

BECCS-Ready Thermal Power Generation

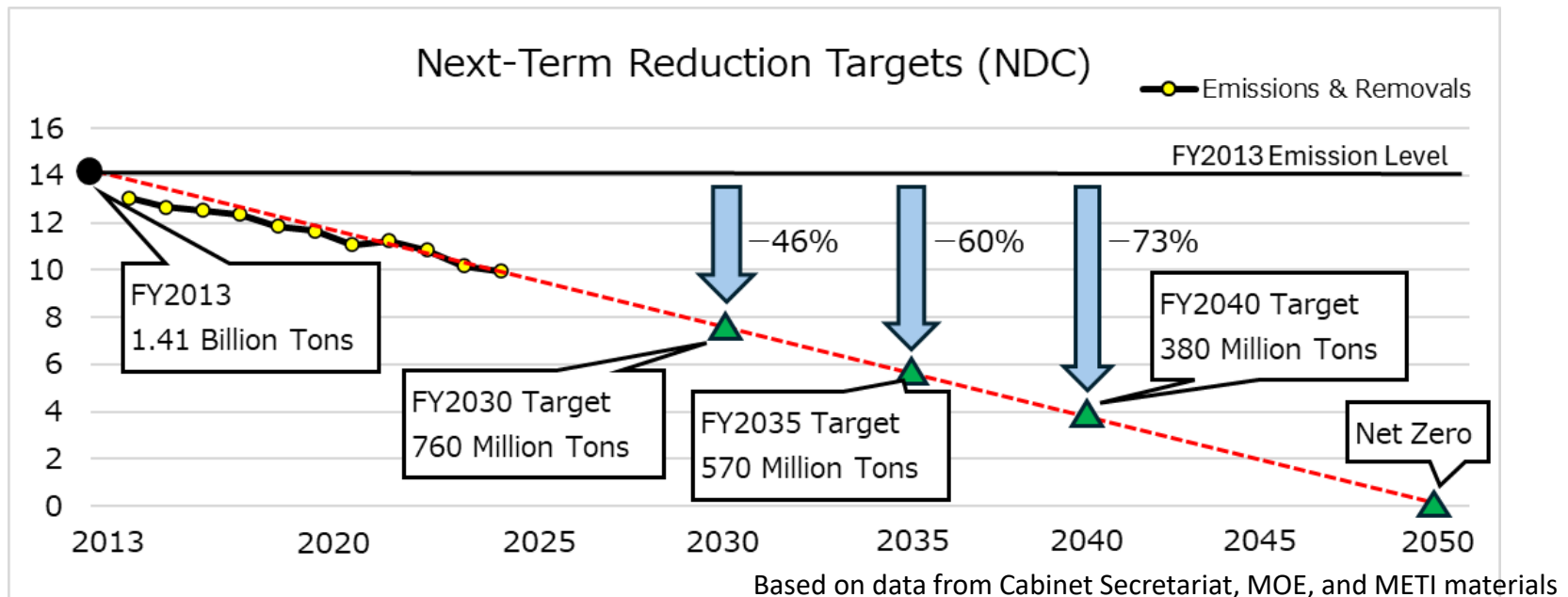
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The Chugoku Electric Power Co.,Inc

