

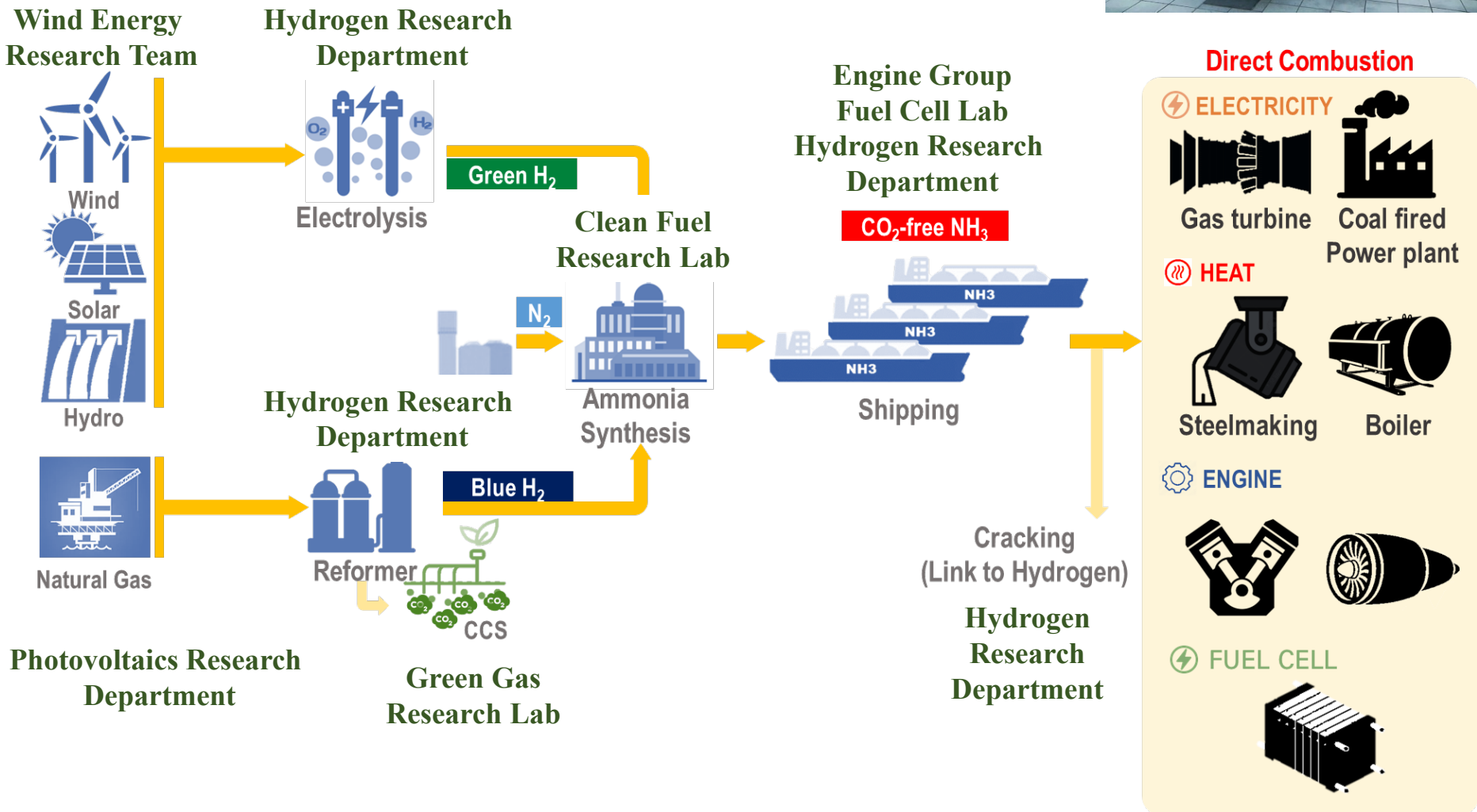
Production and utilization of green ammonia :KIER's current status and future plans

