

Ammonia Gas Turbine Panel Session

*Innovative Clean Energy Solutions for
Future Generations*

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Vice President – Clean Energy Solutions

12 November 2024

PSM

a Hanwha company

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Industrial Gas Turbine Service – Global Footprint



Integrated Service Network to Provide Dedicated Local Support



Product Center & HQ
50/60Hz Gas Turbines
100,000 ft² Workshop
60,000 ft² Warehouse
Jupiter, Florida, USA

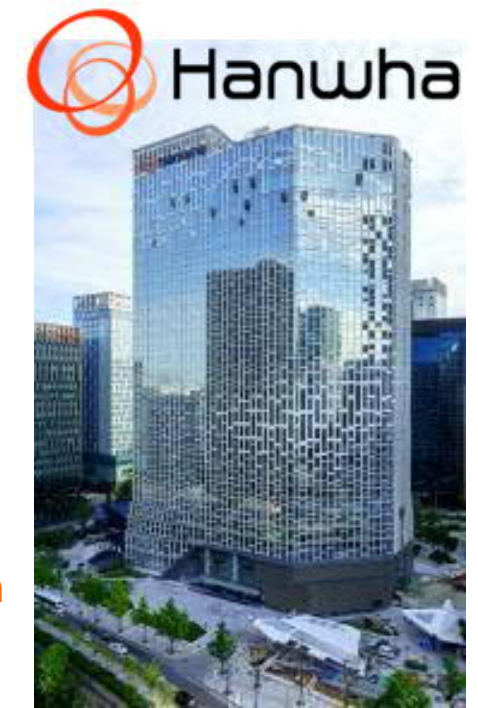


New: Expanded Service Center
60Hz Gas Turbines
20,000 ft² Tooling Facility
Houston, Texas, USA



Thomassen Energy
a Hanwha company

Product Center
50Hz Gas Turbines
55,000 ft² Workshop
Rheden, Netherlands



PSM Japan

Execution Center
60Hz Gas Turbines
Workshop (2023)
Pang-yo, Changwon, Korea

PSM
Thomassen Gulf
a Hanwha company

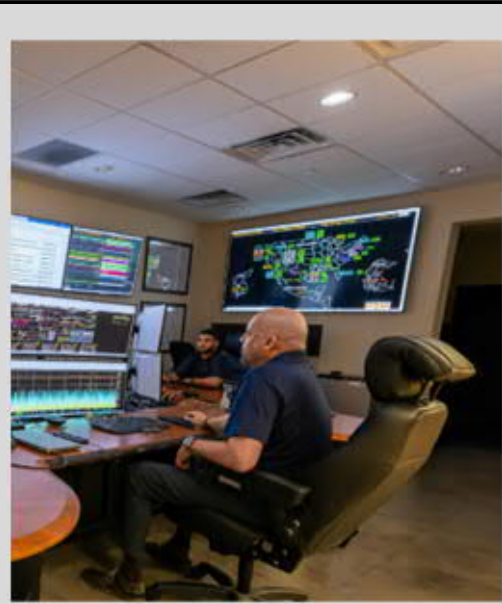
Execution Center
50/60Hz Gas Turbines
12,000 ft² Workshop (2023)
Abu Dhabi, UAE



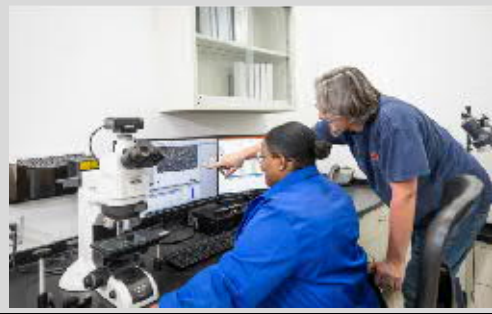
- PSM Headquarters
- Thomassen Headquarters
- Branches and Offices

