MOVE THE WORLD FORWARD

MITSUBISHI HEAVY INDUSTRIES GROUP

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2-3, Marunouchi 3-chome, Chiyoda-ku, Tokyo, 100-8332, Japan
TEL: +81-3-6275-6200
Info_breeze@mhi.co.jp

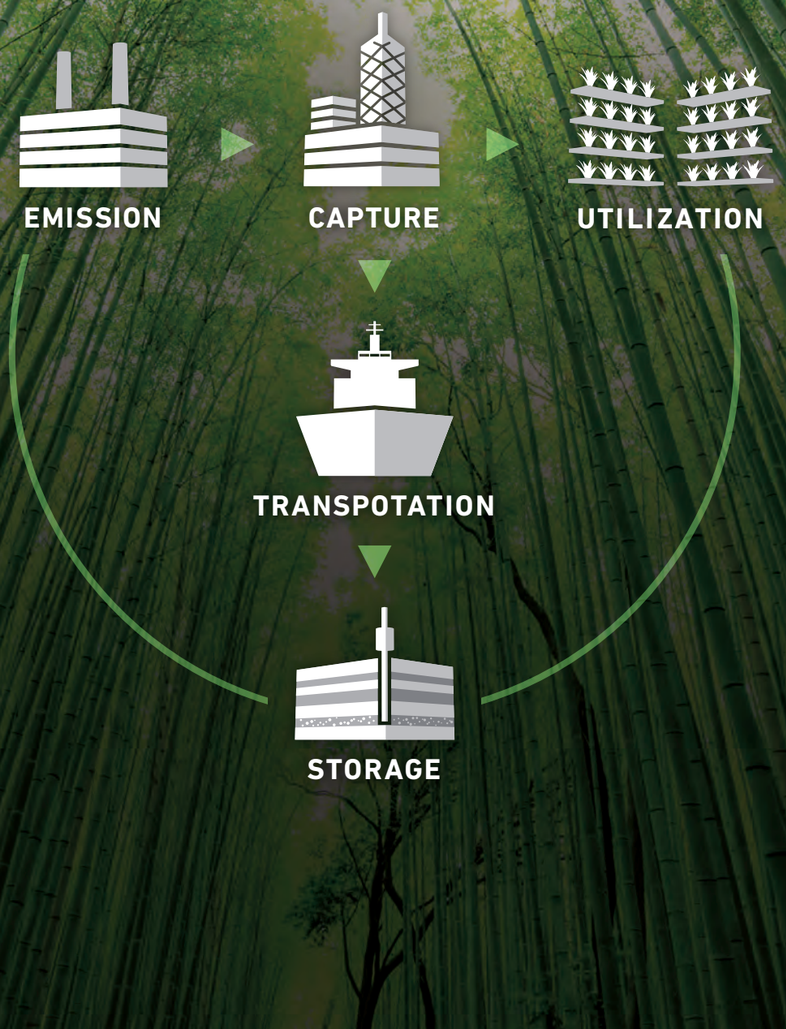
MITSUBISHI HEAVY INDUSTRIES ENGINEERING, LTD.
MITSUBISHI SHIPBUILDING CO., LTD.

MITSUBISHI HEAVY INDUSTRIES

Solving CO_2 for Good

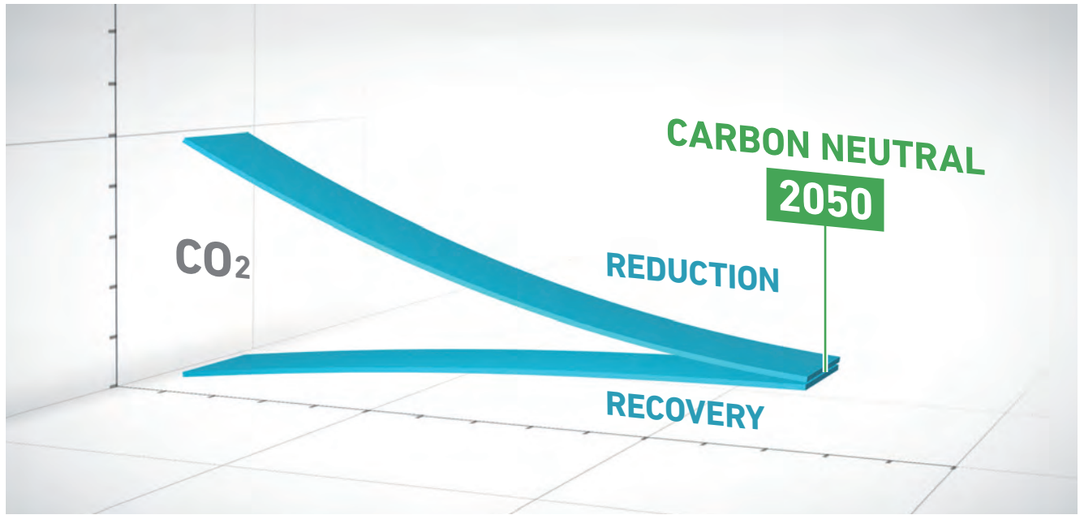
For all living things on Earth, we promote every viable solution for reducing anthropogenic and atmospheric CO_2, so that carbon neutrality can be achieved as early as possible in the 21st century.

