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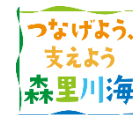
# CCUS in Japan

## - Overview of Policies and MOEJ's Projects -

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# Policies in Japan

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# Realizing a Carbon-neutral, Decarbonized Society by 2050

## ■ Policy Speech to the 203rd Session of the Diet on Oct 26<sup>th</sup>, 2020

*"We hereby declare that **by 2050 Japan will aim to reduce greenhouse gas emissions to net-zero**, that is, to realize a carbon-neutral, decarbonized society."*

## ■ Speech at the 42nd meeting of Global Warming Prevention Headquarters on Oct 30<sup>th</sup>, 2020

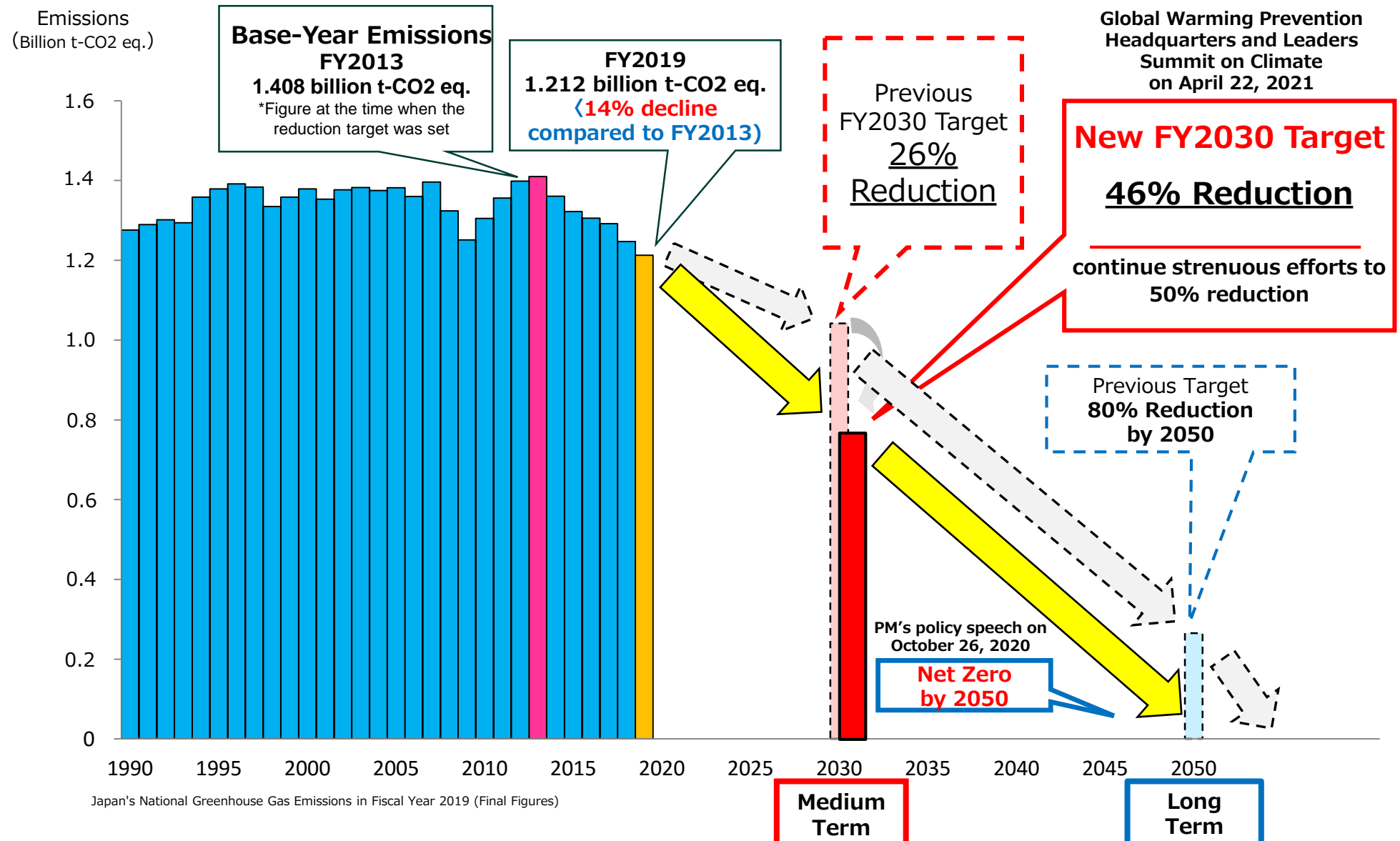
*"Japan is taking on the challenge of achieving carbon neutrality by 2050 as part of its new Growth Strategy. We will leverage our efforts in this regard into the development of industrial structure, the economy and society, creating a virtuous cycle between the economy and the environment."*



