

Ammonia Fueled Gas Turbines

Prepared for
AEA Annual Conference

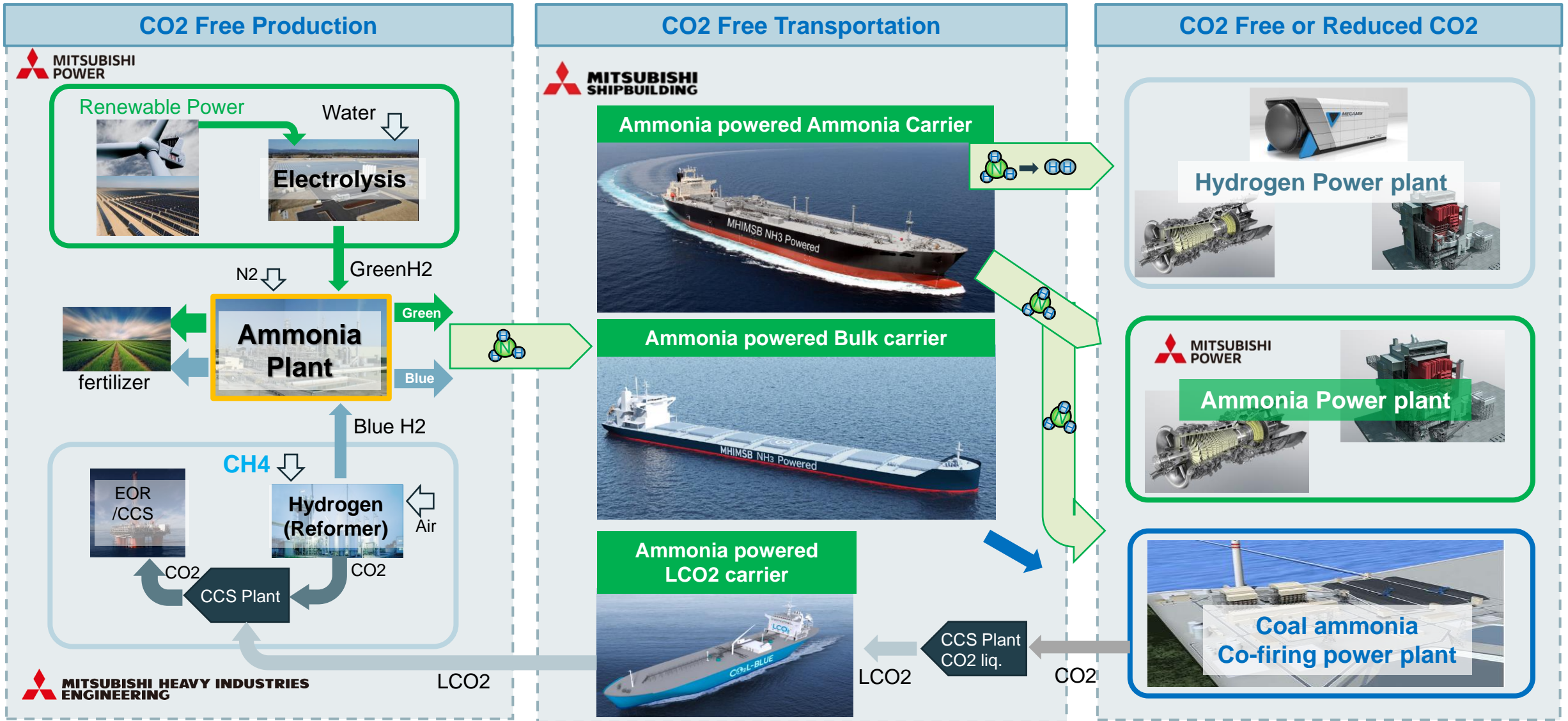
November 2023



1. Ammonia Value Chain

2. Ammonia Fueled Gas Turbines

Ammonia as Fuel - Ammonia Value Chain



Also partnering with innovative tech-startups in H2/NH3:



Ammonia (NH₃)

Benefits:

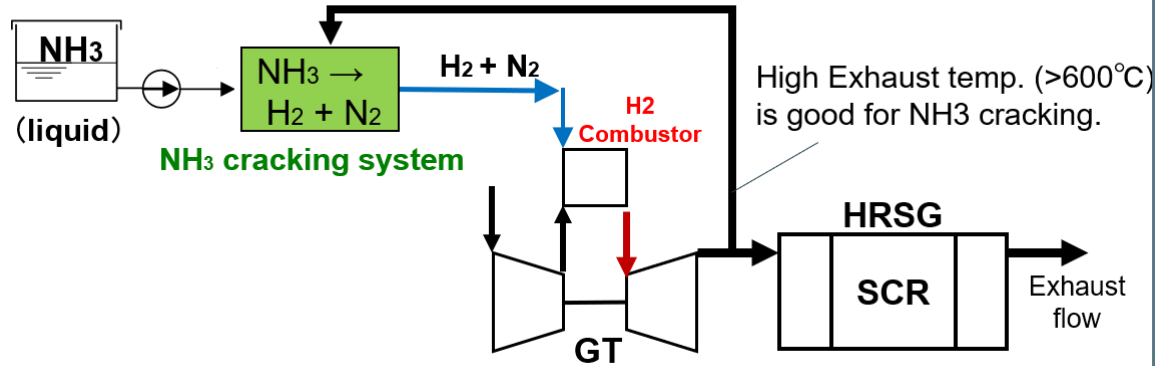
- Carrier of H₂
- Direct combustion with no CO₂

