MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP

Mitsubishi Heavy Industries Group

Today & Tomorrow

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Managing Director,
Mitsubishi Heavy Industries India, Pvt. Ltd.

2025/9/23

MITSUBISHI HEAVY INDUSTRIES

1. Introduction of MHI group
2. Mission net zero
3. JCM application case in Thailand
4. Clean Energy Technology
5. CO_2 Capture Technology
6. Summary

1. Introduction of MHI group -MHI Group at a Glance-

1884 Foundation
over 140 years history

77,274 Employees
(Consolidated)

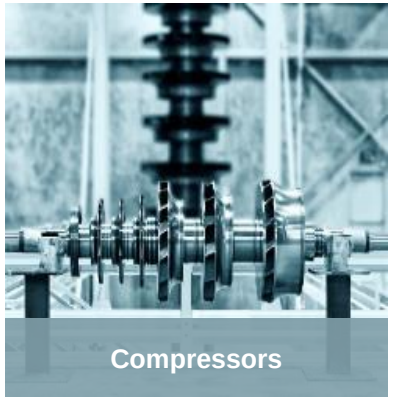
256 Group Companies
(Consolidated)

¥5.0TN ($33.0BN*) Revenue
(FY2024, consolidated)

Diverse products
On land, at sea, in the sky, in space

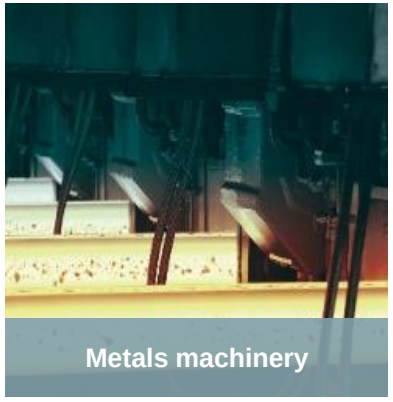
Note: The U.S. dollar revenue figure was converted from Japanese yen using the FY2024 average exchange rate, JPY 152.2/USD.


