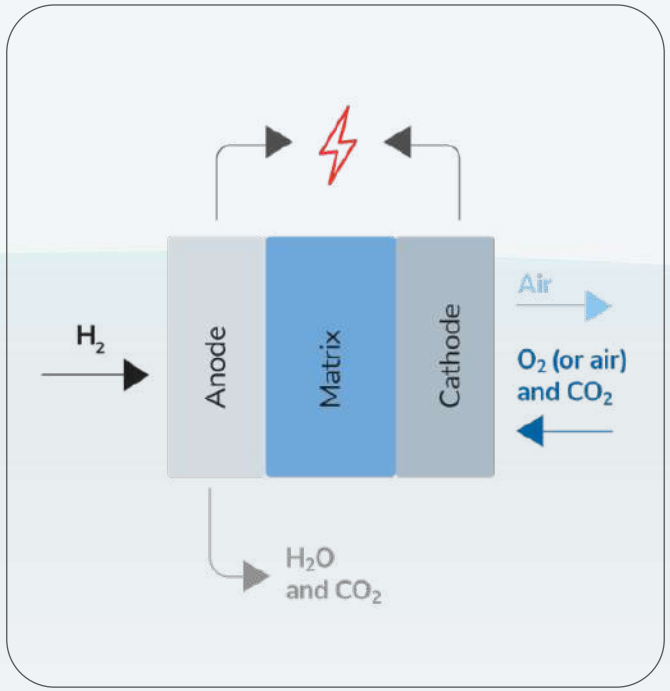
# our **Carbon Capture** technologies

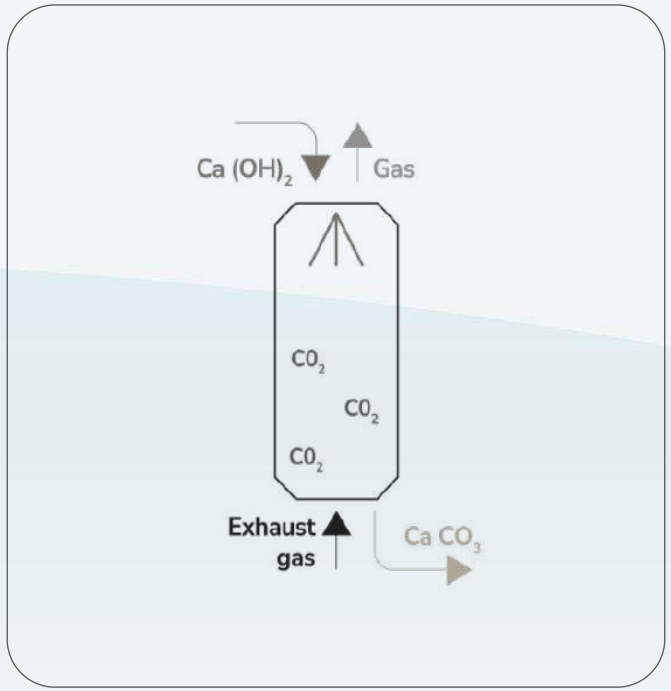
## Amines




## MCFC




## Ca(OH)

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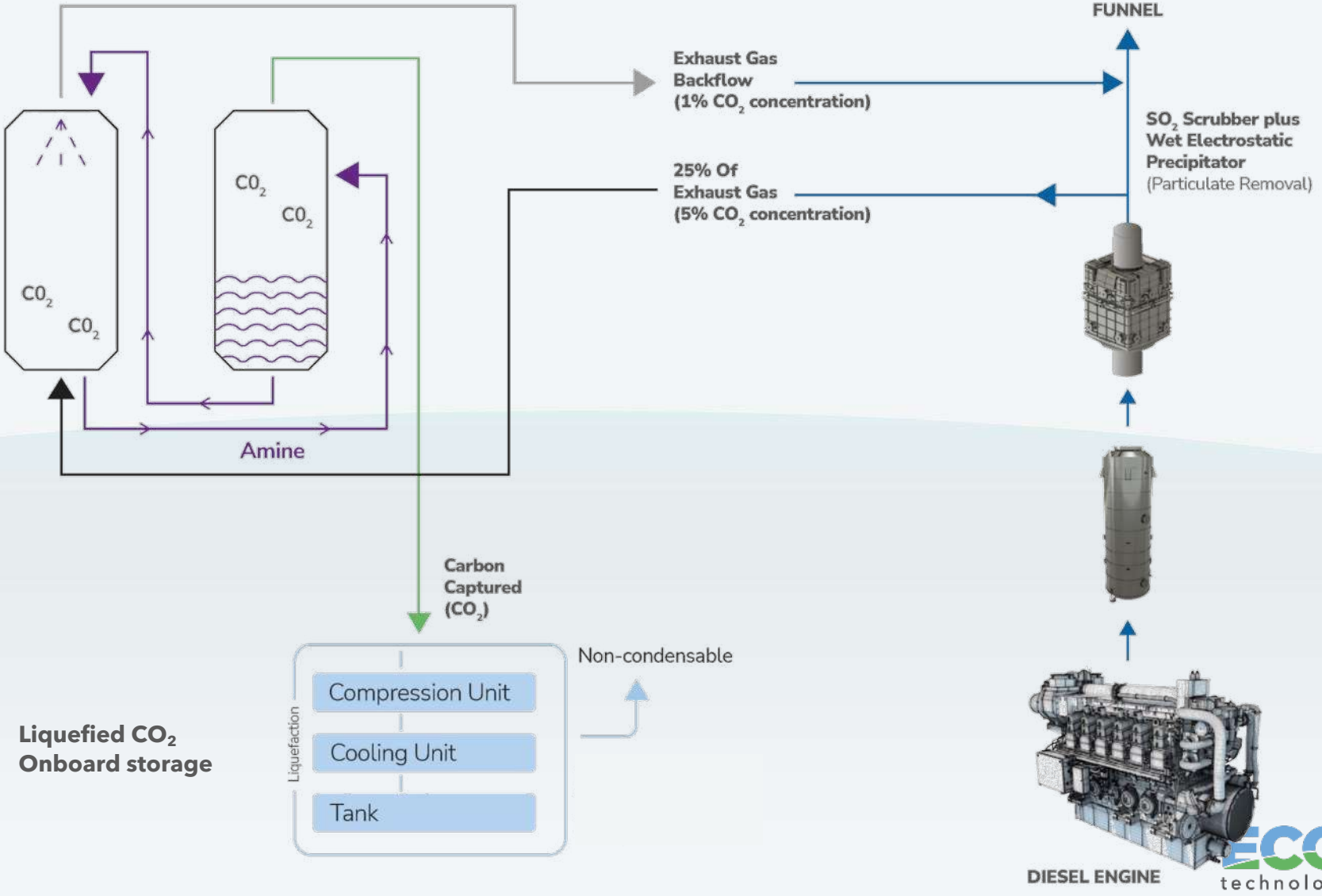
# Carbon Capture with **Amines**