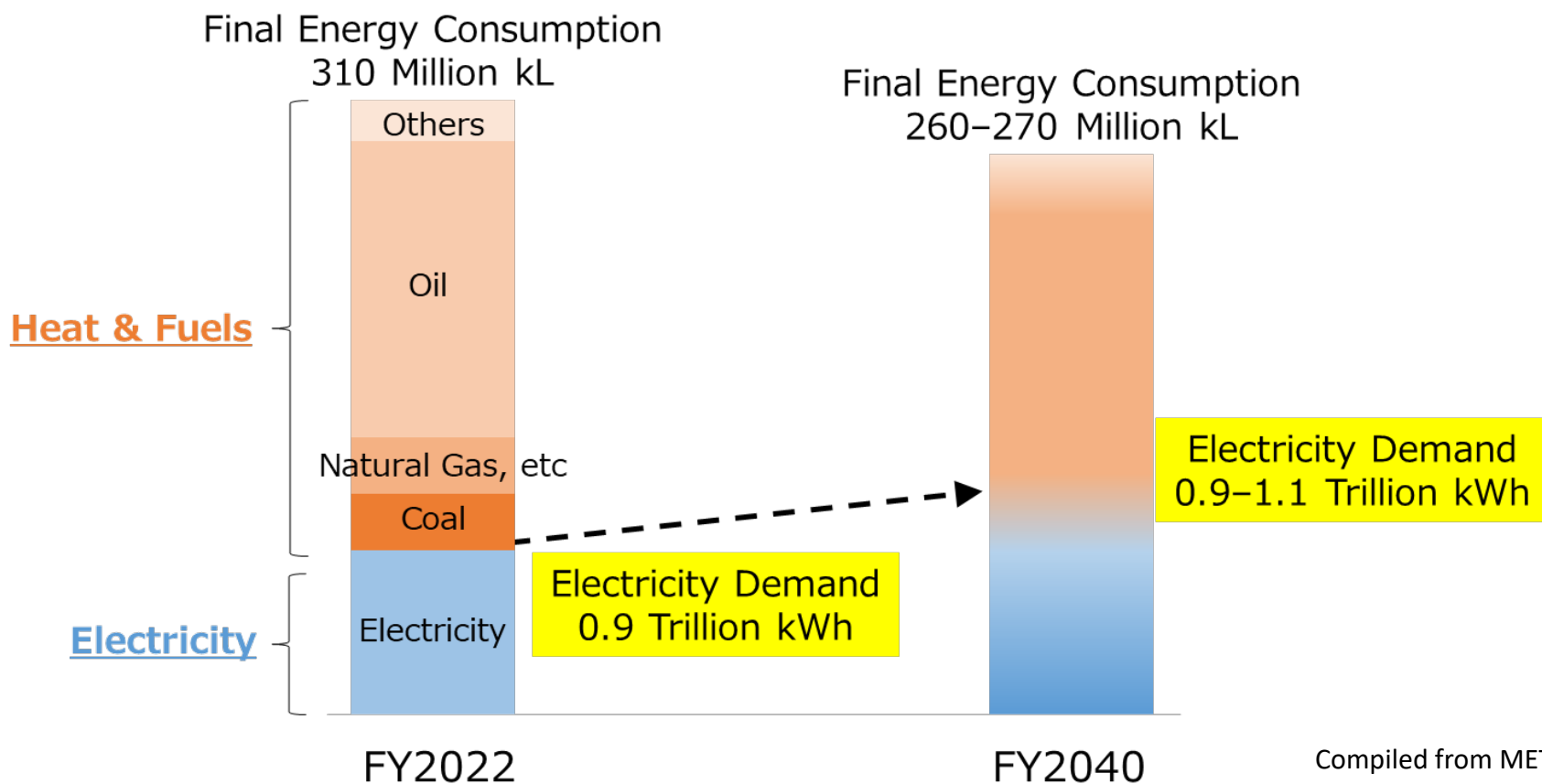
Japan's Initiatives toward Achieving Carbon Neutrality

