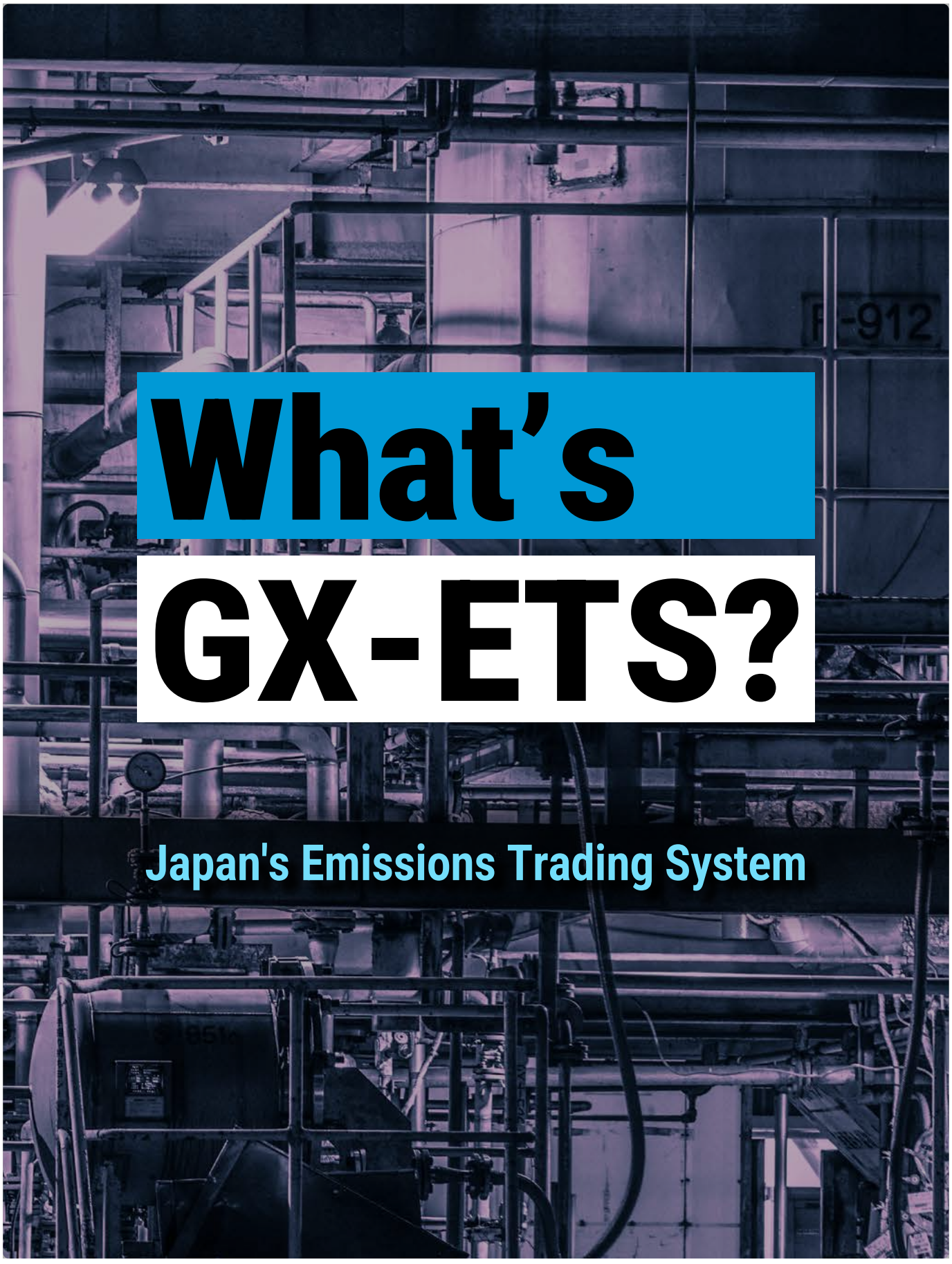
Climate Integrate



What's GX-ETS?

Japan's Emissions Trading System

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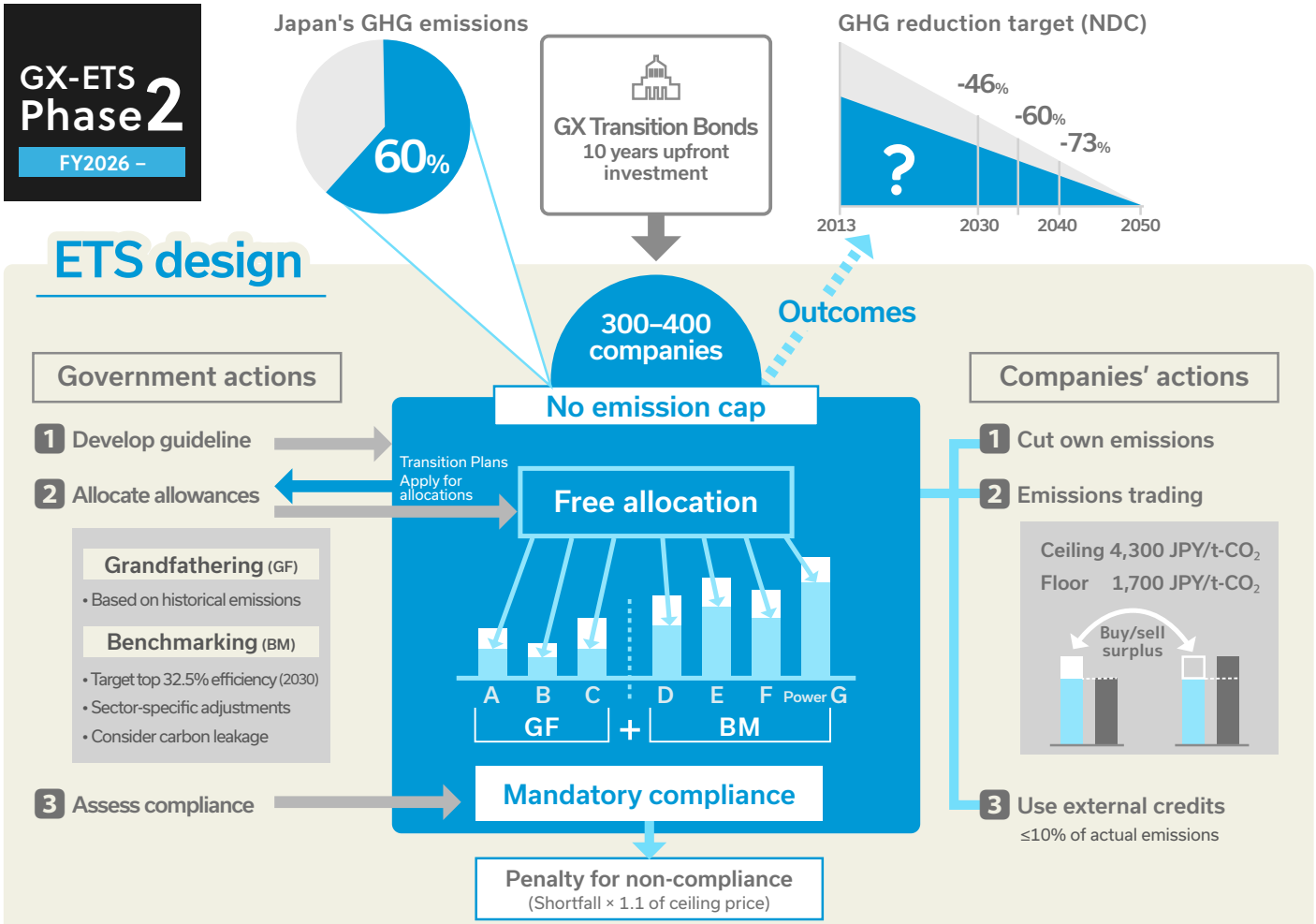
Appendix 1: Design and provisional evaluation of Phase 1 (in Japanese)

Appendix 2: Simulation of carbon pricing levels (in Japanese)

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Introduction

Carbon pricing has been implemented in 81 countries and regions as an important means to achieve carbon neutrality. In April 2026, Japan will launch an Emissions Trading System (ETS). This report outlines the framework of Japan's ETS (GX-ETS) and analyzes the outlook for carbon prices. Furthermore, it identifies key points to ensure that the GX-ETS effectively promotes carbon dioxide (CO_2) reductions and contributes to enhancing Japan's industrial competitiveness.



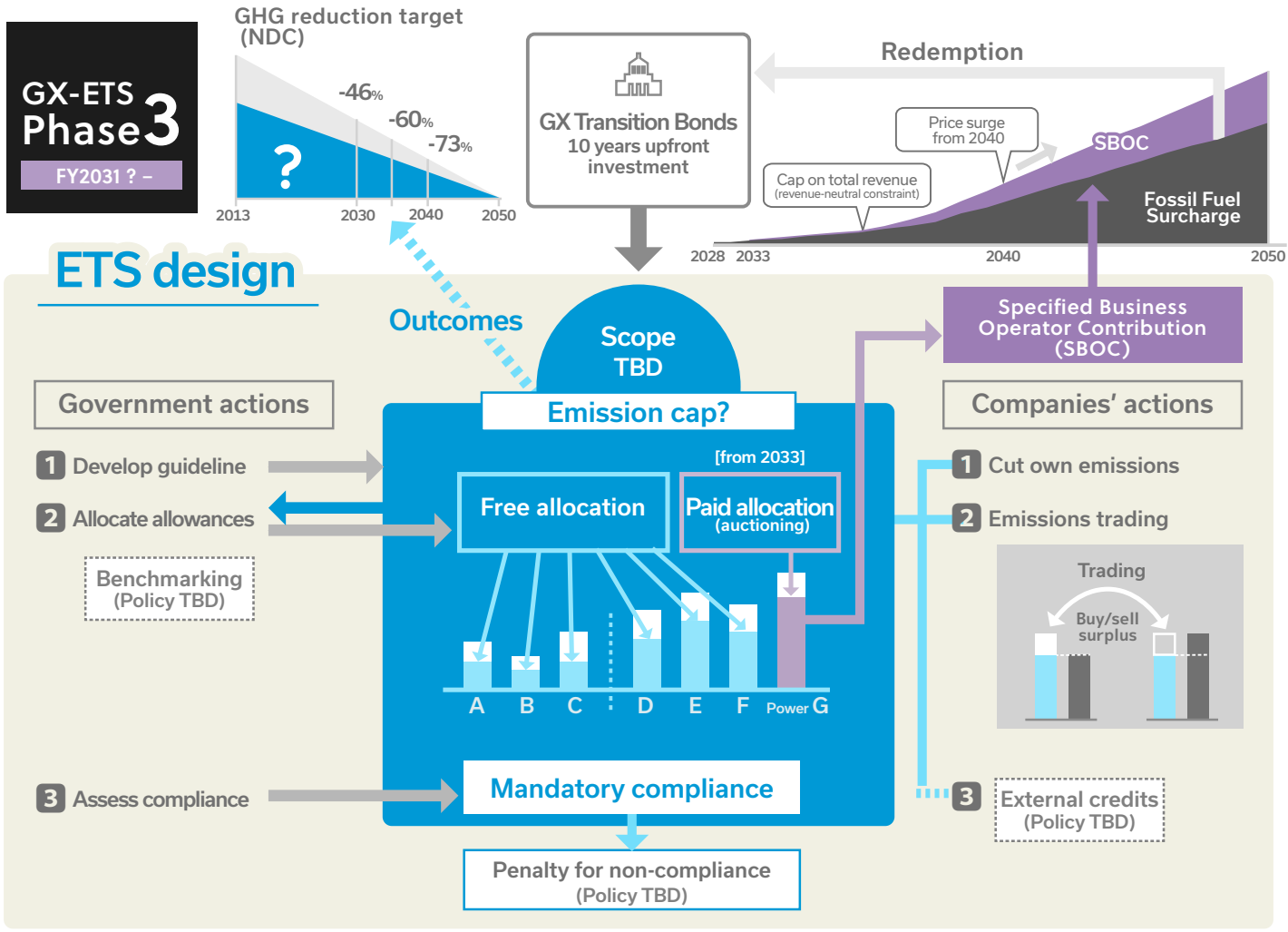
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Mechanism of the GX-ETS

- **Promoting reductions via allocation**: The government has established rules for corporate CO_2 reductions, which were previously voluntary.
- **Obligatory holding of allowances**: Target companies are under an obligation to hold emissions allowances, which will be lowered in stages, creating an incentive to systematically reduce emissions.
- **Trading in the market**: Companies can procure allowances if their emissions exceed their allocation or sell them if they achieve deeper reductions.