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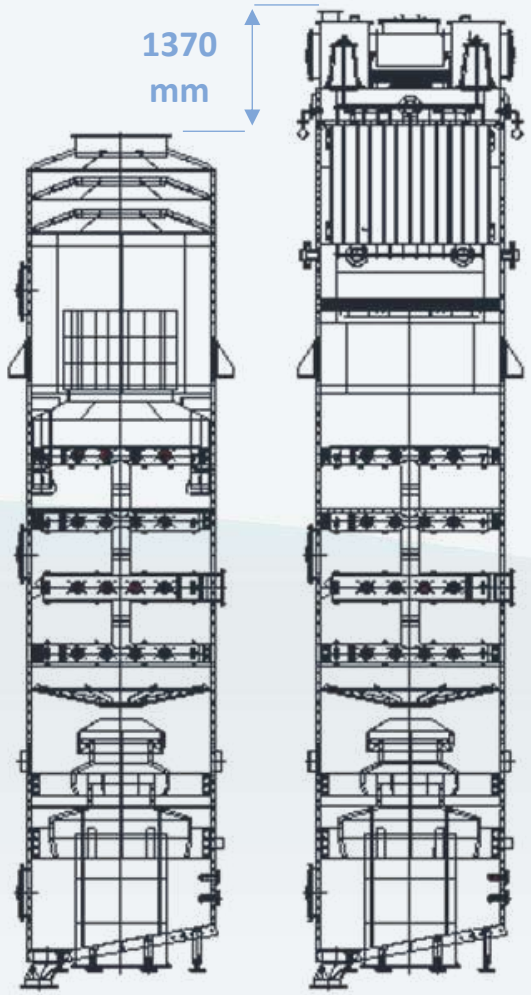
Enabling technologies:
**WESP**

# First full scale WESP installation

Left drawing show the original EGCS tower (10110 mm x 2200 mm). On the right side the tower modified, including WESP unit (11480 mm 2200 mm).

