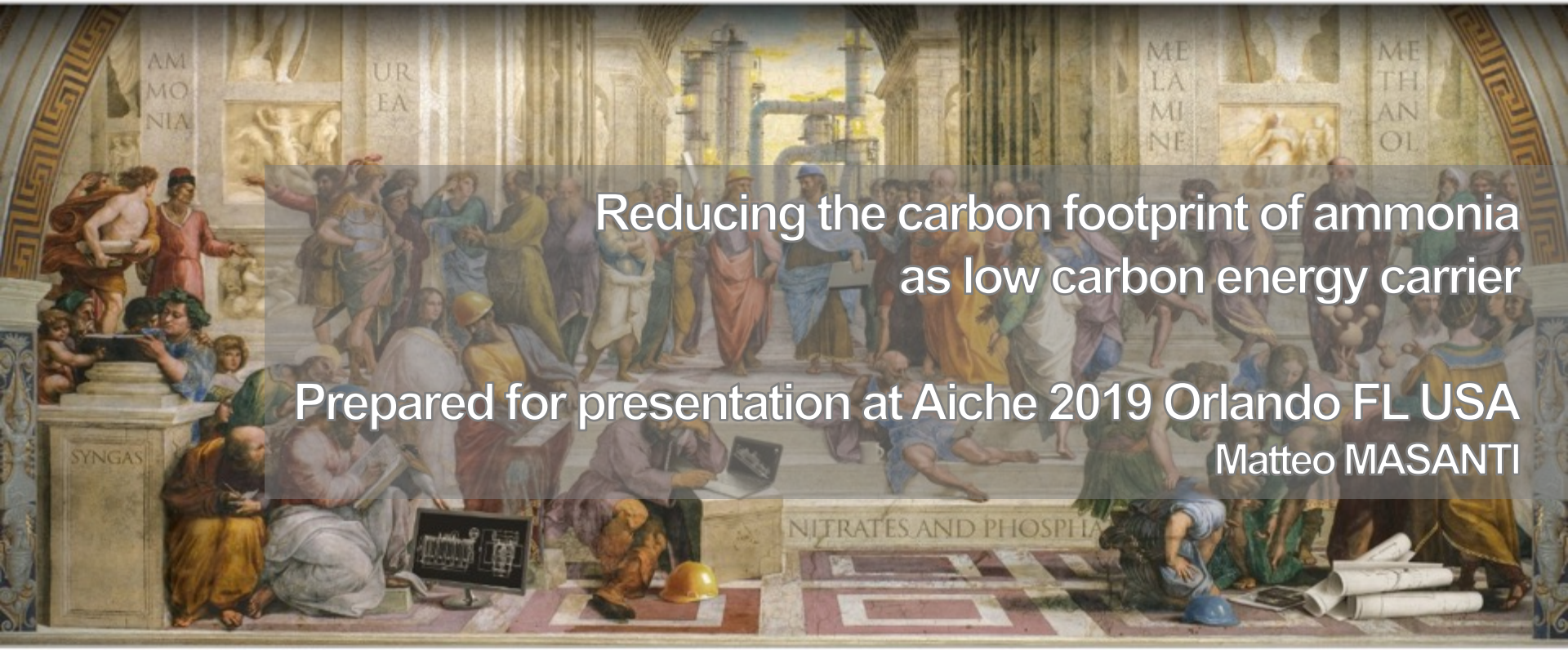


Reducing the carbon footprint of ammonia as low carbon energy carrier

Prepared for presentation at Aiche 2019 Orlando FL USA

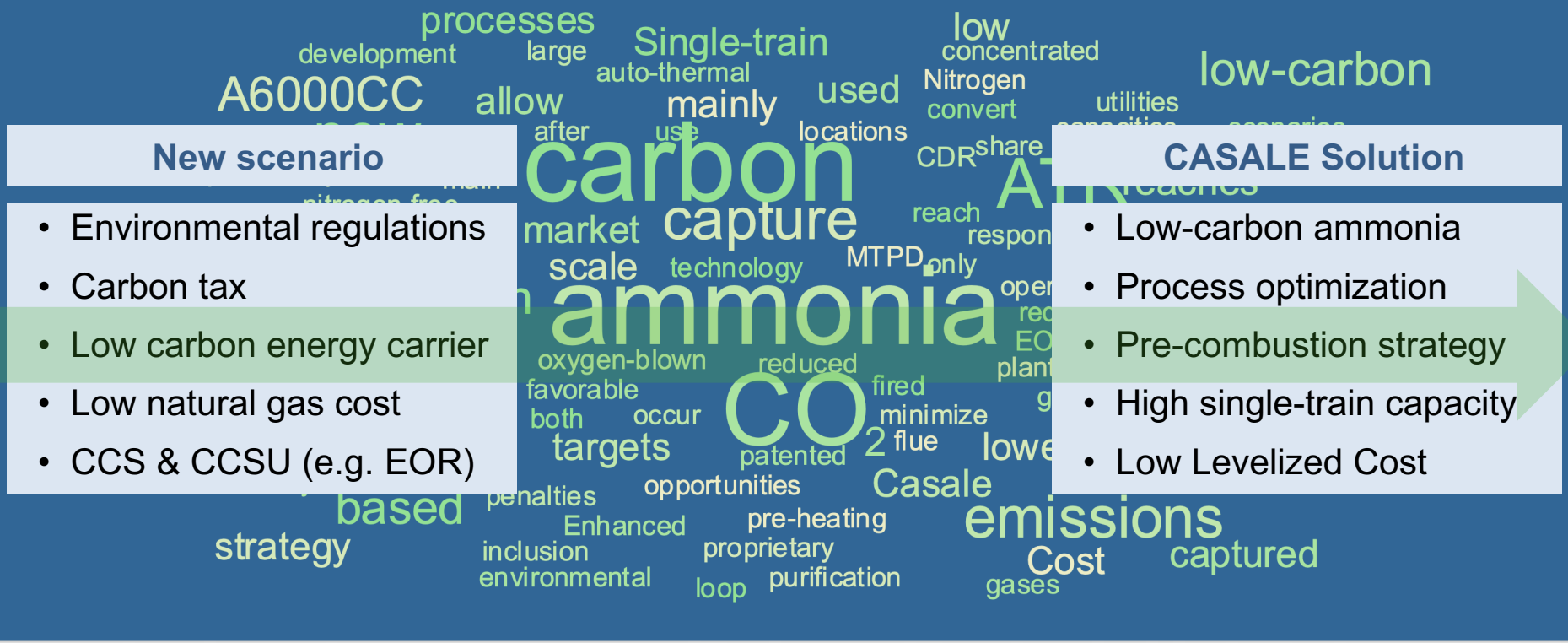
Matteo MASANTI

CASALE

Masanti Matteo