Full Scope Gas Turbine Service Solutions with Innovative Technology Enablers

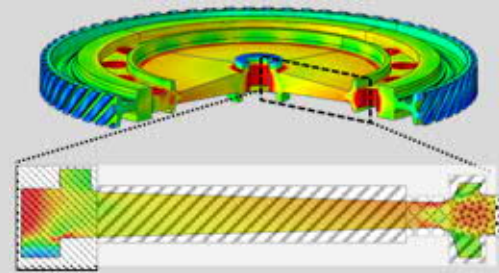
Operations



Repairs



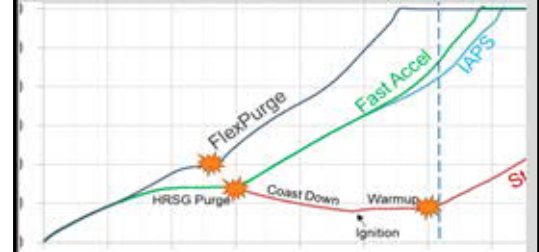
FS & LTE Services



GT Upgrades



Plant Solutions

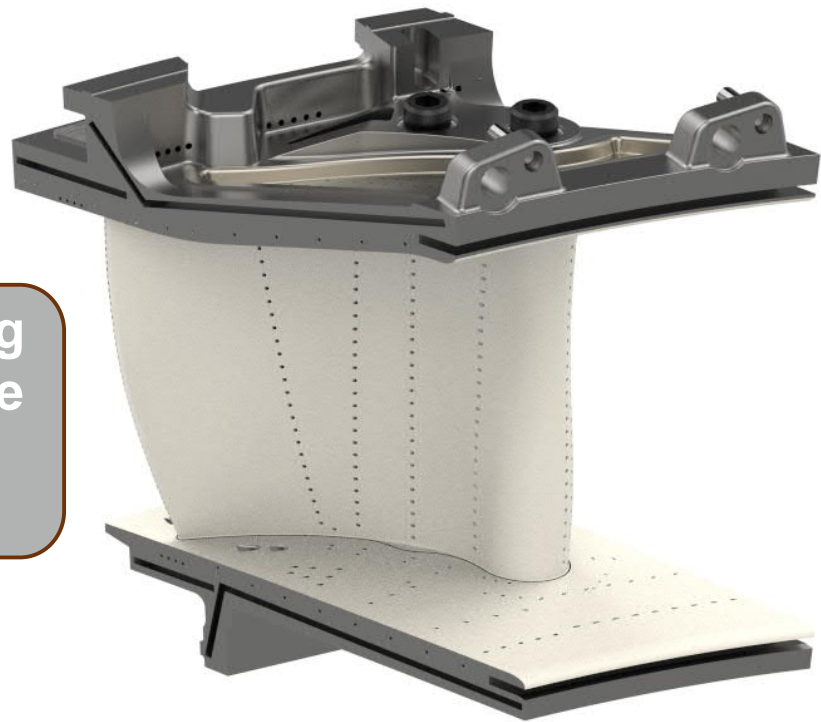


Scope of Long-Term Agreements