Weight: original tower 7050.5 Kg → tower modify with WESP 11100 Kg

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# Enabling technologies: **WESP**

## Plume removal

**DG2 load 60% WESP off**

**DG2 load 60% WESP on**

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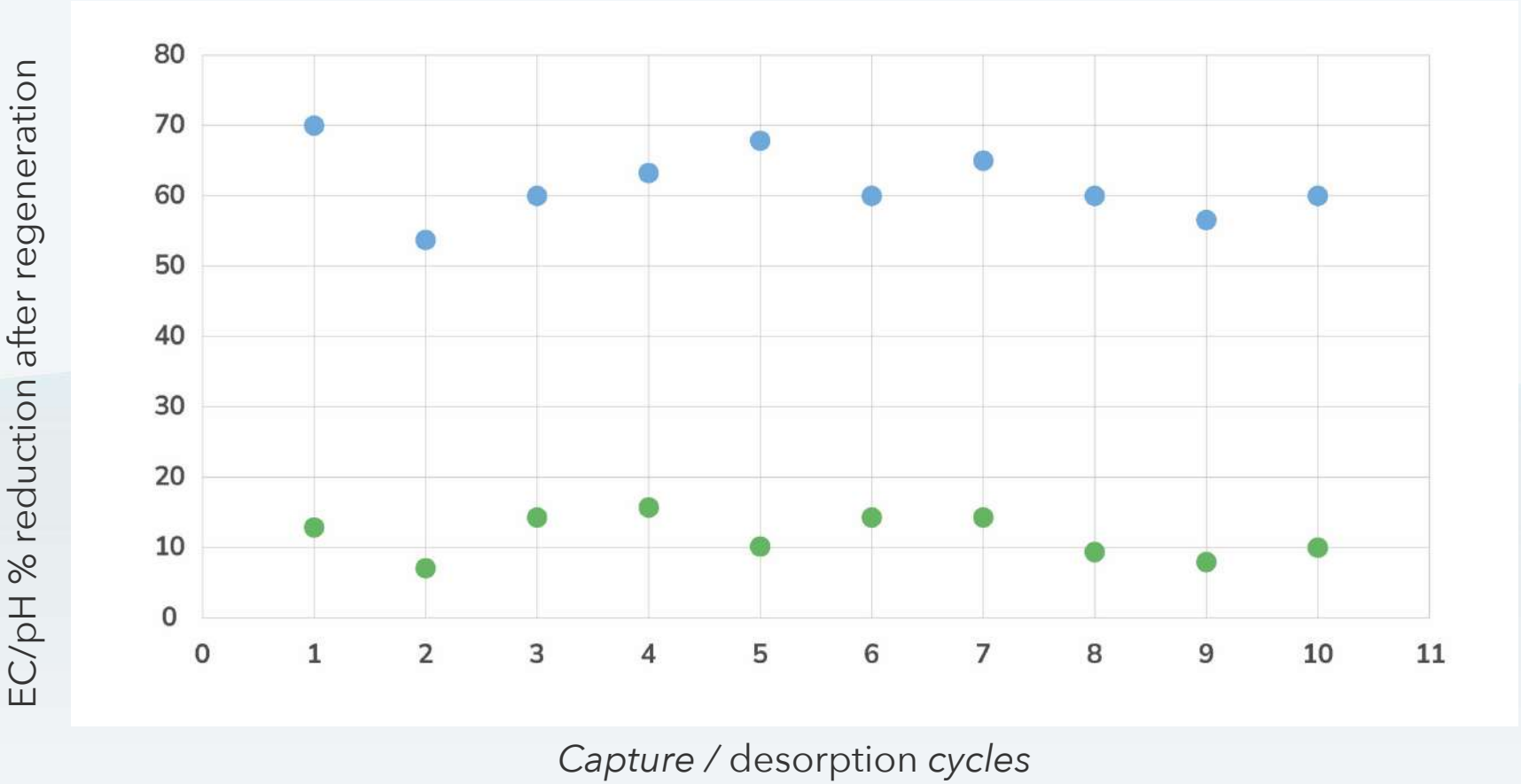
# Carbon Capture with **Amines**