Challenges:

- Combustion emits high NO_x (Fuel NO_x)
- Flame stability

Large frame GT

Ammonia cracking cycle gas turbine system



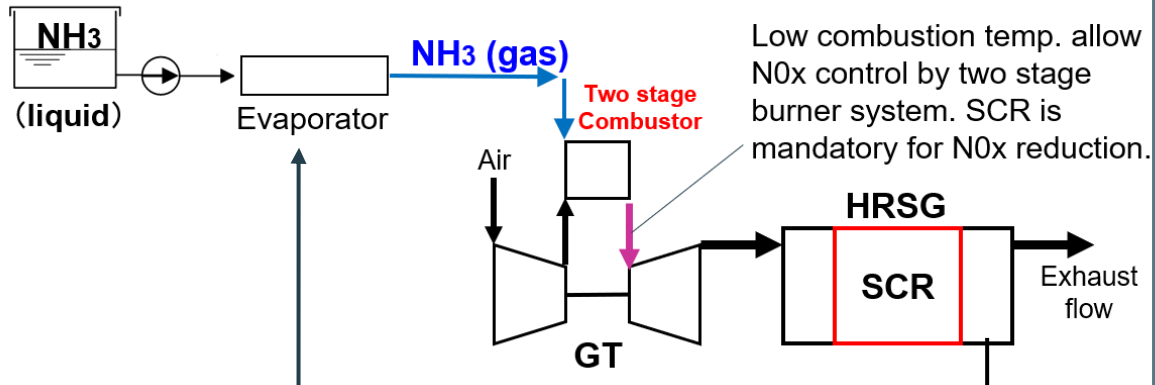
NH₃ Cracking System
Standalone
Verification Test: 2025



GTCC Combination:
2030

Small Frame GT

Ammonia direct combustion gas turbine system



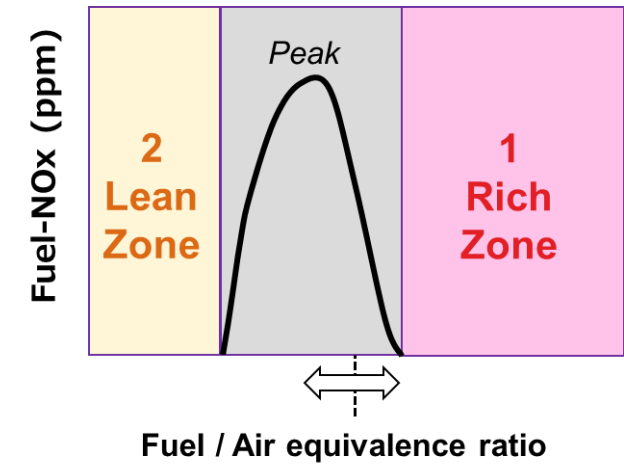
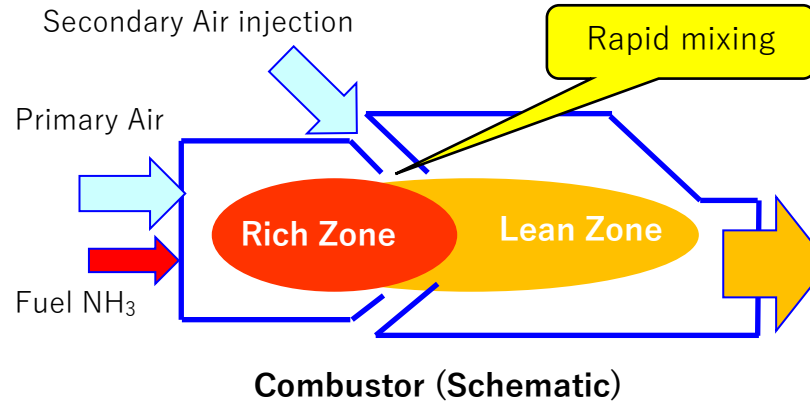
Combustor Test: 2023
Full Engine
Verification: 2025



Large Frame GT
combustor
development

Key challenges of Ammonia combustion
Flame stability
Higher NOx (Fuel NOx)

Solution
Rich/Lean 2-stage combustion



H25 gas turbine

- 41MW (Output)
- 36.2% (SC efficiency)
- 80% (Cogeneration)
- 199 units orders



Ammonia Direct Combustion Power Projects

Keppel, MHI and DNV Sign Agreement to Explore Adoption of Ammonia-fueled Gas Turbine on Jurong Island (Sep 2022)

MHI and JERA Asia will jointly explore establishing an ammonia direct combustion power plant.

The project aims to accomplish the twin goals of supplying green electricity and developing an ammonia bunkering terminal (Aug 2022)



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