

FOR IMMEDIATE RELEASE

No. 3909

Customer Inquiries
GIST Project Team
Sustainability Business Development Division
Sustainability Innovation Group
Mitsubishi Electric Corporation

info.gist@rh.MitsubishiElectric.co.jp
www.MitsubishiElectric.com/

Media Inquiries

Public Relations Division

Mitsubishi Electric Corporation

prd.gnews@nk.MitsubishiElectric.co.jp
www.MitsubishiElectric.com/en/pr/

Mitsubishi Electric and Finland's VTT Establish Core Technology for Direct Ocean Capture

*System uses gas-capture method and will accelerate societal implementation
by integrating with existing infrastructure*



Lab-scale pilot facility for DOC

TOKYO, June 9, 2026 – [Mitsubishi Electric Corporation](https://www.mitsubishi-electric.com) (TOKYO: 6503) today announced that it has completed the core development of a direct ocean capture (DOC) system that removes CO₂ via seawater, working in collaboration with VTT Technical Research Centre of Finland Ltd., headquartered in Espoo, Finland and headed by CEO Kalle Härkki. Supported by verified system performance and accumulated experimental data, Mitsubishi Electric and VTT are accelerating their efforts toward early deployment and are actively seeking partners to advance the technology's demonstration and commercialization.

Mitsubishi Electric places sustainability at the cornerstone of its management. The company is advancing comprehensive initiatives that extend beyond the boundaries of its existing business domains and organizational structures. These initiatives are aimed at creating synergistic value streams that drive growth while contributing to society and environmental stewardship ("Trade-On" activities). Within this framework, Mitsubishi Electric is pursuing the establishment of DOC as a key technology to support carbon neutrality and nature-positive¹ outcomes. DOC is one of the marine carbon dioxide removal (CDR) technologies that leverages the mechanism by which the ocean absorbs CO₂ due to differences in concentration between the atmosphere and ocean. By capturing

¹ Contributions by not only reducing environmental damage, but also enhancing biodiversity, improving ecosystem health, and supporting the sustainable use of natural resources.

dissolved inorganic carbon² from seawater and lowering CO₂ concentrations in seawater, DOC promotes the uptake of CO₂ from the atmosphere into the ocean, thereby ultimately removing CO₂ from the atmosphere. Since CO₂ concentrations in seawater are approximately 140 times higher than those in the atmosphere (per unit volume),³ DOC is expected as a highly efficient and scalable approach for carbon removal and recovery.

Mitsubishi Electric and VTT have adopted an acidification-based approach (acid-DOC) for the electrochemical DOC process. In this method, hydrogen ions are introduced into intake seawater to temporarily increase⁴ its acidity, allowing dissolved CO₂ in gaseous form for capture. Unlike basification approaches (base-DOC), which recover carbon as solid mineral carbonates, acid-DOC enables not only carbon dioxide capture and storage (CCS) but also supports carbon dioxide capture and utilization (CCU) applications, including synthetic fuels and industrial feedstocks.

In parallel, Mitsubishi Electric and VTT are developing technologies to extract and recover valuable resources⁵ from seawater during the process of CO₂ recovery. By advancing the development of a value chain for the recovered resources, they aim to create additional value streams and strengthen the overall business profitability.

To accelerate deployment, the focus has been to develop system configurations that can be seamlessly integrated with existing large-scale seawater infrastructure, such as seawater desalination facilities and power plants. This integration strategy reduces capital expenditure while enabling scalable and efficient implementation.

Going forward, Mitsubishi Electric and VTT will validate technology in the field through a coastal demonstration system and expand the collaboration with new partner organizations to accelerate commercialization of the developed technologies.

DSc (Tech) Antti Arasto, Vice President of VTT and Project Leader of this collaboration, said, “This is exactly the type of long-term, high-impact challenge that can translate research into real-world breakthroughs. Through strong commitment and focused development efforts, we have achieved significant technological progress in a short time. Our collaboration with Mitsubishi Electric has now advanced DOC to a stage where further technology validation can be pursued, supporting future scale-up and field implementation activities.”

Seiji Oguro, Executive Officer, Vice President, Sustainability Innovation Group, Mitsubishi Electric, said, “This achievement represents a significant milestone toward the real-world deployment of a promising new solution. This success was made possible by our shared commitment with VTT to rapidly commercialize innovative technologies that can contribute to solving the climate crisis, and by the decisive pace that drove our collaboration. Moving forward, we will further strengthen our strategic partnership and welcome new collaboration partners to accelerate our commercialization initiatives. In doing so, we are committed to realizing ‘Trade-On (mutual benefit)’ business to address societal challenges and drive sustainable business growth.”

