

# 2021 Medium-Term Business Plan Progress (FY2021-2023)

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During this presentation, I will outline the progress we have made in our 2021 Medium-Term Business Plan.

- I. 2021 MTBP Targets**
- II. Strengthening Profitability**
- III. Developing Growth Areas**
  - III-1. Energy Transition**
  - III-2. Smart Infrastructure**
- IV. New Business Opportunities in the Changing Operating Environment**
- V. MISSION NET ZERO Initiatives**
- VI. Conclusion**
- VII. Appendix**

Today's presentation will cover the topics listed in the table of contents.

## Executive Summary



1

**2021 Medium-Term Business Plan (MTBP) initiatives progressing according to plan with positive effects now being seen.**

**Further build on these positive outcomes in FY23 to achieve 7% business profit margin.**

- Existing business growth : Steady progress in initiatives in Metals Machinery and other businesses addressing industry's decarbonization needs
- Services expansion : Utilize DX and fill out services portfolio
- Profitability improvements : Review business portfolio, including reorganization of Thermal Power and others and organizational transformation

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**Responding to the world's diverse needs, contribute to decarbonization of both energy supply and demand in leadup to global achievement of Carbon Neutrality**

- Decarbonize existing infrastructure: World's No. 1 market share in gas turbines.  
Further expand business, responding to need for future conversion to hydrogen firing
- Build a CO<sub>2</sub> solutions ecosystem : Inquiries for CO<sub>2</sub> capture doubled YoY.  
Lead market creation efforts together with partners such as ExxonMobil.
- Smart Infrastructure : Pursue unique value offering with ΣSynx

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**New business opportunities appearing due to increased concern for national security as geopolitical risks surface.**

**Fulfill the role expected of MHI as a leading company in nuclear power and defense.**

This is the executive summary of my presentation.

First, 2021 Medium-Term Business Plan initiatives are progressing mainly according to plan with positive effects now being seen. In FY2023, we aim to further expand on these positive outcomes and achieve a business profit margin of 7%.

Second, in our growth strategy, we are working on the decarbonization of energy supply and demand in the leadup to achieving Carbon Neutrality. I will explain more about this later.

Third, as a new development, geopolitical risks are emerging, and concern for national security is increasing. In this context, expectations for MHI Group as a leading company in the nuclear and defense sectors are high, and we are committed to meeting these expectations.

## I. 2021 MTBP Targets

Next are our 2021 Medium-Term Business Plan targets.

## 2021 MTBP Initiatives

### Strengthen Profitability

- Grow existing businesses
- Expand services
- Execute profitability improvements and organizational transformation

### Develop Growth Areas

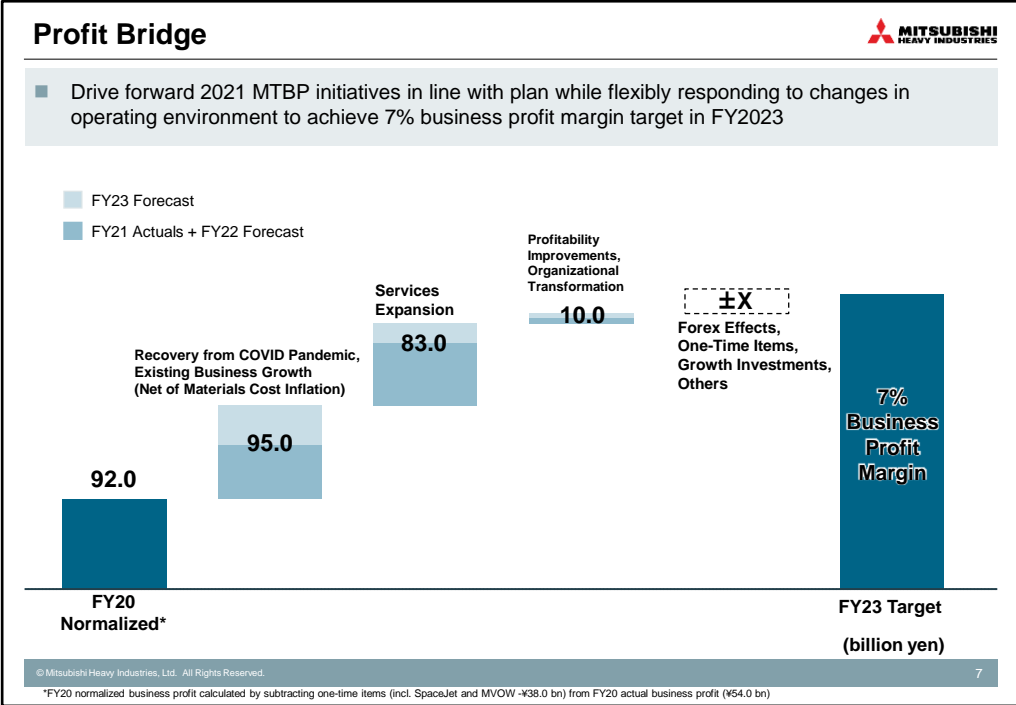
- Boldly reallocate resources
- Strengthen growth investments
- Improve intragroup cooperation

This page reiterates the targets of the 2021 Medium-Term Business Plan.

Two pillars of the 2021 Medium-Term Business Plan are strengthening profitability and developing growth areas.



First, I will speak about strengthening profitability.



This page outlines factors affecting business profit.

The bar at the bottom left represents FY2020 normalized business profit. This is obtained by excluding one-time items such as SpaceJet from FY2020 actual business profit. We have been working toward achieving a 7% business profit margin in FY2023 through recovery from the COVID pandemic, existing business growth, services expansion, profitability improvements, and organizational transformation.

The slightly darker blue lower half of the three blocks to the right of FY2020 normalized profit represent the forecast through FY2022, and the lighter color represents the forecast for FY2023. We believe that things are progressing mostly as planned. We continue to aim for a 7% business profit margin, net of the impact of foreign exchange rates and one-time items such as those related to project profitability issues.

Initiatives Toward Achievement of FY23 Targets		MITSUBISHI HEAVY INDUSTRIES	
<ul style="list-style-type: none"> <li>Steady progress in initiatives laid down in 2021 MTBP with positive effects now being seen</li> <li>Continue pursuing these initiatives in FY23 toward achievement of 2021 MTBP targets</li> </ul>			
	Achievements (1Q FY21 – 4Q FY22)	Effects FY20 → FY23	
<b>Recovery from COVID Pandemic</b>	<ul style="list-style-type: none"> <li>Logistics, Thermal &amp; Drive Systems (LT&amp;D) recovered to pre-COVID levels during FY21</li> <li>In Aero Engines, strengthened internal manufacturing capabilities and growing business with expansion of production facilities (Nagasaki and Komaki)</li> <li>Aero Structures still recovering, continuing fixed cost optimization</li> </ul>	<b>Revenue</b> +¥380.0 bn	<b>Business Profit</b> +¥95.0 bn
<b>Existing Business Growth</b>			
<b>Services Expansion</b>	<ul style="list-style-type: none"> <li>Expanded services businesses through DX and shifting of resources</li> <li>Strengthened LT&amp;D services hubs and grew market share in equipment leases and rentals</li> </ul>	<b>Revenue</b> +¥220.0 bn	<b>Business Profit</b> +¥83.0 bn
<b>Profitability Improvements and Organizational Transformation</b>	<ul style="list-style-type: none"> <li>Revised business portfolio (Naval Ships, Off-Shore Wind, Machine Tools, and others)</li> <li>Reorganized Thermal Power businesses (consolidated manufacturing facilities, downsized European business unit)</li> <li>Sold certain European Metals Machinery operations</li> <li>Reached basic agreement with Mitsubishi Electric to form Power Generator Systems JV</li> </ul>	<b>Business Profit</b> +¥10.0 bn (Benefits from fixed cost reductions and others)	
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			8

This page summarizes our achievements through FY2022 and their effects on profit.

Details on the effects of recovery from the COVID pandemic, existing business growth, services expansion, and other initiatives are listed here. I will discuss these on pages 9 and 10, so I will omit an explanation here.

Regarding profitability improvements, we have continued revising our business portfolio. In addition to acquiring Mitsui E&S's naval and governmental ships business, we divested Koyagi Shipyard and the Machine Tools business, making progress in addressing profitability issues.

