MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP

Energy Transition

Solutions for a net-zero world

Sofia, Bulgaria June 2025

Mitsubishi Heavy Industries EMEA, Ltd.

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MITSUBISHI HEAVY INDUSTRIES

Mitsubishi Heavy Industries Group at a glance

1884 Foundation

JPY5.0 TN yen **($34BN)** Revenue

All figures as of March 31, 2025

257 Group companies (consolidated)

78,000 Employees (consolidated)


Gas turbine


Defense


Aero space


Ship & Ocean


Chemical plant


Transportation


CO_2 Capture plant


Waste to energy


Metal Machinery


Aero Engine


Compressor


Turbocharger

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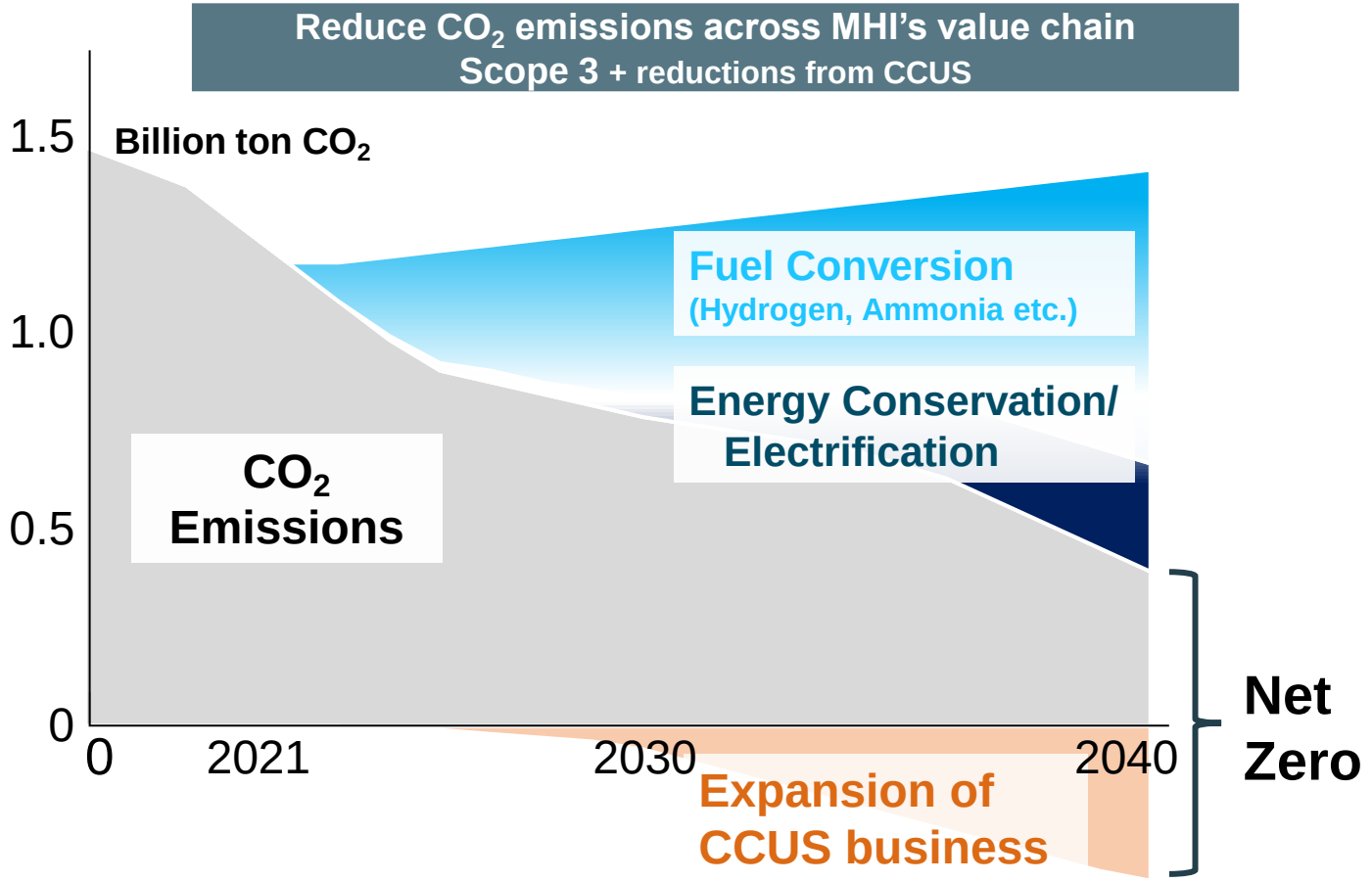
MHI's MISSION NET ZERO

MHI's Declaration to Achieve Carbon Neutrality by 2040

- Through our products, technologies, and services that help reduce CO_2 emissions, as well as new solutions and innovations to be developed with partners around the world, MHI group will contribute to realizing net zero emissions for the world.