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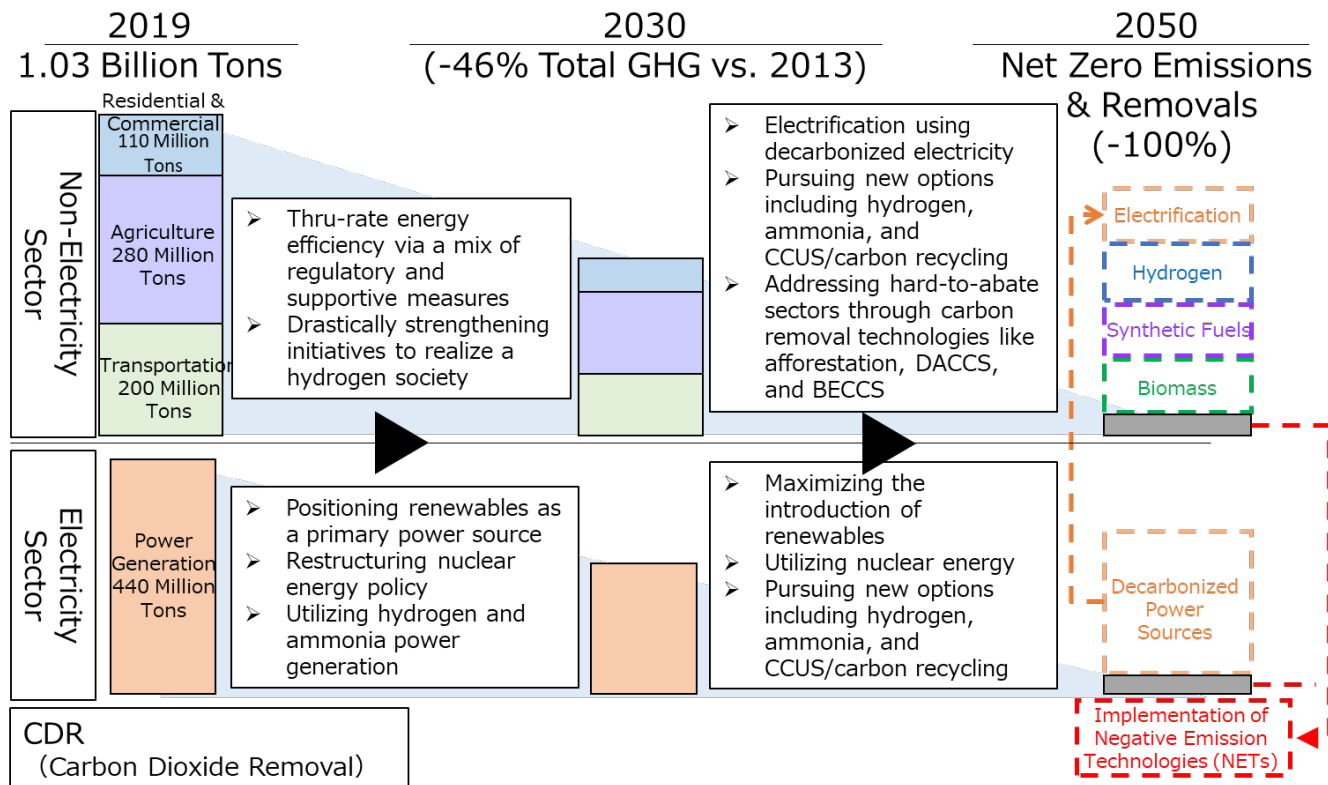
- In October 2020, Japan declared to achieve carbon neutrality by 2050.
- Chugoku Electric Power also declared in 2021.
- Ambitious next-term reduction targets aligned with the 1.5°C goal
 - FY2035:60% reduction (vs. FY2013)
 - FY2040:73% reduction (vs. FY2013)
- In order to achieve this goal, the Japanese government and private sectors accelerate GX (green transformation) investment such as;
 - Energy conservation, renewables, hydrogen, ammonia, bio-fuel, nuclear, CCUS



- The 7th Strategic Energy Plan (Formulated Feb 2025)
 - Expects rising electricity demand driven by DX and GX growth
- Key Actions for Future Demand
 - Develop decarbonized power sources.
 - Advance Negative Emission Technologies to ensure decarbonization.