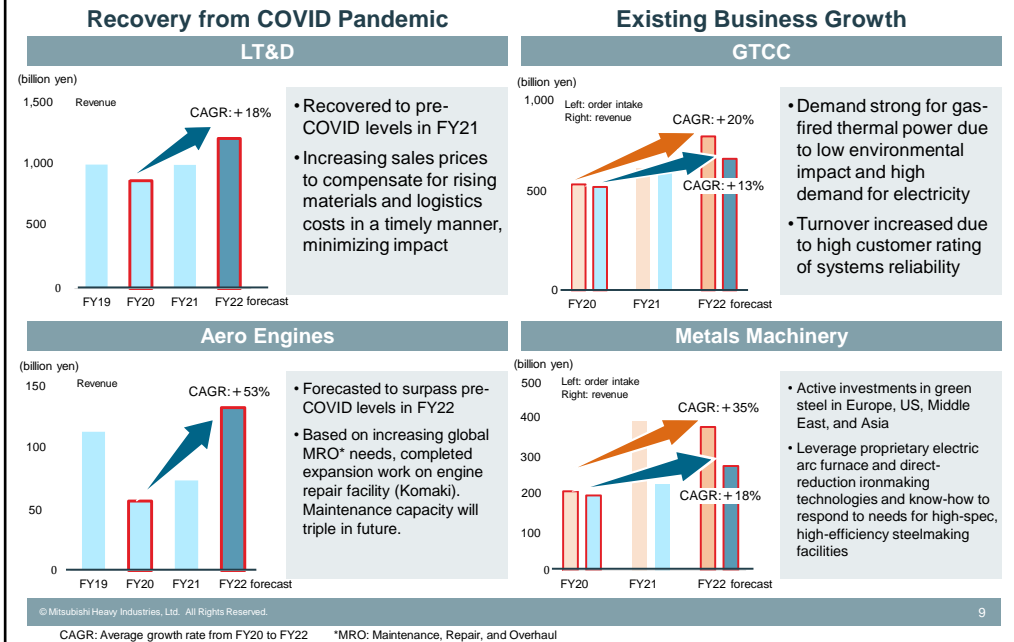
We also reorganized the Thermal Power businesses by consolidating manufacturing facilities and downsizing a European business unit.

In the Metals Machinery business, we consolidated operations in Europe, which we anticipate will positively contribute to profitability going forward.



## Achievements through FY22 (1/2)

Recovery from COVID Pandemic and Existing Business Growth



This page outlines recovery from the COVID pandemic and growth in existing businesses.

Logistics, Thermal & Drive Systems (LT&D) mostly recovered to pre-COVID levels in FY2021. Moreover, the impact of materials and logistics cost inflation has been minimized through sales price increases.

Aero Engines is expected to surpass pre-COVID levels in FY2022. Going forward, we will continue to expand our repair facility and execute other initiatives to meet increasing global maintenance, repair, and overhaul (MRO) needs and steadily grow turnover.

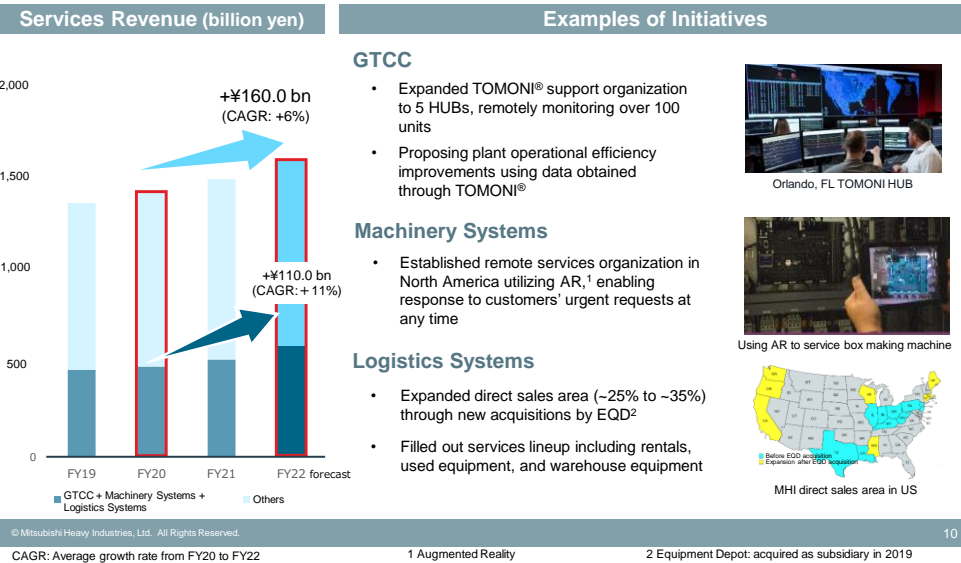
In our existing businesses, gas turbine combined cycle (GTCC) is experiencing steady growth associated with solid demand for gas-fired thermal power as a replacement for coal.

Metals Machinery is seeing an expansion in investment for green steel. As customer efforts to convert to and invest in electric furnaces and direct reduction ironmaking move forward, we expect revenue to increase in this business.

## Achievements through FY22 (2/2) Services Expansion



- Expanding services business turnover by maximizing customer value through DX and other initiatives



In our services businesses, we are implementing various measures in each product area, including leveraging digital transformation (DX), and we are seeing growth mostly as planned.

In GTCC, we have expanded our support organization to five global locations.

In Machinery Systems, as shown in the photo of a box making machine to the right side, we are expanding services using AR for remote assistance.

In Logistics Systems, we acquired Equipment Depot (EQD), expanding our direct sales area. We also broadened our service offerings to include rentals, used equipment, and warehouse equipment.

In summary, strengthening of profitability in existing businesses is progressing nearly as planned.

### III. Develop Growth Areas



Next, I will discuss the development of our growth areas.

## Develop Growth Areas



- Announced commitment to achieve Carbon Neutrality in 2040 (MISSION NET ZERO)
- Promoting decarbonization of energy supply through Energy Transition together with energy conservation, automation, and decarbonization of energy demand with Smart Infrastructure



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We have previously announced our commitment to achieve Carbon Neutrality and are working on the decarbonization of both energy supply and demand.

## III-1. Energy Supply Energy Transition






Over the next few pages, I will explain our efforts on the energy supply side.

## Recent Developments in the Energy Transition



- Forecasting rapid acceleration of Energy Transition, where Europe has previously led, mainly in US

Country/Region	Governmental Support	Monetary Amount	Details	
 US	<b>Inflation Reduction Act (IRA)</b> (2022)	<b>\$369 bn budget includes \$270 bn in tax incentives</b> to combat global warming	Hydrogen/Ammonia	<ul style="list-style-type: none"> <li>• <b>\$8 bn</b> budget (10 years)</li> <li>• Hydrogen production: Tax credits up to 30% CAPEX. Max tax credit \$3/kg-H<sub>2</sub> (10 years).</li> </ul>
			CCUS	<ul style="list-style-type: none"> <li>• <b>\$3 bn</b> budget (10 years)</li> <li>• CO<sub>2</sub> capture: Tax credits up to 30% capex. Tax credits of \$85/t-CO<sub>2</sub> for storage and \$180/t-CO<sub>2</sub> for DAC* (12 years).</li> </ul>
 EU	<b>Fit for 55 REPowerEU</b> (2021, 2022)	<b>Public/private investment ~€1 tr</b>	Hydrogen/Ammonia	<ul style="list-style-type: none"> <li>• Additional <b>€27 bn</b> in investment planned in EU (through 2030)</li> <li>• Set threshold for GHG emissions from hydrogen production (3t-CO<sub>2</sub>/t-H<sub>2</sub>)</li> </ul>
			CCUS	<ul style="list-style-type: none"> <li>• <b>€10 bn</b> in investments planned by 2030 in EU</li> <li>• Building CCUS hub and cluster at North Sea oil fields, suitable sites for CO<sub>2</sub> storage</li> </ul>
 Japan	<b>Green Transformation (GX) Basic Policy</b> (2022)	<b>Public/private investment ¥150 tr, incl. ¥20 tr in government funds</b>	Hydrogen/Ammonia	<ul style="list-style-type: none"> <li>• <b>¥7 tr</b> in public/private investment (10 years)</li> <li>• Considering creation of system to supplement differences in fuel prices and/or support systems for supply point infrastructure improvements</li> </ul>
			CCUS	<ul style="list-style-type: none"> <li>• Execute <b>¥4 tr and ¥3 tr</b> in public/private investments for CCS and CCU, respectively (10 years)</li> <li>• Build CCUS value chain in Asia by 2030 through CCUS business legislation and governmental cost-sharing</li> </ul>

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\*Direct Air Capture

This page outlines recent trends in the Energy Transition.

The Energy Transition, including adoption of renewable energy, had previously been led by Europe. However, with the passing of the Inflation Reduction Act (IRA), we now expect to see renewed acceleration especially in the US.