Characteristics of GX-ETS Phase 2 (FY2026 –)

- Mandatory participation, starting in 2026, following the voluntary Phase 1.
- Core policy for carbon neutrality, covering 60% of Japan's greenhouse gas (GHG) emissions.
- Targeting 300 to 400 companies in power and manufacturing sectors with direct CO_2 emissions of 100,000 tons or more.
- Bottom-up approach without an overall GX-ETS emissions target (emission cap). The degree of contribution toward achieving the national GHG reduction target (NDC) is unpredictable.
- Free emissions allocation, determined based on benchmark standards of top-tier efficiency.
- Sector-specific adjustments and considerations, which may limit reductions toward 2030.
- External credits (offsets) up to 10% of actual emissions can be used.



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Outlook for GX-ETS Phase 3 (FY2031? –)

- **Allowances for the power sector:** From 2033, emissions allowances for power generators will shift to paid allocation, imposing costs on CO_2 emissions. Other industries will continue to receive free allocation.
- **Funding for GX Bonds:** Revenue from paid allocation will be used to redeem the GX Economy Transition Bonds (GX Transition Bonds) issued by the government.
- **Redemption by 2050:** The GX Transition Bonds will be redeemed by 2050 through revenue from the Fossil Fuel Surcharge and the Specified Business Operator Contribution.
- **Upper limit constraints:** Annual collection amounts for the Surcharge and Contribution are constrained by an upper limit, to fall within the range of the reduction in revenue from the Petroleum and Coal Tax and the Renewable Energy Surcharge (FIT Surcharge).
- **Low carbon prices:** There is a possibility of an initial shortfall of funds for the redemption of GX Bonds until around 2035.

Key points for proper future operation

- Ensure high transparency to encourage proactive actions by companies.
- Incorporate a carbon budget perspective and ensure consistency with national reduction targets.
- Strengthen incentives to promote early reductions.
- Introduce carbon pricing that provides a sufficient price signal.
- Set carbon prices with the Carbon Border Adjustment Mechanism (CBAM) in mind.
- Design a system aimed at decarbonizing the power sector by 2040.
- Set an end year for Phase 2 and plan for a system review in 2028.
- Reconsider the “invest now, charge later” framework that defers the financial burden.
- Develop a mechanism that contributes to the decarbonization of society and benefits all stakeholders.

01 Background to the GX-ETS

1. History of deliberations

(1) History of ETS deliberations in Japan

In Japan, discussions regarding environmental taxes as a method of carbon pricing began in the 1990s. While an Emissions Trading System (ETS) (Box 1) was implemented on a trial basis in the 2000s, it did not lead to full-scale introduction. Even in 2009, when the then-Democratic Party of Japan administration proposed a three-pillar policy consisting of an ETS, a Tax for Climate Change Mitigation, and a Feed-in Tariff (FIT) for renewable energy, the introduction of the ETS was postponed.[1] In 2018, the Ministry of the Environment (MoE) and the Ministry of Economy, Trade and Industry (METI) proceeded with parallel deliberations. Ultimately, the introduction of an ETS was decided in 2023 as a policy for promoting a Green Transformation (GX), led by METI.

Currently, systems related to carbon pricing and credit systems operating in Japan include the Tax for Climate Change Mitigation, J-Credits, and the Joint Crediting Mechanism (JCM) (Box 2).



1 Ministerial Committee on Global Warming Issues "Three Major Measures for Global Warming Countermeasures" December 28, 2011 (in Japanese) (link broken, refer to Saitama Prefecture website)

Box 1. What is an emissions trading system (ETS)?

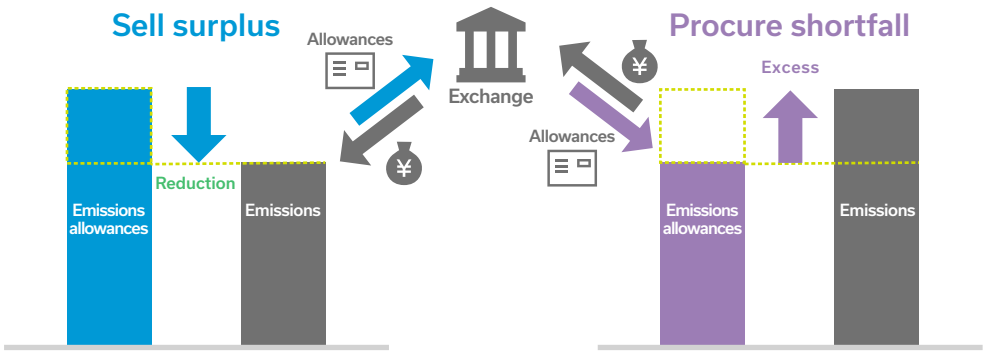
Carbon pricing, which includes carbon taxes and emissions trading systems, is an economic instrument for climate change mitigation that encourages reductions by putting a price on GHG emissions, such as CO_2.[2,3]

An ETS is a mechanism that encourages reductions by setting a cap on emissions from companies or facilities. It allows the trading of emissions allowances (emissions permits allocated by the government) between entities that exceed their limits and those that fall below them (Figure 1).[4] Generally, these systems target large-scale emitters with significant responsibility for reductions.

The method of setting an overall reduction target across an entire target sector (emission cap) and allocating it to participants is known as a "cap-and-trade" system. This is an effective way of reducing emissions below a certain level. The ETS implemented by the European Union (2005–), South Korea (2015–), Tokyo Metropolitan Government (2010–), and Saitama Prefecture (2011–) are all "cap-and-trade" systems. Other methods include "baseline-and-credit" systems, where credits are issued for reductions below a set baseline, or methods based on improvements in emissions intensity. The GX-ETS is a unique mechanism with no overall reduction target for the target sectors, and instead allocates emissions allowances using a bottom-up approach.

There are two methods to allocate emissions allowances: free allocation and paid allocation (auctioning). Many countries provide a higher proportion of free allocations during the early stages and gradually increase the ratio of paid allocations. Methods for free allocation include "grandfathering," which allocates based on historical emissions, and "benchmarking," which allocates based on intensity levels set for each industry.[5]

Figure 1. Emissions Trading System (ETS) Mechanism



Source: Prepared by Climate Integrate based on METI website

2 Ministry of the Environment "Summary of Study Group on Approaches to Carbon Pricing" March 2018 (p. 17-18) (in Japanese)

3 The International Carbon Action Partnership (ICAP) "ICAP Status Report 2025" 2025 (p. 21)

4 METI "What is an emissions trading system? A Q&A on the basics of a key decarbonization tool" December 27, 2024 (in Japanese)

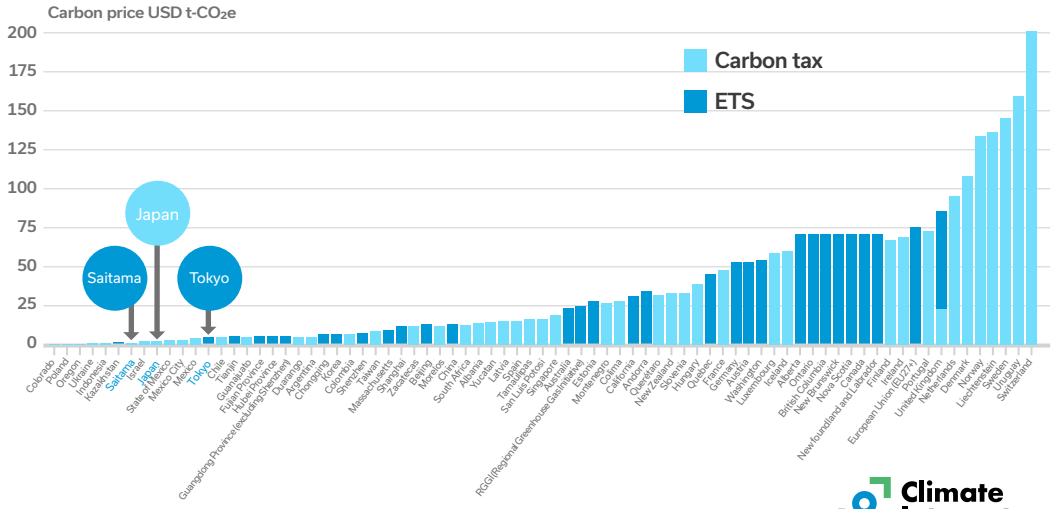
5 METI "Calculation method for allocation quantities using the benchmark method and the grandfathering method" August 7, 2025 (p. 5) (in Japanese)

Box 2. Existing related systems

• Tax for Climate Change Mitigation

Introduced in 2012, this tax is added as a so-called carbon tax on top of the Petroleum and Coal Tax, as a levy on fossil fuels in proportion to their CO_2 emissions.[6] The tax rate is 289 JPY/t-CO_2 and a portion of the tax revenue is allocated to climate mitigation. The level of carbon price is low compared to other countries (Figure 2).[7]

Figure 2. Prices and coverage across ETS and carbon taxes, as of April 1, 2025



Source: Prepared by Climate Integrate based on World Bank "State and Trends of Carbon Pricing 2025"

• J-Credit scheme

J-Credit certified by the government for domestic GHG emission reductions or removals. Can be used for initiatives such as Keidanren's (Japan Business Federation) Voluntary Action Plan and carbon offsetting.[8,9] As of May 2025, the total certified amount reached 14.21 Mt-CO_2, of which 7.13 Mt-CO_2 had been used. Average bid prices are on an upward trend.[10] The government sets a target of a cumulative 15 Mt-CO_2 in certified credits by 2030.

• Joint Crediting Mechanism (JCM)

It is a government-led framework that allocates reductions and removals achieved through technology transfer and other means to developing countries, based on the degree of contribution from both countries. Japan aims to acquire international reductions and removals of cumulatively 100 Mt-CO_2 by 2030 and 200 Mt-CO_2 by 2040, which will be counted toward achieving Japan's NDC.[11,12]

6 Ministry of the Environment website "Introduction of taxes for global warming countermeasures" (accessed Jan 1, 2026) (in Japanese)

7 World Bank "State and Trends of Carbon Pricing 2025" 2025 (p. 32-33)

8 The offset credit scheme (J-VER) established by the Ministry of the Environment in 2008 and the domestic credit scheme created by METI have been integrated.