AIChE, 10-15th November 2019, Orlando

Introduction



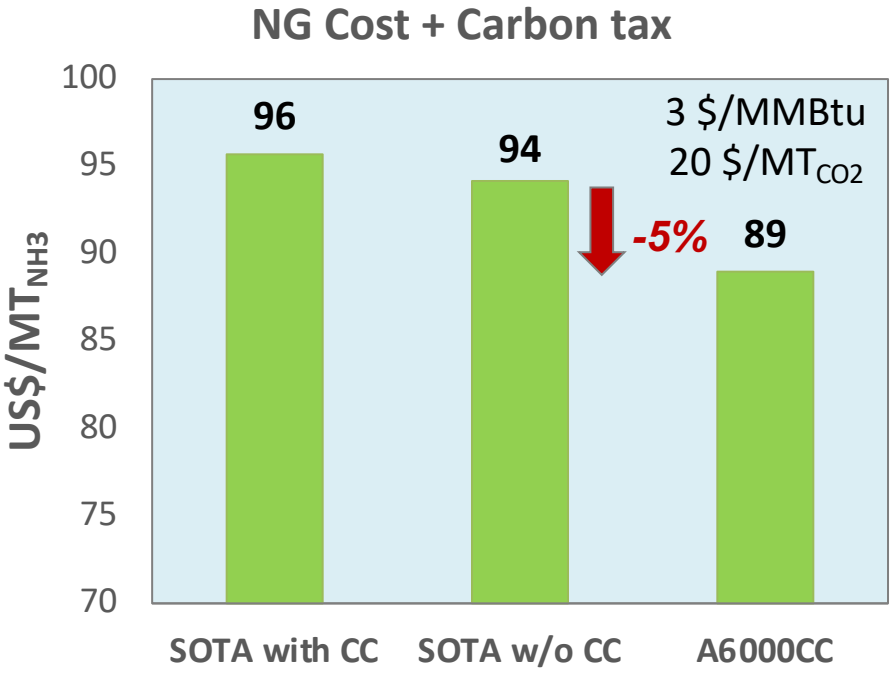
New scenario

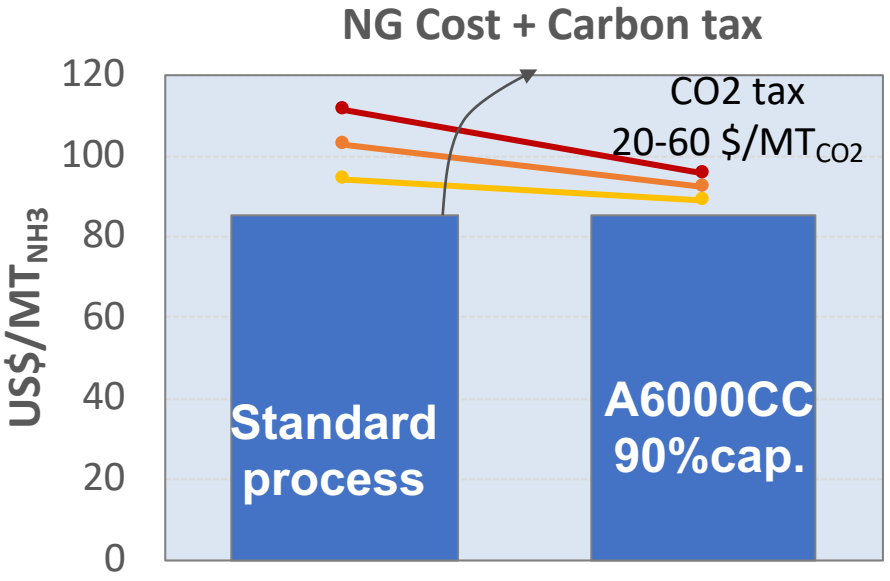
- Environmental regulations
- Carbon tax
- Low carbon energy carrier
- Low natural gas cost
- CCS & CCSU (e.g. EOR)

CASALE Solution

- Low-carbon ammonia
- Process optimization
- Pre-combustion strategy
- High single-train capacity
- Low Levelized Cost

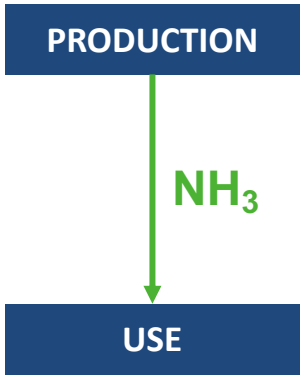
A6000CC Benchmark technologies OPEX comparison