- Current Decarbonization Efforts for Carbon Neutrality by 2050
 - Electrification via decarbonized power
 - Expanding renewable energy introduction
 - Implementing CCUS and carbon recycling
- The Role of Negative Emission Technologies (NETs)
 - Essential to offset residual CO₂ emissions from hard-to-abate sectors.

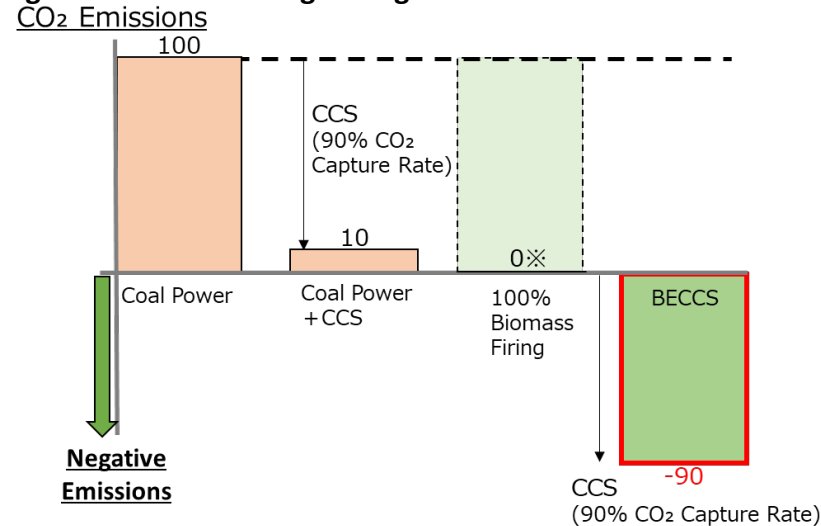


Negative Emissions Technologies

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- Negative Emission Technologies (NETs) contribute to carbon dioxide removal (CDR) by capturing and absorbing atmospheric CO₂ and storing or permanently sequestering it.

Negative Emissions Image using BECCS



*The CO₂ emitted was absorbed from the atmosphere during the growth process; therefore, net emissions are zero.

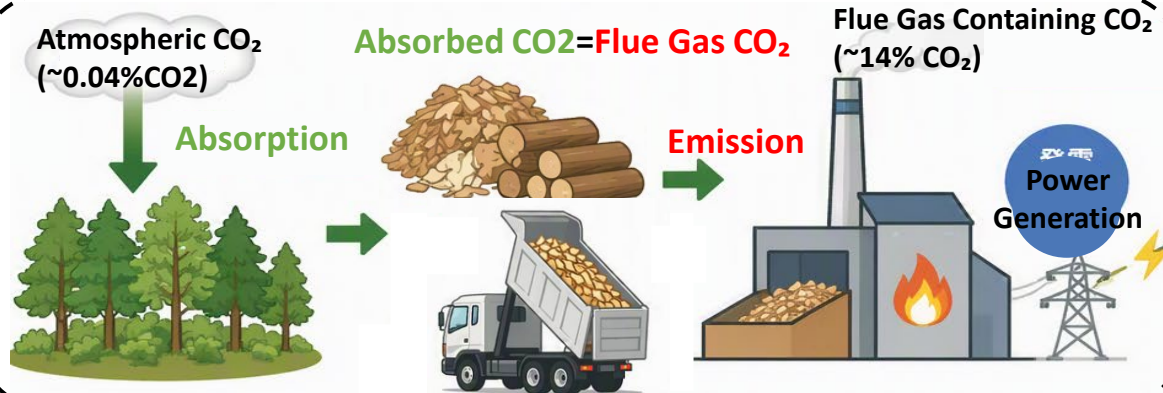
NETs(Examples)		Overview
Afforestation & Reforestation		Afforestation establishes new forests, while reforestation restores degraded or lost forests.
BECCS (Bioenergy with Carbon Capture and Storage)		Captures and stores CO₂ emitted from biomass combustion.
DACCS (Direct Air Capture with Carbon Storage)		Directly captures and stores atmospheric CO ₂ .
Blue Carbon	Ocean Fertilization	A technology that enhances biological productivity through ocean fertilization and ecosystem enhancement, increasing CO ₂ uptake and sequestration.

