Ministry of Economy, Trade and Industry

Energy Efficiency Benchmark System of Japan

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Agency for Natural Resources and Energy

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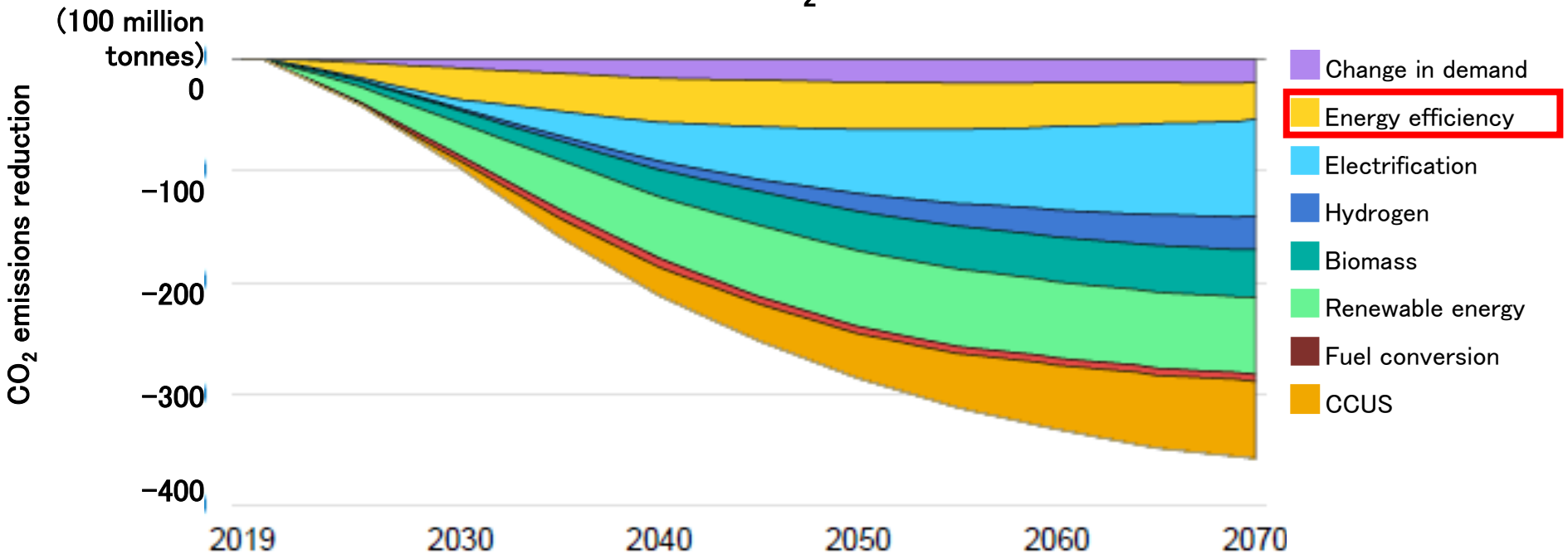
Future Potential of Energy Efficiency

- According to the IEA, when the whole world **becomes carbon-neutral, energy efficiency improvements will have contributed to approx. 15% of the CO_2 reduction**.

Contribution to the reduction of global energy-related CO_2 emissions



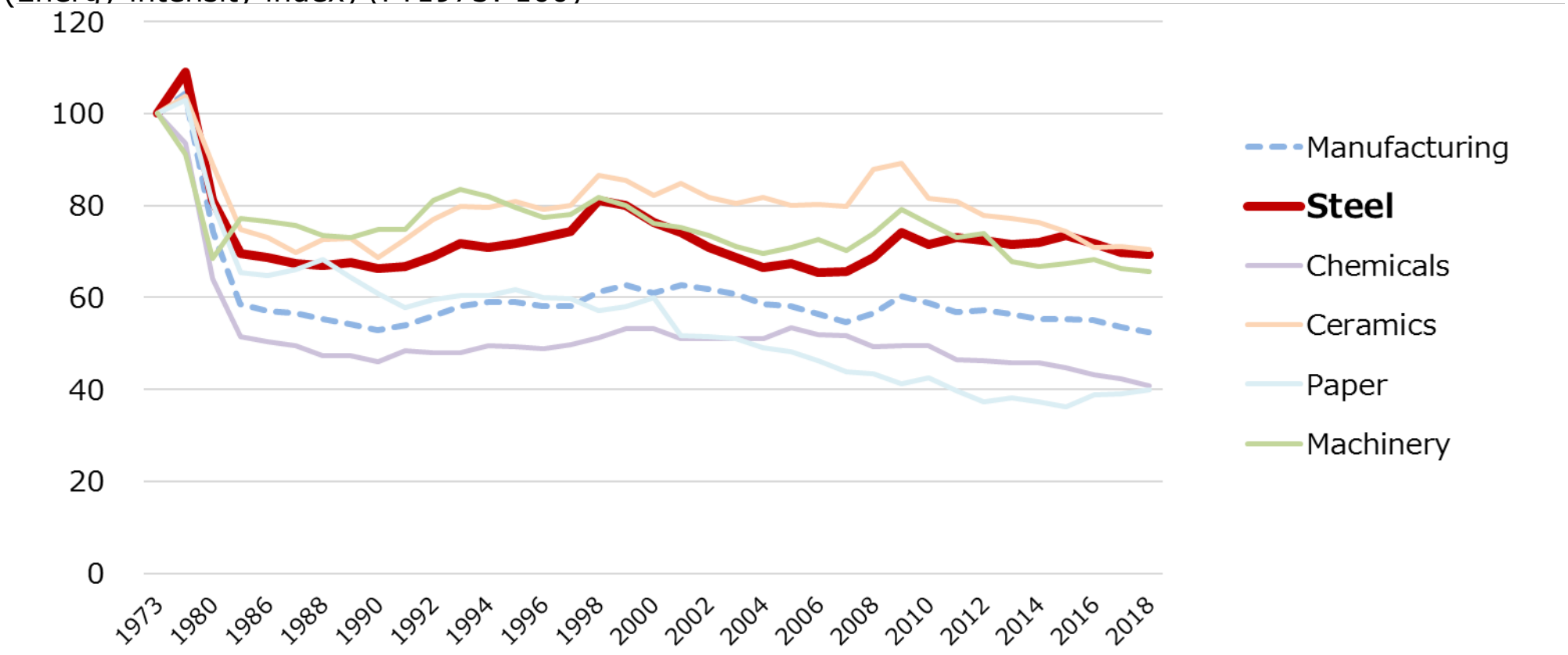
*Amount of reduction required to keep the global temperature increase within 2° C till 2100 (becoming carbon-neutral in 2070), on top of the emissions declared by countries as part of their NDCs under the Paris Agreement.