9 J-Credit Scheme website "About the J-Credit Scheme" (accessed January 21, 2026) (in Japanese)

10 J-Credit Scheme secretariat "About the J-Credit Scheme (Documents page)" May 2025 (p. 13-16) (in Japanese)

11 METI website "Joint Crediting Mechanism (JCM)" (accessed January 21, 2026) (in Japanese)

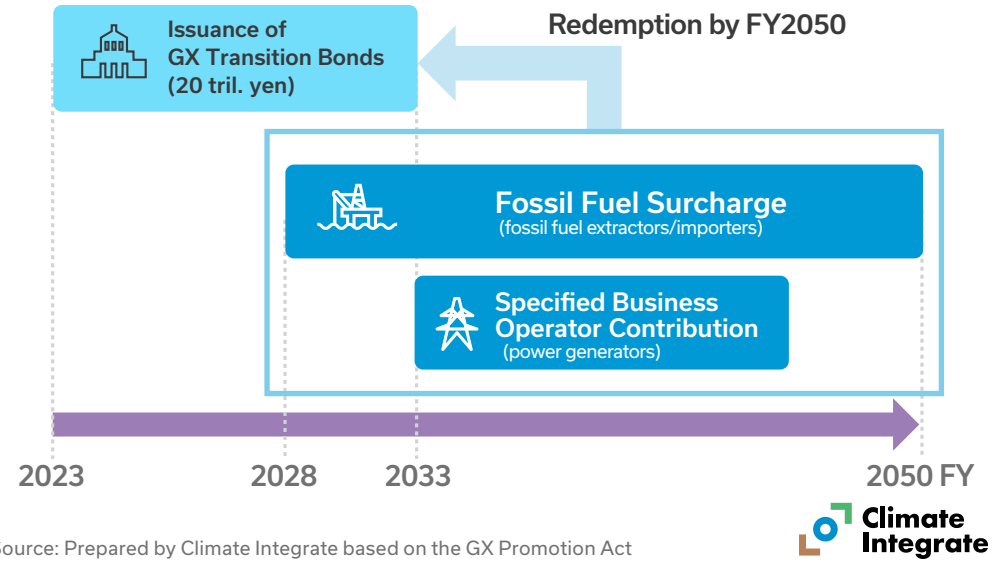
12 Global Warming Countermeasures Plan, Document 1 "Targets for each GHG and other category and benchmarks for sector-specific emissions of energy-related CO_2 in FY2030 and FY2040" February 18, 2025 (in Japanese)

2. Design process and establishment of the GX-ETS

(1) Background of the GX-ETS

In December 2020, the government stated in the Green Growth Strategy that it would "proactively engage in initiatives contributing to the growth strategy, including the introduction of new system".[13] In 2021, MoE and METI each published interim reports on carbon pricing.[14,15] Simultaneously, METI began inviting companies to participate in the GX League as a collective effort.[16,17] Following these developments, the government decided to mobilize over 150 trillion yen in public and private investment over the next ten years, including 20 trillion yen in upfront investment utilizing GX Transition Bonds and simultaneously decided to introduce the GX-ETS (Figure 3).[18,19]

Figure 3. GX Transition Bonds and carbon pricing revenue



Source: Prepared by Climate Integrate based on the GX Promotion Act

(2) Transition to a mandatory framework under the GX Promotion Act

In May 2023, the government enacted the Act on Promotion of a Smooth Transition to a Decarbonized Growth-Oriented Economic Structure (the GX Promotion Act), creating a legal framework for GX Transition Bonds, the Fossil Fuel Surcharge, and the ETS.[20] The Act was amended in May 2025 to stipulate the pricing for the Fossil Fuel Surcharge, as well as the allocation and obligations for emissions allowances under the ETS.[21] The GX Transition Bonds are to be redeemed using revenues from the Fossil Fuel Surcharge on fossil fuel extractors and revenues from the Specified Business Operator Contribution from power generators. The annual collection is capped at a level corresponding to the decreasing revenue from the Petroleum and Coal Tax and the FIT Surcharge, designed to neutralize additional economic burden.

13 Cabinet Office "Green Growth Strategy Through Achieving Carbon Neutrality in 2050" December 25, 2020 (p. 12) (in Japanese)

14 Ministry of the Environment, Central Environment Council, Global Environment Committee, Subcommittee on the Utilization of Carbon Pricing "Interim Report" August 2021 (in Japanese)

15 METI Study Group on Economic Approaches to Achieving Carbon Neutrality across the World (link broken). Related: The Institute of Energy Economics, Japan "Study on Economic Approaches to Achieving Carbon Neutrality across the World" March 31, 2021 (in Japanese)

16 METI "GX League Basic Concept" December 2021 (p. 16) (in Japanese)

17 METI "GX League Basic Concept" February 1, 2022 (p. 1) (in Japanese)

18 METI "Basic Policy for Realizing GX" February 2023 (p. 1) (in Japanese)

19 Climate Integrate "What is Green Transformation (GX)? " January 29, 2024

20 House of Councillors "Act on Promotion of a Smooth Transition to a Decarbonized Growth-Oriented Economic Structure" (in Japanese)

21 House of Councillors "Act for Partially Amending the Act on Promoting the Transition to a Decarbonized Growth Economic Structure and the Act on the Promotion of Effective Utilization of Resources" (in Japanese)

(3) Design of the Phase 2 System

The Emissions Trading System Subcommittee under METI's Industrial Structure Council held deliberations on the system design and compiled a draft proposal in December 2025.[22]

3. The three phases of GX-ETS

The GX-ETS is being rolled out in three phases (Figure 4).[23]

Phase 1: 2023–2025

This voluntary phase targeted companies in the GX League (747 companies as of March, 2024), which accounted for over half of Japan's CO_2 emissions.[24] The GX Dashboard[25] on the GX League discloses progress toward targets and the status of emissions trading for each company.

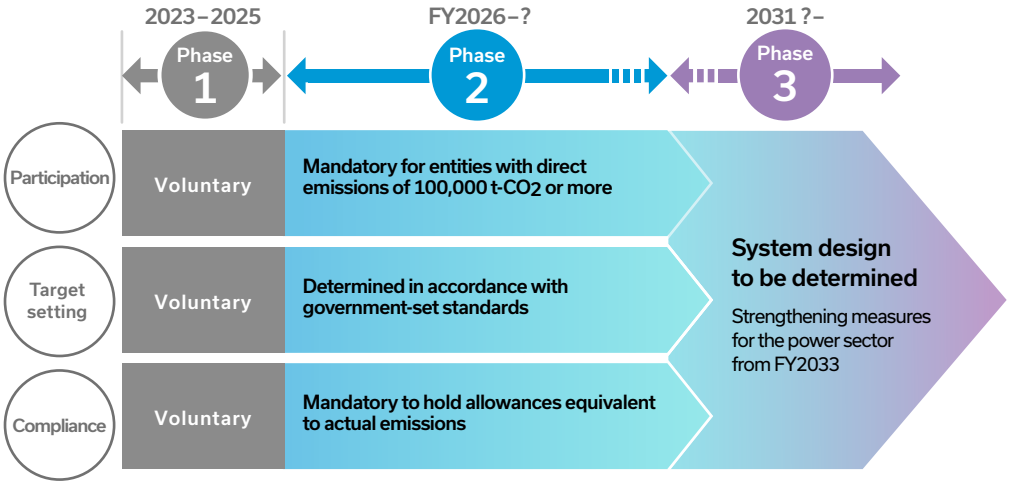
Phase 2: 2026–TBD (about 2030?)

Phase 2 will cover 300 to 400 companies, responsible for 60% of Japan's total GHG emissions. During 2026, the focus will be on emissions verification and allocation applications, with the first round of allocations for both 2026 and 2027 scheduled to occur concurrently in 2027. The emissions allowance trading market established and operated by the GX Acceleration Agency (GXAA) is scheduled to open the fall of 2027.

Phase 3: TBD (about 2031?)–end year TBD

From 2033, paid allocation (auctioning) will be gradually introduced for power generators and collected as a Specified Business Operator Contribution. Further details are yet to be determined.

Figure 4. GX-ETS phased introduction



Source: Prepared by Climate Integrate based on METI document

22 Industrial Structure Council, Emissions Trading Subcommittee "Interim Review: Matters Related to the Implementation Guidelines for Emissions Allowance Allocation" December 19, 2025 (in Japanese)

23 METI documents "Policy for Deliberations on the Detailed Design of Japan's Emissions Trading System (GX-ETS)" July 2, 2024 (p. 6) (in Japanese)

24 METI "News Release" March 27, 2024

25 GX League website "GX Dashboard" (accessed January 21, 2026)

02 Phase 1

Phase 1 design

In Phase 1 (2023 – 2025), participation, target setting, and compliance were all voluntary (Table 1).[26] In addition to setting their own targets, participating companies utilized the concept of "NDC-equivalent emissions" as a target metric to ensure alignment with Japan's national GHG reduction targets (NDC) (Figure 5). This metric is calculated based on a linear reduction path from a base year toward achieving carbon neutrality by 2050 (see Appendix 1.1 for further details on the framework of Phase 1 (in Japanese only)).

Table 1. Framework of GX-ETS Phase 1

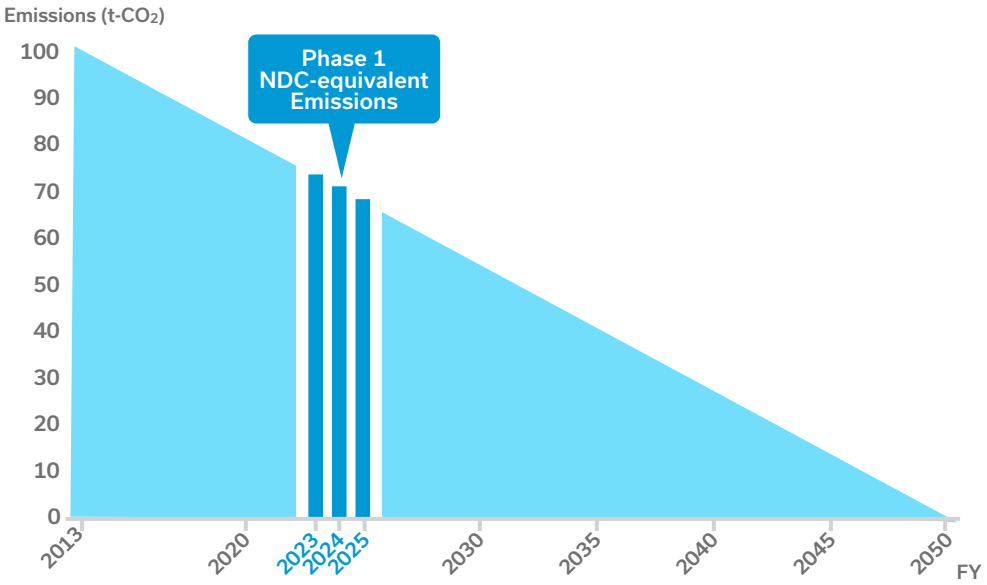
Item	Description
Period (FY)	2023 – 2025
Target gases	Greenhouse gases (GHGs)
Target entities	Voluntary participation for GX League member companies.
Organizational unit	Corporate basis (Inclusion of subsidiaries and affiliates is determined voluntarily.)
Base year	2013. The average of three consecutive years between 2014 and 2021 can also be selected.
Target setting	Voluntarily set: (1) 2030 targets, (2) 2025 targets, and (3) cumulative Phase 1 targets for both domestic direct emissions (Scope 1) and indirect emissions (Scope 2)
Compliance criteria	A company is deemed compliant if its direct emissions fall below either its "voluntary target emissions" or its "NDC-equivalent emissions."
Allocation method	Grandfathering
Generation of surplus allowances	Regardless of voluntary target achievement, if direct emissions are below NDC-equivalent levels AND total direct/indirect emissions are below recent actual levels (2020–2022 average), allowances are granted for the difference from the NDC-equivalent level.
Use of external credits	Non-fossil certificates, J-Credits, and JCM credits
Emissions calculation	Based on the GHG Emissions Accounting, Reporting and Disclosure System. Emissions related to fuel, electricity, or heat supplied to third parties are reported as the company's own direct emissions.