**Achieving carbon neutrality  
by 2050 as part of Growth  
Strategy**

# GHG emission and reduction target in Japan

Former PM Suga declared to reduce Japan's greenhouse gas emissions by 46 percent in FY2030 from FY2013 levels. (Apr 22, 2021)



## “Plan for Global Warming Countermeasures”(Oct. 2021)

- Reduce CO2 emissions from thermal power generation in line with the long-term goals of the Paris Agreement toward the realization of decarbonized society.
- Therefore, by promoting the fading out of inefficient coal-fired power generation, the dependence on thermal power generation will be reduced as much as possible on the premise of ensuring a stable supply.
- Pursue the maximum use of CCUS and power generation using hydrogen and ammonia.

## “6<sup>th</sup> Strategic Energy Plan”(Oct. 2021)

- As for CCUS, it is essential to overcome technical issues and reduce costs toward 2030.
- Promote the development of suitable sites, technology development, transportation demonstration, and business environment improvement necessary for considering introduction of commercialization of CCS by 2030.
- Work on consideration for the introduction of CCS Ready as soon as possible.

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# **CCUS Projects of the MOEJ**

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# Progress of CCUS technology development①

2016 to 2020

Establish of  
Technology

- Verification of operability and environmental impact of CO<sub>2</sub> capture facilities at a commercial-scale thermal power plant
- Investigation of marine transportation and storage technology
- Launch of CCU demonstration
- Survey of suitable storage sites with METI

2021 to 2025

Practical  
Development

- Aiming to establish the first commercial-scale CCU by 2023
- Establishment of an integrated demonstration facility and supply chain
- Feasibility study of CO<sub>2</sub> transportation and storage, including overseas, international cooperation, etc.

2026 to 2030

Implementation

- With the realization of the CCUS integrated demonstration, full-scale field testing will be implemented based on the results of operation and consideration of environmental improvement



Conceptual view of the field testing

# Environment-friendly CCS Demonstration Project (FY2016 to FY2020)

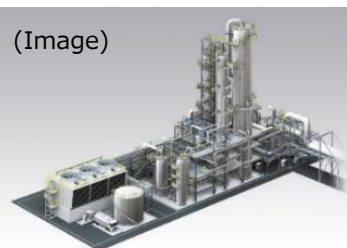


## Initiatives for Social Implementation of CCS

### Capture

Toshiba Energy Systems & Solutions Corporation  
Mizuho Research & Technologies, Ltd.

(Image)



Capture of **more than 600 tons of CO<sub>2</sub> per day**

**Verification of operability of a large-scale capture facility jointly with a thermal power plant.**

### Transportation

Uyeno Transtech Ltd.  
JGC HOLDINGS CORPORATION  
Chiyoda Corporation  
The University of Tokyo  
TAISEI CORPORATION

**\* Full-scale launch in FY 2018**

**Consideration of CO<sub>2</sub> transportation suitable for Japan**

### Storage (Monitoring, etc.)

Mitsubishi Materials Corporation  
TAISEI CORPORATION  
Central Research Institute of the Electric Power Industry  
INPEX CORPORATION  
Mitsubishi Corporation Exploration Co., Ltd.