Source: Adapted from materials of METI's Study Group on the Creation of a Negative Emissions Market.

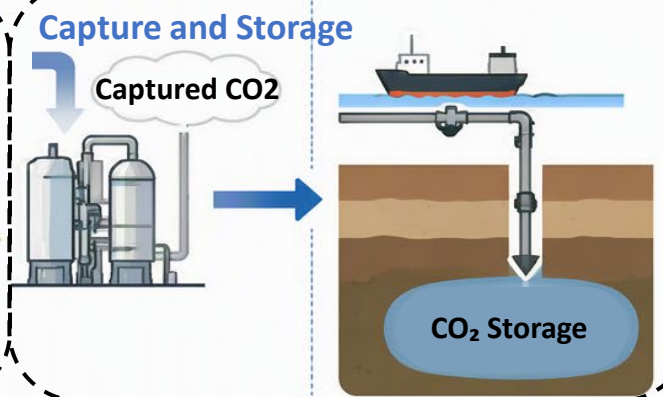
- BECCS achieves net negative emissions by capturing and storing CO₂ emitted from biomass that has absorbed atmospheric CO₂ during growth.
- BECCS combines biomass power generation with CCS and is close to commercial deployment.
- BECCS can provide lower-cost CO₂ removal due to its higher CO₂ capture concentration than DACCS.

$$\text{BECCS} \quad \text{Absorbed CO}_2 - \text{Flue Gas CO}_2 - \text{Captured and stored CO}_2 = -\text{CO}_2$$

Biomass power generation (Established technology)



+ CCS(Established technology)



● IEA Cost Estimates (Unit: ¥10,000/t-CO₂)

NETs	CO ₂ Removal Cost (2024)	Future Potential
BECCS	~1.2-4.8	~0.8-3.2
DACCS	~8.1-30.6	~3.2-9.7

Source: Prepared based on IEA data, "Current and Potential Removal Costs through DAC and BECCS."

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Chugoku Electric Power's Strategy toward Carbon Neutrality ⑥

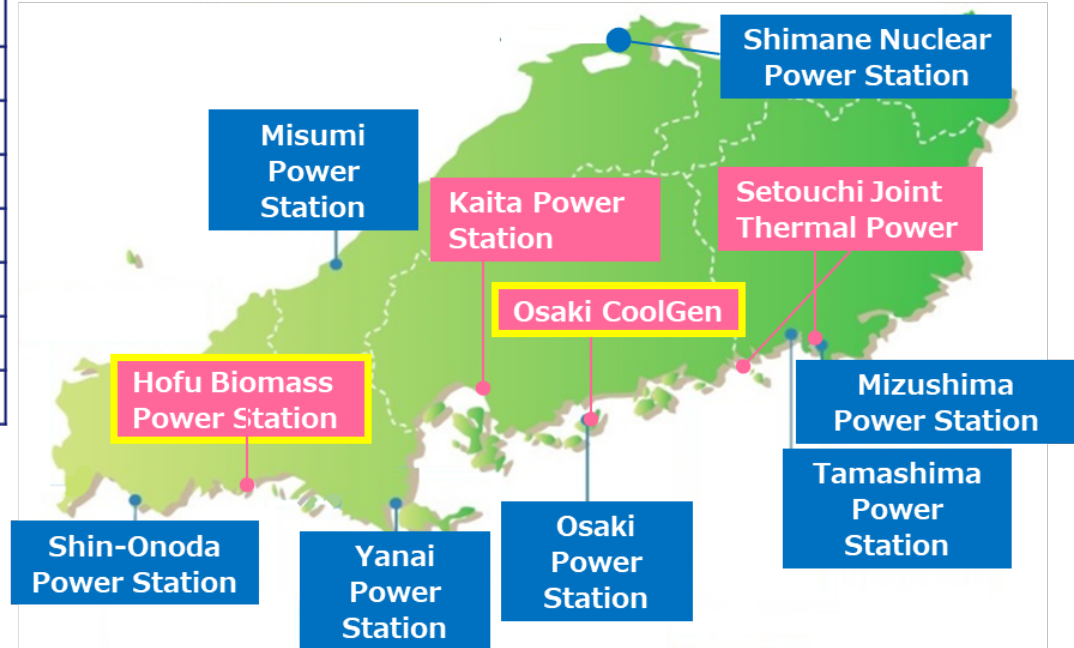
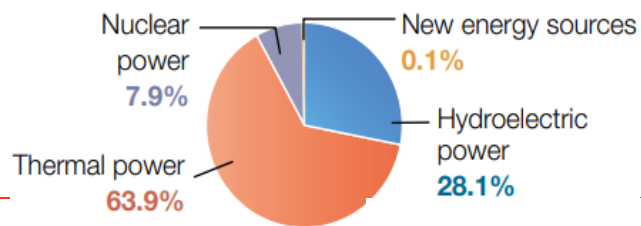
● Asset Footprint

