

Oct. 6, 2020

13 : 00 ~ 14 : 30

Roppongi Grand Conference Center

Cost of CCS

- Current & Future Trends -

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CCS: Process & cost structure

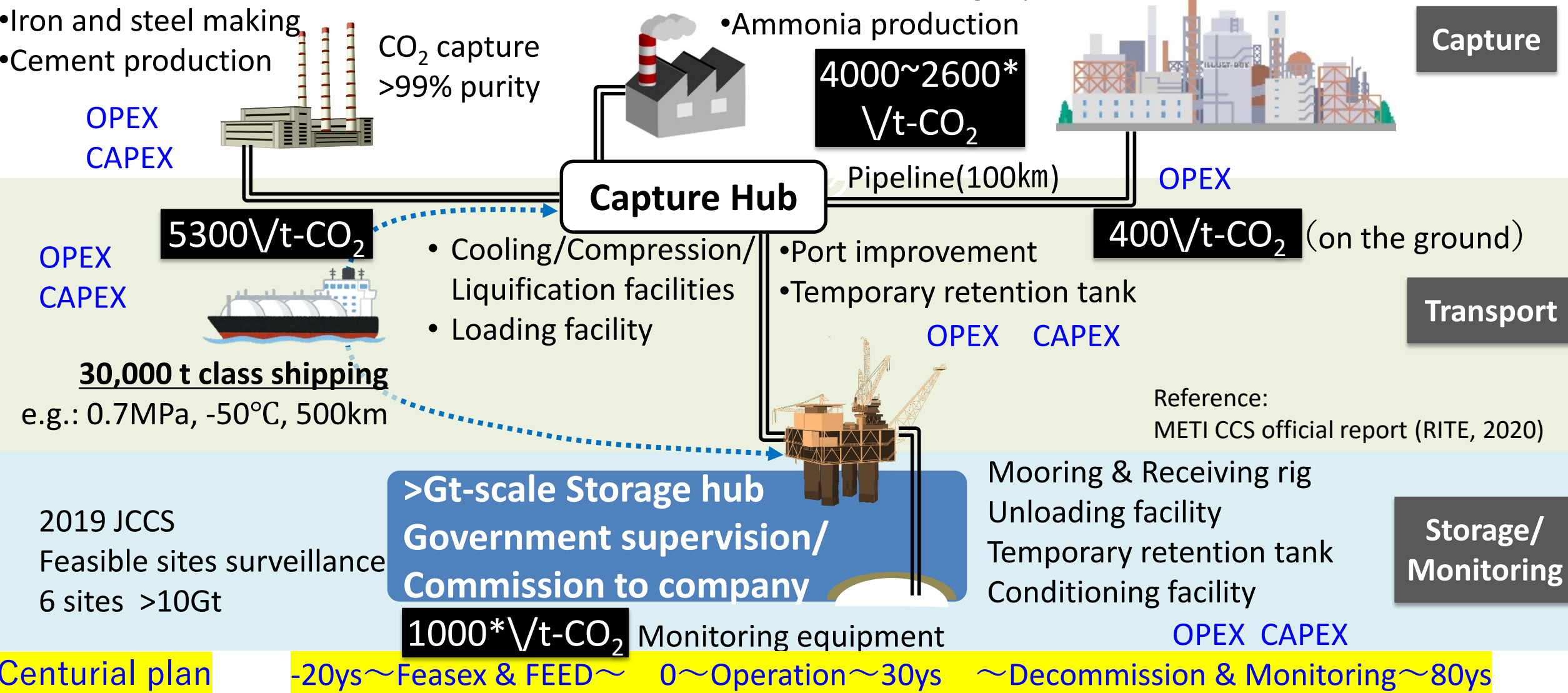
*1 Mt scale estimation based on Tomakomai (JCCS official report)

Retrofittable: Concentrated emission source

- Thermal power generation
- Iron and steel making
- Cement production

Existing CO₂ capture plants (Low Hanging Fruits)

