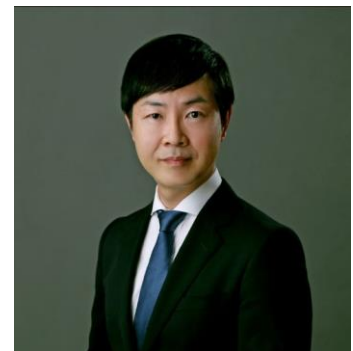


Development of direct air capture technology using LNG cold (Cryo-DAC®)

5th October 2022

Koyo Norinaga Ph.D. Professor, Nagoya University



Cryo-DAC®



Air
(CO₂ < 100 ppm)

Desorber

Release CO₂ by
pressure swing

Absorber

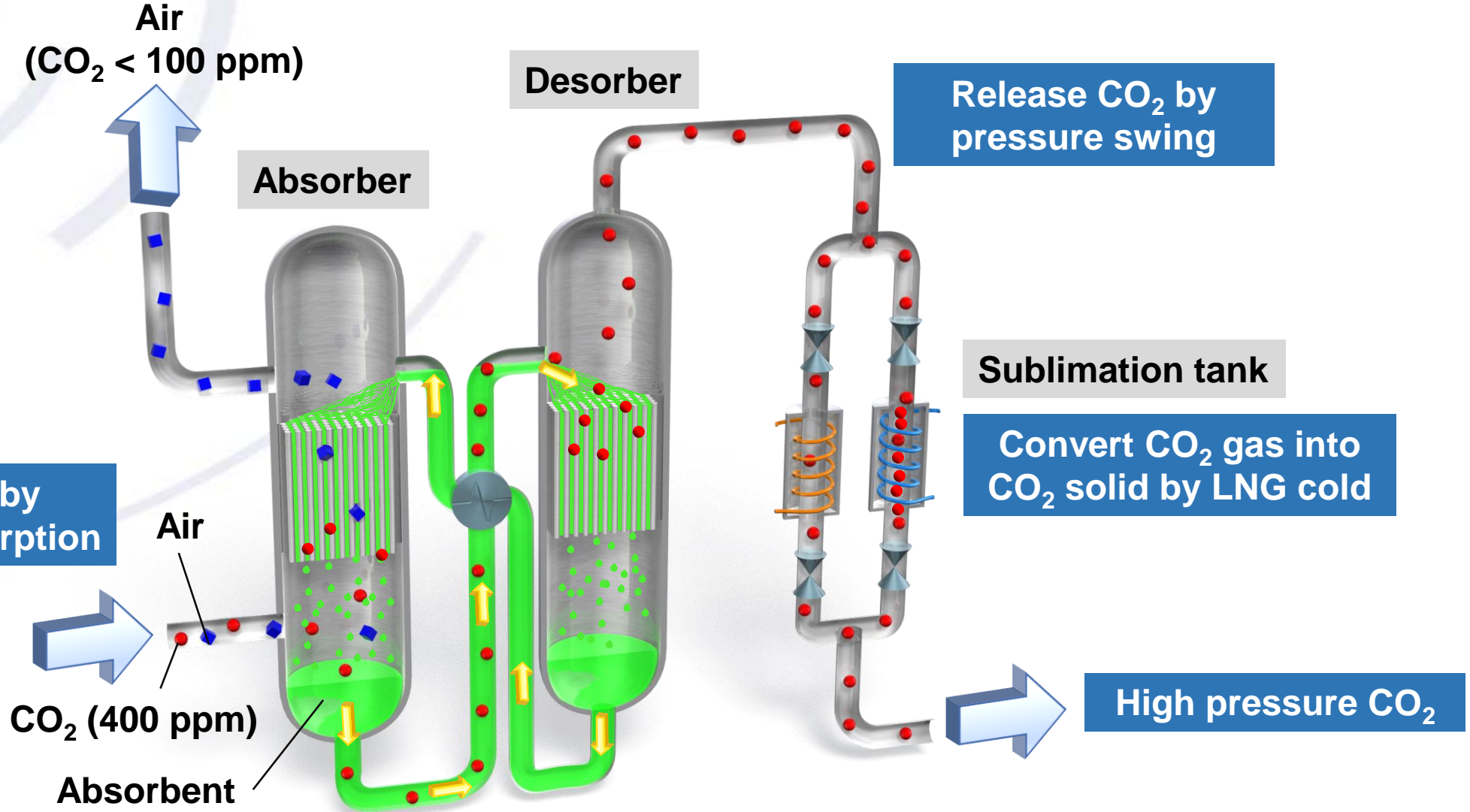
Sublimation tank

Catch CO₂ by
chemical absorption

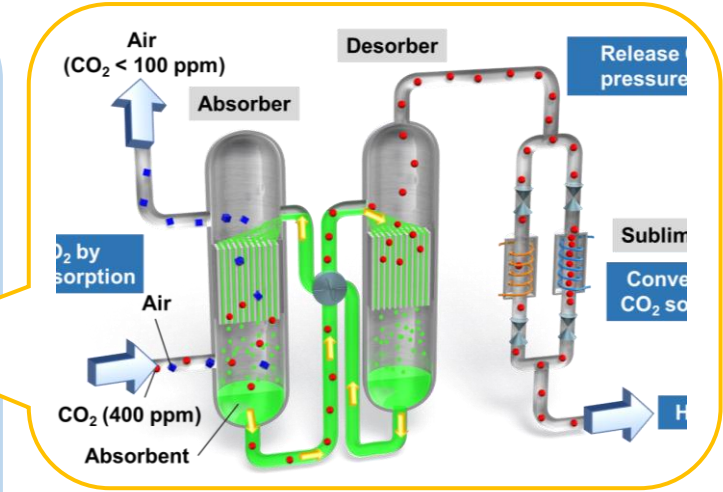
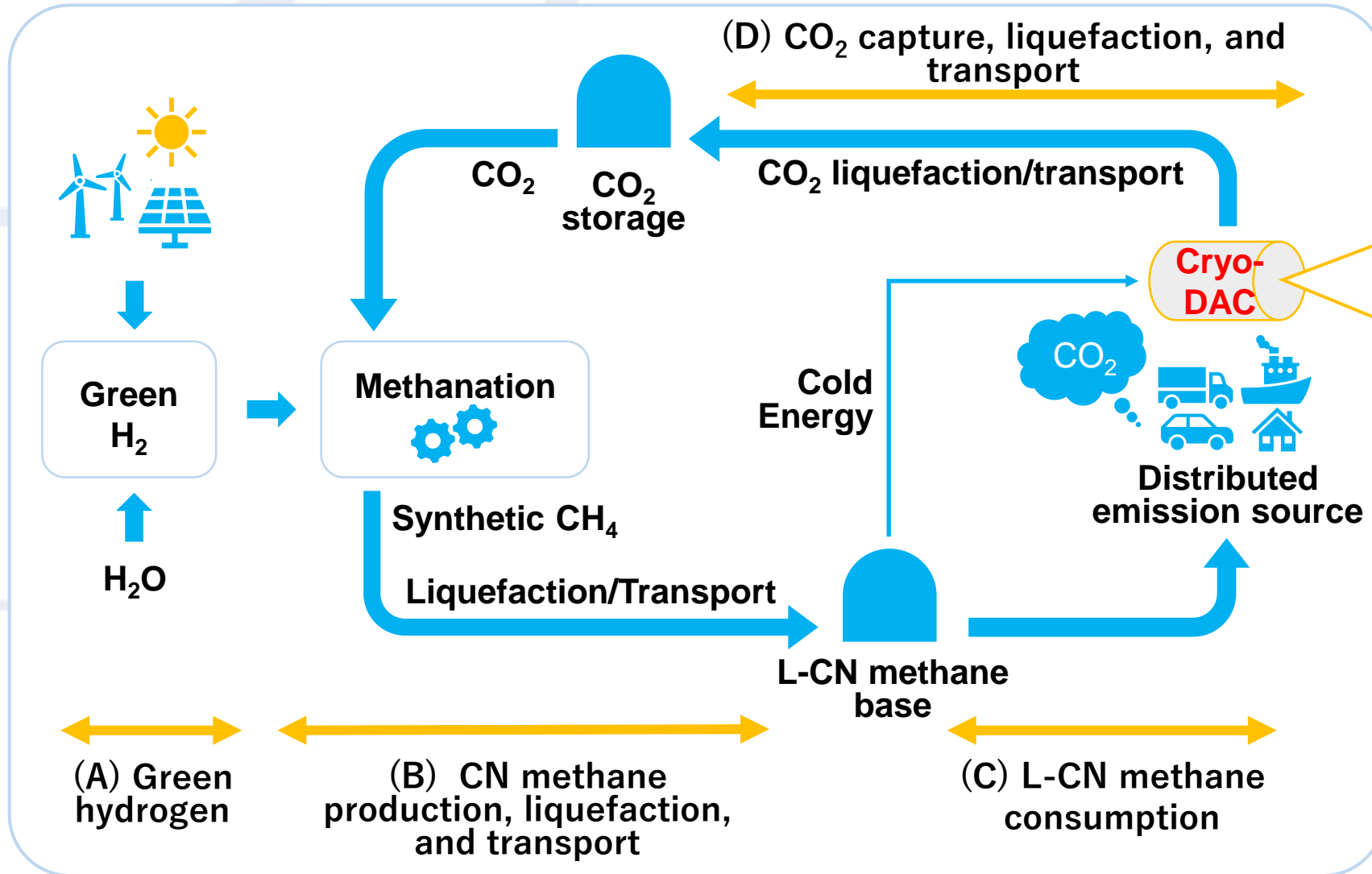
Convert CO₂ gas into
CO₂ solid by LNG cold