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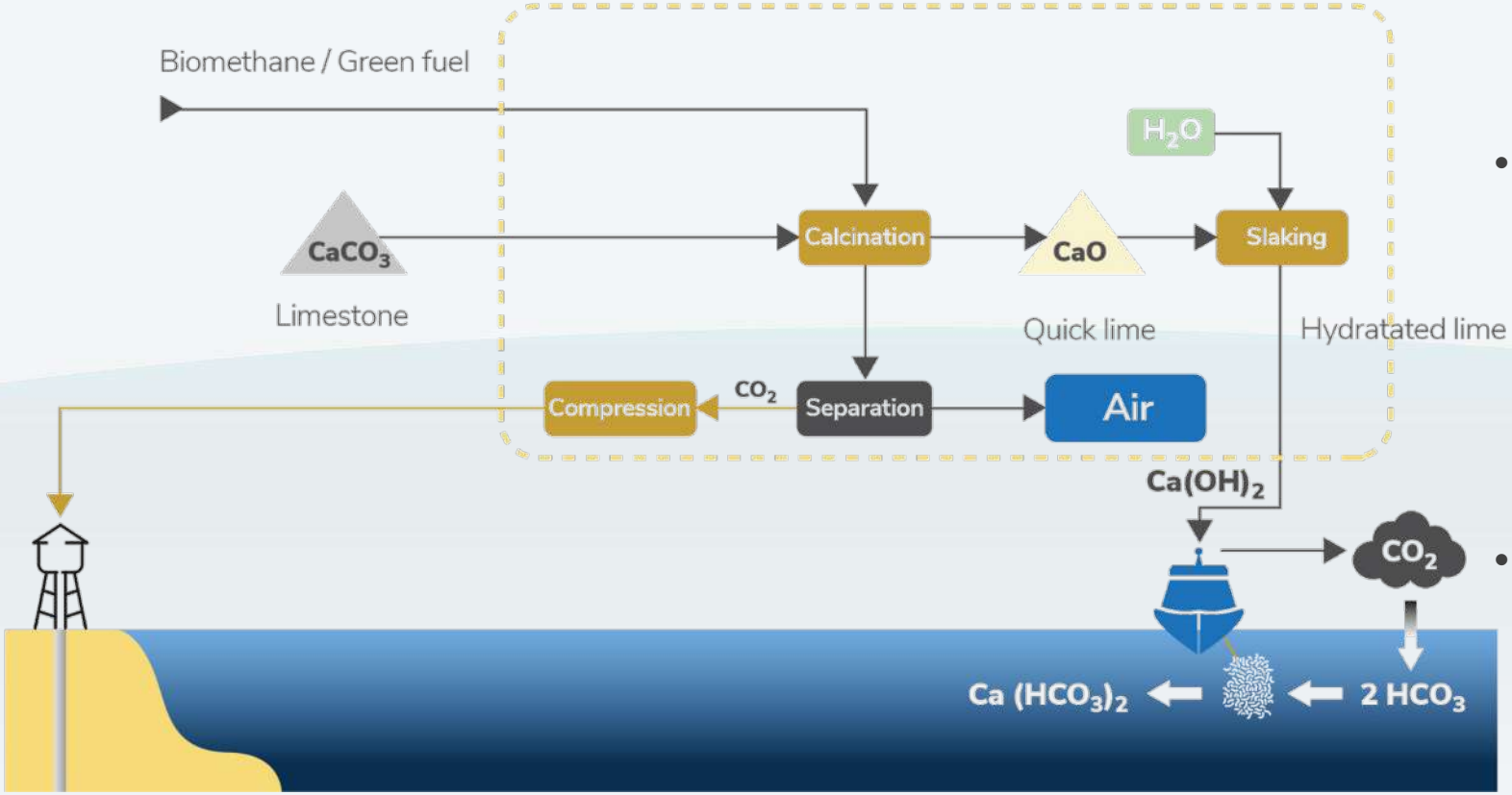
# Carbon Capture with **Calcium Hydroxide**

$$CO_2 + Ca(OH)_2 \leftrightarrow CaCO_3 + H_2O$$




- $CaO/Ca(OH)_2$ is bunkered and stored onboard as a solid bulk powder.
- Afterwards the reagent mixed with water is injected directly into an auxiliary dedicated scrubber with a closed loop process, absorbing $CO_2$.
- As a result, the environmentally safe product containing captured Carbon, is discharged overboard.