This includes enhancing the recycling of CO_2 to transform it into a valuable commodity, and doing so in an environmentally-friendly manner.



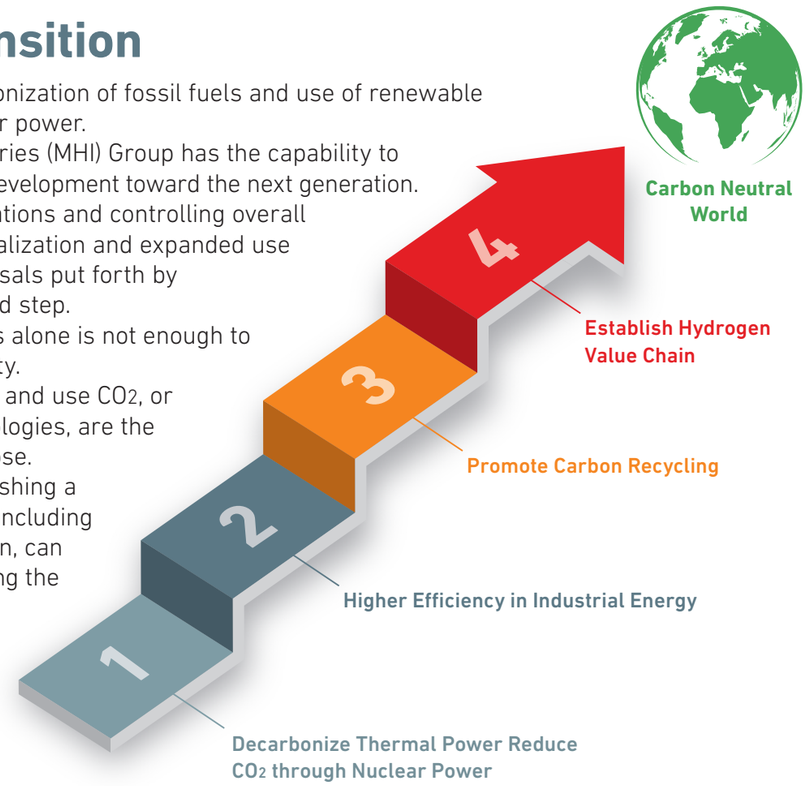
Moving Toward Global Decarbonization

With the adoption of the Paris Agreement at COP21, international leaders began to advocate carbon neutrality.
By 2050, annual worldwide CO_2 emissions must be reduced by more than 80% from the current 40 gigatonnes. This can be accomplished through energy conservation, improvements in energy efficiency, alternative energy sources, use of renewable energy, and CO_2 recovery.
This is an ambitious goal.