Air
CO₂ (400 ppm)
Absorbent

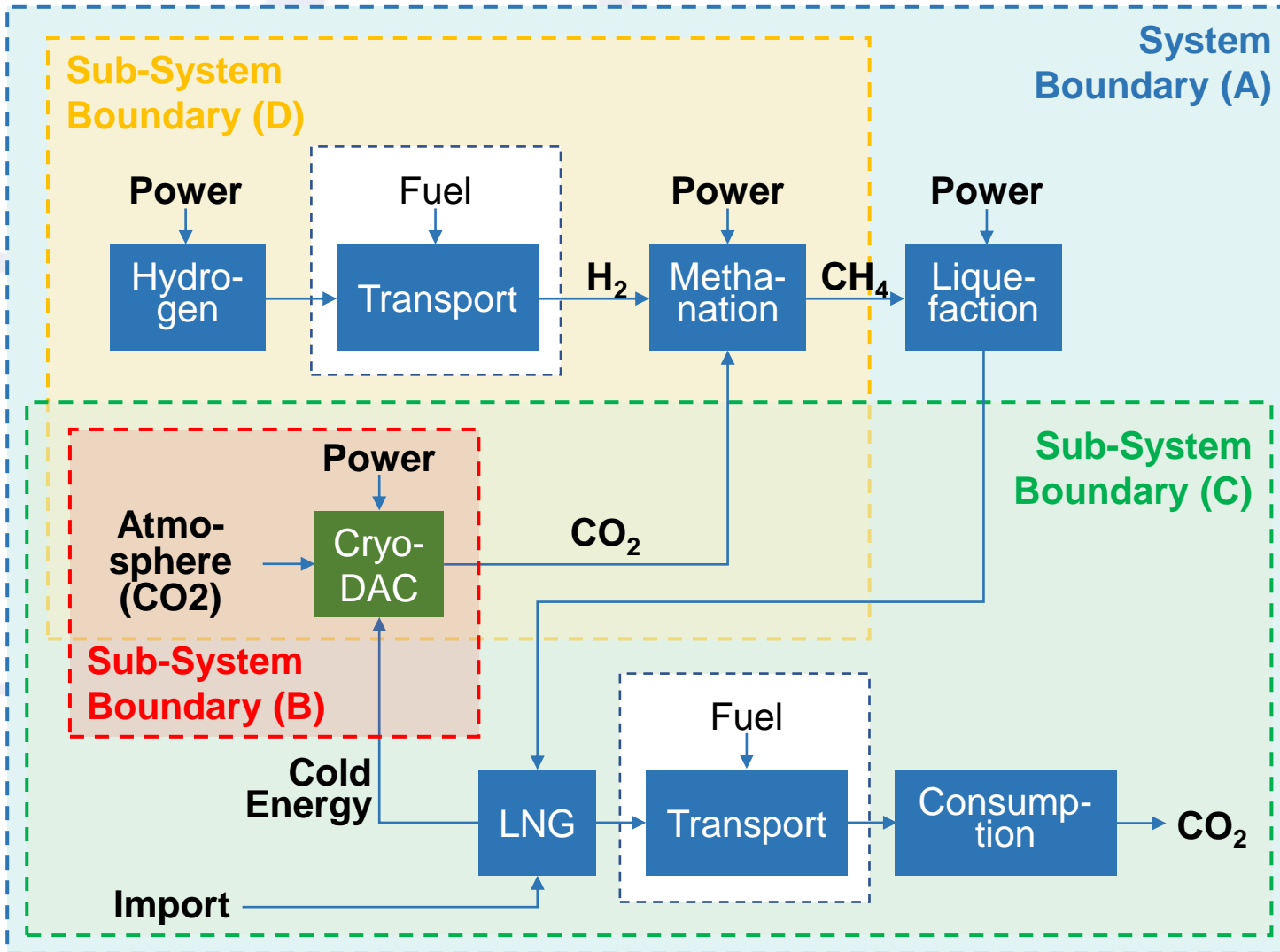
High pressure CO₂



A carbon circulation by Cryo-DAC and carbon neutral (CN) methane



How do we set the boundaries?