Gas turbines

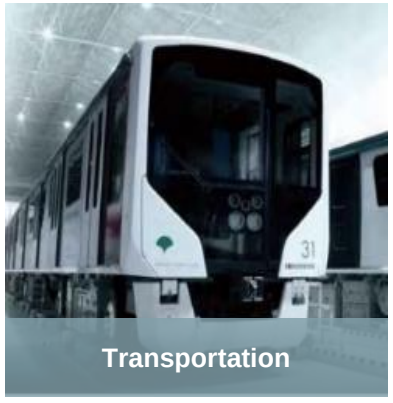

Compressors


Aero engines

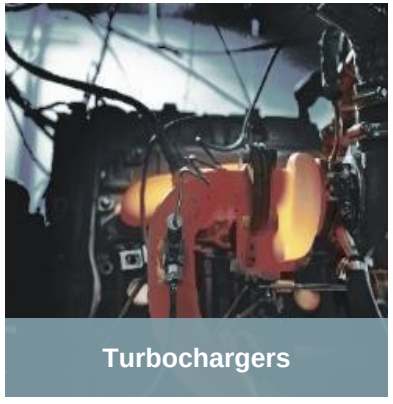

CO_2 capture plants

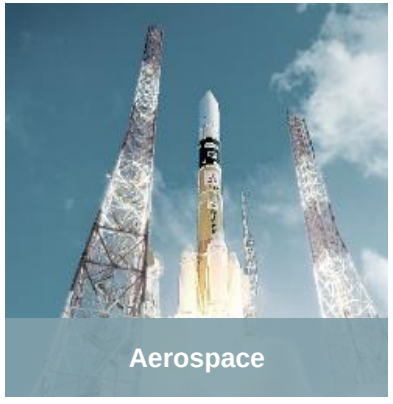

Metals machinery

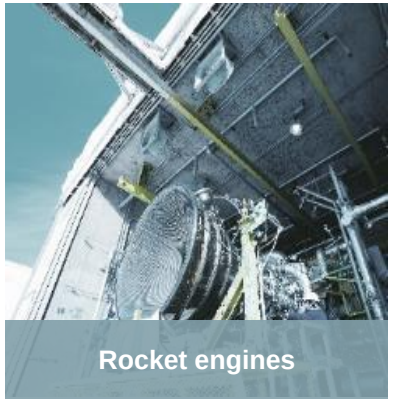

Chemical plants

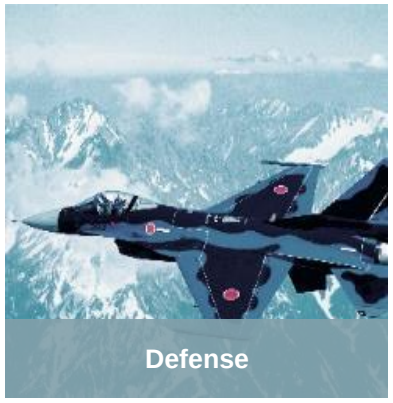

Transportation


Waste-to-energy


Turbochargers

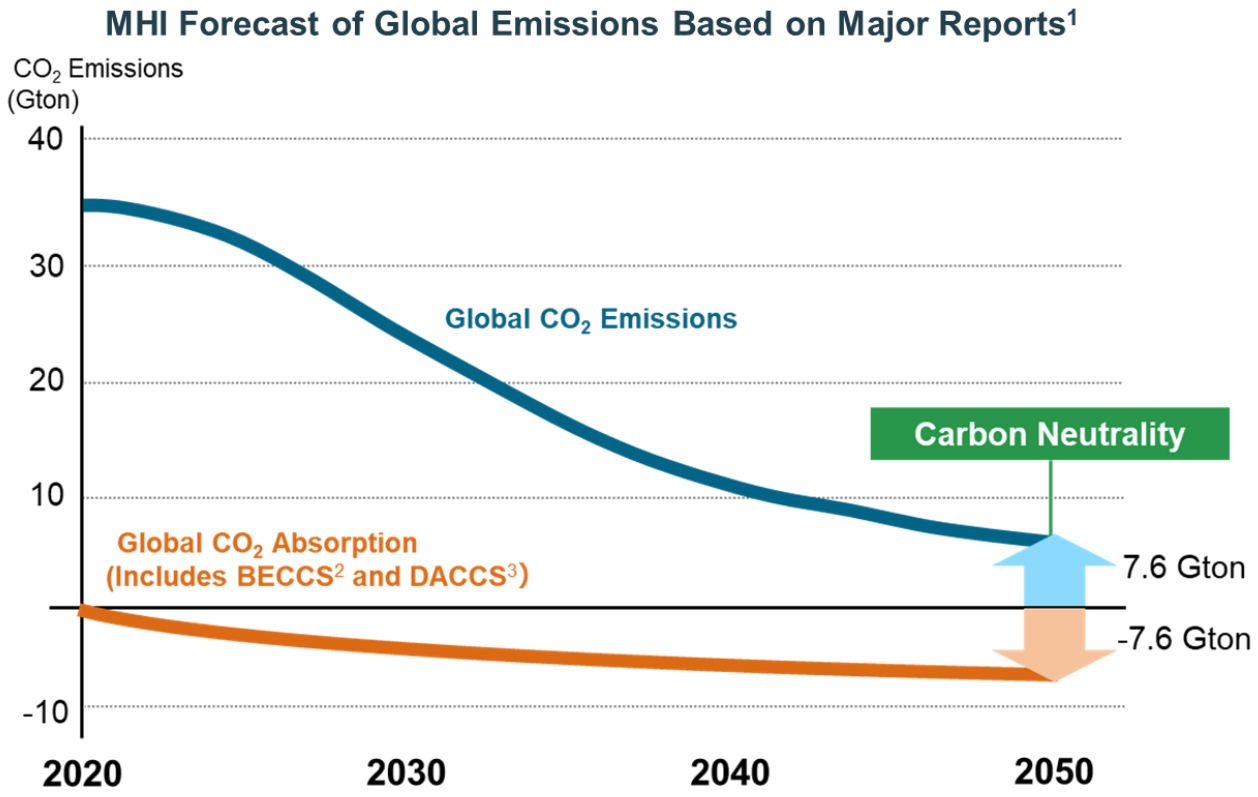

Aerospace


Rocket engines


Defense

2. Mission Net Zero

- The energy transition requires both reduced and recovered CO_2
- MHI Group is set to achieve Carbon Neutrality by 2040 – ***Mission Net Zero*** – both in its operations as well as in its value chain



Target Year	Reduce CO_2 emissions across MHI Group Scope 1&2	Reduce CO_2 emissions across MHI's value chain Scope 3 + reductions from CCUS
2030	-50% (compared to 2014)	-50% (compared to 2019)
2040	**Net Zero**	**Net Zero**

1 Based on major reports (including McKinsey 1.5C Scenario, IEA NetZero by 2050, IEA SDS, and IPCC)
2 Bio Energy with Carbon Capture and Storage: CO_2 capture and storage from biomass power exhaust gas
3 Direct Air Carbon Capture and Storage: Capture and storage of atmospheric CO_2

https://www.mhi.com/expertise/carbon-neutral

3. JCM application case in Thailand -Waste Heat Recovery (ORC)-

Art 6.2 Mechanism : No.7 High end technology for energy efficiency

- Turboden is a subsidiary company of MHI group, located in Milan, Italy, and the globally leading technology provider of the Organic Rankine Cycle (ORC) technology, with its 40 years experiences and over 60 units of delivery record.
- ORC are flexible to accommodate various kind of heat sources, like waste heat from industrial process, gas turbines, urban waste incinerator, biomass boiler, and geothermal.
- Your usage of electricity generated by ORC with those waste heat, will reduce your usage of electricity through grid, generated by coal, oil or gas, and help your carbon footprint reduction, and JCM will contribute CAPEX reduction.