**Clean Fuel Laboratory
Climate Change Division
Korea Institute of Energy Research**

Yoon, Hyung Chul



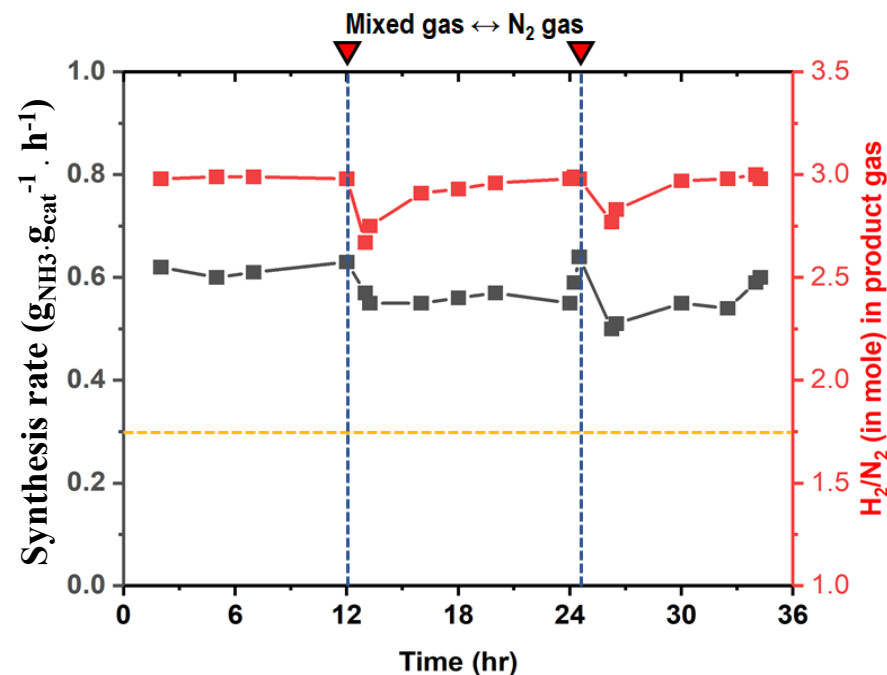
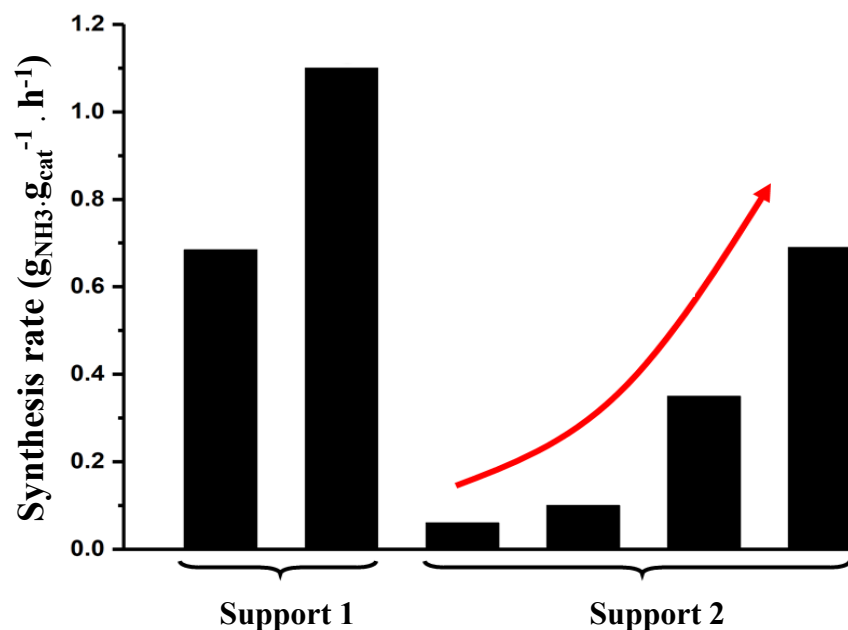
| 1 | KIER's Research Capability



| 2 | Green ammonia production

►► Development of catalyst and system for low-P and low-T ammonia synthesis

- Lowering the energy required for compression
- Reducing pressure and amount of hydrogen storage in a buffer system
- Below results were obtained at 50 bar and 350°C

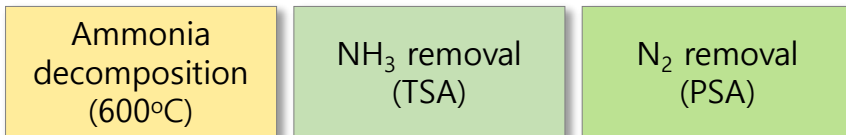


| 2 | Ammonia decomposition

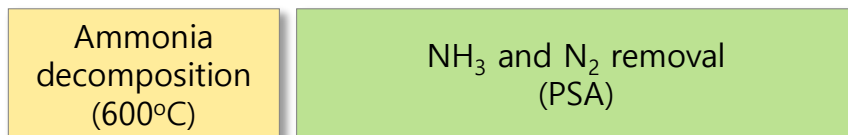
▶▶ Ammonia decomposition for ultra-pure hydrogen production