➤ Operates 10 thermal power generation sites, including Group companies.

Thermal Power Stations	Unit	Max Output (MW)	Fuel	Group Companies (Thermal Power Stations)	Max Output (MW)	Fuel
Misumi	1	1000	Coal	Hofu Biomass Power Station	112	Woody Biomass, Coal
	2	1000	Coal	Kaita Power Station	112	Woody Biomass, Coal
Mizushima	1	285	LNG	Osaki CoolGen	166	Coal (Gasification)
	3	340	LNG	Setouchi Joint Thermal Power (Fukuyama, Kurashiki)	1456	By-product Gas, Heavy Oil, LNG
Tamashima	1	350	LNG & Oil			
	2	350	Oil			
	3	500	Oil			
Osaki	1※1	259	Coal			
Yanai	1	1539	LNG			
	2		LNG			
Shin-Onoda	1	500	Coal			
	2	500	Coal			

※1 Suspended since Dec 2011

FY 3/2025 Power generation facilities: 10,359 MW





写真提供: JCOAL

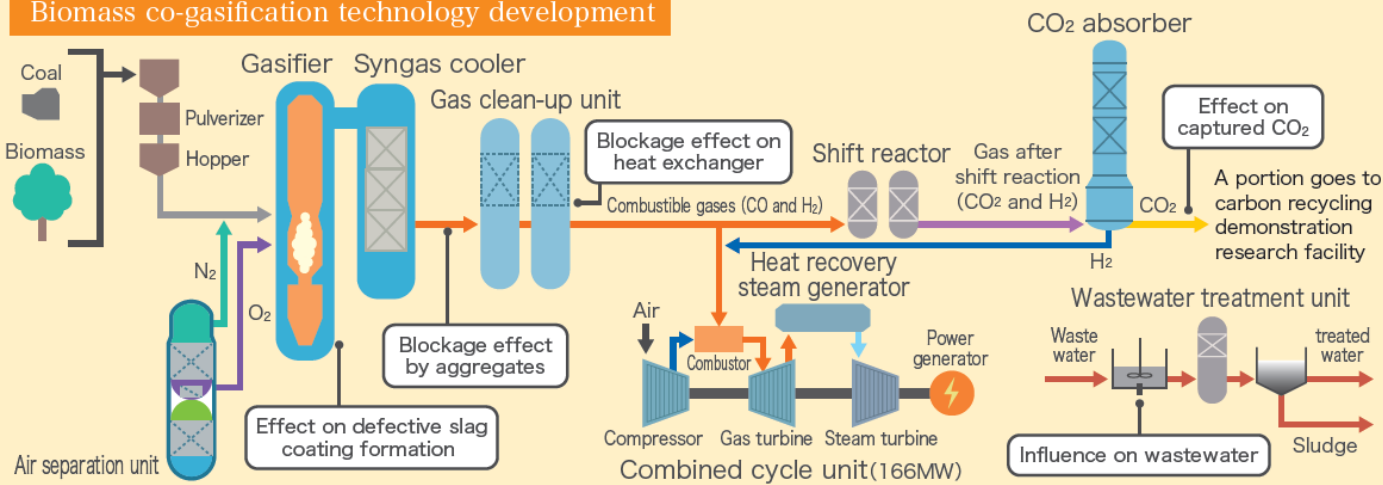
Energia

Our Initiatives (Osaki CoolGen)

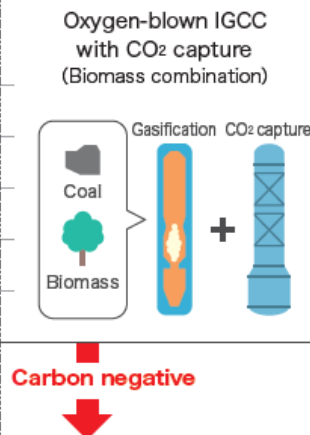
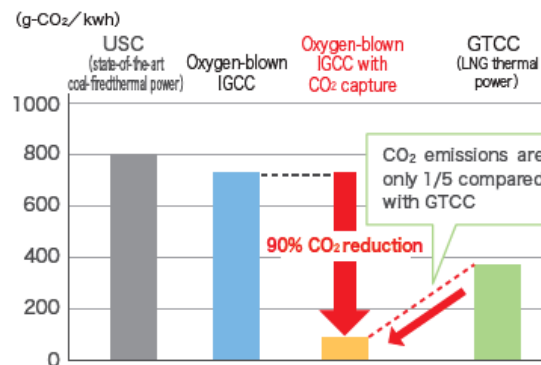
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- FY2023–2024: Co-gasified up to 50% biomass (by thermal ratio) at the world's first CO₂ capture-type IGCC.
- Gained a clear prospect for carbon neutrality and negative emissions.

Biomass co-gasification technology development



Biomass Fuel Used (Black Pellets)



Capture Technology	CO ₂ Capture Cost(JPY/t-CO ₂)
Chemical Absorption	4,200 JPY (Target)