- Domestic natural gas production
- Ammonia production



2019 JCCS
Feasible sites surveillance
6 sites >10Gt

>Gt-scale Storage hub
Government supervision/
Commission to company

Centurial plan

-20ys~Feasex & FEED~

0~Operation~30ys

~Decommission & Monitoring~80ys

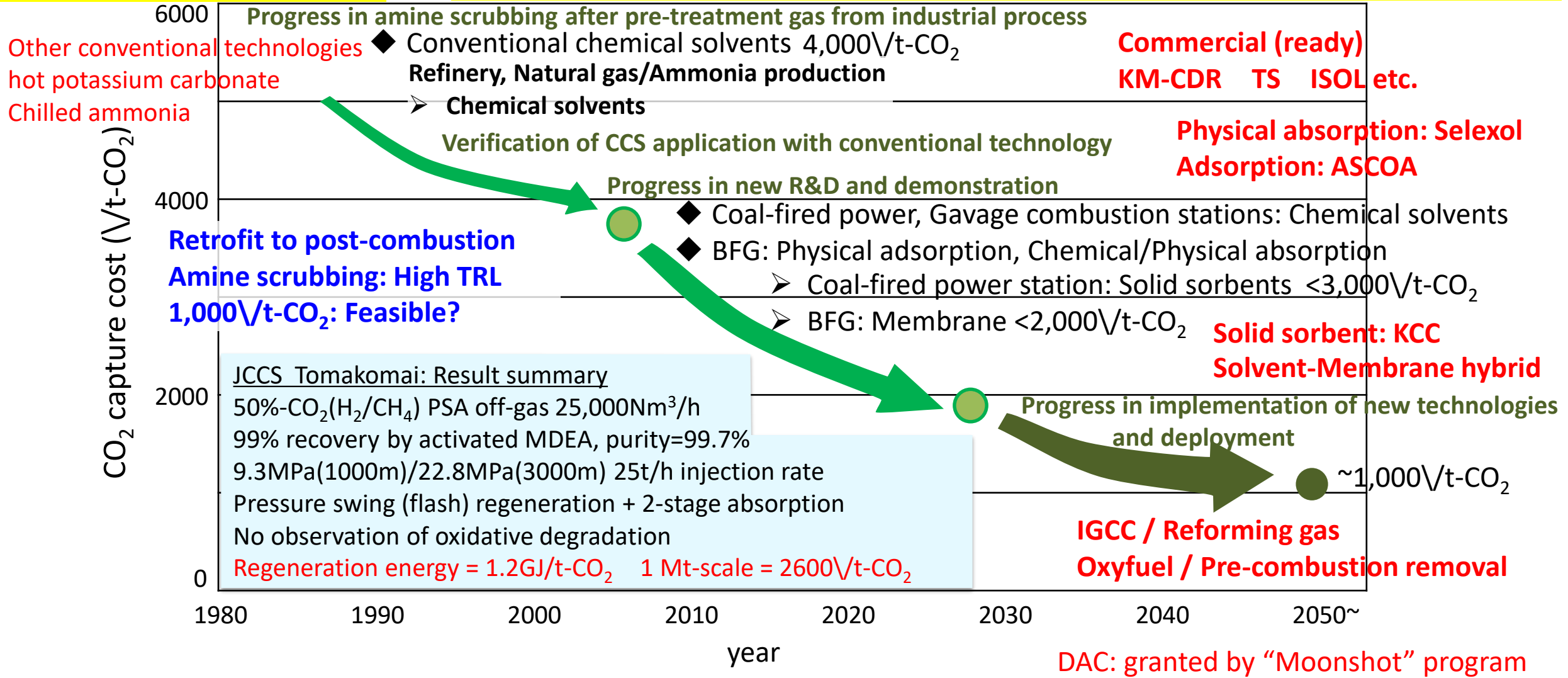
Cost down of capture technologies

Different emission source

Cyclical ABS-RGN reactors: OPEX reduction due to RGN energy

Different suitable technology

Membrane reactors: CAPEX reduction for scale-up (e.g., module manufacturing)