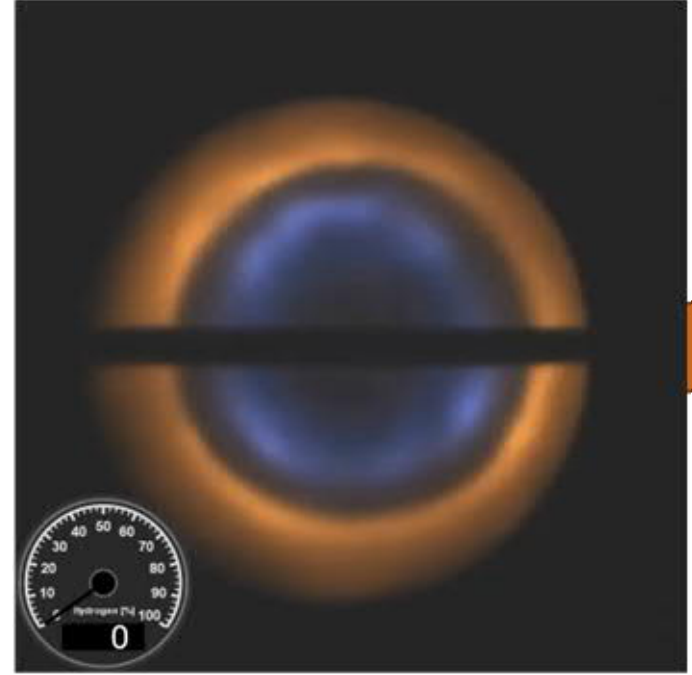
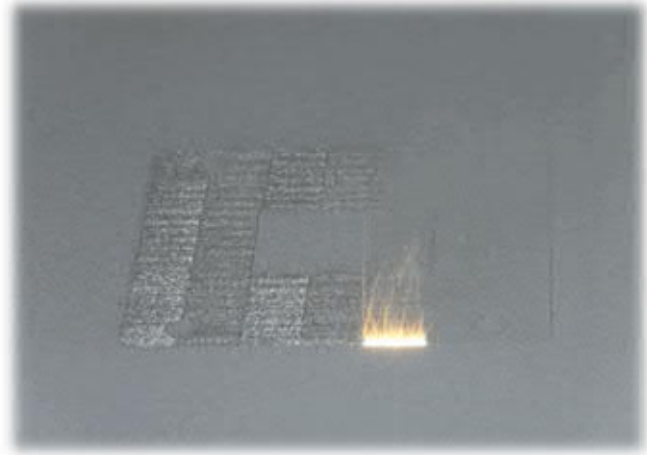
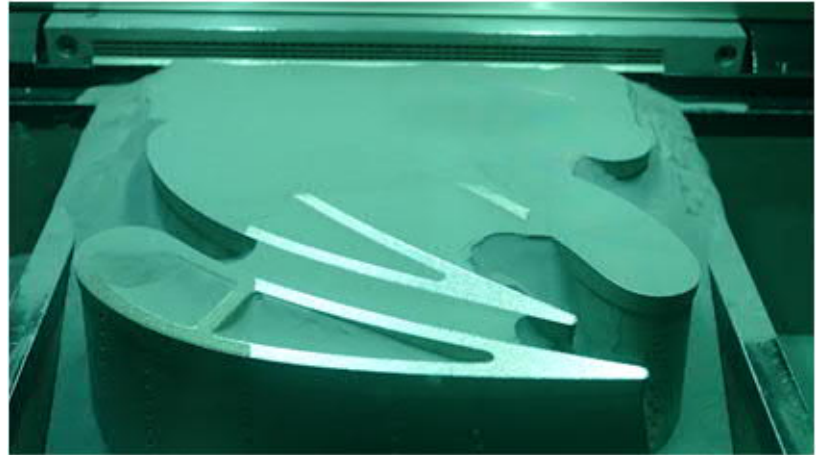
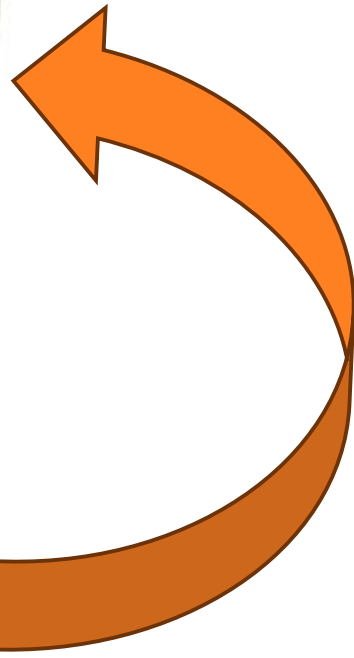
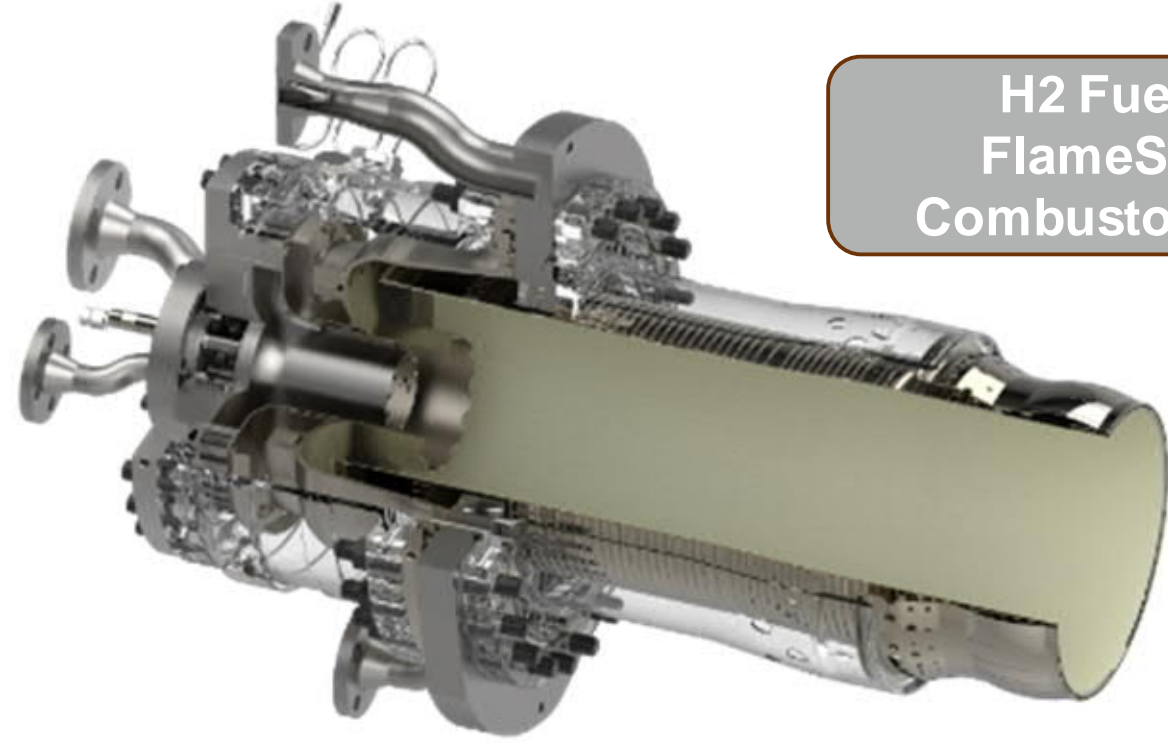
**Enhance Operational & Fuel Flexibility,
Complement Intermittent Renewables**