Solid Adsorption	2,000s JPY range (Target)
Membrane Separation	Under 2,000s JPY range (Target)
Physical Absorption	2,000s JPY range (Achieved)

Source: METI "Technology Roadmap / Reference Materials for Next-Generation Thermal Power Generation" and GI Fund Targets

Created based on METI's [Thermal Power Generation Optimization]

Our Initiative (Energia Power Yamaguchi)

- The Hofu Biomass Power Station, operated by Energia Power Yamaguchi, our subsidiary, is a commercial thermal power plant that co-fires woody biomass and coal at an approximately 50:50 ratio.
- CCS feasibility study is currently underway as JOGMEC's Advanced CCS Project (FY2024-FY2025), continuing in FY2026.
- An 80% CO₂ capture rate could enable BECCS-based negative emissions and future CCU applications.
- Captured CO₂ will be transported to Malaysia for geological storage.

● Power Plant Overview

Emission Source	Energia Power Yamaguchi (EP Yamaguchi) Hofu Biomass Power Station
Location	Hofu City, Yamaguchi Prefecture
Capacity	112 MW
Fuel	Woody biomass (PKS, wood chips): ~55% Coal: ~45%
Operation Start	July 2019



● BECCS Feasibility Study and Implementation Plan

CO ₂ Capture Capacity	500,000 t-CO ₂ /year (equivalent to an 80% capture rate)
CO ₂ Capture Method	Chemical Absorption