Source: Prepared by Climate Integrate based on GX League Secretariat document

26 GX League Secretariat "Rules for Phase 1 of the GX-ETS" February 2023 (in Japanese)

Figure 5. Concept of "NDC-equivalent emissions" in GX-ETS Phase 1

(Case of a company with direct emissions of 100,000 t-CO_2 selecting 2013 as the base year)



Annual reduction rate from 2013 base year: 100%/(2050-2013) = 2.7%

Prepared by Climate Integrate

Box 3. Direct versus indirect emissions[27]

Direct emissions (Scope 1): GHG emissions released directly into the atmosphere from facilities or equipment through fuel combustion or chemical reactions. Under the GX-ETS, emissions from the production of energy sold to other companies must be reported separately as part of the company's own direct emissions.

Indirect emissions (Scope 2): Emissions occurring from the use of electricity or heat supplied by third parties. Under the GX-ETS, while these are subject to target-setting and reporting, only direct emissions are eligible for emissions trading.

27 Prepared based on GX League Secretariat "GX League Regulations" November 11, 2024 (in Japanese)

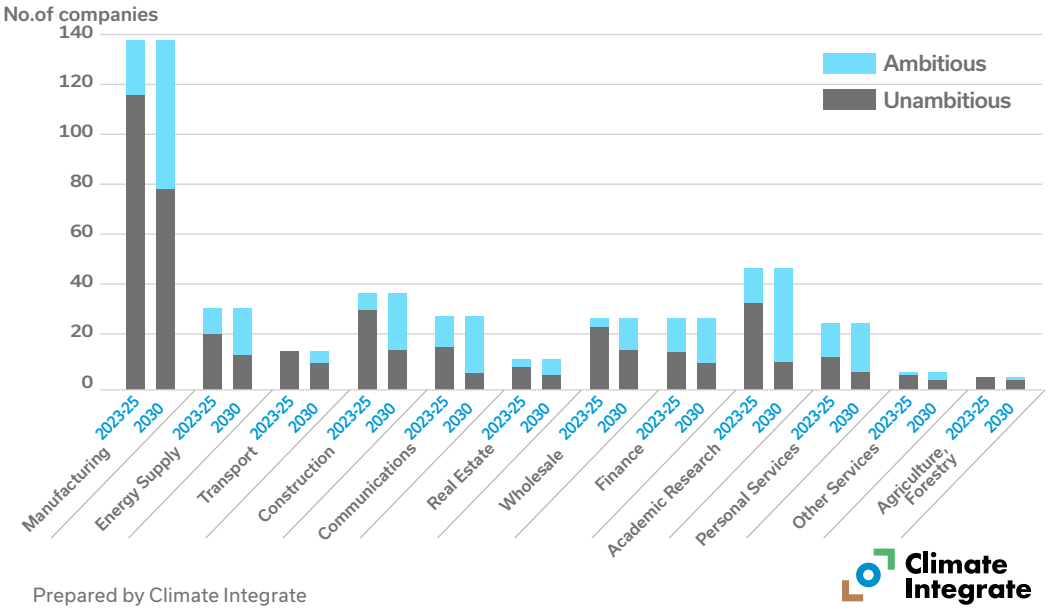
2. Preliminary evaluation of Phase 1

Climate Integrate conducted a preliminary evaluation of performance in Phase 1 based on information as of September 28, 2025, which covers 511 out of 620 (excluding 109 companies due to data quality and consistency concerns). The results are shown as follows (for further details, please refer to Appendix 1.2 (in Japanese only)).

- The number of participating companies increased from 440 at the start of the system in 2023 to 740 in 2024, with increasing industrial diversity.
- Approximately 40% of companies selected 2013 as their base year, while about 30% chose the more recent year 2021.
- Targets were categorized as "ambitious" (stricter than the NDC-equivalent emissions) or "unambitious" (less stringent), with the result that 70% of short-term (2023 – 2025) targets were "unambitious", while 60% of mid-term (2030) targets were "ambitious". Among these, the manufacturing sector had a high share of "unambitious" mid-term targets, at 60% (Figure 6).
- Among companies that set voluntary targets stricter than NDC-equivalent emissions, 47% had already reached their targets.

While the NDC-equivalent emission level functioned to a certain extent as a benchmark in Phase 1, voluntary targets were unambitious in the short-term, and the system did not drive early additional reductions effectively. While about half of the companies with voluntary targets stricter than the NDC-equivalent level achieved them, carefully assessing their ambition would require an examination of historical emissions performance and fluctuations in production.

Figure 6. Level of target ambition among GX League companies
(number of companies by sector and target year)



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03 Phase 2

1. Phase 2 design

In Phase 2, beginning in 2026, the system will transition to a legally-binding framework requiring participants to hold allowances allocated by the government, in amounts equal to their actual emissions, with participation being mandatory for target companies.[28]

Consequently, the GX-ETS will become a core system for achieving carbon neutrality in Japan, with 300 to 400 entities participating and covering approximately 60% of national GHG emissions (Table 2).

Table 2. Framework of GX-ETS Phase 2

Item	Description
Period (FY)	2026 – (2030?)
Target gases	CO_2
Target entities	Entities with average direct CO_2 emissions of 100,000 t-CO_2 or more over the most recent three fiscal years
Organizational unit	Corporate basis (joint compliance by parent/subsidiary groups or affiliated companies is permitted)
Obligations	Obligation to hold emissions allowances (matching actual emissions)
Base period	The three fiscal years preceding the start of the system (2023–2025)
Reduction target (emission cap)	None (no mechanism exists to align with the national NDC)
Target setting	The government allocates annual allowances to each entity. Entities describe their estimated emissions and targets through 2030 in their Transition Plans.
Compliance criteria	Actual emissions must not exceed allocated allowances for each fiscal year.
Allocation method	Primarily benchmarking. Grandfathering is applied complementarily. The 2030 benchmark level is set at the top 32.5% in efficiency, with levels decreasing progressively each year. Allocations are calculated based on various adjustments and considerations.
Use of external credits	J-Credits and JCM credits: Usage is capped at 10% of annual actual emissions (to be reviewed in the future).
Price stabilization	Initial ceiling price: 4,300 JPY/t-CO_2; floor price: 1,700 JPY/t-CO_2 (prices to be raised gradually)
Penalties	A surcharge equal to 1.1 times the ceiling price for non-compliant shortfalls

Source: Prepared by Climate Integrate based on Industrial Structure Council Emissions Trading Subcommittee document

28 Industrial Structure Council Emissions Trading Subcommittee "Interim Summary on Matters Related to Allocation Guidelines for Emissions Allowances" December 19, 2025 (in Japanese)

• Scope of target entities

Entities with average direct CO_2 emissions of 100,000 t-CO_2 or more per year over the most recent three fiscal years are mandated to participate. Group-based compliance is permitted, including closely related parties such as parent, subsidiary, and affiliated companies, is also permitted.

Requirements for target entities

1 Formulation and submission of Transition Plans

By the end of September each year, entities must submit a Transition Plan. In addition to single-year reduction, entities are required to ensure alignment between medium- to long-term management strategies and their Transition Plans. The plans must include:

- Emission projections (targets) for 2026–2030
- Actual emissions
- Capital investment plans and results (incl. reduction measures and the effects)
- Status of research and development (R&D) investments

While plans will be made public by the government, capital investment plans and results will remain undisclosed.

2 Monitoring, reporting, and third-party verification of emissions

Emissions and targets must be reported to the government after verification by a Registered Verification Body.

3 Holding allowances equivalent to emissions

To ensure compliance, entities must manage their allowances—including surpluses or shortfalls —and hold a volume of allowances equal to their actual emissions.

• Reduction targets and allocation methods

An overall reduction target (emission cap) for the GX-ETS has not been set. Without taking into account the total effects of emissions reductions of the system, the Minister of Economy, Trade and Industry will allocate free allowances to each entity using either benchmarking or grandfathering (Table 3). (For specific allocation methods, see section 3.3.)

Table 3. Allocation method for allowances

Benchmarking	Power and energy-intensive industries	• Baseline activity level × Target emissions intensity Determined by setting a target emissions intensity (benchmark standard) using sector-specific benchmark indicators, multiplied by a base activity level (2023–2025 average). Standard will be strengthened each year.
Grandfathering (applied provisionally until 2030)	Other sectors	• Baseline emissions × (1-target reduction rate) Calculated by applying a certain reduction rate to 2023–2025 average emissions. Until 2030, the rate is 1.7% annually for energy-related CO_2 and 0.3% for process-related CO_2 emissions.

Source: Prepared by Climate Integrate based on Industrial Structure Council Emissions Trading Subcommittee document

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• Compliance and the use of external credits (offsets)

Companies achieve their targets by reducing emissions to a level equal to or below their allocated allowances through their own mitigation efforts. Surplus allowances can be sold on the emissions trading market to generate revenue. If emissions exceed the allocated allowances, the shortfall can be covered by purchasing surplus emissions allowances from other companies. Additionally, the use of external credits (J-Credits or JCM) is permitted up to 10% of actual emissions for each fiscal year (emissions before deducting credit cancellations). The utilization rate for external credits is high compared to systems in other countries.

• Price stabilization measures

Upper and lower price limits (price floors and ceilings) are established to prevent extreme market volatility. In the event of price spikes, compliance can be achieved by paying the ceiling price; if prices fall below the floor, a reverse auction (government buyback) is conducted. At the start of the system, the ceiling price was set at 4,300 yen/t-CO_2 and the floor price at 1,700 yen/t-CO_2. While these prices will be increased gradually, government suggest only marginal increases by 2030, with a ceiling price of 4,840 yen/t-CO_2 and a floor price of 1,913 yen/t-CO_2.[29] The ceiling price is too low to incentivize a shift from coal, and the floor price is lower than J-Credit prices for renewable energy power generation; thus, these levels are thought to be insufficient to promote a fuel switch to renewables by 2030. These levels are also low compared to current carbon prices in other countries (Figure 2).

• Cases of non-compliance

If there is a shortfall, a payment equivalent to 1.1 times the ceiling price multiplied by the unfulfilled volume is required. These levels are also low compared to current carbon prices in other countries .

29 GX Group "Upper and Lower Price Boundary Levels in the Emissions Trading System (Draft)" December 19, 2025 (in Japanese)

2. Phase 2 timeline

The timeline from the Phase 2 start to the fulfillment of compliance is as follows (Figure 7).[30,31]

Phase 2 timeline

(a) Formulation of implementation guidelines

The Minister of Economy, Trade and Industry formulates "Implementation Guidelines" for the allocations.

(b) Submission of Transition Plans

Entities submit their transition plans (every September).

(c) Application for allowance allocation

Entities have their calculated emissions verified by a Registered Verification Body, report them annually to the government, and apply for allowance allocations.