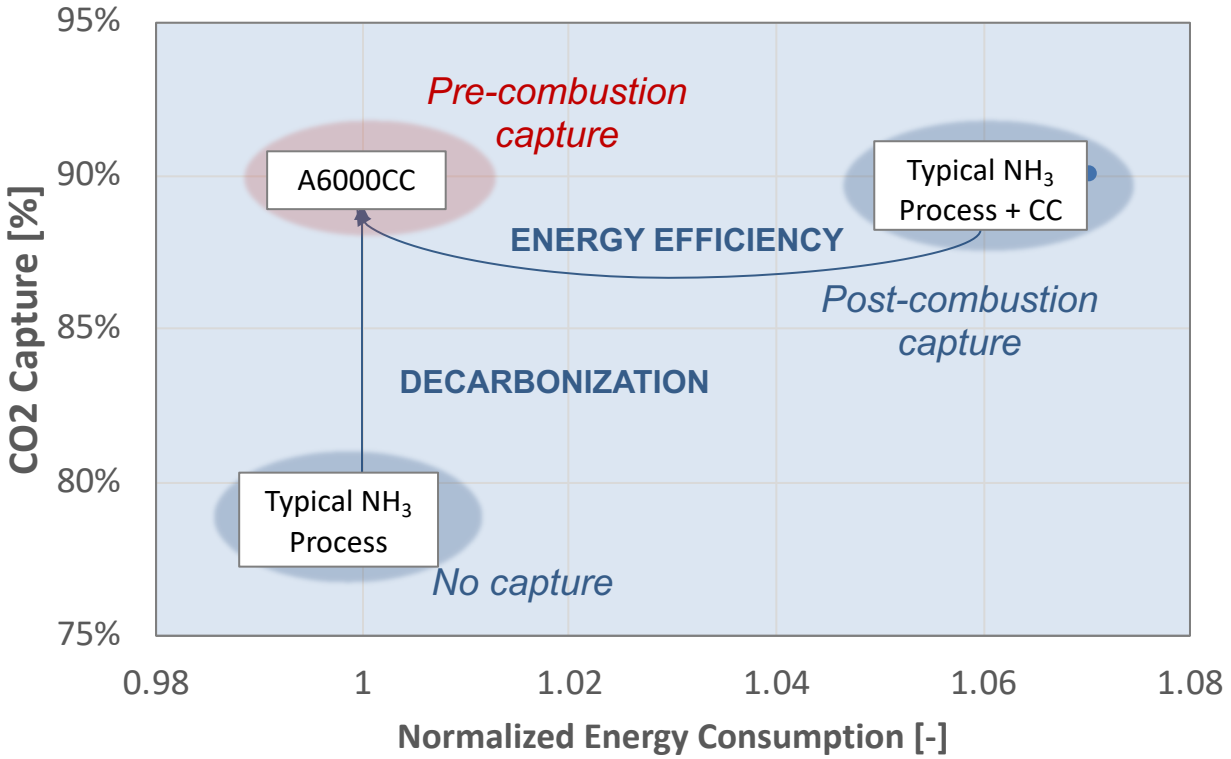




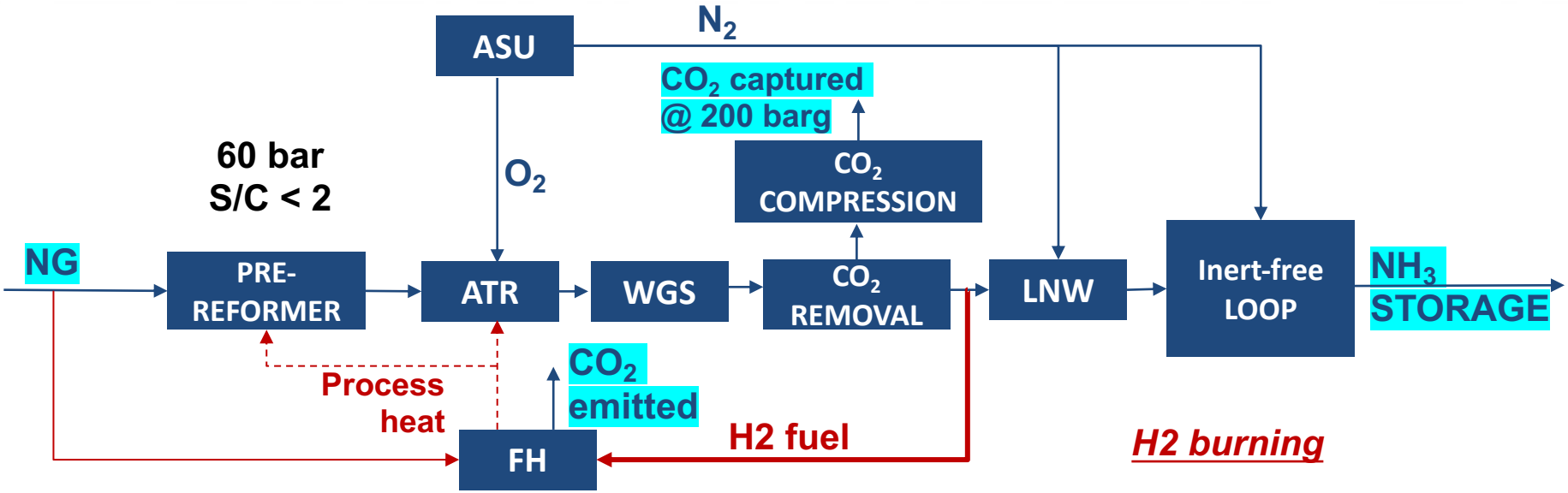
A6000CC Low-carbon ammonia without energy penalties