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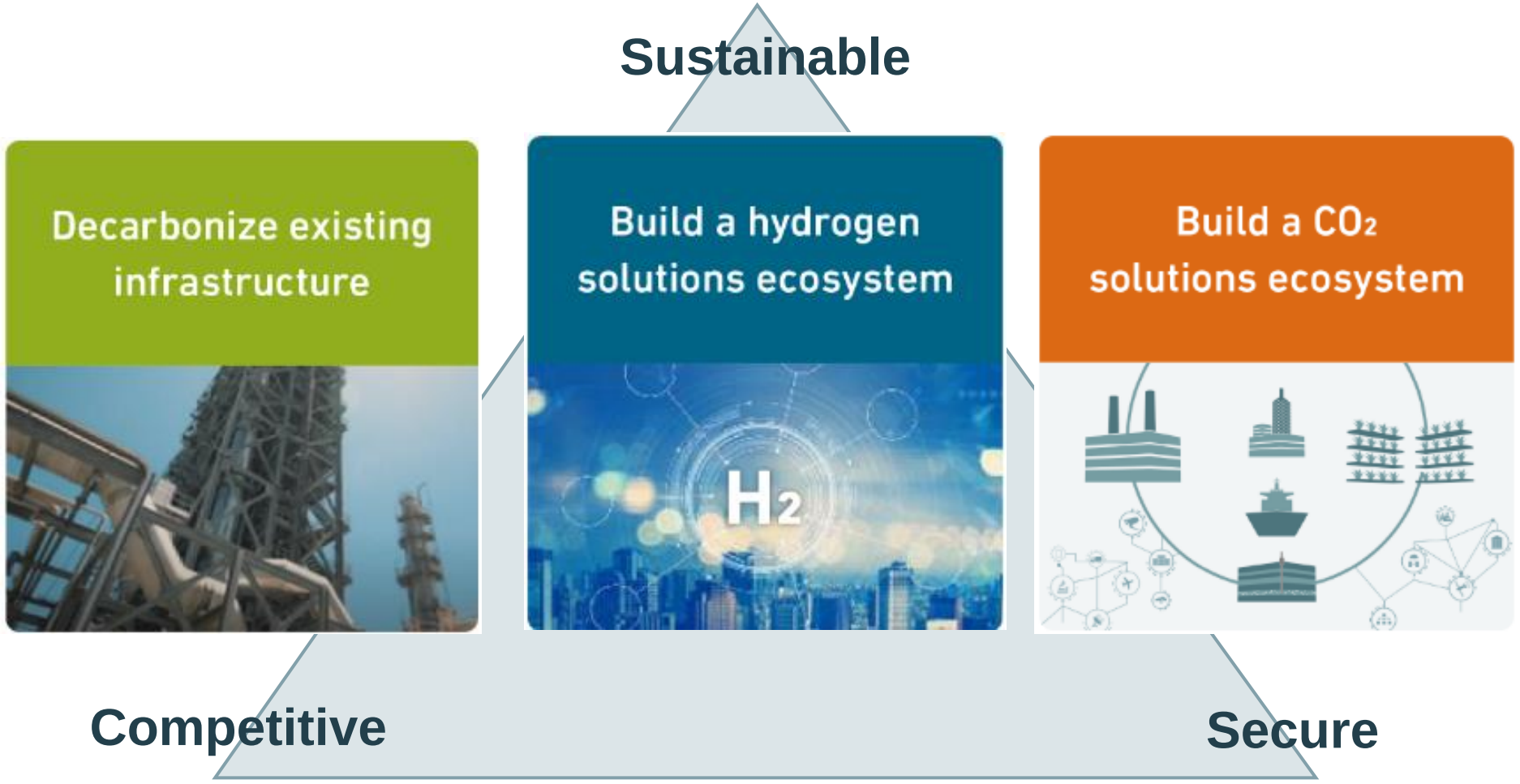
MHI's Three Pillars for achieving Mission Net Zero

We aim to deliver integrated solutions that optimize and decarbonize existing infrastructure, and establish hydrogen and CO_2 ecosystems that are Sustainable, Competitive and Secure.