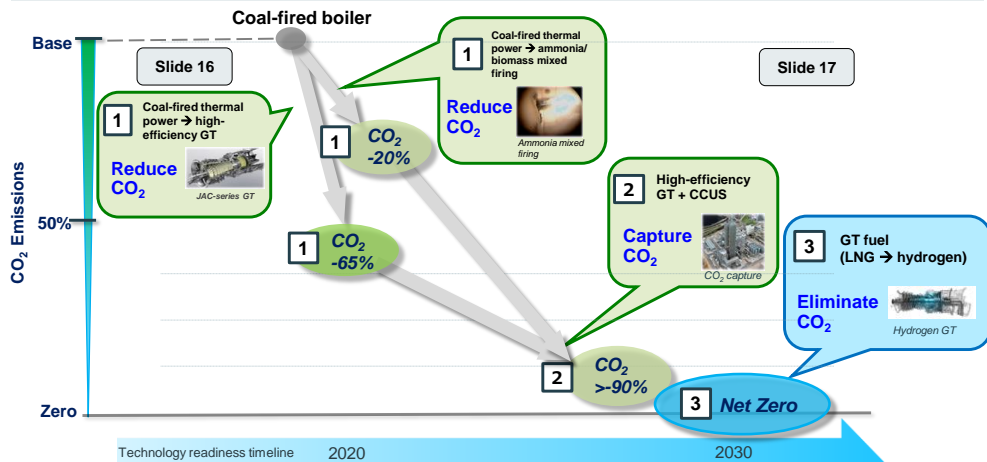
Up until recently, priority of attracting investment in renewable energy had been particularly high, but with the advent of IRA, investments in energy conversions, ammonia and hydrogen utilization, and carbon capture including carbon capture, utilization, and storage (CCUS) are becoming more active.

The way in which the world will transition to Carbon Neutrality is beginning to come into view in a realistic way.

## Decarbonize Existing Infrastructure



- Reducing, capturing, and eliminating CO<sub>2</sub> is one path to decarbonizing thermal power
- Another path is to reduce CO<sub>2</sub> emissions by maximum utilization of nuclear power, a carbon-free energy source (Slides 30 and 31)



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MHI Group envisions several paths to Carbon Neutrality, including CO<sub>2</sub> emissions reductions for coal-fired thermal power plants through ammonia and biomass mixed firing and replacements of aging coal-fired plants with gas turbines.

Furthermore, projects combining GTCC with CCUS are beginning to appear. We are proposing a path to Carbon Neutrality with future hydrogen fuel conversions, and we have already received various inquiries for this kind of project.

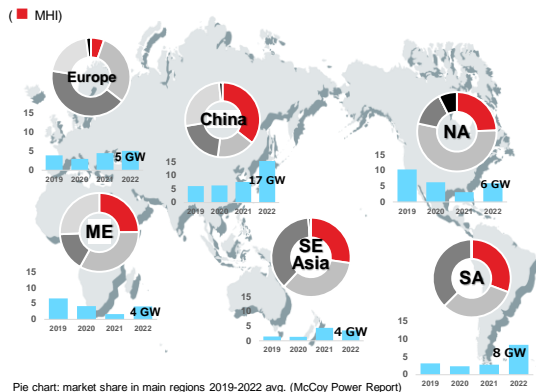
## Decarbonize Existing Infrastructure

1 Reduce CO<sub>2</sub>

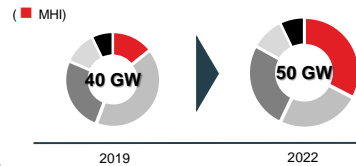


- Respond to needs for conversion from coal-fired thermal power to low-carbon gas-fired thermal power
- Achieved No. 1 market share in CY22 due to high evaluation of gas turbine reliability, ability to install CO<sub>2</sub> capture plants in future, and ease of hydrogen conversion. Maintain high market share while aiming to increase turnover.

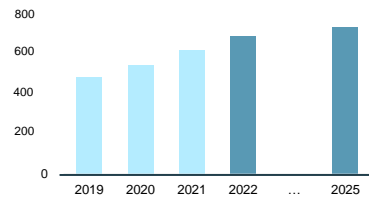
### MHI Market Share in Main Regions (unit: GW)



### MHI Global Market Share



### MHI Revenue (billion yen)



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This page shows the status of our gas turbine business.

The figure on the left shows our market share by region together with bar graphs representing market size on a capacity basis.

Our market share is relatively high in regions where the market is growing.

The right side of the page shows our global market share. MHI Group's market share increased from 2019 to 2022, and in CY2022, we have achieved the top position.

We aim to maintain a high market share and increase turnover by leveraging our GTCC systems' reliability, ease of installing CO<sub>2</sub> capture systems, and the ability to convert to hydrogen combustion in the future.



## Decarbonize Existing Infrastructure

1
2 Reduce + capture CO<sub>2</sub>
3 Eliminate CO<sub>2</sub>

- Amid tailwinds from public CCUS incentives around the world, pursuing overall power plant optimization including CO<sub>2</sub> capture facilities
- Hydrogen gas turbine development has met the first criteria of the EU Taxonomy (development progressing ahead of competitors)

### Ammonia Mixed Firing Boiler

2024
2030
2035
2050

INITIAL	20% Mixed Firing	Burner Development	Validation Prep	Validation Testing	
INVESTMENT	50%+ Mixed Firing (Oil Fund)	Burner Development/ Validation prep		2027-2028	First half 2030s

- In coal-fired thermal power, developing >50% ammonia mixed firing technology with goal of commercialization in first half of 2030s

### Hydrogen Gas Turbine

**Development Schedule**  
 SM GT: 100% hydrogen firing validation (2025), 100% hydrogen firing commercialization (2030)  
 LF GT: 30% mixed firing validation (2025), 30% mixed firing commercialization (2030), 100% hydrogen firing commercialization (2035)  
 Large Frame GT (450 MW class): 30% mixed firing validation (2025), 30% mixed firing commercialization (2030), 100% hydrogen firing commercialization (2035)

Successful combustion test with 50% hydrogen mix (2022)

- In lead up to commercialization in 2025, completed successful combustion test with 50% hydrogen mix, thereby meeting EU Taxonomy goals
- Development progressing in line with plan toward 100% hydrogen firing in large frame gas turbines in 2030

### GTCC + CO<sub>2</sub> Capture

- Awarded Front End Engineering Design (FEED) study for CO<sub>2</sub> capture plant applied to an LNG-fired GTCC power plant in Alberta, Canada
- Supporting customers' decarbonization efforts with both GTCC and CO<sub>2</sub> capture

Genesee Generating Station (Alberta, Canada)

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Next, I will explain initiatives related to decarbonizing existing infrastructure.

The upper left-hand side of the page shows the status of ammonia mixed firing boiler development. We are developing this technology with the goal of commercial operation in the early 2030s. We have already advanced to the stage of developing high-ratio mixed firing technology up to 50%.

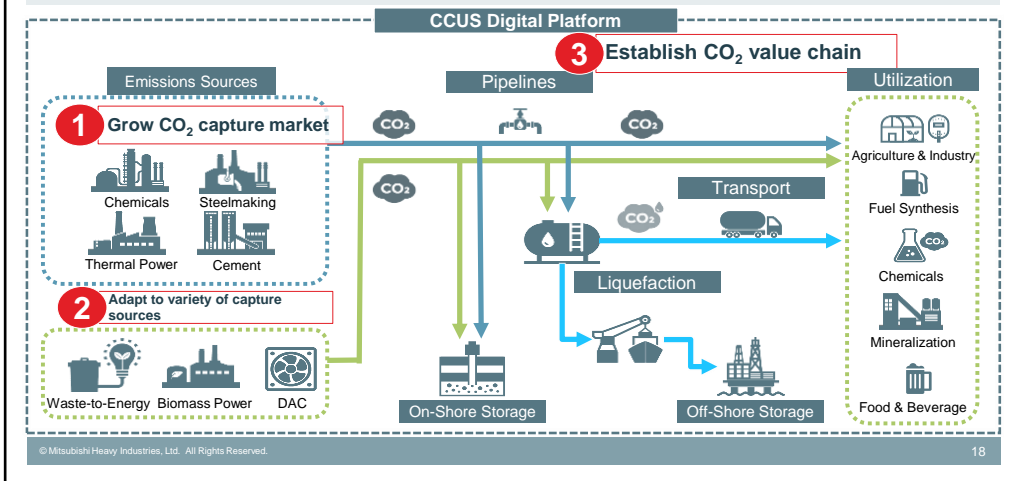
The lower left-hand side of the page shows the combination of GTCC and CO<sub>2</sub> capture. We have received an order for the basic design of a CO<sub>2</sub> capture plant to be applied to a GTCC facility in Alberta, Canada. Projects such as this are increasing, and interest in CO<sub>2</sub> capture is on the rise.

The right-hand side of the page shows the status of hydrogen combustion gas turbine development. In the lead up to commercialization of 30% mixed combustion by 2025, we have already achieved a 50% mix in combustion tests. As such, we have already cleared EU Taxonomy initial criteria. Going forward, we will continue development, aiming for commercialization of 100% hydrogen combustion in large frame gas turbines by the end of 2030.