Simplicity

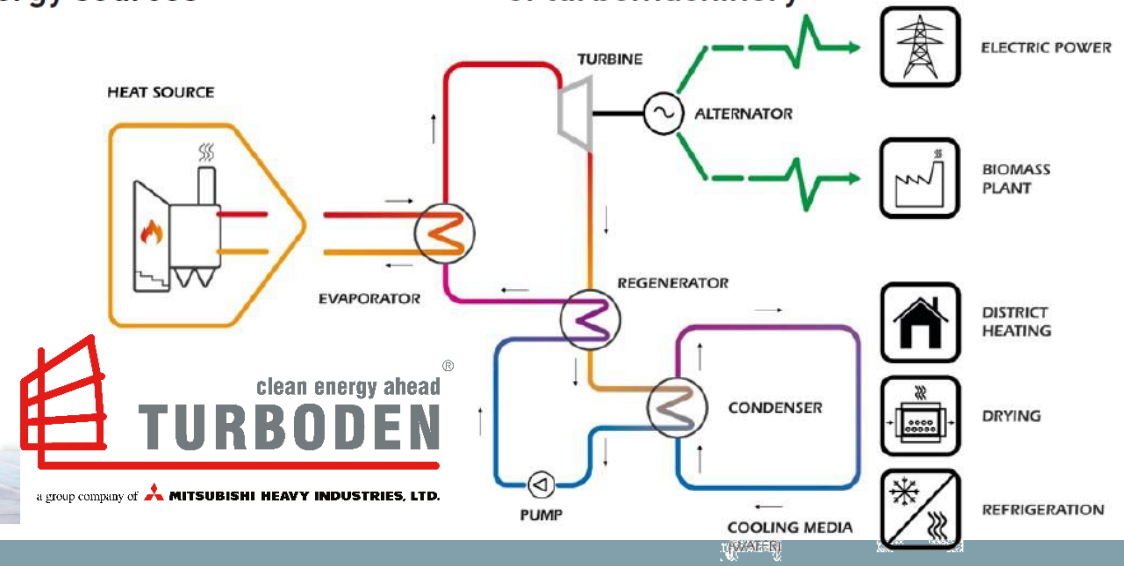
- ✓ Remote monitoring and automatic operation
- ✓ No water use and treatment required
- ✓ Minimal maintenance activities

Flexibility

- ✓ Ease of integration
- ✓ Excellent part load capability down to 10% load
- ✓ Different primary energy sources

Dependability

- ✓ High availability
- ✓ Long life (> 25 years)
- ✓ 40 + years in the design and production of turbomachinery



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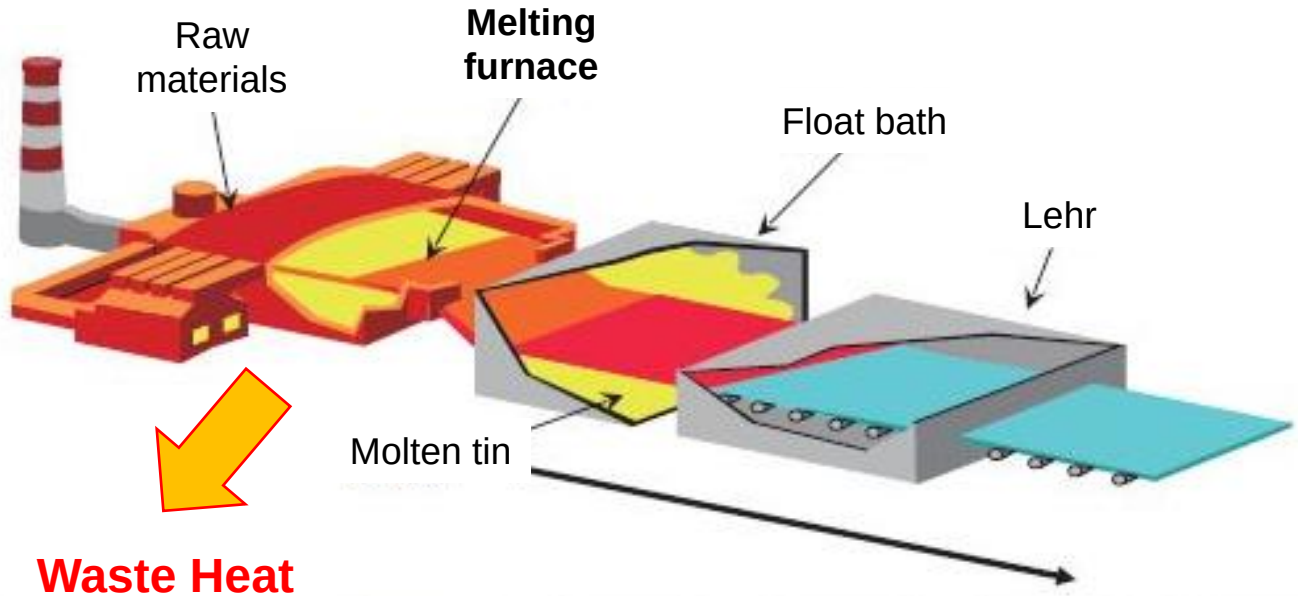
- 1.8MW class ORC waste heat recovery power generation system is introduced to the flat glass manufacturing factory, for its self consumption purposes. The system reduces greenhouse gas (GHG) emissions by substituting a part of grid power consumption, which is generated by fossil fuel, such as coal, oil, and gas.
- This project contributes to the achievement of Thailand policy for energy saving and reduction of CO2 emissions.