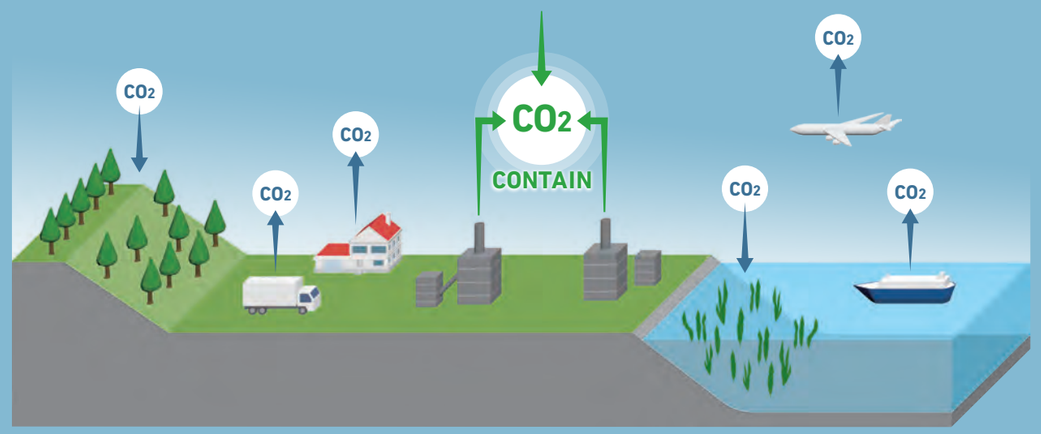
Energy Transition

The first step is decarbonization of fossil fuels and use of renewable energy including nuclear power.
Mitsubishi Heavy Industries (MHI) Group has the capability to advance technological development toward the next generation.
Optimizing facility operations and controlling overall emissions through digitalization and expanded use of AI is one of the proposals put forth by MHI Group as the second step.
Reducing CO_2 emissions alone is not enough to achieve carbon neutrality.
Technologies to recover and use CO_2, or carbon recycling technologies, are the third step that we propose.
In the long term, establishing a carbon neutral society, including the hydrogen value chain, can be the final key to opening the door to a new carbon neutral world.



CO_2NTAIN

MHI Group has proprietary post-combustion carbon capture technology. Our technology has two main advantages;
energy-cost efficiency, and a proven track record of successful projects undertaken with our industry partners. Carbon neutrality cannot be achieved by simply capturing CO_2 from its largest global source, which is conventional power generation. The cement industry, steel industry, and transportation sector also produce high amounts of CO_2 and are the next areas of challenge for reducing CO_2 emissions.
Shifting from point-source to open-source capturing of CO_2 also shows significant promise in reducing atmospheric CO_2, possibly providing a carbon negative solution.
MHI Group will strive to find solutions to the containment of CO_2.



CO_2NNECT

Captured CO_2 must be used effectively for its carbon value, or returned to Earth in an environmentally friendly manner before safe sequestration.
The success of CCUS will depend on the network between CO_2 emitters, and the storage and use of CO_2.
Cost-competitive CO_2 infrastructure, distribution, and digitally connected platforms will be necessary.
MHI Group will provide solutions to these issues.

PERFORMANCE

Petra Nova CO_2 Capture Plant

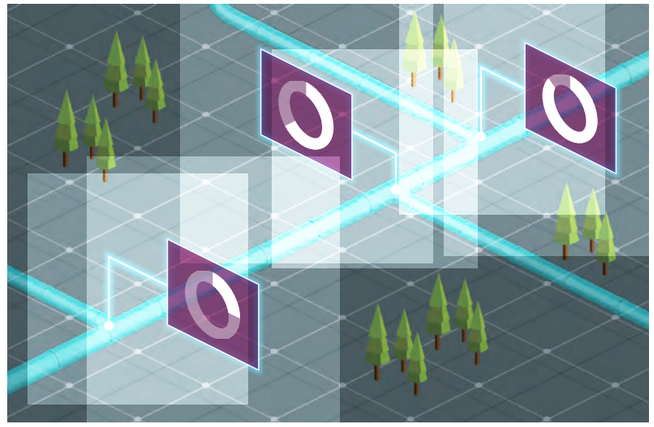
The world's largest CO_2 capture plant for coal-fired power plants provided by MHI Group.