## Realize a CO<sub>2</sub> Solutions Ecosystem



- Working to build a CO<sub>2</sub> solutions ecosystem connecting diverse emissions sources with storage and utilization providers
- Respond to CO<sub>2</sub> capture needs of diverse industries by leveraging long track record
- Accelerating efforts to build a value chain together with our partners



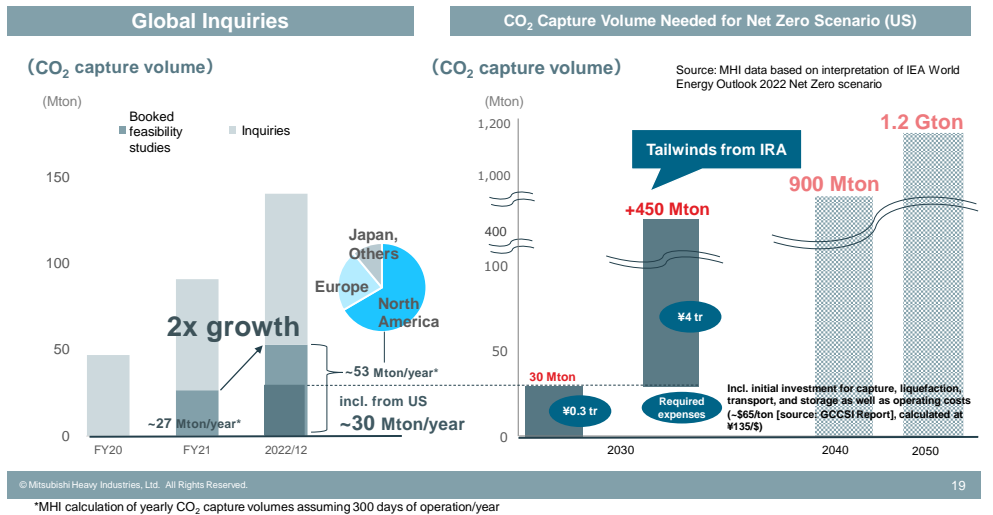
Over the next few pages, I will outline our efforts to build a CO<sub>2</sub> solutions ecosystem.

I will explain how the CO<sub>2</sub> capture market is gaining momentum, how we are currently engaging with diverse CO<sub>2</sub> emissions sources, and how we are working toward building future value chains.

## (1) Grow CO<sub>2</sub> Capture Market



- Inquiries strong especially in Europe and US on back of IRA. Feasibility studies doubled since FY21.
- Aiming to grow business by responding to CO<sub>2</sub> capture demand mainly in US, which has high probability of further growth going forward



In the CO<sub>2</sub> capture market, inquiries have become more active since IRA was passed in the US.

The graph on the left-hand side of this page shows the status of global inquiries. The darker bar represents booked feasibility studies. From FY2021 through December 2022, the volume of CO<sub>2</sub> capture represented by these feasibility studies doubled from FY2021 through December FY2022. As of December 2022, approximately 60% of these projects, or an equivalent of around 30 million tons of CO<sub>2</sub> per year, were in the US.

The graph on the right-hand side of this page shows the amount of CO<sub>2</sub> needed to be captured to meet the Net Zero scenario. The total cost to capture, transport, and store the 30 million tons per year from American projects is estimated at around ¥300 billion. Moreover, if CO<sub>2</sub> capture volumes increase to 450 million tons with tailwinds from IRA and other factors, this amount is expected to expand to ¥4 trillion.

## (2) Adapt to Variety of Capture Sources



- Pursuing improvements and standardization of CO<sub>2</sub> capture process for use in diverse industries (including hard-to-abate sectors)
- Executing validation testing with ArcelorMittal and other diverse partners

### Executing Validation Testing with Multiple Partners

Industry	Partner	Validation Timing/Results												
 Steelmaking	<b>ArcelorMittal and Others</b>	<ul style="list-style-type: none"> <li>• Signed collaboration agreement (Oct '22)</li> <li>• PreFeed for each emissions source using MHI 0.3t/day mobile unit</li> </ul> <table border="1"> <thead> <tr> <th></th> <th>Emission Source</th> <th>Site</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Blast furnace</td> <td>Ghent, Belgium</td> </tr> <tr> <td>2</td> <td>Rolling mill reheat furnace</td> <td>Ghent, Belgium</td> </tr> <tr> <td>3</td> <td>Direct reduction furnace</td> <td>North America</td> </tr> </tbody> </table>		Emission Source	Site	1	Blast furnace	Ghent, Belgium	2	Rolling mill reheat furnace	Ghent, Belgium	3	Direct reduction furnace	North America
			Emission Source	Site										
1	Blast furnace	Ghent, Belgium												
2	Rolling mill reheat furnace	Ghent, Belgium												
3	Direct reduction furnace	North America												
<ul style="list-style-type: none"> <li>• After completing first round of validation, will begin conceptual design of commercial scale capture for steelmaking plants</li> </ul>	 Signing ceremony in UK with ArcelorMittal and others													
 Cement	<b>Tokuyama</b>	<ul style="list-style-type: none"> <li>• Validation period: end Jun 2022 – end May 2023</li> <li>• Evaluation: Accumulation behavior of exhaust gas impurities, effect of absorbent degradation</li> </ul>												
 Waste-to-Energy	<b>Yokohama City</b>	<ul style="list-style-type: none"> <li>• Validation period: Jan 2023 – Mar 2024</li> <li>• Evaluation: Accumulation behavior of exhaust gas impurities</li> </ul>												
 Gas Engines	<b>In-House</b>	<ul style="list-style-type: none"> <li>• Validation period: end Jul 2022 – end May 2023</li> <li>• Evaluation: Accumulation behavior of exhaust gas impurities</li> </ul>												



Modular CO<sub>2</sub> capture system (mobile unit)

There is much demand for the application of CCUS to diverse CO<sub>2</sub> emissions sources.

We are working on the following key points in this area: improving capture processes, creating standard designs, and advancing validation testing with various partners.

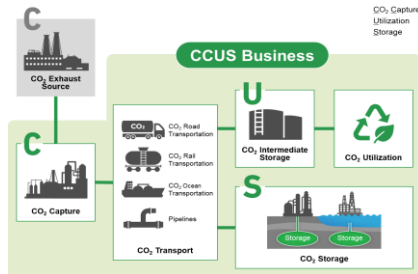
We are pursuing validation testing with partners in the steel, cement, waste-to-energy, and gas engine sectors. Through these validation efforts, we will create real business opportunities.

### (3) Establish CO<sub>2</sub> Value Chain



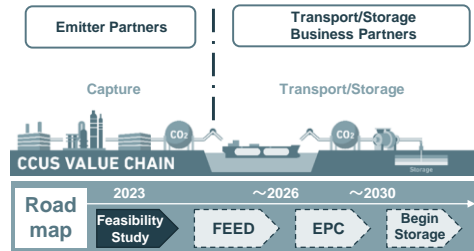
- Formed alliance with ExxonMobil in 2022. Working to establish organization to provide solutions for entire value chain and to accelerate development of projects around globe.
- Building CO<sub>2</sub> solutions ecosystem by linking diverse emissions sources with storage and utilization providers

#### Global: Partnership with ExxonMobil



- Joint technological development on CO<sub>2</sub> capture processes and project development using this technology
- Enables end-to-end CCS solutions from capture to storage for industrial customers by combining MHI's CO<sub>2</sub> capture technology with ExxonMobil's pipeline transport and underground storage technology

#### Japan: Joint Study on Value Chain Businesses



- Japanese government promoting long-term CCS roadmap including CAPEX and OPEX subsidies
- Plan for domestic CCS efforts to develop rapidly with 3-5 projects representing different combinations of CO<sub>2</sub> emissions source, transport method, and CO<sub>2</sub> storage region selected.
- MHI plans to execute joint study as CCS provider with INPEX and others in FY23

Capturing CO<sub>2</sub> is not the end goal; storing and utilizing the captured CO<sub>2</sub> is key to establishing value chains in this area.

As shown on the left-hand side of the page, MHI is currently collaborating with ExxonMobil on CO<sub>2</sub> capture processes and project development. To that end, we formed a carbon capture technology alliance last year.

The right-hand side of this page shows our efforts to build a value chain in Japan. We are partnering with other companies to jointly study capture, transport, and storage as part of CCS governmental projects. We believe that as these initiatives become more concrete, they will lead to business opportunities.

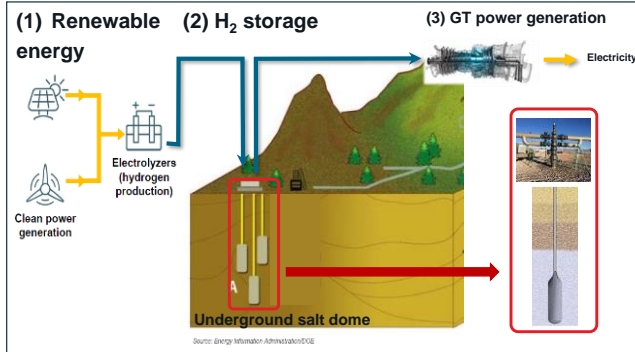
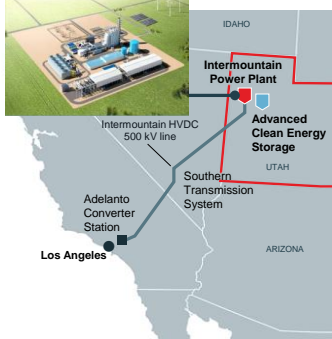
## Build a Hydrogen Solutions Ecosystem

Advanced Clean Energy Storage Project



- Developing world's largest hydrogen hub in Utah with American partners
- Project will produce hydrogen with renewable electricity, store it in underground salt domes, and supply hydrogen to nearby power station
- Received ~\$500 mn loan guarantee from US Department of Energy in June 2022. Aiming for start of commercial operation in 2025

(artist's rendition of hydrogen power/storage plant)



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On this page, I will provide an example of a project seeking to realize a hydrogen ecosystem in Utah, US.