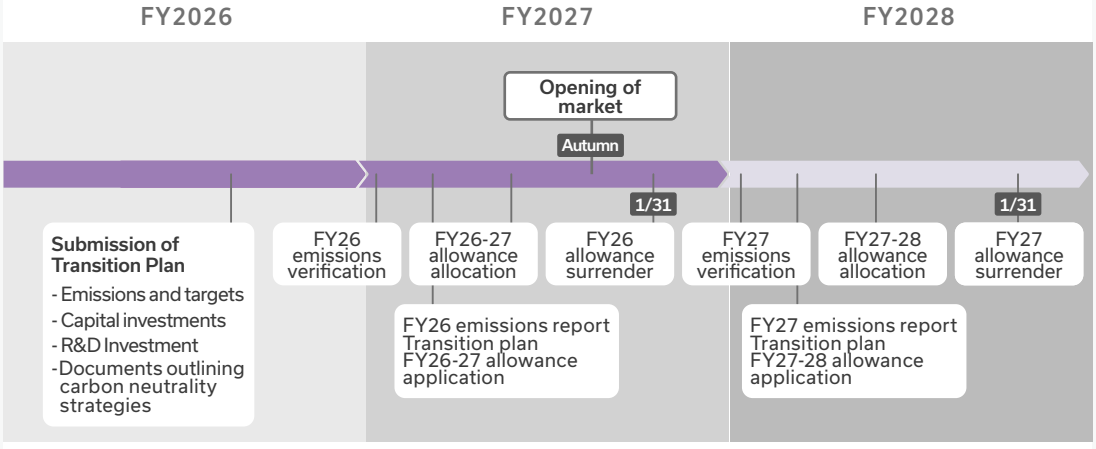
(d) Allocation of allowances

The Minister of Economy, Trade and Industry allocates allowances based on either the benchmark or grandfathering method.

(e) Assess compliance

Targets are achieved if emissions are below the allocation. If emissions exceed the allocation, the shortfall must be procured from the market or by external credits, or by paying a penalty of 1.1 times the ceiling price for the shortfall.

Figure 7. Timeline of GX-ETS Phase 2



* Timeline prepared assuming the same annual process continues onward from 2028

Source: Prepared by Climate Integrate based on METI document

30 METI "Regarding Specific Issues Related to Allocation" November 7, 2025 (p. 31) (in Japanese)

31 Cabinet Secretariat GX Promotion Office "Issues Related to the Trading System for Emissions Contributing to the Realization of GX (Draft)" December 19, 2024 (p. 39) (in Japanese)

3. Benchmark-setting methodologies

The benchmark indicators by sector are listed in Table 4.[32]

Table 4. Benchmark indicators by sector

Sector	Activity level	Scope of activities	Benchmark indicators and adjustment
1. Pulp and paper (paper)	Sum of (ave. production by grade × grade adjustment factor)	Direct + indirect emissions from pulping, papermaking, and linked utilities (boilers/turbines, etc.)	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level. Grade adjustment factors are corrected for differences in paper type.
2. Pulp & paper (paperboard)	Sum of (ave. production by grade × grade adjustment factor)	Direct + indirect emissions from pulping and papermaking processes, and utilities	Same as above (grade-specific factors are corrected for paperboard type)
3. Caustic soda production	Ave. production output of caustic soda (97% conversion) from electrolyzers	Direct + indirect emissions related to electrolyzers	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
4. Carbon black manufacturing	Sum of (ave. production by grade × grade adjustment factor)	Direct emissions from oil furnace process (*by-product gas is treated as fully combusted within the boundary)	Allocation = target emissions intensity × base activity level. Grade adjustment factors correct for product differences.
5. Basic petrochemicals (naphtha crackers, etc.)	Ave. production of basic petrochemical products during base period	Direct + indirect emissions related to basic product manufacturing	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
6. Organic chemicals (excluding fermentation)	Ave. fuel consumption (excluding by-product fuels)	Direct emissions from target processes (excluding areas covered by other BMs)	Allocation = target emissions intensity × base activity level
7. Oil refining	Sum of (throughput by unit × unit factor)	Direct + indirect emissions from refining processes and utilities	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level. Unit factors are corrected for process differences
8. Rubber products	Ave. production	Direct + indirect emissions from target processes	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
9. Flat glass manufacturing	Sum of (ave. production by grade × grade adjustment factor)	Direct + indirect emissions from target processes (excluding some electricity for compressed air)	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level. Adjusted by grade factors.
10. Glass bottle manufacturing	Ave. production	Direct emissions from target processes	Allocation = target emissions intensity × base activity level
11. Cement manufacturing (clinker)	Ave. clinker production	Direct + indirect emissions from target processes	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
12–1. Lime (energy-related CO_2)	Ave. production	Fuel-derived direct emissions from the calcination process	Allocation = target emissions intensity × base activity level
12–2. Lime (quicklime: process CO_2)	Ave. production	Non-energy-derived direct emissions from the calcination process	Allocation = target emissions intensity × base activity level
12–3. Lime (light-burned dolomite: process CO_2)	Ave. production	Non-energy-derived direct emissions from the calcination process	Allocation = target emissions intensity × base activity level

32 METI "Benchmark Indicators by Sector (Draft)" December 9, 2025 (in Japanese)

Sector	Activity level	Scope of activities	Benchmark indicators and adjustment
13. Blast furnace steelmaking (upstream)	Ave. pig iron production	From raw material intake to crude steel (direct; by-product gas treated as combusted within boundary)	Allocation = target emissions intensity × base activity level
13. Blast furnace steelmaking (downstream)	Ave. fuel consumption (excluding by-product fuels)	From rolling to final product (direct)	Allocation = target emissions intensity × base activity level
14. Electric arc furnace (EAF) carbon steel (upstream)	Ave. crude steel production	From raw material intake to cast steel + utilities (direct + indirect)	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
14. EAF carbon steel (downstream)	Ave. fuel consumption (excluding by-product fuels)	From rolling to final product (direct)	Allocation = target emissions intensity × base activity level
15. EAF specialty steel (upstream)	Ave. crude steel production	From raw material intake to cast steel + utilities (direct + indirect)	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
15. EAF specialty steel (downstream)	Ave. fuel consumption (excluding by-product fuels)	From rolling to final product (direct)	Allocation = target emissions intensity × base activity level
16. Aluminum (upstream)	Ave. production	Direct + indirect emissions from upstream processes	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level
16. Aluminum (downstream)	Ave. fuel consumption (excluding by-product fuels)	Direct emissions from downstream processes	Allocation = target emissions intensity × base activity level
17. Automotive (painting)	Ave. converted production units	Direct + indirect emissions from painting plant (*excluding compressor electricity for air)	Allocation = target emissions intensity × [previous year direct / (previous year direct + previous year indirect)] × base activity level. Base activity conversion (units + 2-coat adjustment + bumper painting adjustment).
18. Power generation (thermal)	Ave. thermal power generation by fuel type	Thermal power generation	Allocation = power generation × benchmark level. Benchmark level = (all-thermal benchmark × α) + (fuel-specific benchmark × (1-α)). α increases from 0 to 20 in 2029, and to 40 in 2030. Note: Non-fossil co-firing is adjusted for efficiency loss using a correction factor: either ① 1 / (1 − co-firing ratio) or ② 1 + (1 / (1 − co-firing ratio)) × 0.2, whichever is smaller.
19. Road freight transport	Ave. transport ton-kilometers	Freight trucks (direct; excluding refrigerated or frozen transport)	Allocation = target emissions intensity × base activity level
20. Coastal shipping	Ave. transport ton-kilometers by ship type	Coastal shipping (direct)	Allocation = target emissions intensity × Σ(ton-km by ship type × ship-type adjustment factor)
21. Air transport (domestic scheduled)	Ave. transport ton-kilometers	Domestic aviation (direct)	Allocation = target emissions intensity × base activity level

Source: Prepared by Climate Integrate based on METI document

Climate Integrate

Benchmark standards have been established, as detailed below, including various adjustments.

• Concept of top-tier efficiency

The top-tier efficiency for benchmark standards assumes it will take about 10 years for an entire sector to reach the "top-runner" level (top 15%). Accordingly, the standard for 2030, five years into the period, has been set at 32.5%—the median value between the top 15% and 50% efficiency levels. However, to ensure that the reduction rates do not significantly deviate from those in sectors subject to grandfathering, the maximum reduction rate until 2030 is capped at 8.5%. Specifically, the allocation uses whichever result produces the larger emissions intensity: the top 32.5% level or 91.5% of the top 50% level (top 50% × 0.915). This design takes into account entities with lower efficiency levels.

• Benchmarks for the power sector

For the first three years, the benchmarks for the power sector will utilize indicators based on specific fuel types, such as coal-fired or LNG-fired power. Consequently, this may be insufficient to incentivize a transition to LNG power, which has lower emissions. From the fourth year in 2029, a benchmark based on the average of all thermal power—regardless of fuel type—will be introduced gradually. However, because this does not cover all power sources including renewables, the design provides a weak incentive for switching to decarbonized power sources (Box 4).

• Consideration of complex or specialized manufacturing processes

In sectors where manufacturing processes are complex or specialized and it is difficult to use production-based indicators (such as downstream steel processes, organic chemical manufacturing, and rubber product manufacturing), a fuel benchmark is adopted. Because fuel consumption is used as the activity level, differences in energy efficiency, such as energy consumption per unit of production, are not reflected in the allowance allocation.

• Consideration of entities with in-house power generation facilities

For industries with in-house coal or oil power generation facilities or steam boilers, direct emissions tend to be larger. To address this, indicators are developed based on direct + indirect emissions intensity. The benchmark standard then calculates the allocation volume by multiplying this intensity by the ratio of each operator's direct emissions. This method is adopted to accommodate entities that have existing facilities with high CO_2 emissions.

• Consideration of sectors with multiple product grades or types

In sectors such as pulp and paper, which handle multiple grades and products where emissions intensity varies significantly by product, a method is used to determine the benchmark level by normalizing the differences between companies. This normalization uses correction factors based on the industry's average product mix.

Furthermore, additional considerations are taken into account during the allocation process (Table 5). Since all of these measures mitigate a portion of the allowance shortfall through additional allocations, the actual reduction volume decreases accordingly.

Table 5. Considerations for GX-ETS Phase 2 allowance allocations

Category	Details
Early reduction efforts	For companies subject to grandfathering, reduction achieved beyond the grandfathered reduction rate from a past year (principally 2013) until the base period are recognized as prior corporate effort, and added to the base year emissions to calculate allocations.
Carbon leakage risk	For sectors with high trade shares and a risk of industrial relocation overseas, if the ratio of allowance procurement costs to profit exceeds a certain level, a specific portion of the allowance shortfall will be added to the following year.
GX R&D investment effort	Entities whose R&D expenses (self-funded portion) in government-defined GX technology fields exceed a certain level may receive additional allocations within the scope of their allowance shortfall (about 10–20% of shortfall).
Activity level fluctuations	Allocations are made with adjustments for entities that open or close offices or undergo significant changes in production volumes. Allocations are adjusted for activity level fluctuations of 7.5% or greater in a single year.