JAPAN NUS Co., Ltd.  
The National Institute of Advanced Industrial Science and Technology  
The University of Tokyo  
DIA CONSULTANTS Co., Ltd.  
Kyushu University

**Consideration of storage plans at candidate sites found through research on suitable sites**

**Consideration of monitoring plans at candidate sites found through research on suitable sites.**

## Consideration of smooth introduction methods for CCS

QJ Science Co., Ltd.  
JAPAN NUS Co., Ltd.  
Mizuho Research & Technologies, Ltd.  
Kyushu University  
Taiheiyo Cement Corporation  
Japan Coal Frontier Organization

- Analyses and deliberations for the social implementation of CCS
- The cross-sectoral evaluation and verification of related technologies will be conducted by the investigative commissions, subcommittees and interviews by related parties, and international symposiums will be organized.



# Environment-friendly CCS Demonstration Project (FY2016 to FY2020)



## Demonstration of CO<sub>2</sub> capture

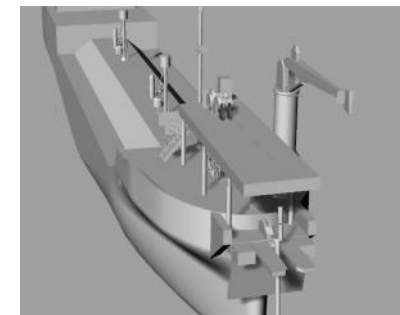
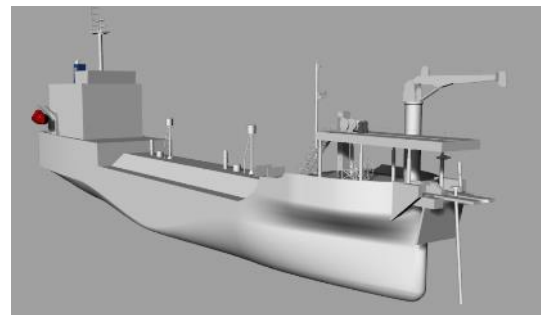


Demonstration plant for CO<sub>2</sub> capture  
Capture capacity: 600 tons per day  
Launch of operation: October 2020

Japan's first demonstration of commercial-scale capture technology

A project toward BECCS (Bio-energy CCS)

## Consideration of CO<sub>2</sub> transportation methods



In March 2021, approval in principle (AiP) for the concept design of a CO<sub>2</sub> transportation ship was obtained.

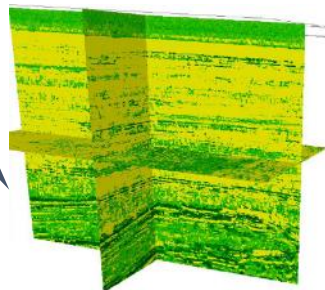
## ➤ Consideration of CO<sub>2</sub> storage

Entry of elastic wave probe data

Output of 3D maps by a machine learning model

Model learning

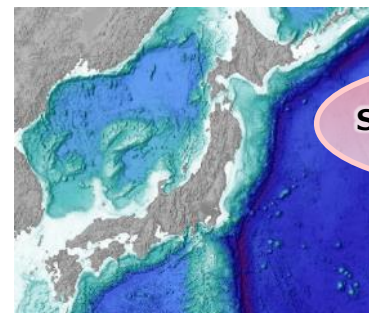
3D prediction



Consideration and demonstration of the CO<sub>2</sub> monitoring technology was implemented.

Development of reservoir evaluation technology using a machine learning model

## Research on suitable storage sites (in cooperation with METI)



Select CO<sub>2</sub> Storage Sites



Research on suitable storage sites in Japan by implementing 3D elastic wave probe, etc.

# Storage Sites and Cooperation toward the Development of Practical Application: Large-scale Demonstration and Technical Collaboration

## ■ Overseas storage sites

- CO<sub>2</sub> is transported from the CCUS bases and stored in the sea floor.