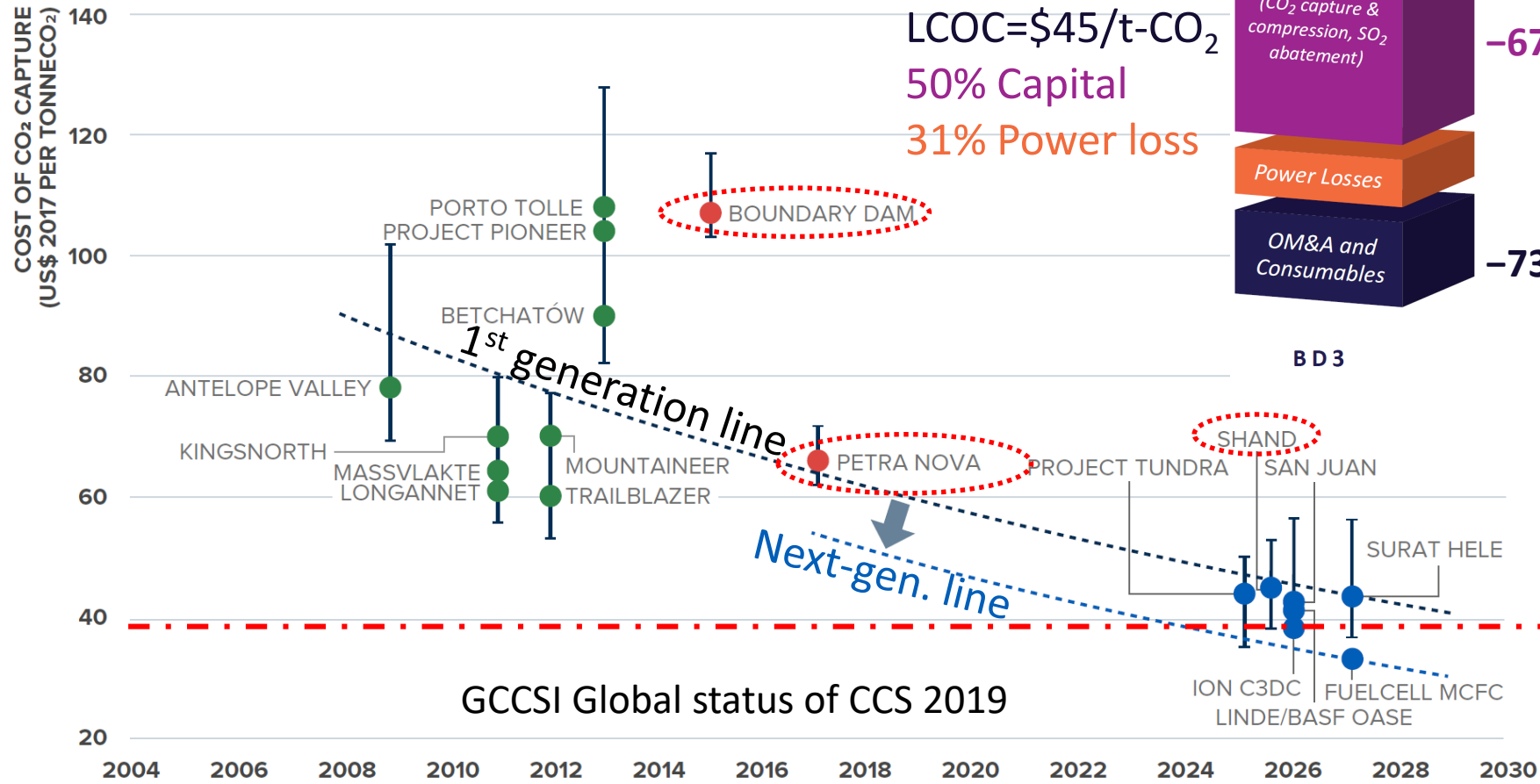
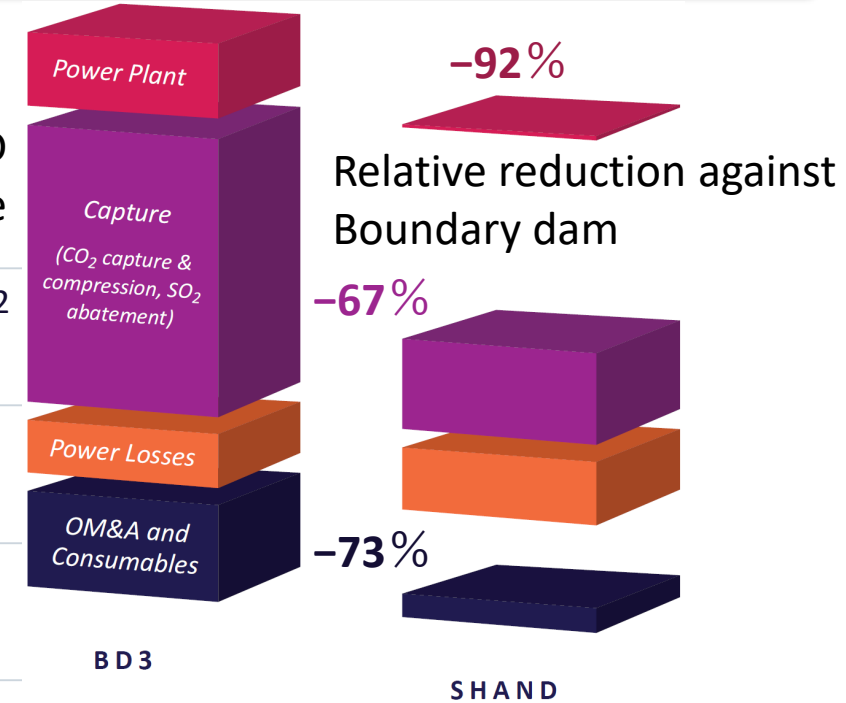
Thermal PP: Additional modification for regeneration heat source