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CO2 Zero Power Generation Technology Roadmap

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Reduce CO_2 by High Efficiency Gas Turbine ➡ ZERO CO_2 by Hydrogen Gas Turbine

CO_2 Reduction -65%

1 High Efficiency NG Fired Gas Turbine

JAC series

Co-firing

2-1 Ammonia Biomass Co-firing Boiler

Ammonia co-firing

CO_2 Capture

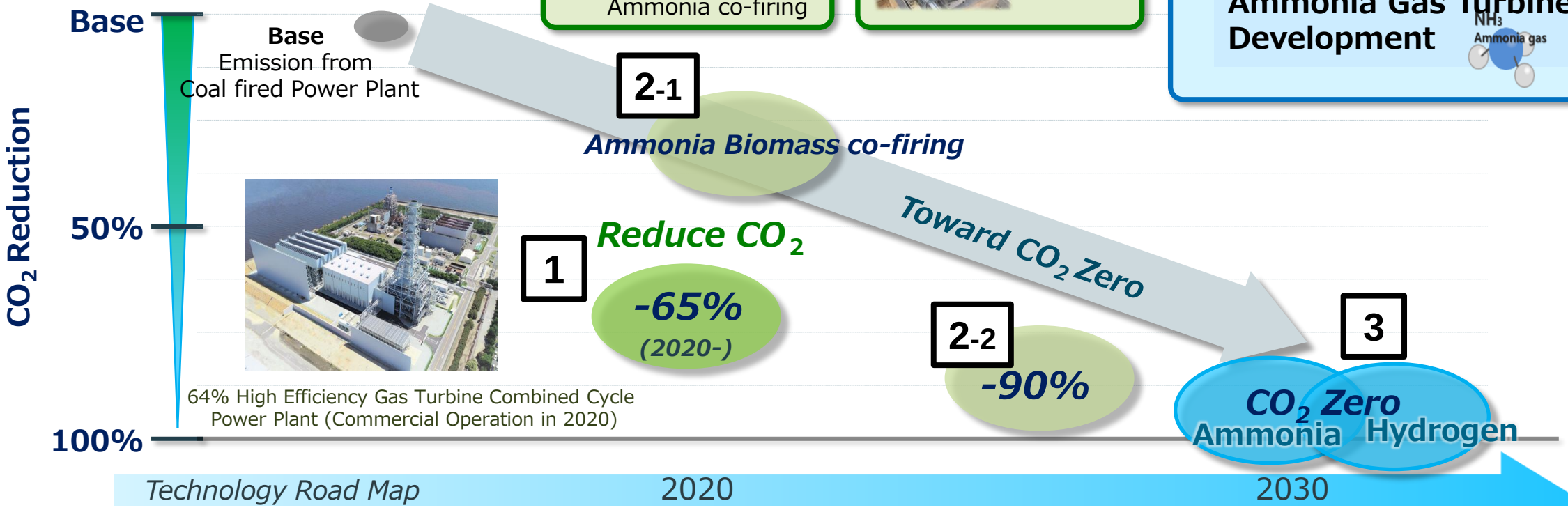
2-2 Gas Turbine Combined Cycle plant **+CCUS**

CO_2 Zero

3 Hydrogen Gas turbine Development

Hydrogen Gas turbine

Ammonia Gas Turbine Development



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Decarbonizing thermal power — High efficiency & H_2-ready GTCC

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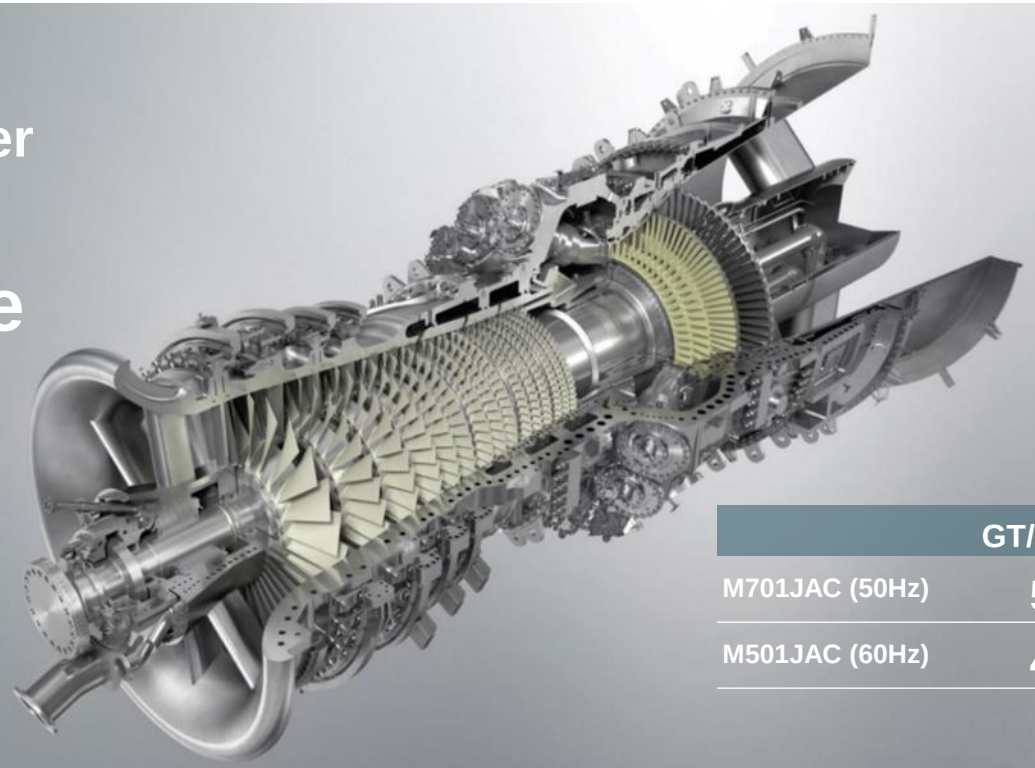
Mitsubishi Power "JAC" Gas Turbine