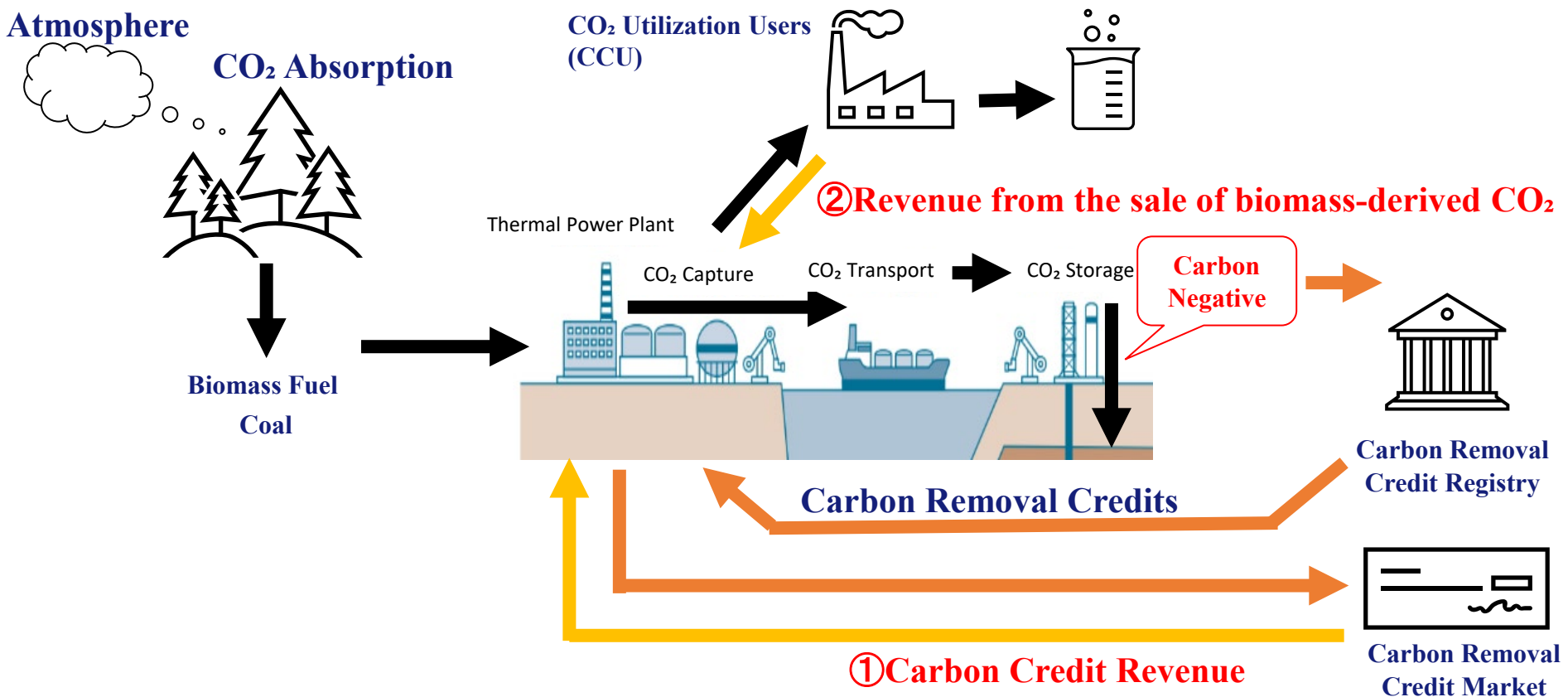


Potential Business Model

- ① Sale of carbon removal credits from carbon-negative emissions
- ② Sale of biomass-derived CO₂ for utilization

Key Challenges

- No established framework for valuing and trading carbon-negative emissions
- Uncertainty regarding carbon prices and project economics
- Expected growth in demand for CO₂ utilization



一日も。百年も。

for one day and for one hundred years

Thank you for your attention!