## ■ Saga, Saga Pref.

- Japan's first CCU project conducted at a waste incineration facility
- CO<sub>2</sub>-based businesses are being operated. (Cosmetics, agricultural products)



## ■ Omuta, Fukuoka Pref.

- World's first large-scale BECCS project (Realization of negative emissions)
- Demonstration of Japan's largest commercial-scale CO<sub>2</sub> capture technology



## ■ Tomakomai, Hokkaido

- Japan's first large-scale CCS demonstration. In November 2019, 300,000 tons cumulative CO<sub>2</sub> injection was achieved.



## ■ Maizuru, Kyoto Pref.

- Scale-up gas test of a solid absorbents moving layer system (CO<sub>2</sub> capture from coal-fired power plants)



## ■ Kuji, Iwate Pref.

- Ethanol production from CO<sub>2</sub> captured at a waste incineration facility



## ■ Odawara, Kanagawa Pref.

- Methane production from CO<sub>2</sub> captured at a waste incineration facility



## ■ Wyoming, USA

- Environmental assessment of energy-saving CO<sub>2</sub> capture technology



## ■ Osakikamijima, Hiroshima Pref.

- Demonstration project of CO<sub>2</sub> separation/recovery-type IGCC/IGFC
- Demonstration and research facility for carbon recycling



## ■ Akashi, Hyogo Pref.

- DAC (Direct Air Capture: CO<sub>2</sub> capture from the atmosphere) demonstration project (Realization of negative emissions)



# Progress of CCUS technology development②

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# Project of the Environment-friendly Integrated Demonstration Facility and Supply Chain (From FY2021)



## ① Capture

- Development of a CCUS integrated demonstration facility, environmental impact assessment according to operation patterns, and environmental assessment of energy-saving CO<sub>2</sub> capture technology employing activated amine absorbent will be conducted

### Long-term operation and environmental impact assessment of the CO<sub>2</sub> capture facility using liquid absorbents, and development of a demonstration base

- Establish a model and supply chains for the mass transport and effective use of captured CO<sub>2</sub>, by using the existing site in Omuta and the planned sites for the CCU
- Conduct a demonstration operation and **identify the necessary measures for the social implementation** of large-scale CO<sub>2</sub> capture technology; capture performance (volume and rate), stability, evaluation and verification of challenges and improvement measures



CO<sub>2</sub> capture demonstration plant  
(Operation started in October 2020)

### Demonstration of energy-saving CO<sub>2</sub> capture technology using solid sorbents

- A collaborative green growth project stated in “**The U.S.-Japan Climate Partnership on Ambition, Decarbonization, and Clean Energy**”
- Establish a facility that captures CO<sub>2</sub> from a thermal power plant, conduct a technical demonstration
- Conduct an environmental assessment
- Consideration for exporting and disseminating it as an established technology

# Project of the Environment-friendly Integrated Demonstration Facility and Supply Chain (From FY2021)



## ② Transportation and storage

■ CO2 transportation and storage in Japan and abroad will be considered, and supply chains for domestic transportation will be established.

- Construction of CO2 liquefaction storage facility planned in order to transport captured CO<sub>2</sub>
- Examination of CO2 transportation and storage methods in Japan and overseas, and verification and technical demonstrations of CO<sub>2</sub> transportation and storage
- Investigation of port equipment, ship equipment and storage method to send CO2 from ship to injection well
- Continue to study monitoring for leaks of stored CO2
- Continue to survey of suitable storage sites with METI



# Conclusion

- To realize a carbon-neutral society, we will work on mass introduction of renewable energy and thorough energy saving.
- However, there will be still remained or unavoidable CO2 emissions, CCUS is recognized as one of the important technologies.
- CCUS technology has not been established, and we are proceeding with verification and evaluation of further cost reduction, CO2 reduction effect, environmental impact assessment, etc. through demonstration of CCUS.
- We will continue to demonstrate CCUS and aim for full-scale implementation after 2030.