GT/CC	
M701JAC (50Hz)	574MW / 840MW
M501JAC (60Hz)	453MW / 664MW

High Efficiency

Achieved 64% CC efficiency

- High pressure compressor (25:1)
- Enhanced air-cooled combustor
- Advanced TBC/Aerodynamics

Reliability

Achieved 99.5% reliability by

- Over 2.0 million operation hours
- Ordered: 104 GT units

Commercial operation: 58 GT units
(J Series as of March 2023)

Hydrogen

Minimal investment to adopt

Power providers can transition to low-CO2 or CO2-free systems with minimal modifications*.

*Detailed scope is subject to plant specification

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Decarbonizing Iron and Steel Industry

COKE/COAL BASED

BF and BOF route

(84% hot metal and 16% scrap in BOF)

Emission factor **80 g CO_2** / kWh (2050)

1,943 kg CO_2 / t liquid steel

Emission factor **226 g CO_2** / kWh (EU 27 –2019)

1,968 kg CO_2 / t liquid steel

NATURAL GAS BASED

DR and EAF route

(80% hot DRI and 20% scrap in EAF)

577 kg CO_2 / t liquid steel

659 kg CO_2 / t liquid steel

-60–70% CO_2 emissions

HYDROGEN BASED

HYFOR

DR and EAF route

(80% hot DRI and 20% scrap in EAF)

187 kg CO_2 / t liquid steel

260 kg CO_2 / t liquid steel

-85–90% CO_2 emissions

HYFOR – Hydrogen Based Fine Ore Reduction (Austria)

- Commissioning completed in Q2 2021
- Multiple campaigns successfully executed
- Continue tests with various ores – process improvements
- Evaluate design parameters for next plant size

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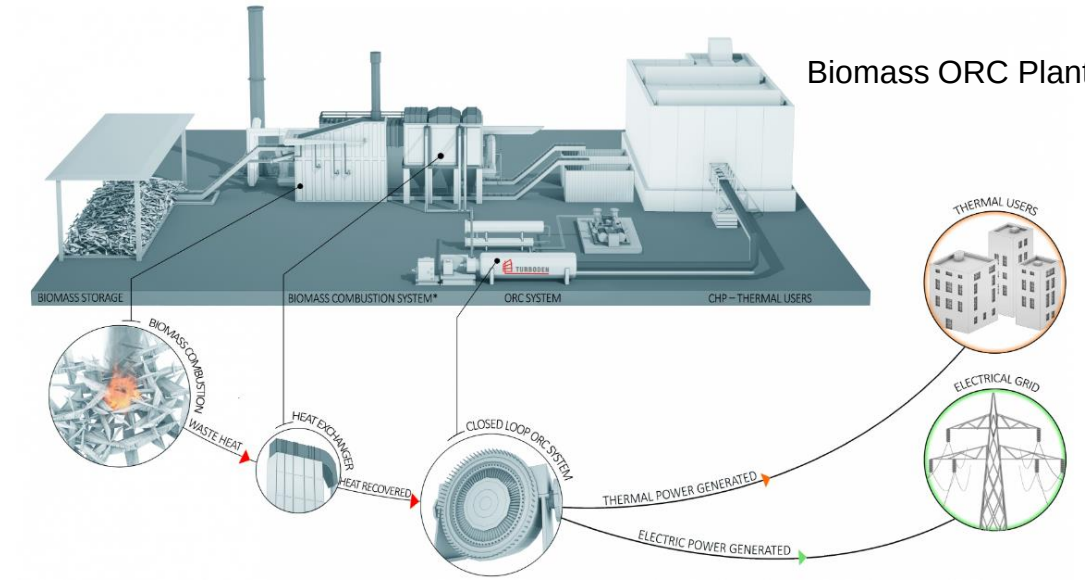
Organic Rankine Cycle (ORC) and Large Heat Pumps

MHI's Group company Turboden brings clean heat and power to the world

The **Organic Rankine Cycle (ORC) system** is based on an innovative **closed thermodynamic cycle** for the flexible and distributed production of electric and thermal power **exploiting various heat sources**, like Geothermal, Industrial Waste Heat, Biomass and other kind of Waste.