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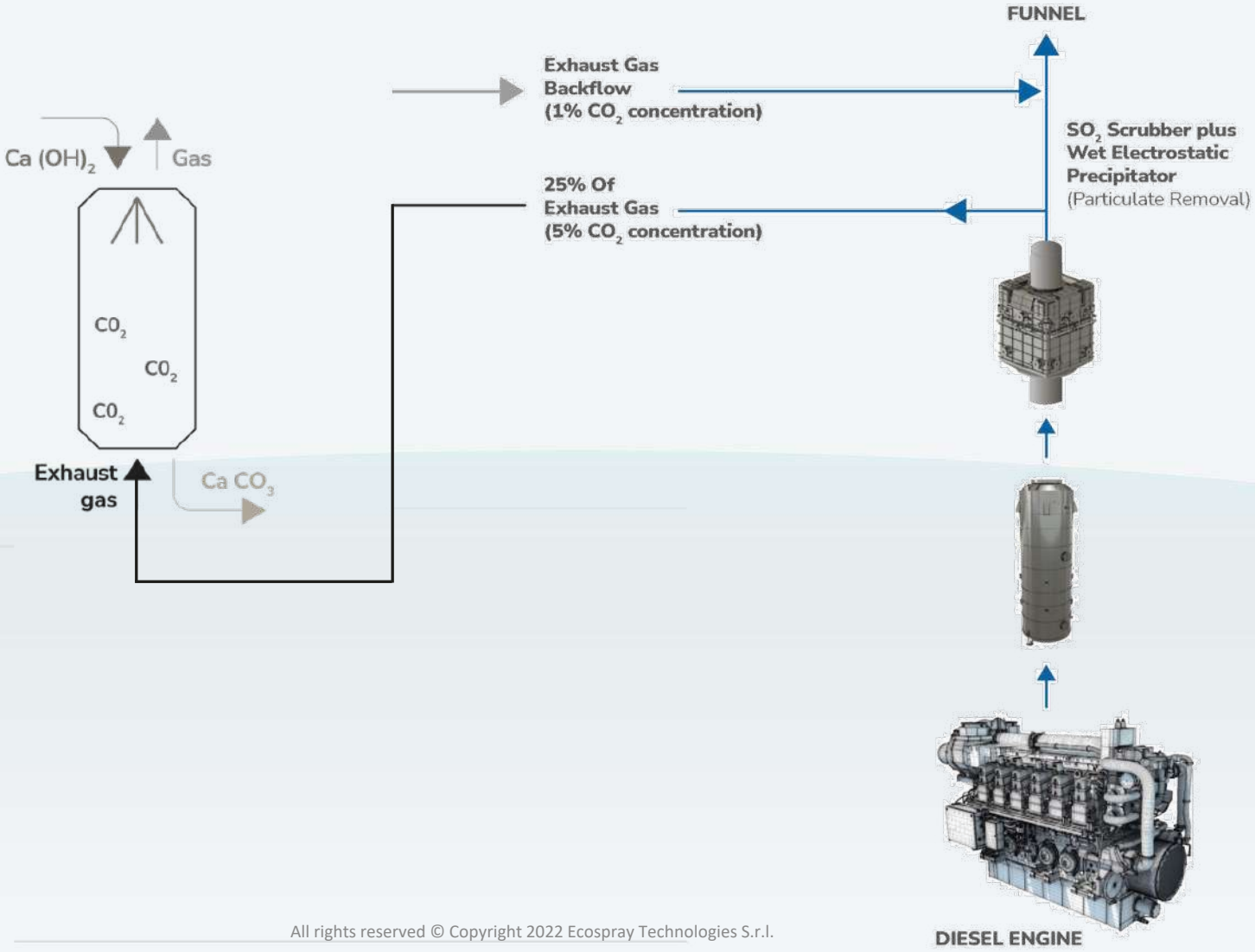
# Carbon Capture with **Calcium Hydroxide**