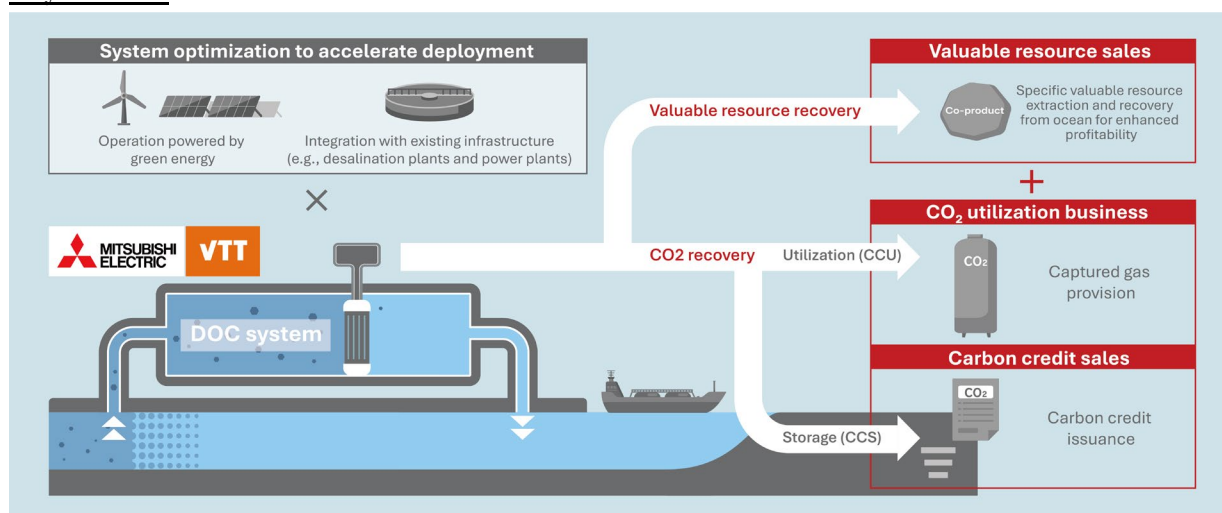
² Dissolved inorganic carbon (DIC) is the total amount of inorganic carbon species, such as dissolved CO₂, carbonic acid, bicarbonate ions, and carbonate ions, dissolved in water.

³ According to Mitsubishi Electric’s research.

⁴ After CO₂ capture, the water is neutralized and treated to ensure it has a low environmental impact before being returned to the ocean.

⁵ Substances that have economic value and can be traded or circulated as resources.

Key Features



Conceptual image of the DOC business model envisioned by Mitsubishi Electric and VTT

1) *Adopted a gas-capture method that facilitates both CCS and CCU*

- Among electrochemical DOC pathways, Mitsubishi Electric and VTT have adopted an acid-DOC approach that temporarily acidifies intake seawater, converting carbonate and bicarbonate ions into gaseous CO₂ for capture. Compared with base-DOC, which captures carbon as solid mineral carbonates, this method is expected to offer advantages for large-scale CCS and CCU.
- The focus was placed on CO₂ losses that occur during the purification process⁶ for removing impurities from the captured gaseous CO₂. By recovering leaked CO₂ and recirculating it within the DOC system, CO₂ loss can be suppressed.

2) *Recovery of valuable resources from seawater*

- In parallel with CO₂ capture, a method has been developed to selectively recover valuable dissolved resources from seawater as a co-product during the DOC process. Although seawater contains a wide range of dissolved substances, the approach establishes a foundational principle for targeted and selective extraction.
- During extraction, chemical additions to seawater are minimized to realize a low-environmental-impact approach. To commercialize recovered resources, applied development and the creation of value chains will strengthen overall business profitability.

3) *Integration-ready system architecture*

- To enable early contributions to carbon neutrality through DOC deployment, emphasis is being placed on integration with existing equipment from the foundational development stage, helping to reduce capital expenditure and accelerate adoption. Also, operational efficiency and modularization are being improved to enable the system to be readily incorporated into existing infrastructure with seawater-intake, such as plants for seawater desalination, power generation and chemicals.

⁶ Purity requirements for CO₂ storage and utilization are specified in various standards (e.g., ISO), so impurities must be removed from the captured CO₂.

About VTT Technical Research Centre of Finland Ltd.

VTT is a visionary research, development and innovation partner and one of the leading research organizations in Europe. VTT is owned by the Finnish state and has more than 2,300 professionals working to develop systemic and technological solutions that can bring about fundamental transformation. Through scientific and technological means, VTT turns large global challenges into sustainable growth for businesses and society.

###

About Mitsubishi Electric Corporation

Guided by its [corporate philosophy](#), Mitsubishi Electric Corporation (TOKYO: 6503) places sustainability at the core of its operations and values stakeholder trust—encompassing society, customers, shareholders and employees. In pursuing profitability, capital efficiency and growth, Mitsubishi Electric works closely alongside customers to develop value-added solutions that address today’s complex challenges while enhancing the company’s sustainable corporate value.

Founded in 1921, Mitsubishi Electric has over a century of experience in delivering reliable, high-quality products and solutions. With over 200 group companies and approximately 150,000 employees worldwide, the company is a recognized global leader in manufacturing, marketing and selling electrical and electronic equipment and systems across a broad range of sectors, including public utility systems, energy systems, defense and space systems, factory automation systems, automotive equipment, building systems, air conditioning systems & home products, digital innovations, and semiconductor & devices.

Mitsubishi Electric recorded consolidated revenue of 5,894.7 billion yen (U.S.\$ 36.8 billion*) in the fiscal year that ended on March 31, 2026. For more information, please visit www.MitsubishiElectric.com

*JPY 160=USD 1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2026