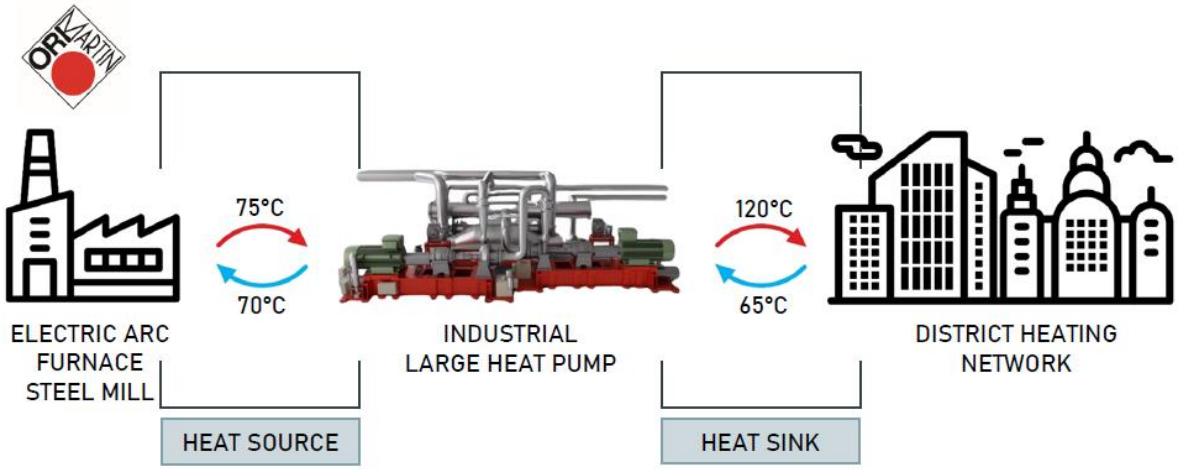


Biomass ORC Plant

- Track record of +460 plants totaling 1041.5 MWe Many applications in hard-to-abate industries (cement, glass, steel and non-ferrous industry)

Innovative **Large Heat Pumps** are utility-scale heating solutions in applications like district heating and energy-intensive industrial processes.

ORI MARTIN Steelworks (Brescia, Italy): Waste heat from the steelmaking process raised through a **Large Heat Pump** and used for district heating.



- In operation since 2023
- Size: 6MWth (equivalent to energy needs of 3,500 homes)
- Output: pressurized water at 120°C delivered to the district heating network

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MHI Group's Selected References in Bulgaria

clean energy ahead TURBODEN

- **Eco Energy Management**
  Biomass CHP Plant
- ORC 1.2MW

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- **Kaliakra Wind Power**
  Wind Power Plant
- 1MW x 35 units

clean energy ahead TURBODEN

- **Eko Garb OOD**
  Waste to Energy Plant
- ORC 9.1MW (under construction)

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Build a hydrogen solutions ecosystem