Schematic image of float glass process



Expected GHG Emission Reductions

7,845 tCO2-eq./year

= (Reference CO_2 emissions)
− (Project CO_2 emissions)

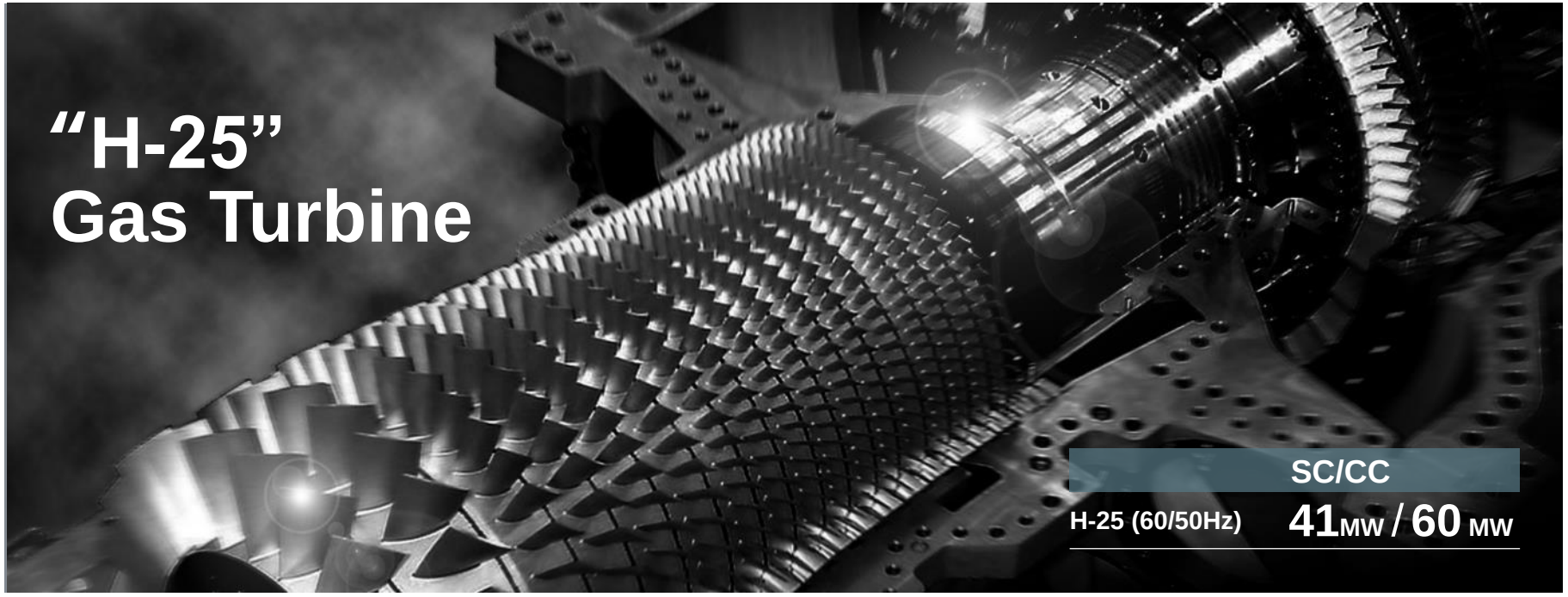
・ Reference CO_2 emissions
= (Quantity of the electricity generated by the project) [MWh/year]
×Emission factor [tCO_2/MWh]
・ Project CO_2 emissions
= 0 [tCO_2/year])

https://gec.jp/jcm/projects/22pro_tha_02/

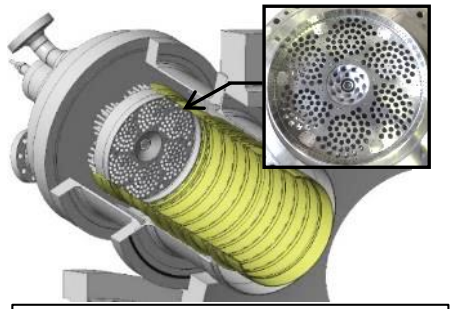
4. Clean Energy Technology -Hydrogen, Ammonia Gas Turbine-

Art 6.2 Mechanism : No. 4 Green Hydrogen / No.13 Green Ammonia

Our Advanced Gas Turbines are designed for decarbonization, and JCM will help CAPEX.