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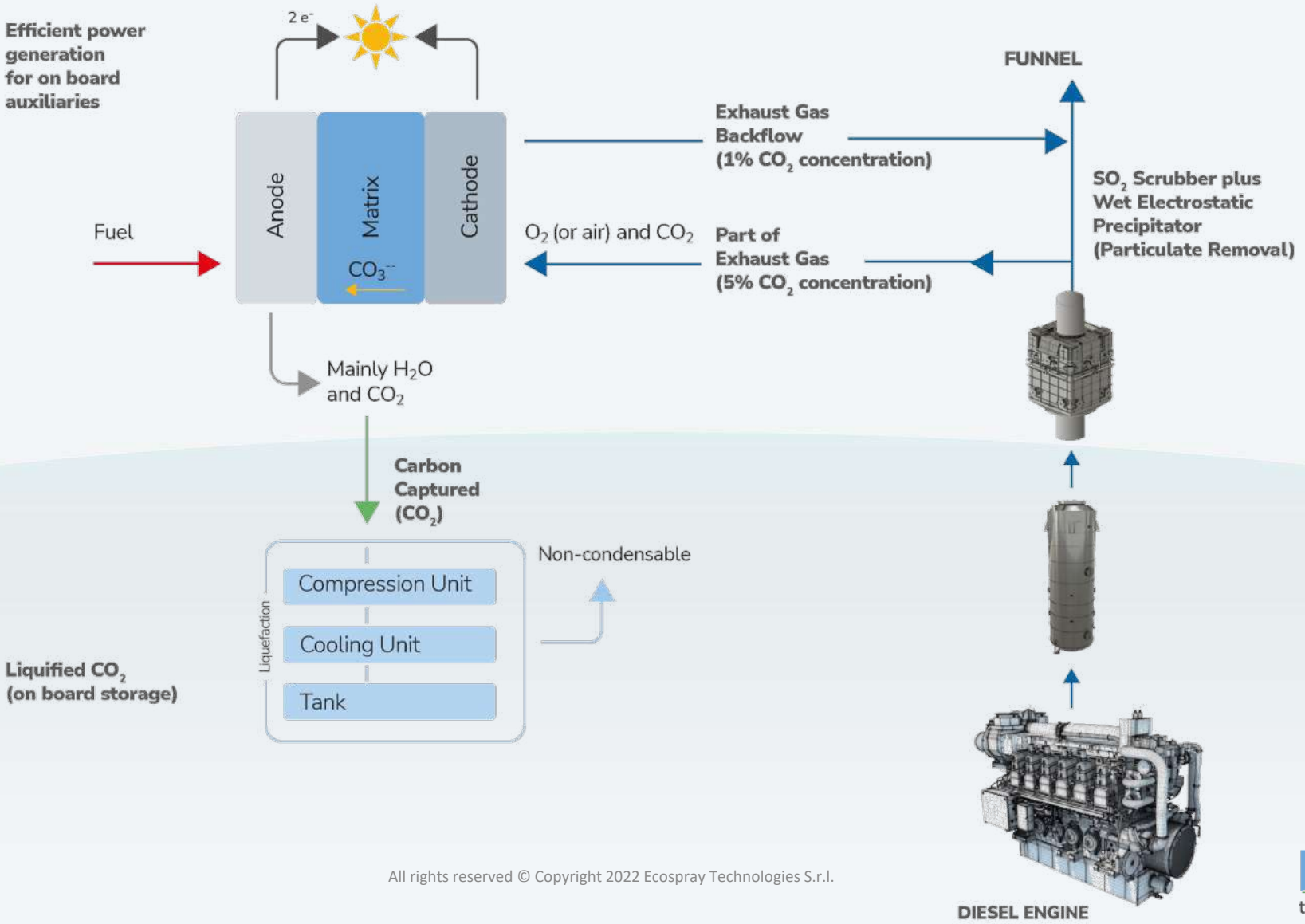
# Carbon Capture with **MCFC**