Large-scale stand-alone plant coupled with CCS to produce low carbon NH_3 energy carrier



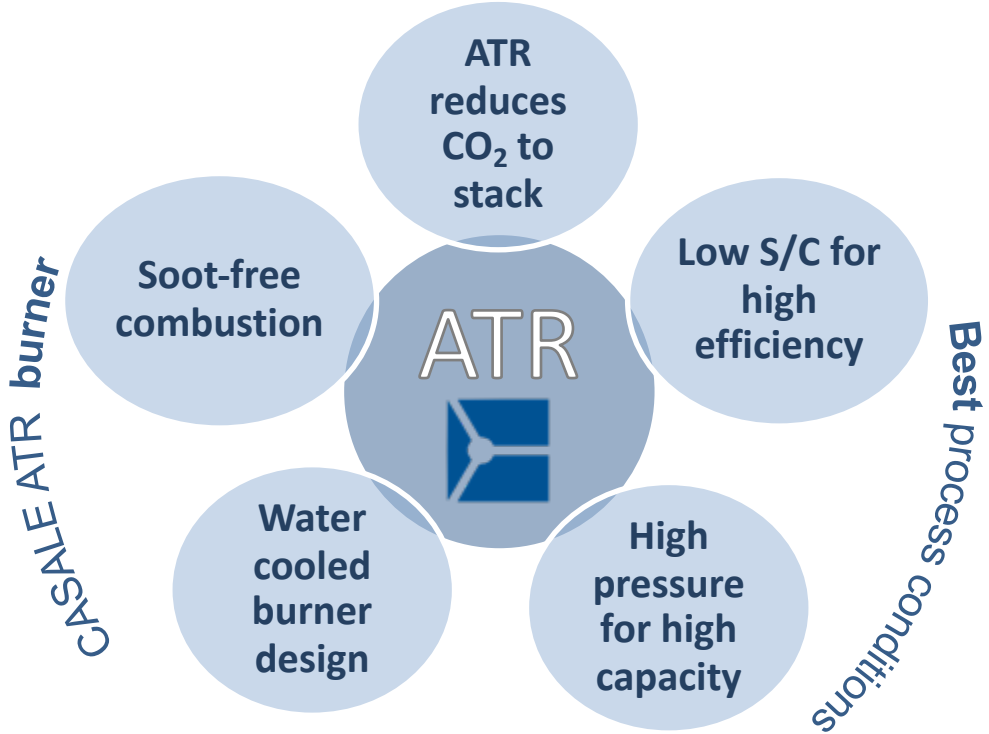


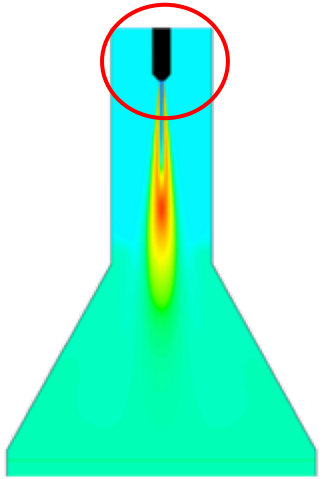
A6000CC Based on patented pre-combustion strategy