Combustor: Multi-Cluster



Under development

Demonstration of H2 100% firing in actual pressure done at MHI Takasago in 2024

High Efficiency

More than 80% Co-generation Overall Efficiency

- Simple cycle 36.2%
- Combined Cycle 54.0%
- Cogeneration Over 80.0%
  79 ton/h (Heat Output)

High Reliability

Cumulative total operating time exceeds 12.5 million hours

- Ordered: 206 GT units
  (H-25 as of July 2025)

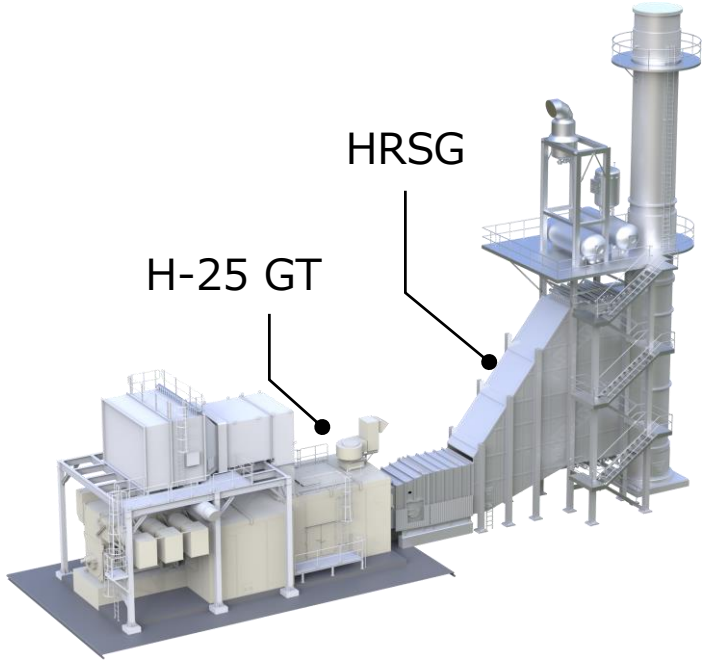
Fuel Flexibility

Gas Turbine can be fueled by

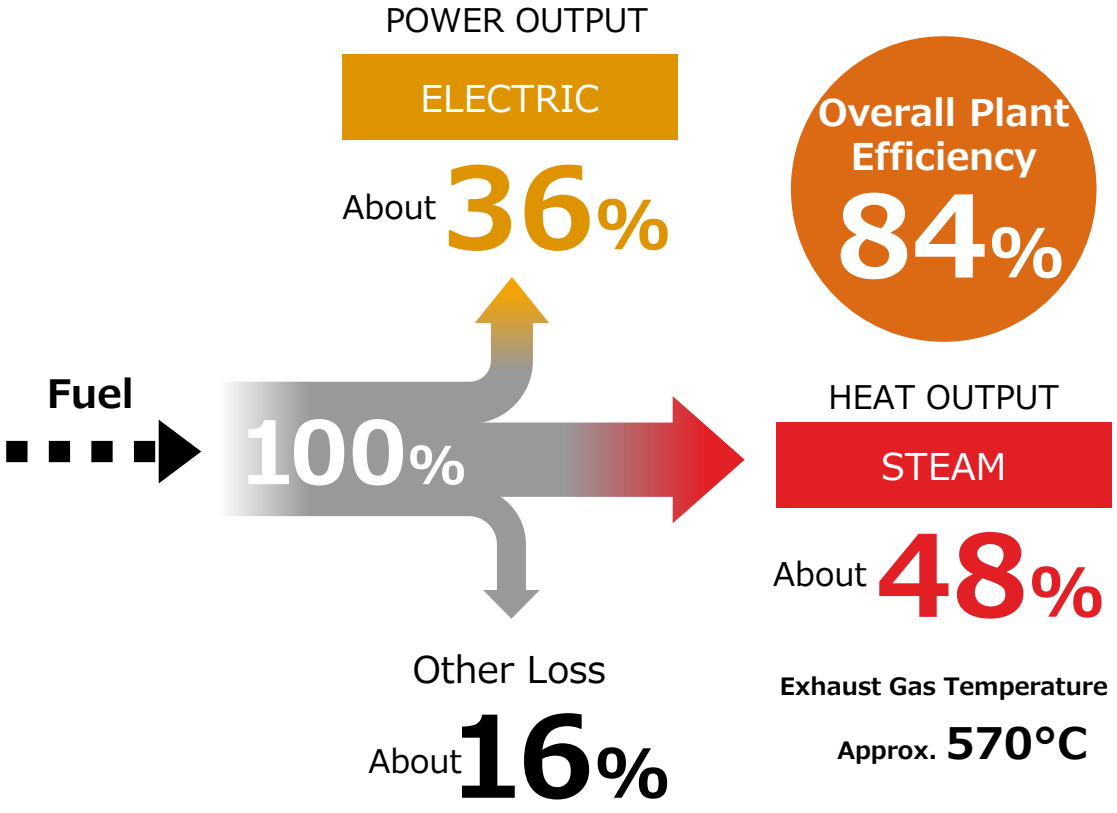
- Natural Gas, LPG, Off gas, Light Diesel, Bio Ethanol, etc
- **Hydrogen, Ammonia (under development)**