USC-PCPP, 300MW, 90% Capture

Replacing LP Turbine, High-pressure deaerator...

Shand CCS FEED
International CCS Knowledge Centre

LCOC=\$45/t-CO₂
50% Capital
31% Power loss



↓ \4,000

● PREVIOUSLY STUDIED FACILITIES ● CURRENTLY OPERATING ● RECENTLY PROPOSED AND NEW FACILITIES
 - - - - FIRST GENERATION CAPTURE TECHNOLOGY LEARNING RATE - - - - - NEXT GENERATION CAPTURE TECHNOLOGY LEARNING RATE

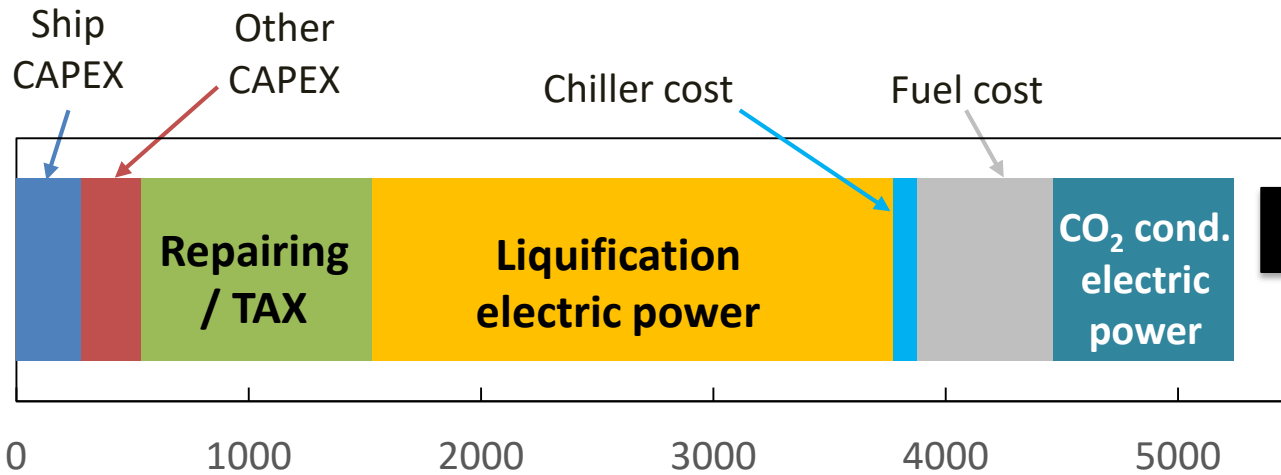
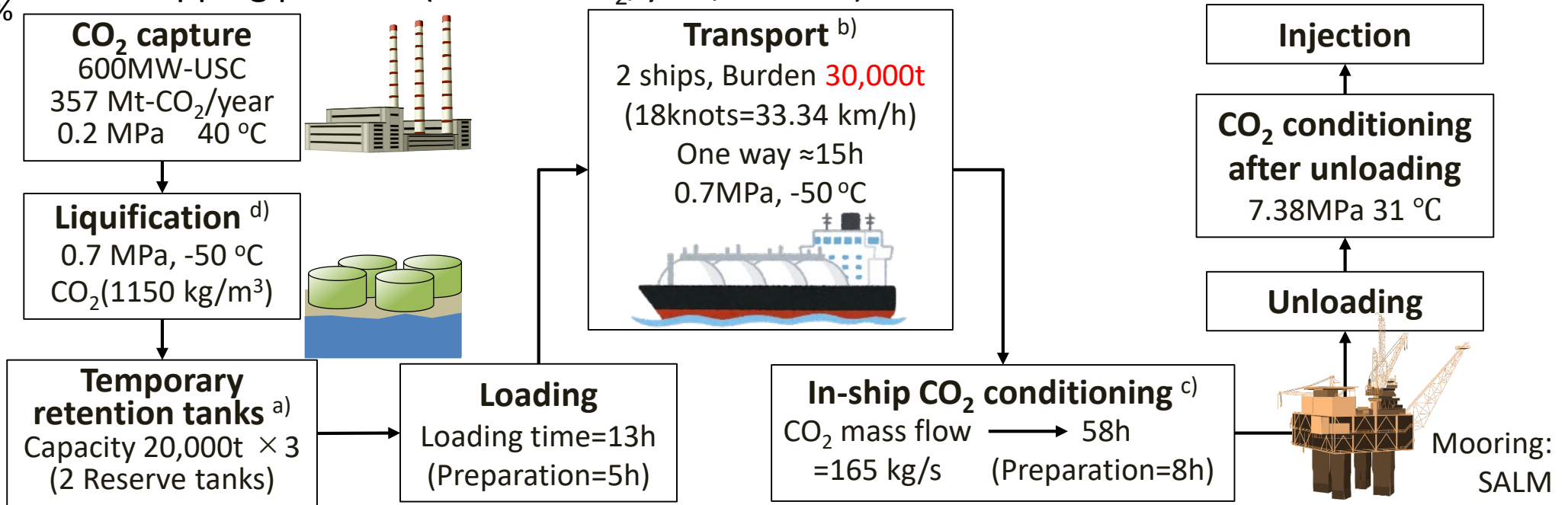
Shipping cost of liquefied CO₂

Shipping process (357 Mt-CO₂/year, 500 km)

Legal CO₂ purity > 98%
(H₂ separation)

EU recommendation:
O₂, CH₄ < 4%*
N₂+Ar+H₂ < 4%
Others: ~ppm

*EOR requires lower concentration



- a) Not include countermeasures for CO₂ leakage
- b) Not include periodical legal inspection (biannually for 2 Weeks)
- c) CO₂ conditioning in ship and on site
- d) Electricity does not include avoided CO₂ by CCS

5236 [\$/t-CO₂]

**Liquification power cost:
2241 [\$/t-CO₂] >40% share**

Depreciation period:

- Ship + CO₂ conditioning → 15 years
- Other → 30 years