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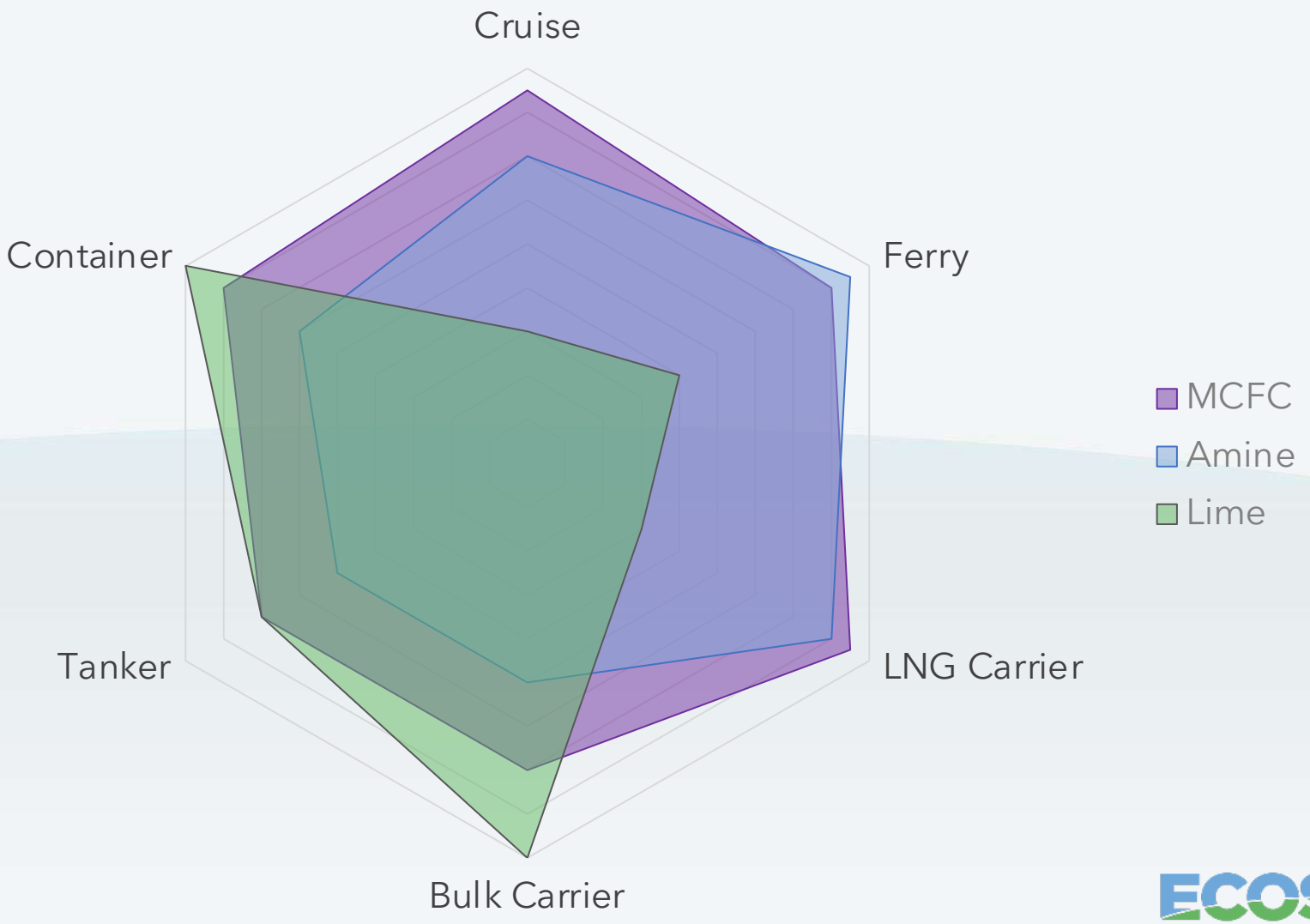
# Carbon Capture: **solutions for all needs**

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What's **next?**

# 2023

Carbon capture **demonstration** using a **3.5 kW MCFC** stack coupled with an **80 kW diesel engine.**

The pilot plant represents a scaled onboard complete system including diesel engine, scrubber, MCFC and $CO_2$ liquefaction unit.

# Milestones

***Q1/Q2 - 2021***
- **MCFC:** *process definition for marine application*

***Q3/Q4 - 2021***
- **Amine and Lime:** *feasibility study*
- **MCFC:** *button cell production*

***Q1/Q2 - 2022***
- **MCFC:** *stack geometry design*
- **CapLab:** *deployment of new lab in Genoa*

***Q3/Q4 - 2022***
- **Amine and Lime:** ashore and onboard testing
- **MCFC:** small scale *test with marine engine in Alzano*

***Q1/Q2 - 2023***
- **MCFC:** *pilot system (20 kW)*
- **Amine and Lime** *industrialization*

***2024***
- **MCFC:** *real scale pilot system (400 kW) onboard testing*

**Join the (R)evolution**

**Thanks**

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