High heat, Heavy duty, & fuel flexibility. Suitable for cogeneration user industrial plant.

Highest Combined Heat and Power performance in the same GT class



Item	Unit	H-25
Power Output	MW	39.6
Heat Output* (6 MPa / 300 deg.C)	t/h (kpph)	79 (174)
Cogen. Overall Efficiency	LHV	**84%**



Note: Fuel: 100% CH4, ISO Condition, Steam 30bara 300℃, Feed water 50℃, no supplementary firing
The value can be change based on the condition.

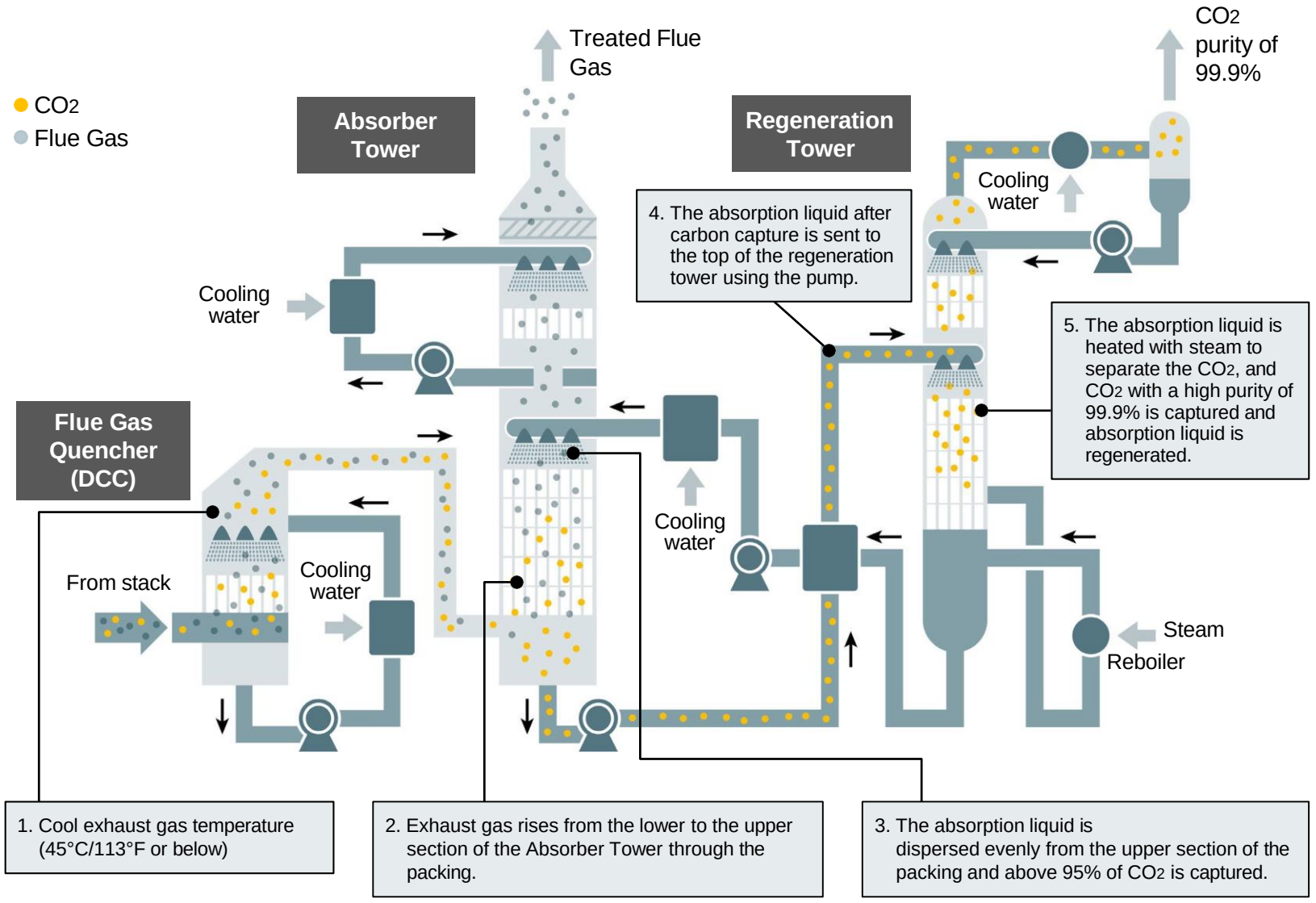
https://power.mhi.com/products/gasturbines/lineup/h25