Source: Prepared by Climate Integrate based on Industrial Structure Council Emissions Trading Subcommittee document

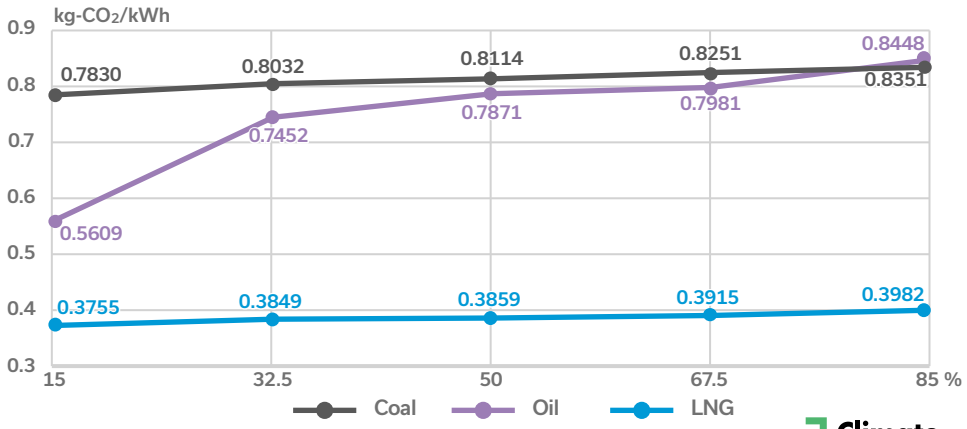
Climate Integrate

Box 4. 2030 reduction outlook for the power sector (case study)

The 2030 benchmark has been set at a level equivalent to the top 32.5% of performers—the midpoint between the top 15% and top 50% efficiency benchmarks. Based on the current distribution of emissions intensities, the benchmark standard for 2030 is set to raise average performance to the 32.5% level (Figure 8). In the power sector, fuel-specific bechmarks are applied from 2026 to 2028. From 2029 onward, an all-thermal benchmark—a unified standard across different fuel types—will be introduced gradually (20% in 2029 and 40% in 2030).

Climate Integrate conducted a case study to estimate implied reductions required by JERA and J-POWER, assuming constant power production and no changes in fuel mix.

Figure 8. Power generation emissions intensities by fuel



Source: Prepared by Climate Integrate based on METI document

Case study 1: JERA

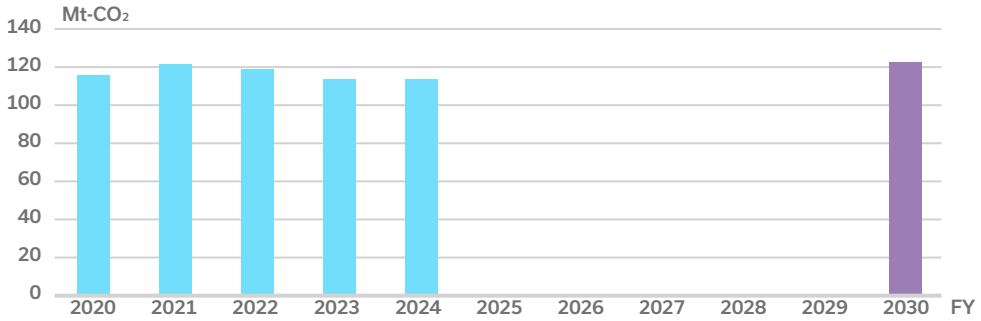
In recent years, JERA's fuel mix has consisted of 75% LNG, 25% coal, and less than 1% oil. Consequently, the LNG-specific benchmark is the primary determinant.[33] Under the LNG-specific benchmark, the difference in emissions intensity is negligible between the top 50% (0.3859 kg-CO_2/kWh) and the top 32.5% (0.3849 kg-CO_2/kWh) efficiency levels. As a result, this benchmark provides almost no incentive to improve efficiency. Moreover, because LNG has the lowest emissions intensity among thermal fuels, the phased introduction of the all-thermal benchmark from 2029 further relaxes the effective benchmark constraint in relative terms for LNG-heavy generators.

Consequently, JERA could increase emissions by roughly 8% by 2030 relative to 2024 (Figure 9). JERA has committed to reducing domestic CO_2 emissions by at least 60% by 2035 compared to 2013.[34] This represents a reduction of about 23% by 2030 relative to 2024. Hence, the GX-ETS benchmark requirement falls far behind JERA's own commitment and is also inconsistent with Japan's NDC trajectory.

33 Average domestic thermal power fuel mix for FY2023–FY2024

34 JERA "JERA Group Integrated Report 2025" September 2025 (p. 56). Domestic goals of the JERA Group. In FY2024, JERA's domestic direct emissions (scope 1) accounted for about 90% of the total.

Figure 9. JERA's actual and estimated emissions*



* Domestic scope 1 emissions

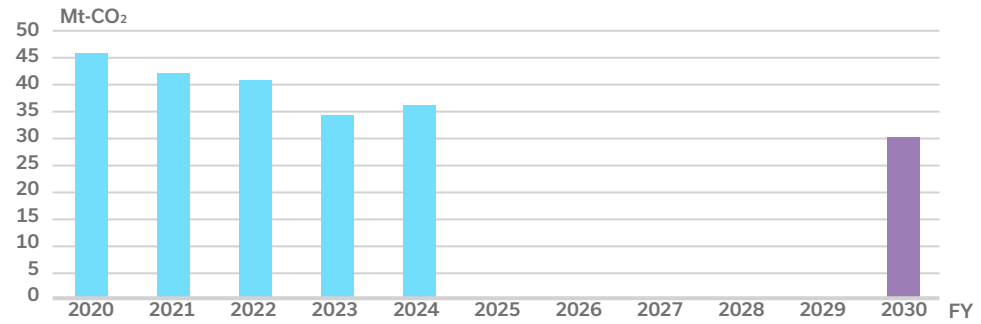
Source: Prepared by Climate Integrate based on JERA Group Integrated Report 2025

Case study 2: J-POWER

J-POWER's domestic thermal power is entirely coal-fired. As the difference in the coal benchmark emissions intensity is negligible between the top 50% (0.8114 kg-CO_2/kWh) and 32.5% (0.8032 kg-CO_2/kWh), the required reductions remain limited through 2028. The standards will become increasingly stringent from 2029 as the all-thermal benchmark is phased in, because coal has a higher carbon intensity. As a result, J-POWER would be required to reduce CO_2 emissions by about 17% by 2030 relative to 2024 (Figure 10).

J-POWER has committed to reducing domestic CO_2 emissions by 46% by 2030 compared to 2013.[35] This represents a reduction of about 27% compared to 2024. The GX-ETS benchmark is less ambitious than J-POWER's own commitment, and, as in the JERA case, remains misaligned with Japan's NDC pathway.

Figure 10. J-POWER's actual and estimated emissions*



* Domestic scope 1 emissions

Source: Prepared by Climate Integrate based on J-POWER Group Integrated Report 2025

In summary, for the power generation sector, the application of fuel-specific benchmarks through 2028 results in almost no required emission reductions.

Moreover, because Japan's current mix retains a substantial share of coal-fired power generation, the phased introduction of the all-thermal benchmark structurally advantages LNG-heavy generators. As shown by this analysis, GX-ETS benchmark requirements may be looser than companies' own commitments and, in some cases, may even allow increases in absolute emissions. This highlights the need to critically review the design of benchmark-based allocations in light of their consistency with Japan's NDC.

35 J-POWER "J-POWER Group Integrated Report 2025" September 2025 (p. 39)

04 Phase 3

1. Phase 3 design

• Paid allocation (auctioning) for power generators

For power generators, paid allocation (auctioning) is to be introduced gradually from 2033. Power generators will be mandated to participate in bidding for allowances, effectively adding a cost to CO_2 emissions. This pricing effect will give a relative advantage to renewable energy and nuclear power. The details have not yet been decided, including the ratio of paid (auctioning) versus free allocation, as well as the emission cap (speed and timing of power sector decarbonization).

• Sources for GX Economy Transition Bonds redemptions

Under the GX Promotion Act, 20 trillion yen is to be raised through the issuance of GX Transition Bonds, redeemed by 2050 using revenue from the Fossil Fuel Surcharge and Specified Business Operator Contribution. A distinctive feature of Japan's GX-ETS is that revenue from the auctioning of allocations to power generators (Specified Business Operator Contribution) is directly linked to the redemption of GX Transition Bonds.

The total annual amount collected from the Surcharge and Contribution is stipulated to not exceed the revenue reduction from the Petroleum and Coal Tax and the FIT Surcharge. In the initial years beginning in 2028, the collection amounts will remain low because the reduction in Petroleum and Coal Tax revenue and FIT Surcharge will be small. However, the amount that can be collected will increase accordingly. Climate Integrate estimates that the cumulative reduction in the Petroleum and Coal Tax and FIT Surcharge could reach 40 trillion yen by 2050. Theoretically, this system could generate 20 trillion yen needed for the redemption of GX Transition Bonds (see Appendix 2.1 (in Japanese only)).

2. Outlook for carbon pricing levels

The ceiling of annual revenue from the Fossil Fuel Surcharge and Specified Business Operator Contribution significantly impacts carbon prices. However, this mechanism was not designed to provide the price signals necessary to incentivize CO_2 reductions within a carbon pricing system. Therefore, Climate Integrate simulated the transition of revenue collection and carbon price levels (JPY/t-CO_2) through 2050 under two scenarios, assuming that 30% of redemption funds are sourced from GX-ETS paid allocations and 70% from the Fossil Fuel Surcharge (see Appendix 2.2 for details (in Japanese only)).

- **Case 1 (Power sector decarbonization by 2040):**

  This scenario assumes that power sector emissions will reach net zero by 2040. While acknowledging the 2024 G7 Summit commitment to "decarbonize the power sector entirely or predominantly by 2035",[36] this scenario prioritizes early decarbonization of the power sector, based on the rationale that the sector possesses viable alternatives and technologies and is essential for the decarbonization of other sectors. The scenario assumes that the power sector auction ratio will increase linearly from 20% in 2033 to 100% in 2040.

- **Case 2 (Power sector decarbonization by 2050):**

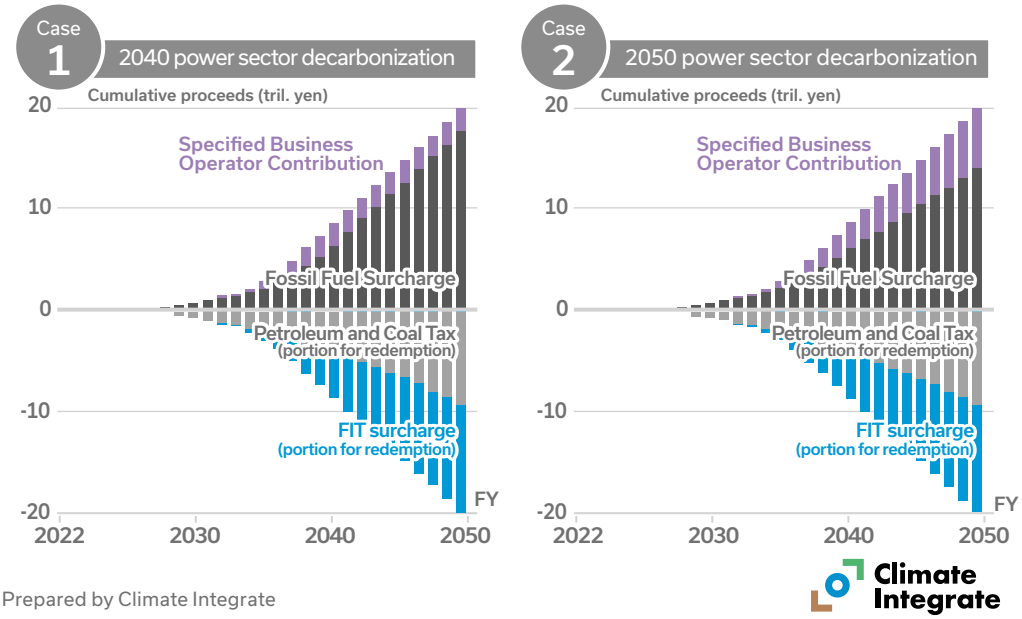
  This scenario assumes that power sector emissions will reach net zero by 2050. This aligns closely with current government policy, that does not envision full power sector decarbonization until 2050. The power sector auction ratio is the same as Case 1.

The simulation results are as described below.