- 20 Nm³/h (approx. 43 kg/day) of ultra pure hydrogen production (H₂, < 0.1 ppm NH₃) tests with a PEM fuel cell were complete in May 2021
- 1,000 Nm³/h (approx., 2 ton/day) pilot test will start in Sep 2021 and complete in 2025

20Nm³/h test setup



1,000 Nm³/h test setup



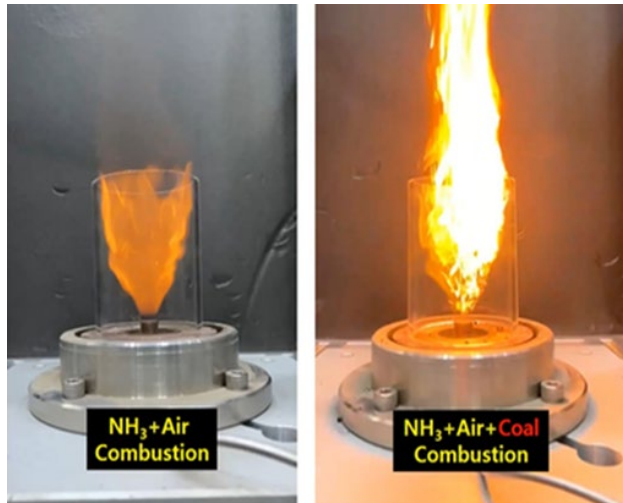
20Nm³/h ammonia decomposition reactor



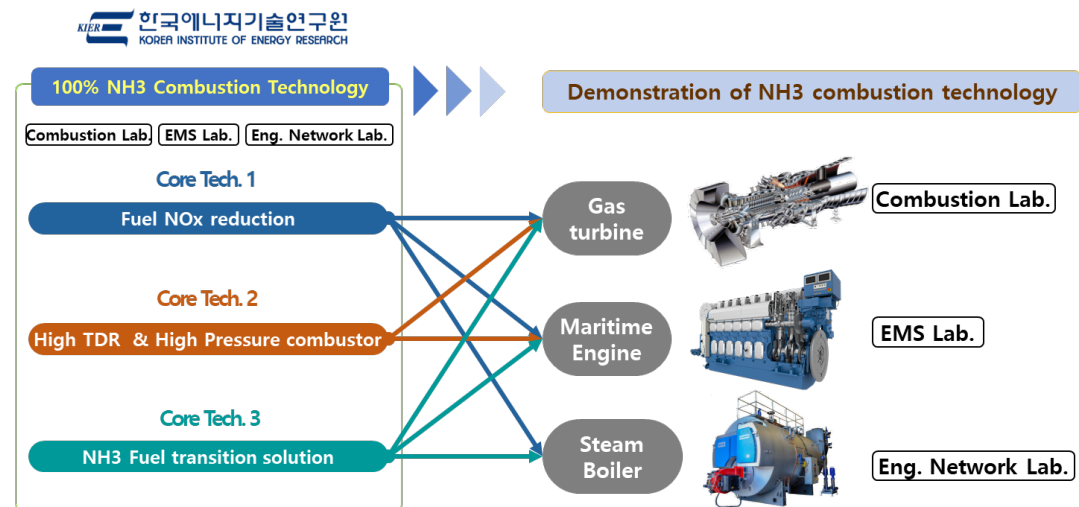
| 2 | Ammonia combustion

▶▶ 100% ammonia combustion

- (Purpose) CO₂ reduction and 2030 NDC achievement in the power generation, industry, and transportation sectors
- (In progress) 10 kW_{th} of 100% NH₃ fuel gas turbine combustor and coal-fired boiler (2021~)
- (Planning) Development of NH₃ combustion technology for gas turbine, marine engine, industrial boiler (2022~)