5. CO2 Capture Technology -Process of CO_2 Capture-

Art 6.2 Mechanism : No.14 Carbon Capture Utilization and Storage

KM CDR Process™

- KM CDR Process™ = ***Kansai Mitsubishi Carbon Dioxide Recovery Process***
- Amine-based absorption technology
- Capable of capturing above 95% CO2 from combustion gas (depending on source)
- Automatic load adjustment control (ALAC)
- JCM will help CAPEX



Renewal of Compact CO_2 Capture System "CO_2MPACT™" Series

- The new model of "CO_2MPACT™ Full-Module," have capacity of CO_2 capture from the flue gas with the range of 1 to 200 tons/day
- Shorter delivery time by optimization of the flue gas from the customer's facility and a compact module configuration with varieties.

CO_2MPACT™ Mobile

0.3 tons/day

CO_2MPACT™ Full-Module

(Renewal)

1 ~ 200 tons/day

https://www.mhi.com/news/240919.html

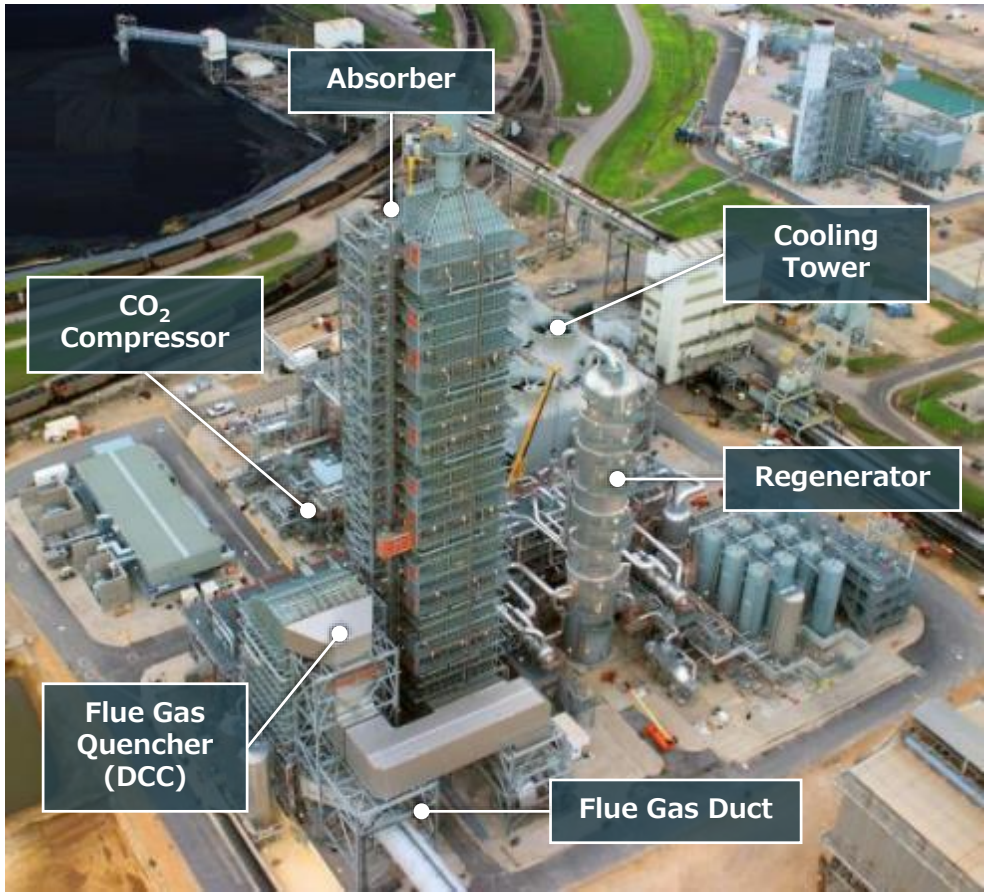
Petra Nova Project

The World's Largest Post-Combustion Carbon Capture Plant

EPC full turnkey project

- MHI has provided the world's largest carbon capture plant on coal-fired flue gas delivered in December 2016
- Supported by DOE (U.S. Department of Energy) grant program (CCPI* Round 3) and Japanese government finance (JBIC / NEXI)