Renewable energy will be used to produce hydrogen, which will be stored in underground salt domes. The stored hydrogen will then be supplied to a nearby power plant for clean power generation and electricity supply, making it the world's largest hydrogen hub.

The project received a loan guarantee from the US Department of Energy in June 2022 and is scheduled to begin commercial operations in 2025.

## III-2. Energy Demand Smart Infrastructure



Next, I will explain our initiatives on the energy demand side.

# Smart Infrastructure



- Offer customers automation, optimization, and high reliability with easy, one-stop solutions

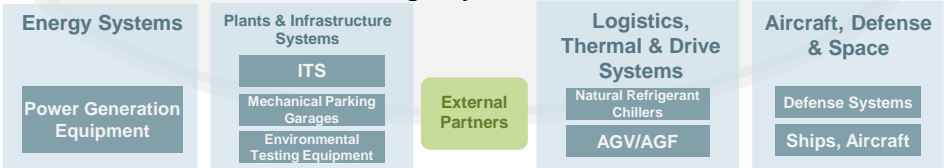
## Customer Pain Points

### One-Stop Solutions

- 1 Intelligent Logistics
- 2 Refrigerated Warehouses
- 3 Data Centers

- New growth areas
- Existing products/technologies

## $\Sigma$ SynX<sup>1</sup> Intelligently Connect

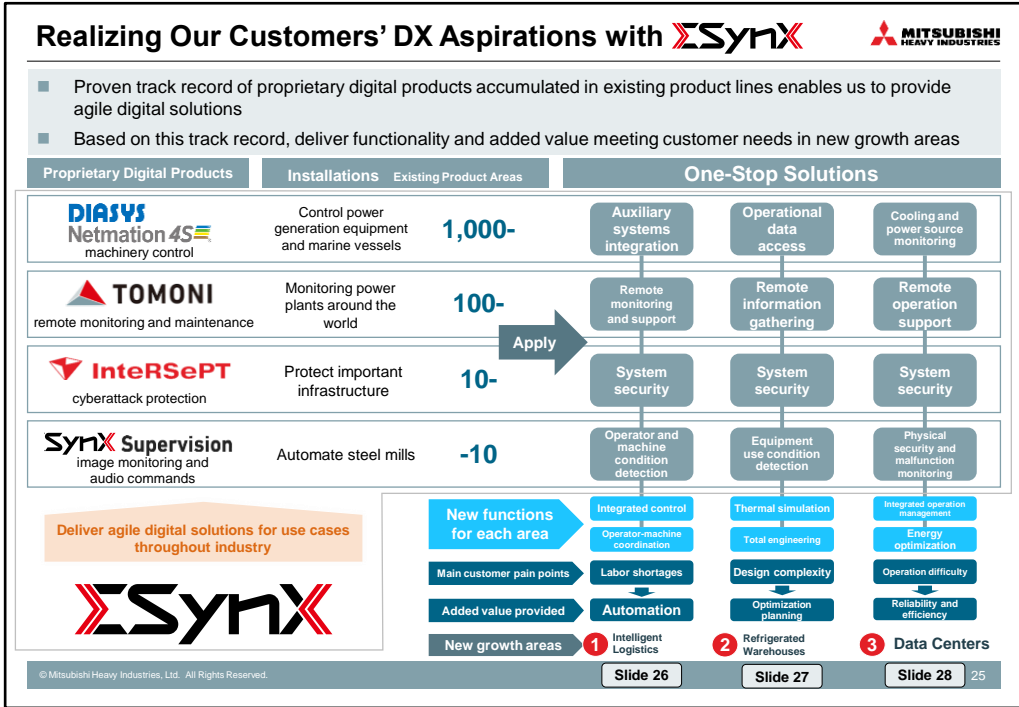


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1 Read "Sigma SynX" ITS: Intelligent Transport Systems AGV: Automated Guided Vehicle AGF: Automated Guided Forklift

In order to provide our customers with automation, optimization, and high-reliability solutions, we are combining power generation equipment, intelligent transport systems (ITS) technologies, and logistics systems into a new platform called  $\Sigma$ SynX ("Sigma SynX") to meet various customer needs.

Over the next few pages, I will introduce our efforts in intelligent logistics, refrigerated warehouses, and data centers.





MHI Group has developed and implemented various digital products to date.

One example is DIASYS Netmation, which operates machinery and power generation equipment, and has already been implemented in more than 1,000 systems.

TOMONI®, a remote monitoring and maintenance system for power generation equipment, has been implemented in over 100 systems.

Recently, we have also developed digital products such as InterSePT, which protects against cyberattacks, and SynX Supervision, which offers image monitoring and audio representation.

The functions of each product are listed on the right, and by combining these products, we can provide the added value shown at the very bottom of the page. For example, we will be able to provide automation solutions for intelligent logistics, optimization planning and optimal systems for refrigerated warehouses, as well as energy conservation and improved reliability for data centers.

$\Sigma$ SynX will serve to integrate all of these digital products into a single platform.

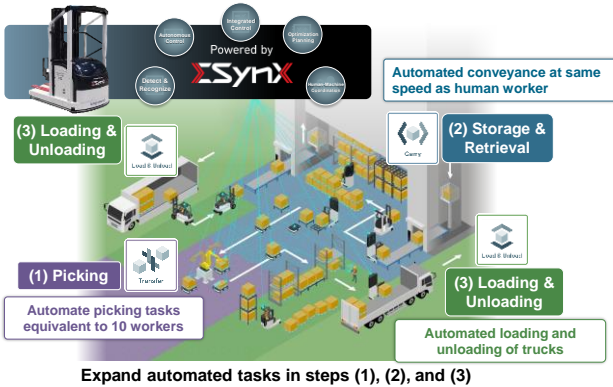
# 1 Intelligent Logistics



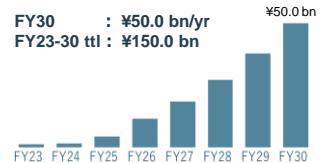
- Integrate  $\Sigma$ SynX into AGF and Warehouse Control Systems (WCS) to improve functionality including object detection and recognition, automated control, human-machine coordination, and integrated control
- Expanding automation to areas including storage/retrieval and loading/unloading zones, aiming to automate all of warehouse logistics
- Started joint validation of automated picking solution with Kirin Group in November 2022

Integrate  $\Sigma$ SynX into AGFs and WCS to drive warehouse logistics automation

Started joint validation with Kirin Group



MHI Revenue Targets




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I will explain intelligent logistics on this page.

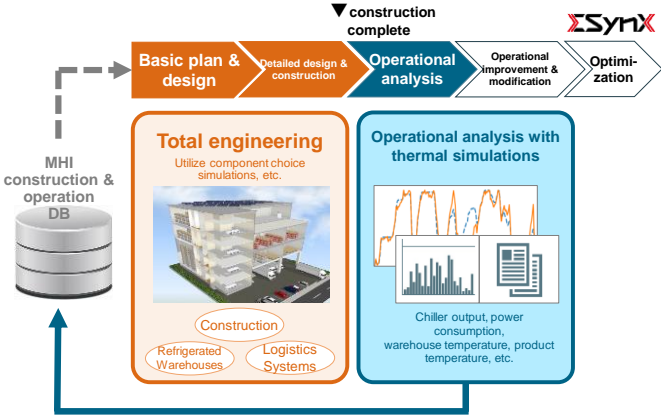
In one example of intelligent logistics, automated guided forklifts (AGF) and warehouse control systems (WCS) connected to  $\Sigma$ SynX will allow for the optimization of picking, shipping, and storage/retrieval, as shown in the image to the lower left.

This will enable the automation of warehouse logistics. Since November of last year, we have been conducting joint validation testing with Kirin Holdings at Yokohama Hardtech Hub. After this validation work has been completed, we plan to commercialize these products. Our revenue target for FY2030 is ¥50 billion.

**2 Refrigerated Warehouses** 

- Propose optimal facilities for new construction projects based on operational analysis using total engineering and thermal simulations
- Achieved ~1.5-month (10%) decrease in construction time of warehouse for Kyoto Salted and Dried Fish Wholesale Cooperative (completed Jan 2023)
- Improved cooling efficiency and reduced power usage through equipment and operational optimizations
- Grow business within Japan while keeping an eye on demand in international markets (Southeast Asia)


▼ construction complete




MHI construction & operation DB

**Total engineering**  
Utilize component choice simulations, etc.

**Operational analysis with thermal simulations**  
Chiller output, power consumption, warehouse temperature, product temperature, etc.