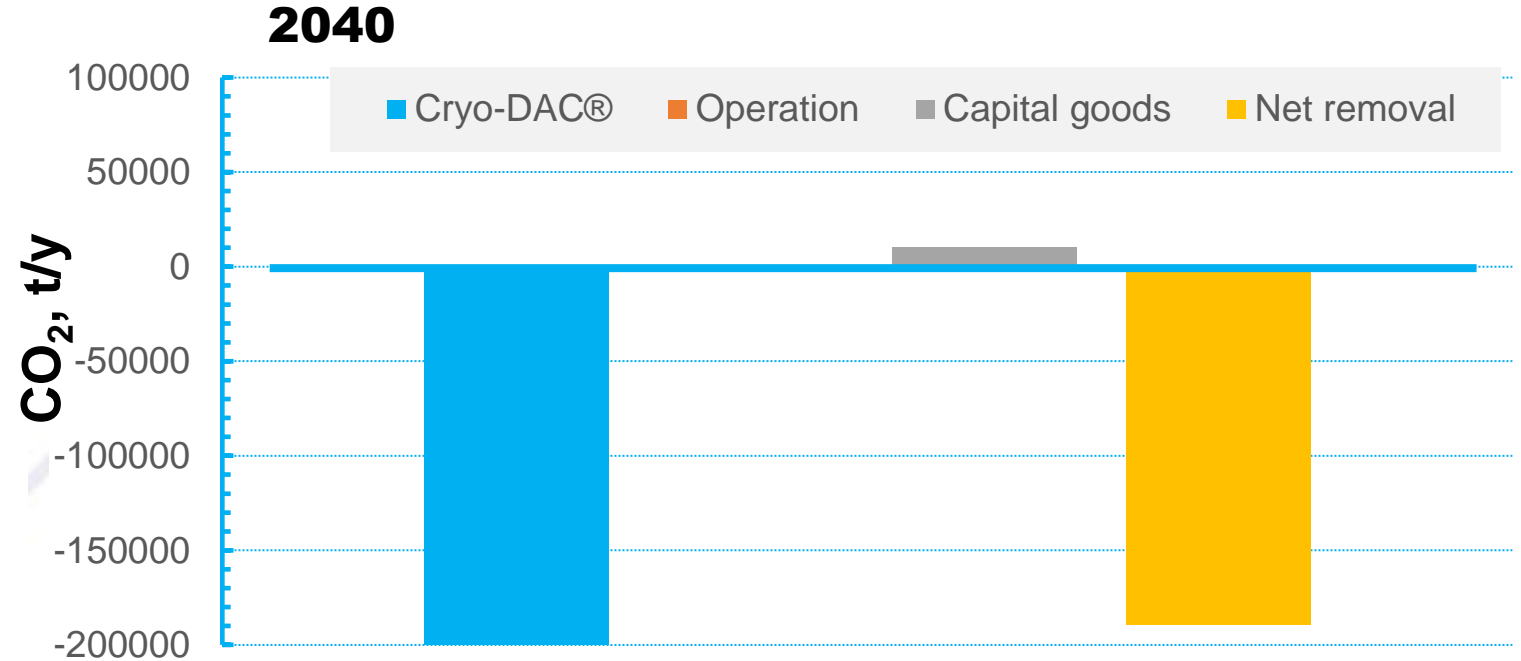
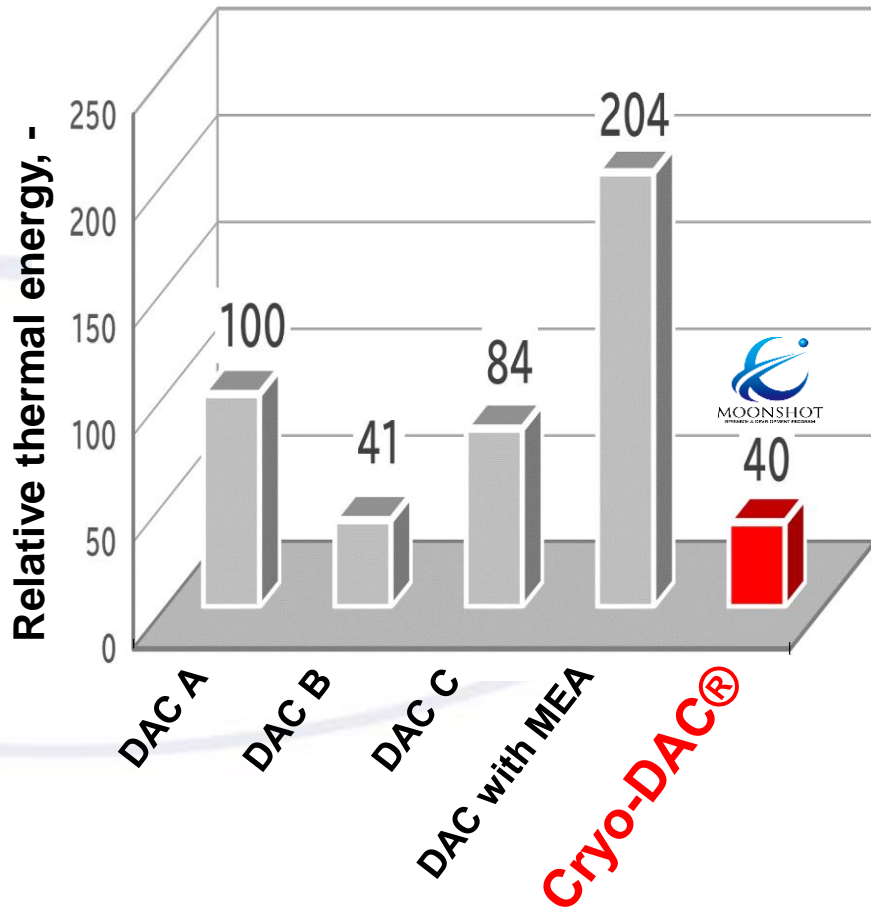
● A system boundary (A)

- Synthetic methane substitutes LNG, and is the main source of cold energy.
- Cycling use of synthetic methane will reduce CO2 emission by the amount of replaced LNG.

● Three sub-system boundaries (B)-(D)

- (B) DAC only
- (C) DAC and the procurement and consumption of LNG
- (D) DAC and methanation with green hydrogen.

LCA can guide the Cryo-DAC R&D



- CO₂ emissions from capital goods are based on Aspen Economic Analyzer / National Institute for Environmental Studies 3EID database

- Operation CO₂ emissions are calculated based on the CO₂ emission factor recommended by NEDO.

Year	kg-CO ₂ /kWh
2020	0.506
2030	0.158
2040	0.00665