Project Formation	• Consortium of MHI / The Industrial Company (TIC) (MHI: Engineering and Procurement for Carbon Capture Plant)
Plant location	NRG WA Parish Power Plant (Thompsons, TX)
Project owner	Petra Nova - partnership between NRG Energy and JX Nippon Oil&Gas Since 2022, full ownership under JX Nippon Oil&Gas
Plant scale	240 MW_{eq}
CO_2 capacity	4,776 t/d (1.4 Mt/y)



Carbon Capture Plant

*Clean Coal Power Initiative
*U.S. Department of Energy "W.A. Parish Post-Combustion CO_2 Capture and Sequestration Project Final Environmental Impact Statement Volume I" (Feb, 2013), DOE/EIS-0473

https://www.mhi.com/products/engineering/co2plants_projectrecords.html

6. Summary

- MHI is a leading company in the pursuit of decarbonization, and in addition to the technologies introduced this time, we have numerous products and achievements.

- We hope to collaborate and connect with you towards the utilization of JCM, and we look forward to supporting you.

Our Group companies in India

- Mitsubishi Heavy Industries India (MHII)
- MITSUBISHI POWER INDIA PVT LTD (MPW-IND)
  (Energy Systems)
- L&T- MHI Power Boilers Private Limited (LMB)
  (Energy Systems)
- L&T- MHI Power Turbine Generators Private Limited (LMTG)
  (Energy Systems)
- PRIMETALS TECHNOLOGIES INDIA PVT LTD (PT IND)
  (Plants & Infrastructure Systems - Primetals Technologies / PT)
- CONCAST INDIA LTD
  (Plants & Infrastructure Systems - Primetals Technologies / PT)
- ABP Induction Systems Pvt. Ltd.
  (Plants & Infrastructure Systems - Primetals Technologies / PT)
- MITSUBISHI HEAVY INDUSTRIES-VST DIESEL ENGINES PVT LTD (MVDE)
  (Logistics, Thermal & Drive Systems - MHI-ET)
- Logisnext India Pvt ltd.
  (Logistics, Thermal & Drive Systems – Logisnext / ML)
- MHI ENGINEERING & INDUSTRIAL PROJECTS (MEIP)
  (Plants & Infrastructure Systems - MHI Engineering / MHI-ENG)


MITSUBISHI
HEAVY INDUSTRIES

Appendix-1 Hydrogen & Ammonia related projects

Hydrogen related projects

Ammonia related projects

Zero Carbon Humber (H2H Saltend)
M701F, 1,200MW (3 CCGT)
Hull, Humber, UK (TBD)

Magnum
M701F, 440MW (1 CCGT out of 3 CCGT)
Eemshaven, the Netherlands (in 2028)

Linkou Steam Power Plant
NH_3 co-firing, 800MW×3units,
New Taipei, Taiwan (FS)

Taiwan Fertilizer
MOU for NH3 Value Chain

BLCP Steam Power Plant
NH_3 co-firing, 700MW×2units,
Map Ta Phut, Thailand (FS)

ADNOC
MOU for Blue Hydrogen, Ammonia and CCS

OQ
MOU for Blue & Green Hydrogen, Ammonia, and CO2 Value Chain

McDonough
M501G, 2,520MW (3 CCGT)
Smyrna, Georgia, USA
20vol% hydrogen co-firing validated (**in 2022**)
50vol% hydrogen co-firing validated (**in 2025**)

Intermountain Power
M501JAC, 840MW (2 CCGT)
Delta, Utah, USA
(**30vol% H_2 firing in 2025, 100% firing in 2045**)

Meranti Power
M701F, 340 MW x 2 (in 2025)

Keppel Infrastructure
M701JAC, 600 MW (**in 2026**)

Sembcorp Industries
M701JAC, 600 MW (**in 2026**)

Keppel Data Center
CCGT Singapore (**TBD**)

Advanced Clean Energy Storage
Green Hydrogen Production and Storage
Delta, Utah, USA (**in 2025**)

Energy Decarbonization
Decarbonizing Entergy' utilities Texas, USA
M501JAC (2 CCGT) (**in 2026**)

EMA/ MPA
Ammonia bunkering & power generation (**Pre-FEED**)

PTT
Pre-FS for using NH_3 GT Power Generation

PTTGC
Pre-FS for Decarbonization of Petrochemical Plant

Keramasan CCGT Project
H-25, 80MW (2 CCGT),
South Sumatra, Indonesia (FS)

Suralaya Steam Power Plant
NH_3 co-firing, 600MW×3units,
Cilegon, Indonesia (FS)

Port of Newcastle
Under discussion to establish H2 HUB and clean energy economy

Guacolda Steam Power Plant
NH_3 co-firing, 150MW×5units,
Atacama, Chile (FS)