Takasago Hydrogen Park

World's first integrated hydrogen technology validation center

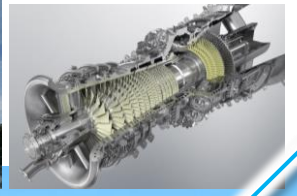
Hydrogen Use（Power Generation）

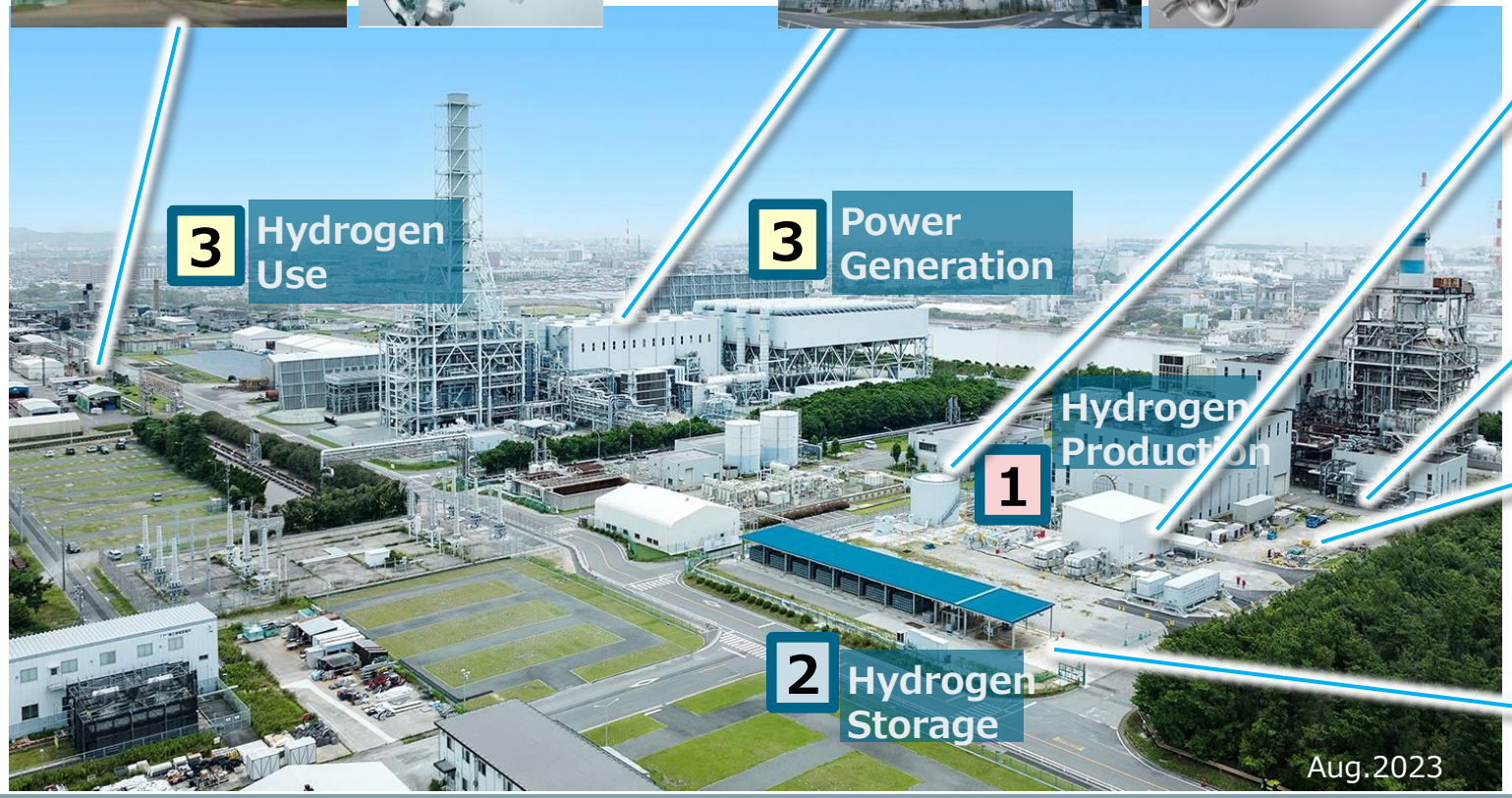
GT 40MW

H-25 Gas Turbine

GTCC 566MW

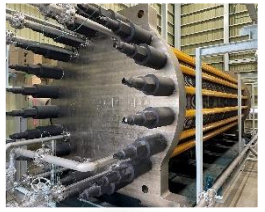
M501JAC Gas Turbine



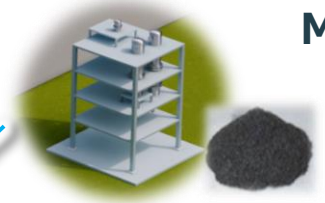


Various Hydrogen Production

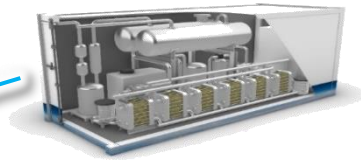
SOEC(for demo)【Operation】



Alkaline Electrolyzer【Operation】



Methane Pyrolysis (Turquoise Hydrogen)



AEM (Anion Exchange Membrane)

Hydrogen Storage

Hydrogen Cylinders

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Advanced Clean Energy Storage (ACES) project (US)