Flue gas source:
240 MW slipstream from 650 MW coal-fired boiler
CO_2 capture capacity: 4,776 Mt/d (1.4 MMt/y)
Design CO_2 capture ratio: 90%
CO_2 use: CO_2 EOR

TECHNOLOGY

Connecting CO_2 from pier to pier

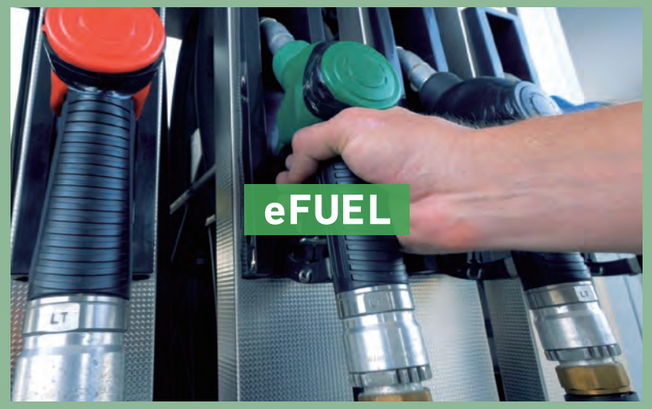
The most cost-effective transportation method is determined by various factors, such as the distance, volume, location and existing assets. Pipelines, trucks or even ships could offer solutions, but a seamless physical and digital CCUS value-chain stretching from pier to pier is the key.



LCO_2 carrier (CO_2L-BLUE)

MHI Group's LCO_2 carrier aims to transport liquefied CO_2 safety and economically.
The technology allows the transporting of large amounts of CO_2 over long distances at low cost.
The LCO_2 carrier reduces CO_2 emissions by connecting the world, and it will play a vital role in a decarbonized society.

In order to prevent the further increase of CO_2 emissions, it is important to promote its reuse and recycling. Converting CO_2 into various valuable commodities is a global challenge that has been attracting a lot of attention.
MHI Group will find solutions to the conversion of CO_2 by investing in and developing new technologies.



Converting CO_2 into other valuable materials means altering the duration of its sequestration within the carbon cycle. Mineralization, artificial protein synthesis, photosynthesis by plants, and absorption by marine organisms can lead to natural and almost permanent sequestration of CO_2. Making concrete, resin, or plastic can sequestrate CO_2 for a long, but limited time. The synthesis of primary energy, such as fuel, has a relatively short carbon cycle. We need to design a more thorough and sustainable carbon-cycling system.

TECHNOLOGY

Infinium, an Electrofuels Solution Provider

MHI Group has completed a capital investment in Infinium.
Infinium's proprietary technology enables the production of Electrofuels™, a clean fuel allowing organizations to meet carbon reduction goals faster while accelerating the transition away from fossil fuels. Converting carbon dioxide and renewable power into net-zero carbon fuels, Electrofuels™ can be used in today's air, maritime, and surface transportation fleets.

CO_2 INFINIUM™

EXECUTIVE COMMENTS

Hitoshi Kaguchi

Executive Vice President, CSO

One of the most serious social issues is climate change, which in turn is caused by greenhouse gases, and we have now reached the point where we must go beyond what corporations and countries can do alone and take action on a global scale. In aiming to solve this issue, we should address our values to contribute to the realization of a carbon neutral world, and energy transition is an initiative to help us get there.
MHI Group plays a role in supporting social infrastructure, and is responsible for tackling the issue of carbon neutrality. In addition, as the carbon neutral world becomes a shared goal in industries around the world, energy transition is expected to promote the enhancement of MHI Group's corporate value.

Makoto Susaki

Breeze Concept Lead, Growth Strategy Office (Mitsubishi Heavy Industries, Ltd.)
General Manager, Decarbonization Business Dept. (Mitsubishi Heavy Industries Engineering, Ltd.)

The Decarbonization Business Department will actively respond to shifting global trends and customer needs that are trending towards carbon neutrality. Technology to capture CO_2 from flue gas is the core value of our business.
To expand our capabilities, we will look at the entire CO_2 value chain.
MHI Group will make a sustained effort in areas such as reducing the cost of CO_2 capture, diversifying CO_2 emission sources, open-source CO_2 capture, establishing CO_2 transportation infrastructure, CO_2 storage and utilization.
Time is running out for humans to respond to anthropogenic global warming. MHI Group and Decarbonization Business Department will take the initiative in providing global solutions to CO_2 issues.

COMPREHENSIVE ORGANIZATION

Breeze CONCEPT

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- MITSUBISHI HEAVY INDUSTRIES ENVIRONMENTAL & CHEMICAL ENGINEERING CO., LTD.
- MITSUBISHI HEAVY INDUSTRIES COMPRESSOR CORPORATION
- PRIMETALS TECHNOLOGIES, LTD.