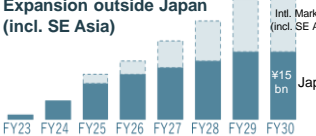
Completed warehouse for Kyoto Salted and Dried Fish Wholesale Cooperative



construction    chillers    logistics systems

**MHI Revenue Targets**

FY30 : ¥15.0 bn/yr  
FY23-30 ttl: ¥75.0 bn  
Expansion outside Japan (incl. SE Asia)



¥15 bn Japan

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On this page, I will explain refrigerated warehouses.

MHI Group will propose facilities that combine our engineering and thermal simulation technologies to achieve optimal equipment configurations, high efficiency, and reduced power consumption.

We have already delivered a refrigerated warehouse such as this to the Kyoto Salted and Dried Fish Wholesale Cooperative, shortening the construction period by 1.5 months and significantly reducing power consumption.

By accumulating such simulation technologies, we believe we can propose even more optimal solutions for future projects.

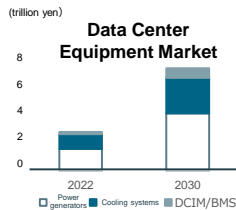
Going forward, we would like to expand our business to include addressing cold chain needs in Southeast Asia and other regions.

### 3 Data Centers

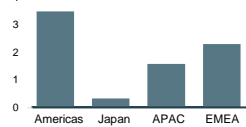


- Energy conservation, decarbonization, and stable operation are challenges for data centers
- MHI offers high-reliability, high-efficiency power supplies, cooling and monitoring systems, and integrated controls in one stop

#### The expanding data center market



#### Market Size by Region (2030)



Source: MHI estimates based on Arizton "Data Center Construction Market Global Outlook & Forecast" and others

#### Value offered in one stop

##### Reduce power use, decarbonize

##### Zero-carbon power sources (small-large)

- Hydrogen power generation systems (under development)
- Renewable power sources + BESS
- UPS (planning integration)

##### Advanced cooling systems

- Chillers
- Immersion cooling (under development)
- Chip cooling (under development)

##### Reduce maintenance costs, stabilize operation

- Operation monitoring
- DCIM
- Stand-by power generators



#### Our goal

**High availability systems**  
Contribute to 99.999% availability rate

**High energy efficiency**  
PUE <1.1<sup>1</sup>  
(35% improvement vs. standard 1.7)

**Zero CO<sub>2</sub> emissions**

##### One-Stop Integrated solutions

Power supply + Cooling + Monitoring

2030 revenue target >¥100.0 bn

#### Validating next-generation cooling technologies

##### Achieve >90% cut in cooling power use<sup>2</sup>



<sup>1</sup> Index of data center power conservation (Power Usage Effectiveness) = data center facility total energy use ÷ IT component energy use  
<sup>2</sup> Joint validation with KDDI and NEC Networks & System Integration Corporation

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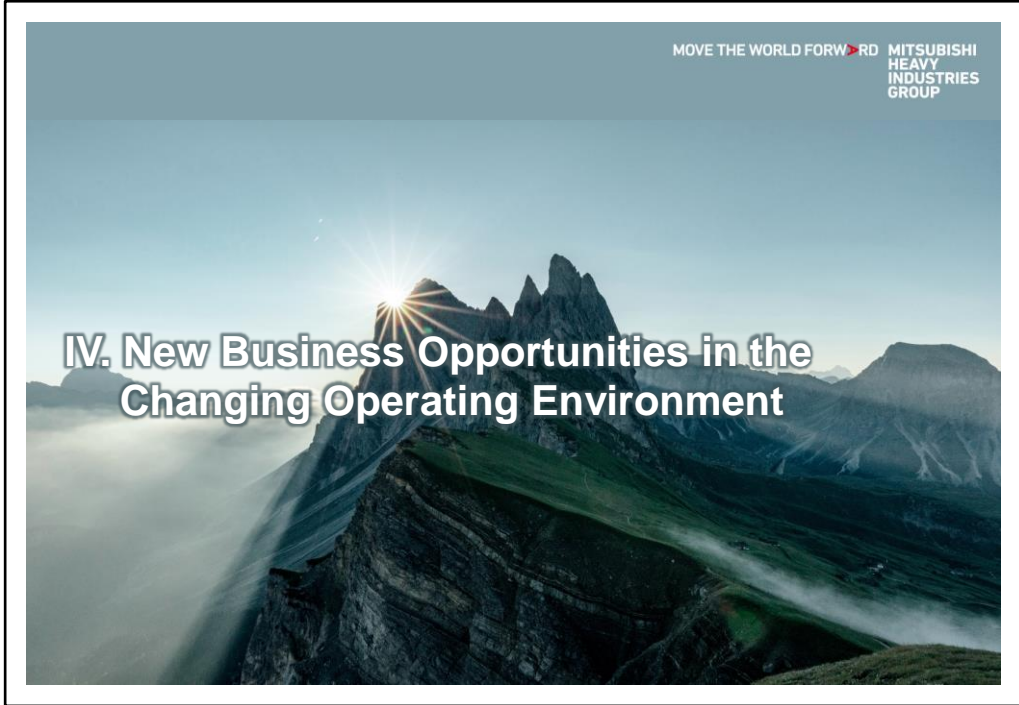
28

DCIM: Data Centre Infrastructure Management, BMS: Building Management System, BESS: Battery Energy Storage System

On this page, I will talk about data centers.

As data centers have become more densely packed and highly integrated, energy conservation has become a significant challenge. By proposing zero-carbon power sources and optimal cooling systems, we aim to provide one-stop solutions including energy-savings and integrated controls featuring the ability to monitor system conditions.

We are now in the process of conducting validation testing in this area, and as a result, we expect to significantly reduce cooling power consumption. Moving forward, we will work toward increasing orders, aiming to achieve approximately ¥100 billion by FY2030.

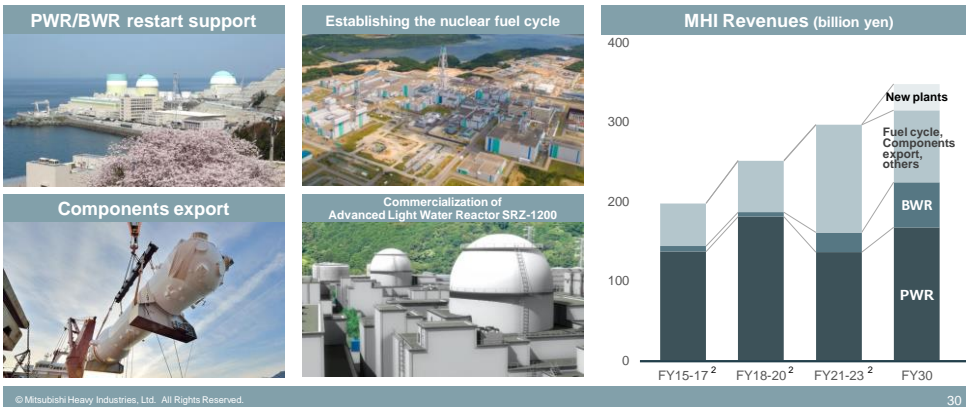


Over the next few pages, I will explain the new business opportunities we are seeing in Nuclear Power and Defense arising from changes in the operating environment.

## Nuclear Power's Contributions to Energy Security and Carbon Neutrality



- Nuclear power is a carbon free, large-scale, stable power source. Viewed through the lens of energy security, utilization of nuclear power will be essential to achieving Carbon Neutrality by 2050.
- Supporting restarts aiming to achieve safe and stable operation of existing plants. Providing regularly scheduled maintenance work for restarted plants and continuing efforts to establish the nuclear fuel cycle.
- Contribute to achieving stable, carbon-neutral energy supply by accelerating commercialization of Advanced Light Water Reactor SRZ-1200,<sup>1</sup> which will boast some of world's highest standards of safety



Nuclear power as a carbon-free, large-scale, and stable power source.

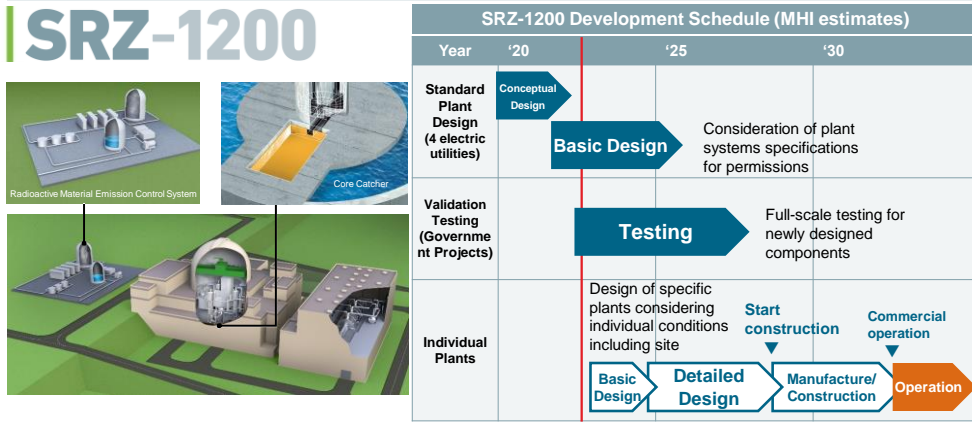
MHI Group is supporting plant restarts to achieve safe and stable operation of existing plants, providing maintenance work after restarts and continuing efforts to establish the nuclear fuel cycle.