F. Baratto, R. Ostuni, WO2018/149641 - Process for the synthesis of ammonia with low emissions of CO_2 in atmosphere

A6000CC Casale ATR – High performance burner is the key enabler

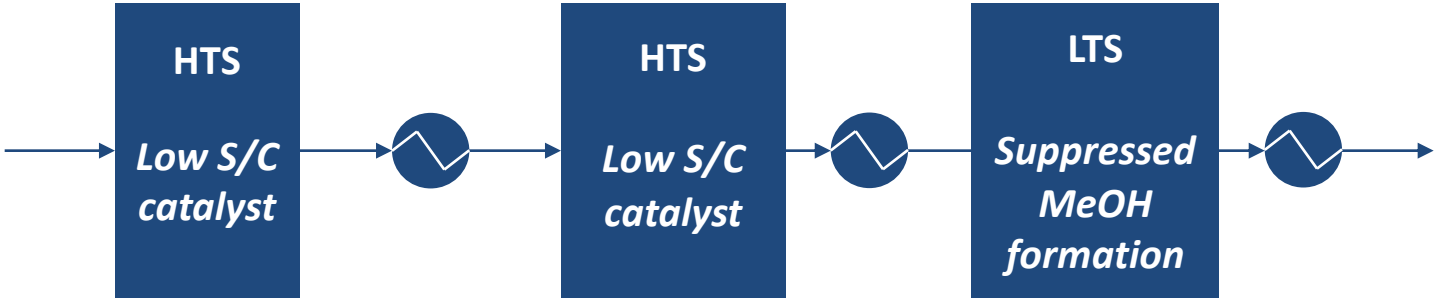


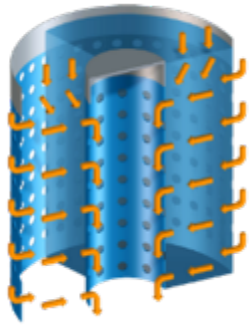


8 units already in operation
3 units under construction

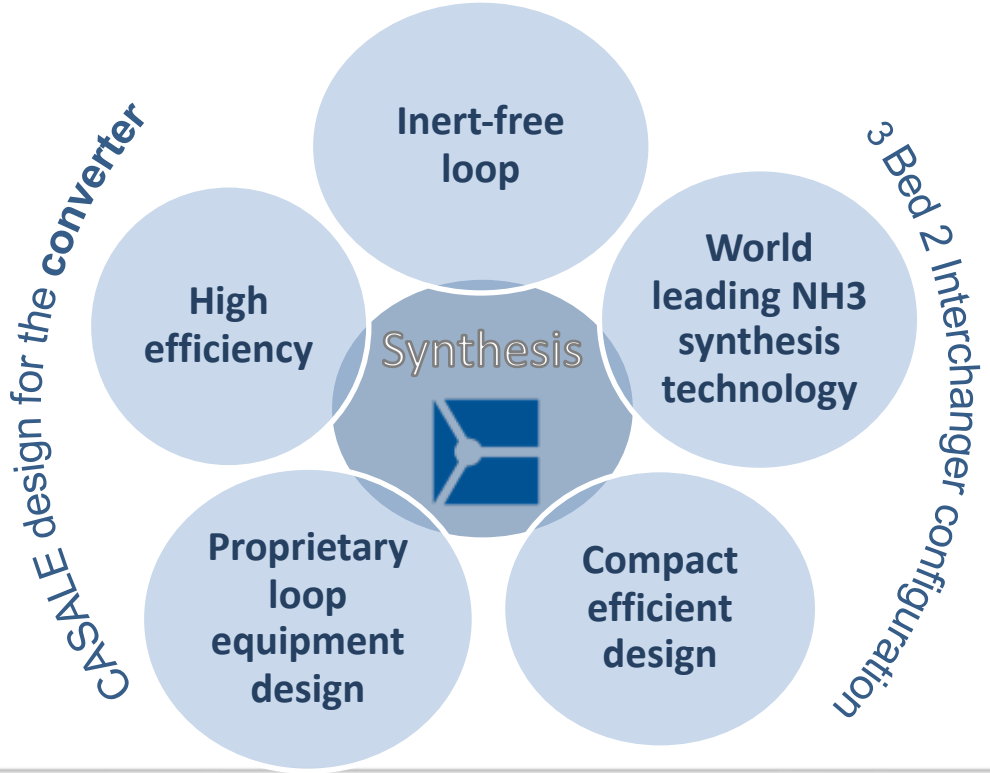
A6000CC Shift with process heat recovery

- **HTS**: Low S/C catalyst & axial-radial reactor design
- **LTS**: Suppressed MeOH make catalyst & axial-radial reactor design
- High **process heat recovery** for steam generation & SSH





A6000CC is enabled by Casale converter and Amomax Casale synthesis catalyst



A6000CC Key take-home messages

- Demand for a **low-carbon energy carrier**, fostered by **incentives** and **carbon taxation**, can be achieved today with a smart proprietary process by Casale: **A6000CC**
- **A6000CC** achieves high carbon capture without the costly dedicated flue gas capture unit.
- Casale's **A6000CC** ammonia process has **low energy consumption** vs the state-of-the-art solutions while achieving the **CO_2 capture well above 90%**.

THANK YOU

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CASALE

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