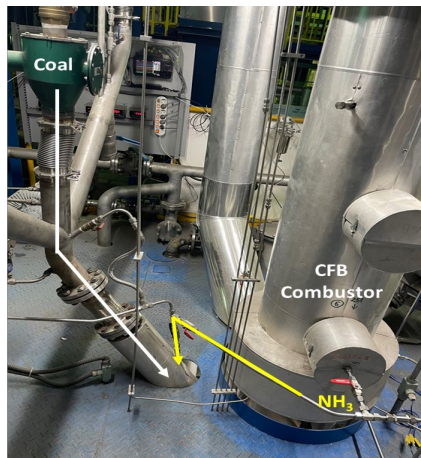
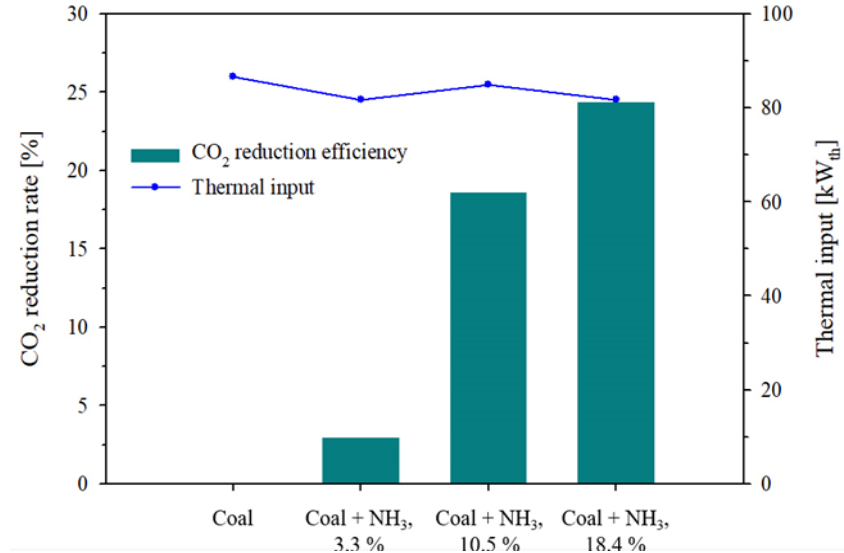
2021~



2022~

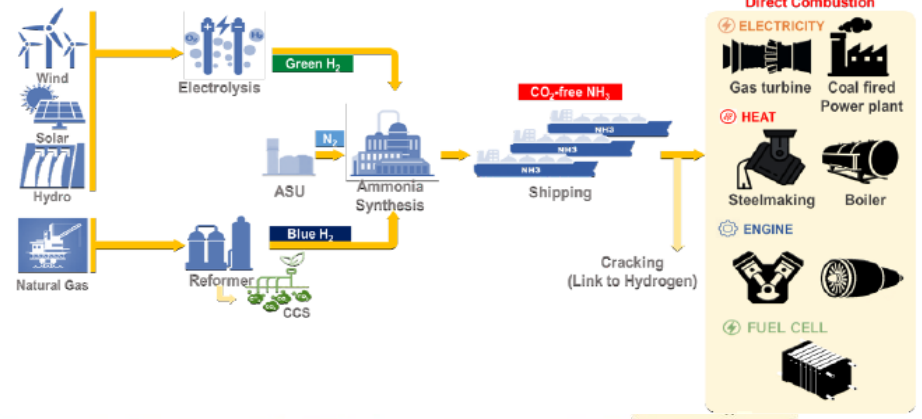
| 2 | Ammonia co-combustion

▶▶ Ammonia-coal co-firing in a 100 kW_{th} circulating fluidized bed combustor



	Coal feeding rate [kg/h]	Thermal input (coal) [kW _{th}]	NH ₃ MFC [LPM]	Thermal input (NH ₃) [kW _{th}]	Thermal input (Total) [kW _{th}]	NH ₃ co-firing ratio [%]
Run 1	10.9	86.6	-	0	86.6	-
Run 2	9.9	79.0	11.5	2.7	81.7	3.3
Run 3	9.6	75.9	37.7	8.9	84.8	10.5
Run 4	8.4	66.7	63.9	15.1	81.8	18.4

| 3 | The Green Ammonia Alliance



탁월한 연구성과를 도출하고 행복한 연구원을 만들어 갑시다 KIER Great 1st

Government-funded research institute	Korea Institute of Energy Research Korea Research Institute of Chemical Technology
Government-owned company	Korea gas safety corporation
Association	H2KOREA, Carbon Neutral Research Association
Company	Doosan Heavy Industries & Construction, Doosan Fuel Cells, Lotte Chemical, Lotte Fine Chemical, Samsung Engineering, Posco, KSOE, Hanwha Solution, Hyundai Oilbank, Hyundai Motor Group, Hyundai Steel, Hyundai Heavy Industries, Hyundai Glovis

Thank you for listening