Furthermore, we are working toward the early commercialization of the Advanced Light Water Reactor SRZ-1200, which will boast some of the world's highest standards of safety.

## Nuclear Power's Contributions to Energy Security and Carbon Neutrality



- Jointly developing advanced light water reactor with Japan's four PWR electric utilities.\* ~80% of basic design for standard plant SRZ-1200 complete.
- In order to acquire and improve data for permissions, executing full-scale tests through opportunities provided by governmental projects. Going forward, will complete basic and detailed design for individual plants, aiming for commercialization in mid-2030s.



\*Hokkaido Electric Power Company, Kansai Electric Power Company, Shikoku Electric Power Company, and Kyushu Electric Power Company

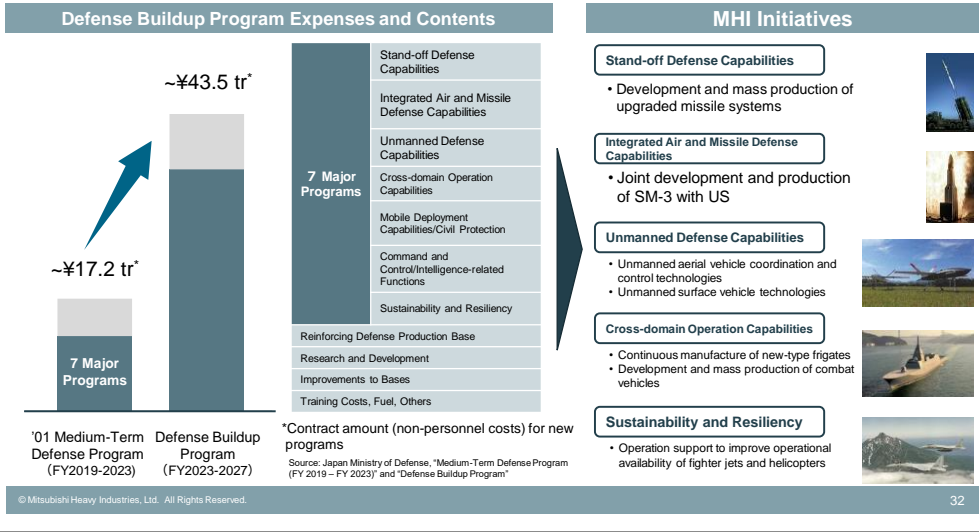
In collaboration with four Pressurized Water Reactor (PWR) electric utilities, we are working on the basic design of a standard SRZ-1200 plant, which is around 80% complete.

In the future, we plan to conduct tests using various data acquisition methods, including government-led projects, continuing development and design work with the goal of commercialization in the mid-2030s.

# Contributions to Japan's National Defense



- In response to growing momentum towards strengthening national defense, Japan's Defense Buildup Program has been expanded extensively
- As a leading company in defense, MHI is pursuing a wide variety of initiatives to support the safety and security of the nation



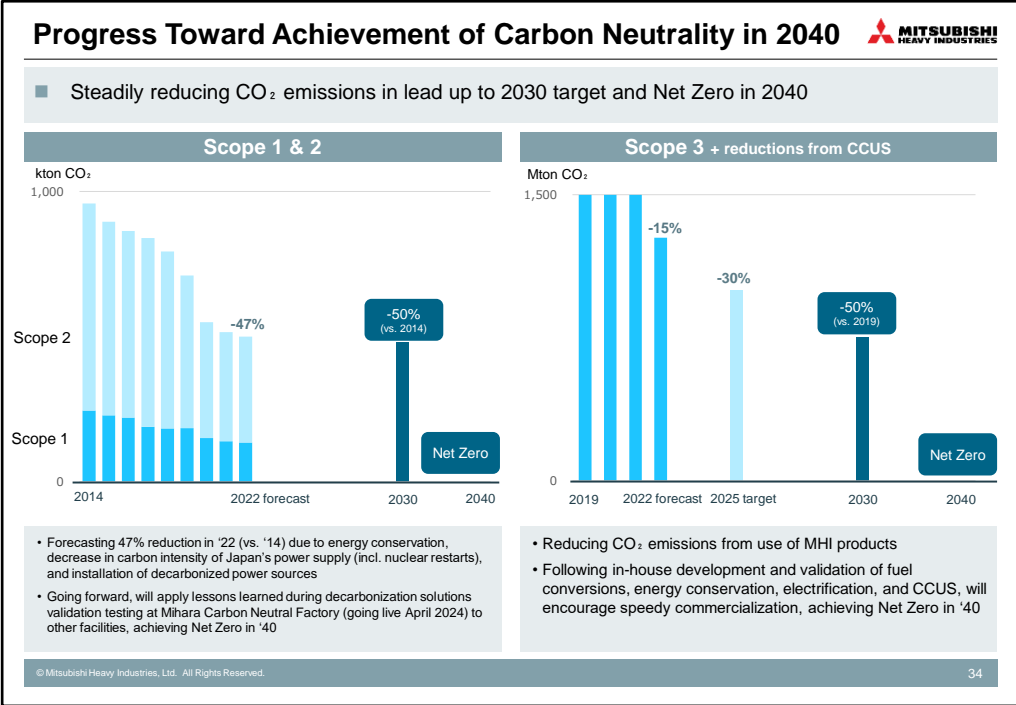
The Defense Buildup Program has been significantly expanded in order to enhance Japan's national security.

As a leading company in the defense sector, MHI Group will continue to undertake a wide range of initiatives to support the nation's safety and security.



## V. MISSION NET ZERO Initiatives

Next, I will explain our Carbon Neutrality initiatives.



MHI Group has been working on energy conservation for a long time, and we are mostly on track to achieve our goal to reduce Scopes 1 and 2 CO<sub>2</sub> emissions by 50% by FY2030.

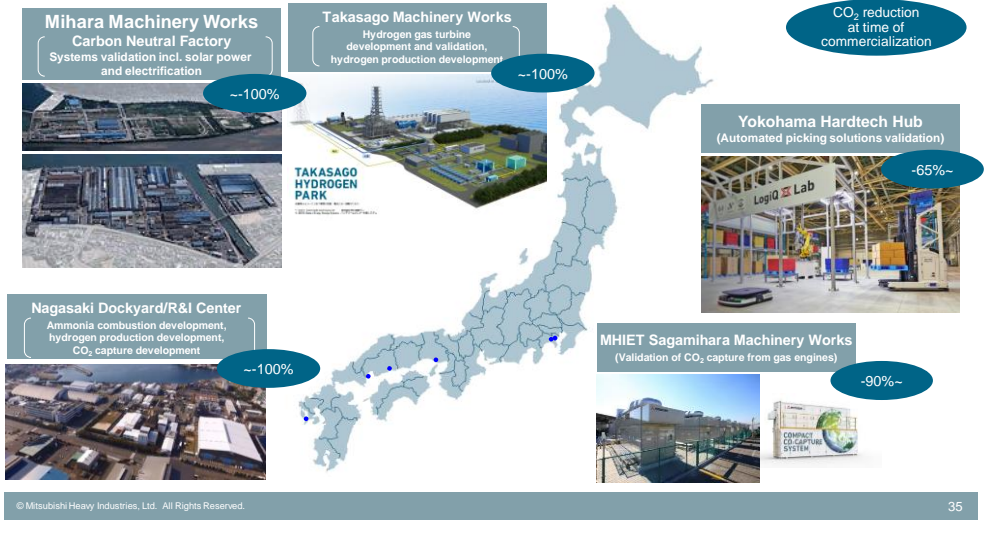
However, we cannot accomplish Net Zero with our pre-existing energy-saving measures alone, so we are planning to create a model Carbon Neutral Factory at Mihara Machinery Works to move forward our Carbon Neutrality initiatives.

Regarding Scope 3 emissions, we are aiming for a 30% reduction by 2025 as an intermediate goal, and 50% by FY2030, and a variety of development efforts are progressing smoothly.

## MISSION NET ZERO Initiatives



- Developing and validating variety of solutions in-house in lead up to MISSION NET ZERO achievement
- Leverage knowledge gained in this process to build actual business



In order to achieve Net Zero, we are exploring various ways to achieve decarbonization at our manufacturing facilities in Japan.

These include Mihara Carbon Neutral Factory at Mihara Machinery Works, Takasago Hydrogen Park at Takasago Machinery Works, validation of automated picking solutions at Yokohama Hardtech Hub, development of ammonia and hydrogen combustion technology at Nagasaki Shipyard and Machinery Works, and validation tests combining gas engines and CO<sub>2</sub> capture at Sagamihiro Machinery Works, as well as initiatives pursued in collaboration with external partners.