Leading Adoption of Innovative Technologies

Additive Manufacturing
High Temp Vane/Nozzle
Life of Turbine Part



H2 Fuel Flex
FlameSheet™
Combustor Retrofit



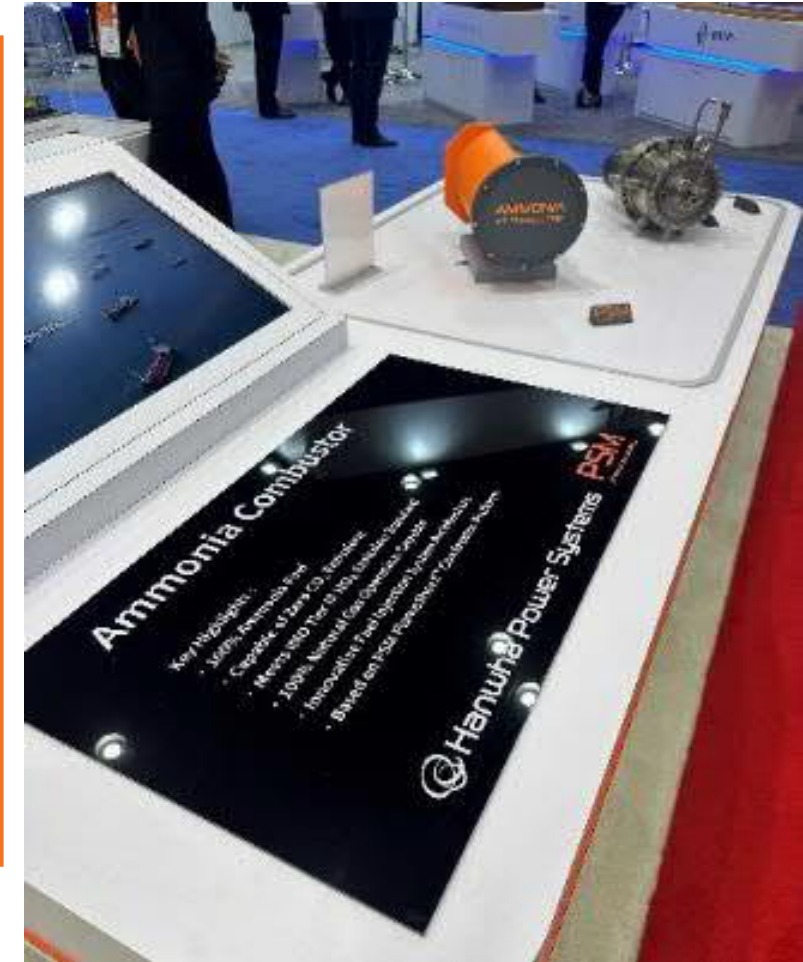
- Shipping accounts for ~3% of global greenhouse gas emissions
- In 2023 Hanwha Ocean secured an Approval in Principle from the American Bureau of Shipping (ABS) for its ammonia-fuelled gas turbine LNG carrier design
- Ships fitted with an ammonia-fuelled gas turbine will substantially reduce carbon emissions by operating on either ammonia, natural gas, or a mixture of the two