• Cumulative revenue trends: low until 2035, then rise thereafter (Figure 11)

The cumulative revenue from the Fossil Fuel Surcharge and Specified Business Operator Contribution (purple and black) remains low until around 2035, reflecting the limited decline in Petroleum and Coal Tax and FIT Surcharge (gray and light blue). Revenue increases significantly after that. Due to the low initial revenue, funds are expected to be insufficient at the time of GX Transition Bond maturity, necessitating the use of refinancing bonds to bridge the gap (Box 5). In Case 1, the power sector is decarbonized by 2040 and collections of the Specified Business Operator Contribution cease from 2041 onward, while revenue from the Fossil Fuel Surcharge increases.

Figure 11. Cumulative proceeds of levies and charges (Estimation)



Prepared by Climate Integrate

36 G7 Summit "G7 Apulia Leaders' Communique" June 2024

Box 5. Redemption schedule and financing for GX Transition Bonds

The government has announced the redemption dates for GX Transition Bonds issued through 2025.[37] However, revenues from the Fossil Fuel Surcharge and the Specified Business Operator Contribution—which serve as the funding for bond redemption—will be suppressed for the time being. This is due to a cap constraint requiring that annual collections do not exceed the declining revenues from the Petroleum and Coal Tax and FIT Surcharge. Climate Integrate estimates that the cumulative revenue will fall short of the cumulative principal required by the respective redemption dates for bonds issued through 2025, resulting in a funding deficit. To bridge this shortfall, the government will need to issue refunding bonds, pushing back the original redemption dates toward 2050. This structural arrangement raises significant concerns regarding intergenerational equity.

Table 6. GX Transition Bond redemption and estimated collection amounts*

(Units: billion yen)

Auction date	Term	Redemption date	Issuance amount	Cumulative issuance (FY)	Estimated cumulative collection (FY)	Difference (shortfall)
2024/2/27	5	2028/12/20	800	800	142	-658
2024/7/18	5	2029/6/20	350			
2025/1/29	5	2029/6/20	350	1,499	308	-1,191
2025/7/15	5	2030/6/20	300			
2026/1/26	5	2030/12/20	300	2,099	497	-1,602
2024/2/14	10	2033/12/20	800			
2024/5/28	10	2034/3/20	350			
2024/10/22	10	2034/3/20	350	3,598	1,243	-2,355
2025/10/21	10	2035/9/20	300			
2026/3 (plan)	10	2036/3**	Approx. 300	4,198	2,175	-2,023

* For each GX Transition Bond, the cumulative collection amount up to that fiscal year is compared with the cumulative principal amount required by that point.
** Estimated based on the auction date and term as it is before auction date.

Source: Prepared by Climate Integrate based on Ministry of Finance website

• Carbon prices remain low initially and rise toward 2050; still insufficient for net zero

Carbon prices (JPY/t-CO_2) will be suppressed at extremely low levels until about 2035 due to the revenue ceiling imposed on the Fossil Fuel Surcharge and Specified Business Operator Contribution. According to simulations by Climate Integrate, the Surcharge in 2035 is estimated at about 500 JPY/t-CO_2, and the Contribution ranges between 1,000 and 1,400 JPY/t-CO_2 (Table 7).

For comparison, the IEA "World Energy Outlook 2022" Net Zero Scenario assumes carbon prices in advanced economies to be about 21,000 JPY/t-CO_2 (140 USD/t-CO_2) in 2030 and 31,000 JPY/t-CO_2 (205 USD/t-CO_2) in 2040. Projected carbon prices under the GX-ETS are significantly lower than these IEA

37 Ministry of Finance website "Interest-bearing Japan Climate Transition Bonds" (accessed January 21, 2026)

prices, implying that the price signal will be particularly limited during the first decade of the system.[38]

In Case 1, the unit price of the Contribution rises earlier but drops to zero after 2041. To compensate for this, the unit price of the Surcharge increases after 2040 (Figure 12, solid line). In Case 2, both unit prices rise significantly after 2045 (Figure 12, dotted line).

As demonstrated, carbon prices in the GX-ETS are determined independently of the price signals needed to promote CO_2 reduction and will remain suppressed until around 2040. Case 1 would provide a more effective price incentive for the power sector by raising its carbon price earlier, thereby accelerating reductions in that sector.

Table 7. Carbon price trend scenarios*

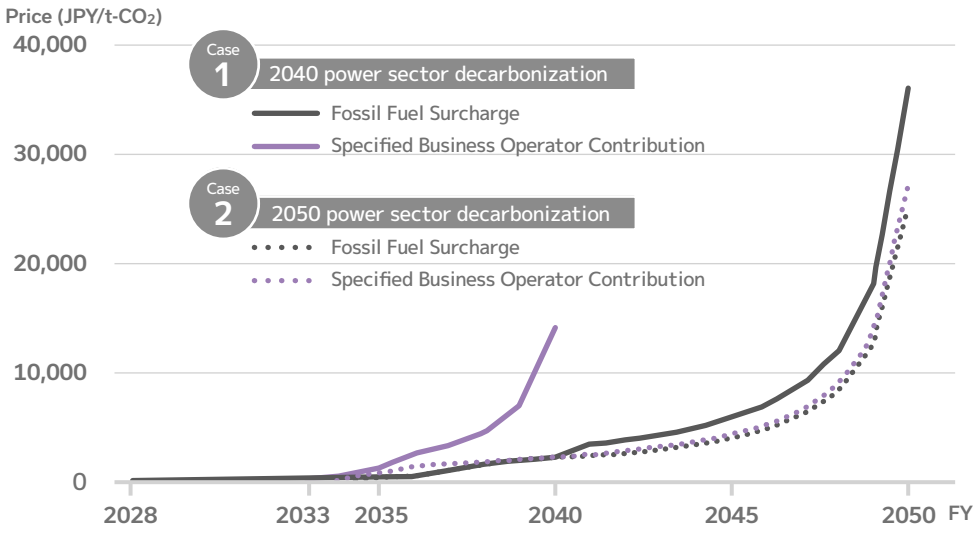
(Units: JPY/t-CO_2)

FY	Case 1: Power sector decarbonization by 2040		Case 2: Power sector decarbonization by 2050		Ref. IEA net zero scenarios (developed countries)
	Fossil Fuel Surcharge	Specified Business Operator Contribution	Fossil Fuel Surcharge	Specified Business Operator Contribution	
2030	244	–	244	–	Approx.21,000
2035	547	1,441	547	1,015	
2040	2,296	14,149	2,296	2,460	Approx.31,000
2045	6,015	–	4,210	4,511	
2050	36,087	–	25,261	27,065	Approx.38,000

* Allocation (auctioning) share of ETS is assumed to cover 30% of redemption funds

Source: Prepared by Climate Integrate based on Table B.2 of IEA "World Energy Outlook 2022."

Figure 12. Unit price trends of levies and charges (Estimation)



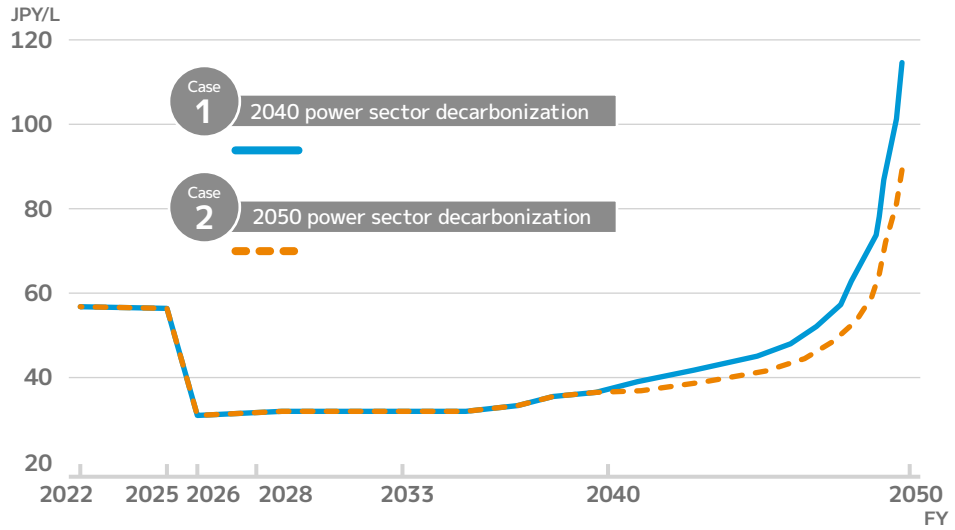
Prepared by Climate Integrate

38 IEA "World Energy Outlook 2022" November 2022, Table B.2 (p. 465). Converted at 150 JPY/USD.

Box 6. Impacts on gasoline prices

Japan's gasoline tax structure traditionally consisted of several components: the Volatile Oil Tax (basic and local) at 28.7 JPY/L, a "provisional" tax rate of 25.1 JPY/L, and the Petroleum and Coal Tax at 2.8 JPY/L, totaling 56.6 JPY/L.[39] However, the provisional tax rate was abolished at the end of 2025. That step was fundamentally inconsistent with carbon pricing objectives, as it undermined the price signals intended to curb CO_2 emissions. Conversely, the Fossil Fuel Surcharge to be introduced in 2028 will again exert upward pressure on gasoline prices from a decarbonization perspective. According to estimates by Climate Integrate, while the abolition of the provisional rate initially reduced the tax burden by 25.1 JPY/L, the incoming Surcharge will only offset this by 1.3 JPY/L in 2035 and 5.3 JPY/L in 2040.[40] It is not until closer to 2050 that the Surcharge will reach the level of the former provisional tax rate, with estimates reaching 90 to 110 JPY/L by 2050 (Figure 13). The impact of the provisional tax rate's abolition will linger long after the Surcharge is implemented, suggesting that the price incentive to reduce gasoline consumption will remain weak for an extended period.

Figure 13. Price trends for gasoline tax and fossil fuel surcharge



Prepared by Climate Integrate

Based on the emission factor (carbon emission factor for volatile oil) from the MoE's mandatory accounting and reporting system for greenhouse gases, the emissions per liter of gasoline is calculated at 0.00229 t-CO_2 per liter.

39 Ministry of Finance "Summary of Automobile and Energy-Related Taxes (FY2025)" 2025 (in Japanese)

40 Ministry of the Environment "List of Methodologies and Emission Factors in the Mandatory Accounting and Reporting System" December 12, 2023 (in Japanese)

05 Comparison with international systems

This section compares Phase 2 of Japan's GX-ETS with the EU-ETS and South Korea's K-ETS (Table 8).[41]

• Scope of target entities

The EU-ETS targets "installations" with direct emissions of at least 25,000 t-CO_2/year, including those in the aviation and maritime sectors. In contrast, the K-ETS targets "entities" with combined direct and indirect emissions exceeding 125,000 t-CO_2. The GX-ETS targets "entities" with direct emissions of at least 100,000 t-CO_2. While an entity-based approach encourages reductions across an entire company, it weakens the incentive to prioritize reductions at high-emitting facilities and reduces the precision of achieving benchmark standards for a specific installation.

• Emission cap

Both the EU-ETS and K-ETS are "cap-and-trade" systems that set overall emission targets and progressively reduce the total volume of allowances. The EU-ETS's emission cap for 2024 is 1,386.05 Mt-CO_2 (combined for power/heat, industry, and maritime; aviation is managed separately). Following a 2023 revision, the cap reduction pace was accelerated to align with a trajectory of reducing covered emissions by 62% by 2030 (relative to 2005 levels), applying a Linear Reduction Factor of 4.3% annually from 2024 to 2027 and 4.4% from 2028 onward.[42] The K-ETS also sets term-based and annual emission caps for each phase; the cap for Phase 3 (2021–2025) is approximately 3,048.3 Mt-CO_2, with annual caps set at 589.3 Mt-CO_2 for 2021–2023 and 506.71 Mt-CO_2 for 2024–2025.[43] Conversely, the GX-ETS does not establish an emission cap or an annual reduction rate, making its contribution toward achieving Japan's GHG reduction target (NDC) difficult to predict.