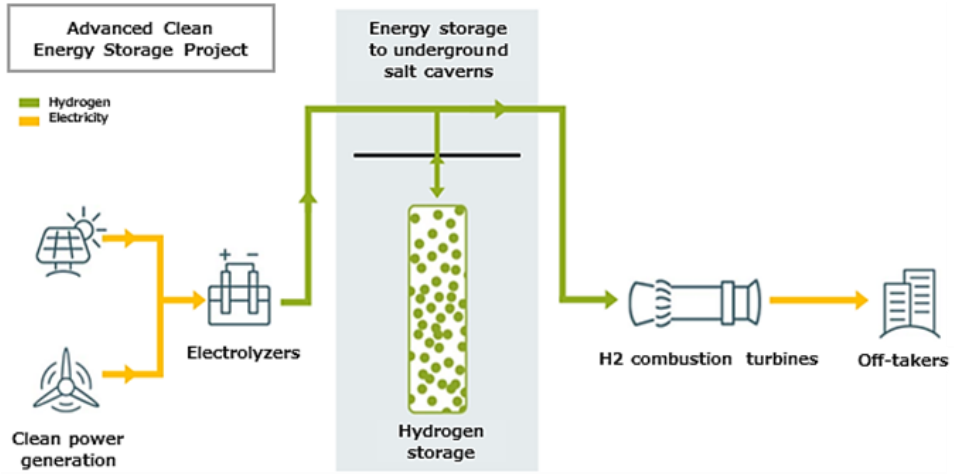
ACES project is the world's largest renewable energy storage project.

- Launched in May 2019 by Mitsubishi Power, Magnum Development and the Governor of Utah.
- **Green H_2** will be stored in underground salt caverns in Utah and supplied to the gas turbine combined cycle power plant of Intermountain Power Agency.
- The DOE Loan Guarantee Program is utilized in this project and the finance close was achieved in June 2022.
- Commercial operation 2025 on 30% green H_2 → 100% green H_2 operation no later than 2045
- Power plant is connected to the Los Angeles power grid by an existing high voltage direct-current (HVDC) transmission line.

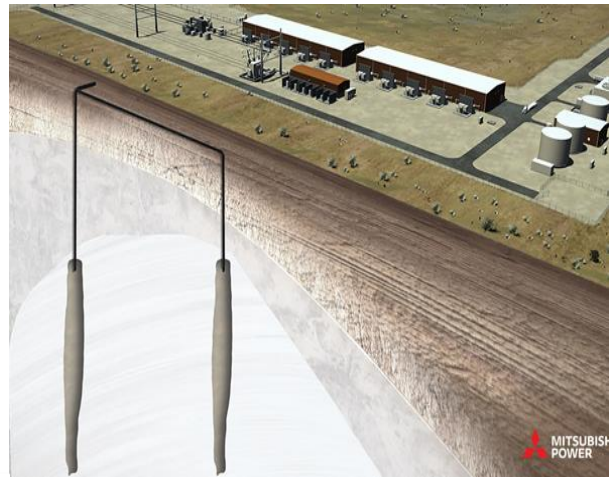
Location of Projects

Source: LADWP Los Angeles Times

Gas Turbine Model	M501JAC
Power Output	840 MW (by 2 CCGT)
Location	Utah, USA



Storage Capacity	150GWh x 2
Location	Utah, USA



Intermountain Power Agency ordered Mitsubishi Power M501 JAC Gas Turbine Technology (840MW by 2 CCGT).

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Build a CO_2 solutions ecosystem

MHI Group's CCUS Value Chain

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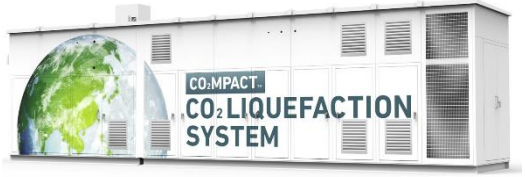
The MHI Group aims to be a one-stop business for the entire CCUS value chain - by providing various products/elemental technologies, and integration abilities across land and sea.

[Partnership]
INFINIUM
(Synthetic Fuel)