PR Newswire

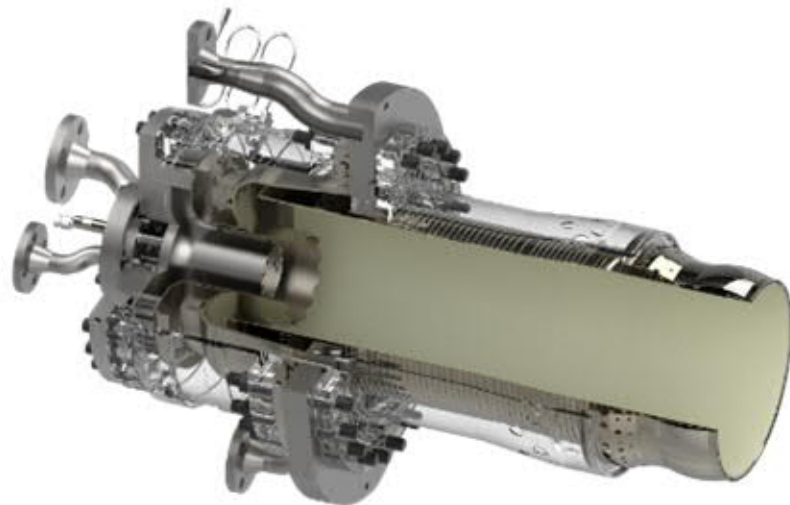
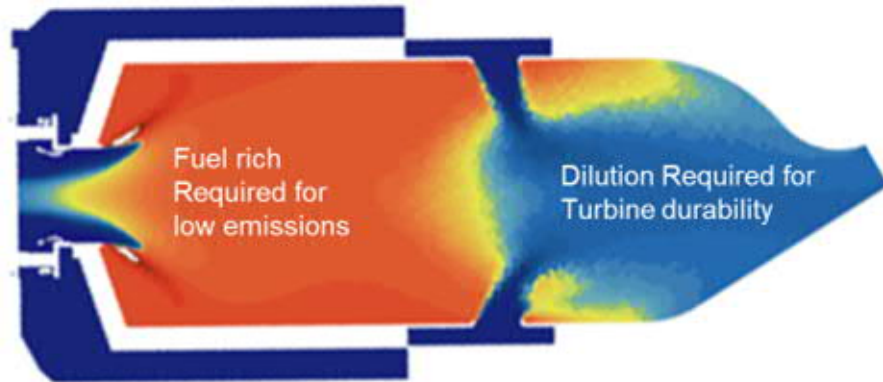
Hanwha Power Systems signed a business agreement at 'Gastech 2024' with a major European LNG carrier shipping company for the retrofitting of ammonia gas turbines for eco-friendly fuel

- *100% NH3 Fuel to 100% Natural Gas Capable*
- *Capable of Zero CO₂ Emissions*
- *Meets Shipping IMO Tier III NOx Emissions Standard*
- *Based on PSM FlameSheet™ Combustion Technology Architecture*



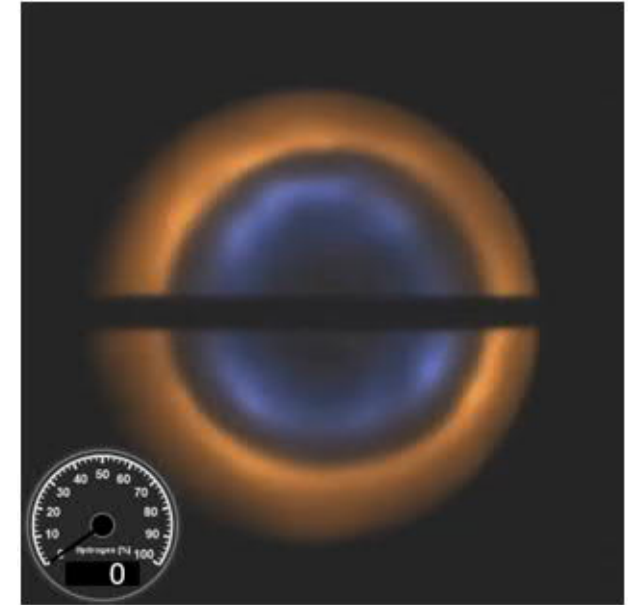
Relative Fuel-Air Mixing Ranges to Achieve Performance

Complexity involves dual fuel operation & functionality for maritime applications



Fuel/Air (Φ) levels representative

- NH₃ and H₂ – PSM combustion retrofits for new or installed turbines
- No '*Real*' Combustion technology barriers for H₂ or NH₃ Fuels
- Strong cooperation required with NH₃ value chain – safety & standards
- H₂GT – Small Peaking, Data Center power, NH₃ production facilities
- NH₃GT – Import facilities (Transport Clean e⁻), maritime propulsion



Demand Side Pull - Clean Fuel Combustion Systems for Carbon Free Power Generation

Thank You!!!

Clean Energy Solutions for Future Generations

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