Finally, I will summarize today's presentation.

## Conclusion



- **During the 2021 Medium-Term Business Plan, MHI Group has moved forward with various initiatives while responding flexibly and quickly to changes in the operating environment, and we are now realizing the benefits of these efforts. In FY23, we will further expand on these accomplishments to achieve a 7% business profit margin.**
- **As we develop growth areas in both the energy supply and demand sides in the leadup to achievement of global Carbon Neutrality, new business opportunities are emerging with increased governmental support for decarbonization and greater momentum toward strengthening national security**
- **In order to seize these opportunities, we will continue reviewing our business portfolio and accelerate the shift of resources into growth areas, ensuring a strong future trajectory for the company**

The 2021 Medium-Term Business Plan is making progress mostly as planned.

Our growth strategy is also steadily advancing, with business opportunities increasing especially in the Energy Transition, which aims to achieve Carbon Neutrality.

This concludes my presentation.

## **VII. Appendix**

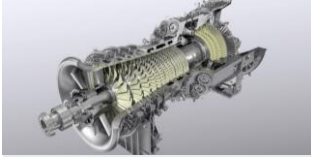
**(FY2022 highlights by business)**

## FY22 Highlights

## Energy Systems



### Achieved World's Top Market Share in Gas Turbines



- Achieved world's top market share in gas turbines in CY2022
- Total installed base of cutting-edge J-series surpassed 100 units

### Expansion of MHAEL Aero Engine Facility in Komaki, Aichi to Meet Increasing Demand



- Completed expansion work at aero engine maintenance shop
- Planning to double commercial engine MRO capacity from 5 units per month by 2026 and to eventually triple this in future

### Announced Joint Development on Advanced Light Water Reactor SRZ-1200 with 4 PWR Electric Utilities



- Jointly developing basic design for Advanced Light Water Reactor SRZ-1200 standard plant, which will achieve the world's highest standards of safety, with four PWR electric utilities\* in Japan
- \*Hokkaido Electric Power Company, Kansai Electric Power Company, Shikoku Electric Power Company, and Kyushu Electric Power Company

### Construction Finished on 5 Specialized Security Facilities, Expanding Support for BWRs



- Completed construction of Specialized Security Facilities at Mihama 3, Genkai 3 & 4 and Oi 3 & 4, which are required under new regulatory standards
- Leveraging track record in PWRs to extend support to BWRs

### World's Largest Hydrogen Mixed Firing Validation Test



- Successfully completed world's largest hydrogen fuel blending test with 20% mixed fuel at existing high-efficiency, large-frame GTCC facility in US

### Signed MOU for Electricity Generation with Clean Fuels



- Multiple MOUs signed for introduction of mixed combustion of hydrogen, ammonia, and biomass in thermal power plants in total of seven countries
- Supporting energy decarbonization to achieve Net Zero targets

## FY22 Highlights

## Plants & Infrastructure Systems



### ExxonMobil Alliance Expands CO<sub>2</sub> Capture Lineup



- Formed alliance with petrochemical major ExxonMobil. End-to-end solutions from CO<sub>2</sub> capture to storage now possible.
- Commercialized modular CO<sub>2</sub> capture system. Our wide lineup of products, including large-scale plants, is now being used in diverse industries.

### LNG-Fueled Ferry Completed



- First ferry in Japan to be equipped with high-performance dual fuel engine capable of using LNG and fuel oil was completed
- Reduces CO<sub>2</sub> emissions by more than 20% per calorific value compared to conventional fuel oil and SOx emissions to nearly zero

### Promoting Green Steel Including for Environmental Benefits



- Third MEROS (dry exhaust gas treatment system) delivered to an Italian steelworks began operation
- Seven systems total were ordered for the same steel plant, with construction of the remaining four underway
- The systems eliminate toxic substances from exhaust emissions and greatly improve air quality

### Contributing to Engineering Industry Development with Execution of International Projects



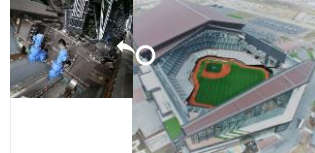
- Three overseas projects were awarded Engineering Commendation Awards by the Engineering Advancement Association of Japan
  - Uzbekistan Fertilizer Plant Project
  - Manila MRT-3 Rail Line Maintenance and System Rehabilitation Project
  - US Large-Scale Polyethylene Plant Construction Project

### Participating in Waste-to-Energy Projects via Public-Private Partnership Schemes



- Completed construction of one of the world's largest waste-to-energy facilities in Singapore. MHI Group is participating in waste-to-energy business via a public-private partnership scheme.
- Began 25-year operation and maintenance service period

### Delivered Large Retractable Roof Drive Mechanism (New Nippon Ham Fighters Stadium)



- 24 drivetrains open and close the ~10,000-ton roof
- System detects real-time changes in load due to effect of snow and automatically controls speed of drive mechanism
- Newly developed integrated management support tool helps user operate drive mechanism remotely



## FY22 Highlights

## Logistics, Thermal & Drive Systems



### Participated in Real-World Validation Test of Fuel Cell-Powered Forklift



- Participated in customer's validation test using a fuel cell-powered forklift. Achieved carbon-neutral cargo handling.

### Received Two Demand Side Management Awards (Chairman's Award and Promotion Award to Air-Cooled Heat Pump Chiller and ATEs, Respectively)

#### High-efficiency air-cooled heat pump chiller MSV2



#### Aquifer Thermal Energy Storage (ATES) system



- High-efficiency air-cooled heat pump chiller MSV2:
- Modular connection enables multiple units to be installed together and is compatible with various heat loads. Contributes to power load leveling.
- Aquifer Thermal Energy Storage system:
- Stores and uses underground heat, an untapped resource
  - Takes into account underground heat balance and achieves significant energy savings

### AI Human-Detection Alarm System



- Hemispherical cameras mounted on the mast and overhead guard detect people in various positions with AI, triggering warning lamps to prevent collisions

### Launched JHT-Y/YI, a New Series of Large-Capacity Centrifugal Chillers with Low-GWP Refrigerant (Jun 2022)



JHT-Y (constant-speed)  
JHT-YI (inverter-equipped)

- Uses HFO-1234yf refrigerant, which has extremely low environmental impact with GWP\* less than 1 and zero ozone depletion
  - A new type of compressor enables high performance in the entire capacity range which varies according to chiller output
- \*GWP: Global Warming Potential

### Development of Hydrogen and Ammonia Engines Contributing to Carbon Neutrality



- Working toward finalization of hydrogen mixed firing production model specs
- Validation testing of 100% hydrogen firing and ammonia mixed firing engines underway. Commercialize in a timely manner responding to infrastructure development status and customer needs.

### Developed Double Scroll Turbocharger for Low-Noise Vehicles



- Developed double scroll turbocharger with improved noise performance, which has been confirmed for use in a customer's next-generation vehicle
- Improved both fuel efficiency and output while maintaining aerodynamic performance and reducing noise levels by 13 dB compared to conventional products

## FY22 Highlights

## Aircraft, Defense & Space



### Delivered Frigate "Mogami"



- Held handover ceremony at Nagasaki Shipyard & Machinery Works for the 3,900-ton frigate "Mogami," built for the Japan Ministry of Defense
- This is the namesake of the Mogami class of frigate. Planning to continue delivery of this class of frigate in the future.

### H-IIA Launch Vehicle



- Successfully launched Intelligence Gathering Satellite(IGS)-Radar 7 with H-IIA launch vehicle No. 46.

### Japan, UK, and Italy Jointly Developing Next-Generation Fighter



- The Japanese government announced that the next-generation fighter will be jointly developed with the governments of UK and Italy
- MHI will continue to work diligently to develop the next-generation fighter and contribute to Japan's national security (Image courtesy of Japan Ministry of Defense)

### Naming and Launch of Patrol Vessel "Hateruma"



- Mitsubishi Heavy Industries Maritime Systems (MTS) held a naming and launch ceremony at its Tamano Shipyard for 1,000-ton patrol vessel "Hateruma," built for the Japan Coast Guard
- This is the second naming and launch ceremony for the new company MTS, which started operations in October 2021

### Naming and Launching Ceremonies for Submarine "Jingei"



- Kobe Shipyard held a naming and launch ceremony for 3,000-ton submarine "Jingei" built for the Japan Ministry of Defense
- Leveraging technological synergies in defense equipment spanning land, air, and sea, this advanced submarine boasts superior functionality as well as technical and cost performance

### Recycling Carbon Fiber Composite Waste into Home Appliances



- Reusing processed waste material from Boeing 787 composite aircraft wings into parts for Mitsubishi Electric cordless stick cleaners
- Contributing to mitigation of environmental impact and protection of global environment by being the first to build a supply chain that includes reuse of difficult-to-recycle carbon fiber waste material into a mass-manufactured product

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