CO_2 Capture

Emitter

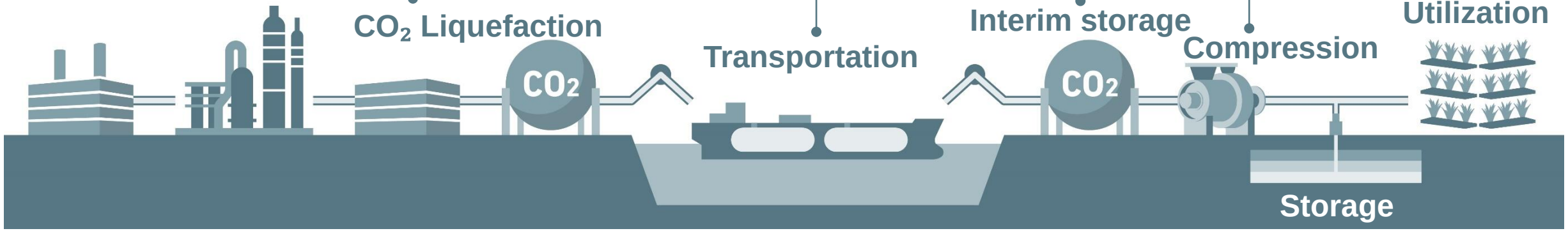
CO_2 Liquefaction

Transportation

Interim storage

Compression

Utilization



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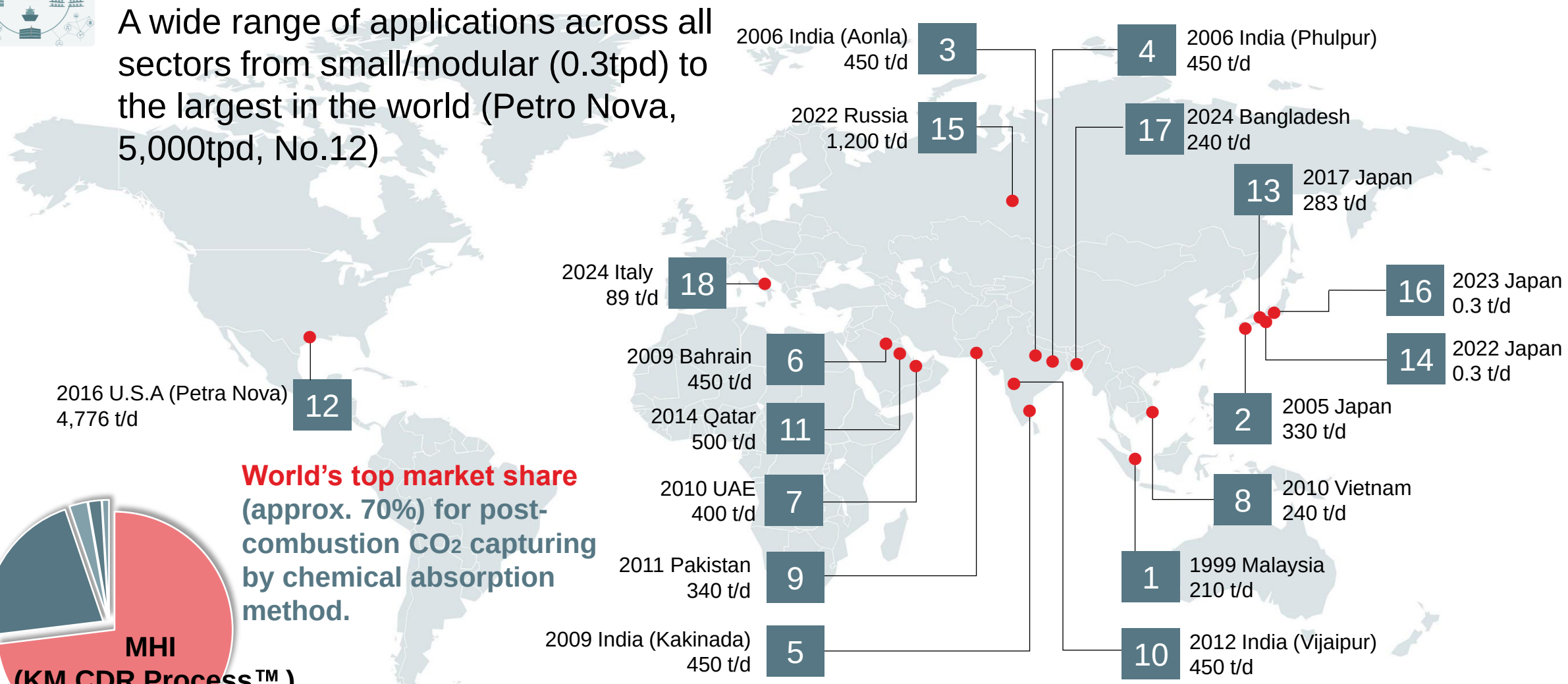
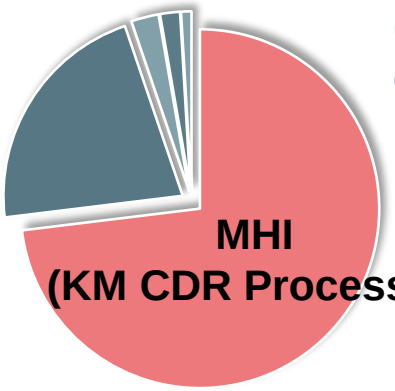
KM CDR Process™ - Worldwide Commercial Experience

A wide range of applications across all sectors from small/modular (0.3tpd) to the largest in the world (Petro Nova, 5,000tpd, No.12)





World's top market share (approx. 70%) for post-combustion CO_2 capturing by chemical absorption method.

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