• Allocation method

The EU-ETS utilized grandfathering during Phase 1 (2005–) and Phase 2 (2008–). From Phase 3 (2013–2020) onward, it transitioned to benchmarking, with the power sector moving to 100% auctioning. Free allocation for sectors covered by the Carbon Border Adjustment Mechanism (CBAM) is scheduled to end by 2034. The K-ETS introduced benchmarking for specific sectors (oil refining, cement, and aviation, etc.) during Phase 1 (2015–2017), while applying grandfathering to other industries. It has since expanded the scope of benchmark coverage through Phase 2 (2018) and Phase 3 (2021–2025). The GX-ETS adopts benchmarking while applying grandfathering as a supplementary measure, with the staged introduction of paid allocation for the power sector starting from 2033.

41 Cabinet Secretariat GX Implementation Promotion Office "Policy Directions of Deliberations toward the Full-scale Operation of the Emissions Trading System" September 3, 2024 (in Japanese)

42 European Commission website "EU ETS emissions cap" (accessed January 21, 2026)

43 International Carbon Action Partnership "Korea Emissions Trading System (K-ETS)" 2022

- **Price stabilization measures**

The EU-ETS employs a Market Stability Reserve to adjust the volume of allowances entering the market based on supply-and-demand imbalances, and the K-ETS also features a mechanism for market intervention to ensure stability. The GX-ETS establishes price floors and ceilings; if prices spike, compliance is permitted by treating allowances as being procured at the ceiling price. Conversely, if prices fall below the floor, the government repurchases allowances via a reverse auction.

- **External credit limits**

The EU-ETS has tightened the use of external credits, stipulating that, in principle, international credits cannot be used for compliance in Phase 4 (2021–2030). The K-ETS has also a staged reduction, from 10% of the surrender volume in Phase 1 (2015–2020) to 5% in Phase 2 (2021–2025). The GX-ETS allows credit utilization up to about 10% of actual emissions, which is high by international standards.

- **Power sector design**

In the EU-ETS, the power sector is subject to 100% auctioning as a general rule. The K-ETS sets benchmarks based on fuel types but plans to increase the auctioning ratio to 50% by 2030.[44] The GX-ETS will utilize fuel-specific benchmarks for the first three years and gradually increase the weighting of an all-thermal benchmark through a combination of fuel-specific and all-thermal indicators.

Table 8. ETS comparison (EU, South Korea, Japan)

Item	EU-ETS (EU)	K-ETS (South Korea)	GX-ETS Phase2 (Japan)
Target entities	Large emitters in industry, power, aviation, maritime, etc.	Large emitters in industry, power, aviation	Large emitters in industry, power, etc.
Threshold (examples)	Installations with direct emissions ≥ 25,000 t-CO_2/year	Entities with total direct + indirect emissions ≥ 125,000 t-CO_2/year	Entities with direct emissions ≥ 100,000 t-CO_2/year
Emission cap	Yes (1,386 Mt-CO_2 in 2024)	Yes 3,048.3 Mt-CO_2 (2021–2025)	None
Allocation	Benchmark-based free allocation in principle for manufacturing Product-specific benchmark for each manufacturing sector (referenced to the top-performing group)	Combination of grandfathering and benchmarking. Benchmark set for each industry, with the scope of covered entities expanding in stages	Benchmarking in principle; grandfathering as a supplementary approach. References the top-performing group, with a gradual reduction in allocation.
Power sector	100% auctioning	Benchmarks based on fuel type. Auctioning ratio to reach 50% by 2030, with a gradual increase from 2026.	Combination of fuel-specific benchmarks and all-thermal benchmarks
External credit limit (offsets)	Progressively tightened. None allowed from Phase 4.	2015 – 2020: 10% 2021 – 2025: 5% (% of surrender amount)	Up to 10% of actual emissions
Penalties	€100 per t-CO_2 (plus inflation adjustment)	Up to 3x the average market price of allowances for the compliance year	1.1 x the celing price for non-compliant shortfalls

Source: Prepared by Climate Integrate based on Cabinet Office document and METI document

Climate Integrate

44 Ministry of Climate, Energy and Environment of South Korea Press Release "2035 NDC and Fourth Emissions Trading Allocation Plan Finalized at Cabinet Meeting" November 11, 2025

06 Key features of the GX-ETS and future outlook

1. Key features of the GX-ETS

(1) Key features of Phase 2

• First mandatory emissions allowance holding for corporations

The GX-ETS is Japan's first mechanism to impose the mandatory requirement to hold emissions allowances on large corporations, which together account for approximately 60% of the nation's GHG emissions. Participating entities are required to calculate their emissions, set targets, formulate transition plans, and reduce emissions to levels consistent with their allocated allowances. The appropriate allocation and management of these allowances are expected to incentivize steady corporate efforts toward achieving carbon neutrality.

• Bottom-up approach lacks aggregate reduction target (emission cap)

The system does not establish an overall reduction target (emission cap) for all participating entities; instead, it utilizes a bottom-up approach to determine individual allocations. This makes it difficult to predict the system's contribution to Japan's NDC and to ensure alignment with national goals. Phase 1 utilized "NDC-equivalent emission" targets aligned with the government's 2030 reduction target for a linear reduction to net zero by 2050. Phase 2 does not adopt such a framework.

• Allowances are subject to various adjustments and considerations

Free allowances are allocated to each entity based on industry-specific benchmarks or grandfathering. Various adjustments account for factors such as early reductions, carbon leakage risks, R&D investment, and fluctuations in activity levels. While these measures mitigate the corporate burden, they also result in smaller reductions. The ultimate mitigation effect will depend on the rigor with which these rules are applied.

• Focus on fuel-specific efficiency in the power sector

For the first three years, fuel-specific benchmark standards will be applied to the power sector. This provides a weak incentive for switching from coal or LNG to non-fossil sources such as renewables, and may delay the phase-out of inefficient coal power and stall investment decisions for renewable energy projects.

• External credit utilization up to 10%

Entities are permitted to use external credits for up to 10% of their actual emissions. This level is high by international standards. These credits represent external offsets, which result in lower reductions by the participating companies.

• Weak initial price signals may fail to incentivize early action

The combination of free allocation and low price floors (1,700 JPY/t-CO_2) and ceilings (4,300 JPY/t-CO_2) results in a weak initial price signal. This may fail to sufficiently incentivize companies to pursue early reductions.

(2) Key features of Phase 3

• Eight-year delay in introducing paid allocation (auctioning)

Free allocation will continue for the first seven years. Paid allocation for power generators will not be introduced until 2033, eight years after the system's inception. Compared to the EU, which already utilizes 100% auctioning for the power sector, and South Korea, which aims for 50% by 2030, the price signal for the Japanese power sector remains limited.

• Linkage to GX Transition Bond redemption

Revenue from paid allocations (Specified Business Operator Contributions), combined with Fossil Fuel Surcharge revenues, is earmarked for the redemption of GX Transition Bonds. However, annual collections are capped to remain within the range of declining revenues from the Petroleum and Coal Tax and the FIT Surcharge.

• Carbon prices and cumulative collections suppressed until near 2050

Due to the annual revenue ceiling on the Fossil Fuel Surcharge and Contribution, collections will remain suppressed for the time being. Consequently, carbon prices will remain low through the 2030s, only beginning to rise in the 2040s. These levels are significantly lower than international carbon prices and the IEA Net Zero Scenario projections for advanced economies.

2. Future outlook

To evolve the GX-ETS into a robust carbon pricing system that drives NDC-aligned reductions while properly recognizing corporate efforts and enhancing industrial competitiveness, several key institutional improvements are necessary.

• Ensure high transparency to encourage proactive corporate action

Disclosure of transition plans and operational data (allocations, trading volumes, and target achievement) is vital for system integrity and the fair valuation of ambitious corporate efforts. While capital investment plans and actual decarbonization results are currently slated to remain private, increasing transparency in these areas is essential.

• Incorporate a carbon budget perspective and ensure consistency with national reduction targets

The absence of an aggregate reduction target for the GX-ETS, which covers roughly 60% of Japan's GHG emissions, creates uncertainty about whether the NDC can be achieved. It is essential to adopt a carbon budget perspective and establish a total cap aligned with the Paris Agreement to ensure the system effectively contributes to national goals.

• Strengthen incentives to promote early reductions

Decarbonizing business activities enhances corporate value and competitiveness. Encouraging early reductions can accelerate corporates' decisions. Effective measures include raising benchmark standards, limiting the use of external credits, and applying adjustment factors more stringently.

• Introduce carbon pricing that provides a sufficient price signal

While price signals are fundamental to an ETS, price effectiveness is not central to the current design. Carbon prices are expected to remain too low to catalyze energy-efficiency investments or fuel switching in the near term. Given that Japan's carbon price is low by international standards, the system must be strengthened to generate a sufficient price signal from an early stage, balancing this with a repayment pace capable of meeting the GX Transition Bond redemption dates.

• Set carbon prices with the Carbon Border Adjustment Mechanism (CBAM) in mind

The carbon price for Phase 4 of the EU-ETS (2021–) is expected to be around 8,000 to 14,000 JPY/t-CO_2, which represents a significant gap with the GX-ETS. Under the EU's CBAM, deductions for carbon prices paid in Japan may be limited, potentially exposing Japanese exports to additional payments. Japan should aim for alignment with global carbon price standards to maintain international trade competitiveness.

• Design a system aimed at decarbonizing the power sector by 2040

Achieving early decarbonization of the power sector is a prerequisite for decarbonization of the broader economy. To achieve a zero-carbon power sector by 2040, carbon prices for generators must be raised early to provide a transformative price signal. Accelerating the transition to paid allocation (auctioning) would be an effective lever.

• Set an end year for Phase 2 and plan for a system review in 2028

The end year for Phase 2 should be clearly defined, with a formal review scheduled for 2028 (two years after launch) to confirm alignment with the national NDC. Simultaneously deciding Phase 3 allocation rules and carbon pricing will ensure long-term system predictability and stability.

• Reconsider the “invest now, charge later” framework that defers the financial burden

While GX Transition Bonds are issued over only 10 years starting in 2023, their redemption extends to 2050. Similarly, carbon prices remain low in the near term and only rise closer to 2050. This structure defers the financial burden to future generations, raising concerns regarding intergenerational equity. It is crucial to reconsider this framework, raising carbon prices earlier.

• Develop a mechanism that contributes to the decarbonization of society and benefits all stakeholders

Carbon pricing should not be viewed merely as a burden, but as a tool to mobilize investment in energy efficiency and renewables, create business opportunities, and drive growth. As the decarbonized electricity and products become relatively cheaper and widely available, companies will be more fairly recognized for making efforts. Furthermore, stakeholders such as small- and medium-sized enterprises and consumers can get economic benefits by making low-carbon choices.

Conclusion

Ensuring the effectiveness of the GX-ETS is fundamental to realizing carbon neutrality in Japan. It is essential to clearly demonstrate the system's role in achieving Japan's NDC and provide the foresight necessary for corporate investment. Participating companies are expected to comply with targets, formulate robust decarbonization investment strategies, and take proactive measures to lead the transition toward a carbon-neutral future.

What's GX-ETS?

Japan's Emissions Trading System

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