Source: IEA "Energy Technology Perspectives 2020," Figure 2.2

Progress of Energy Efficiency in Japan

- Japan has achieved **one of the highest levels of energy efficiency in the world**, but **the pace of improvement in energy intensity is now slowing.**
- **In some industries including steel**, energy intensity has leveled off.
- **Further energy efficiency improvement is necessary**.

■Energy Intensities per IIP in the Industrial Sector

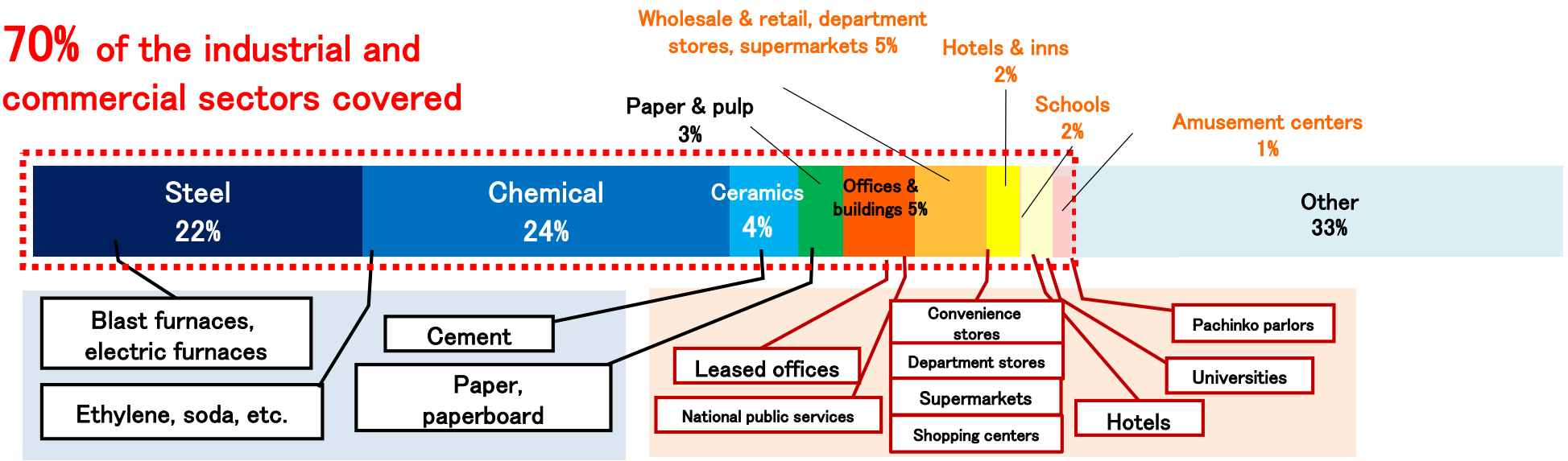


Source: Prepared by ANRE based on the Handbook of Energy & Economic Statistics in Japan

Benchmark System

- To improve energy efficiency in the industrial sectors, Japan introduced the benchmark system in 2009.

70% of the industrial and commercial sectors covered



The benchmarks for electric furnaces, paper, paperboard, convenience stores, and leased offices are revised in 2020–2021.

Concept of Benchmark Indicators and Targets

Principles for the benchmark performance indicator

The indicator must:

1. Be able to **cover wide scope of the energy consumed** (Ex. Up-stream & Down-stream)
2. Be **quantitatively measurable**
3. **Accurately represent the status of energy efficiency**
   (impacts of factors other than energy efficiency must be removed as much as possible
   e.g.: difference in boundaries and product types, use of renewables and waste heat, etc.)
4. Be **simple and easy to understand**

Concept of benchmark target levels

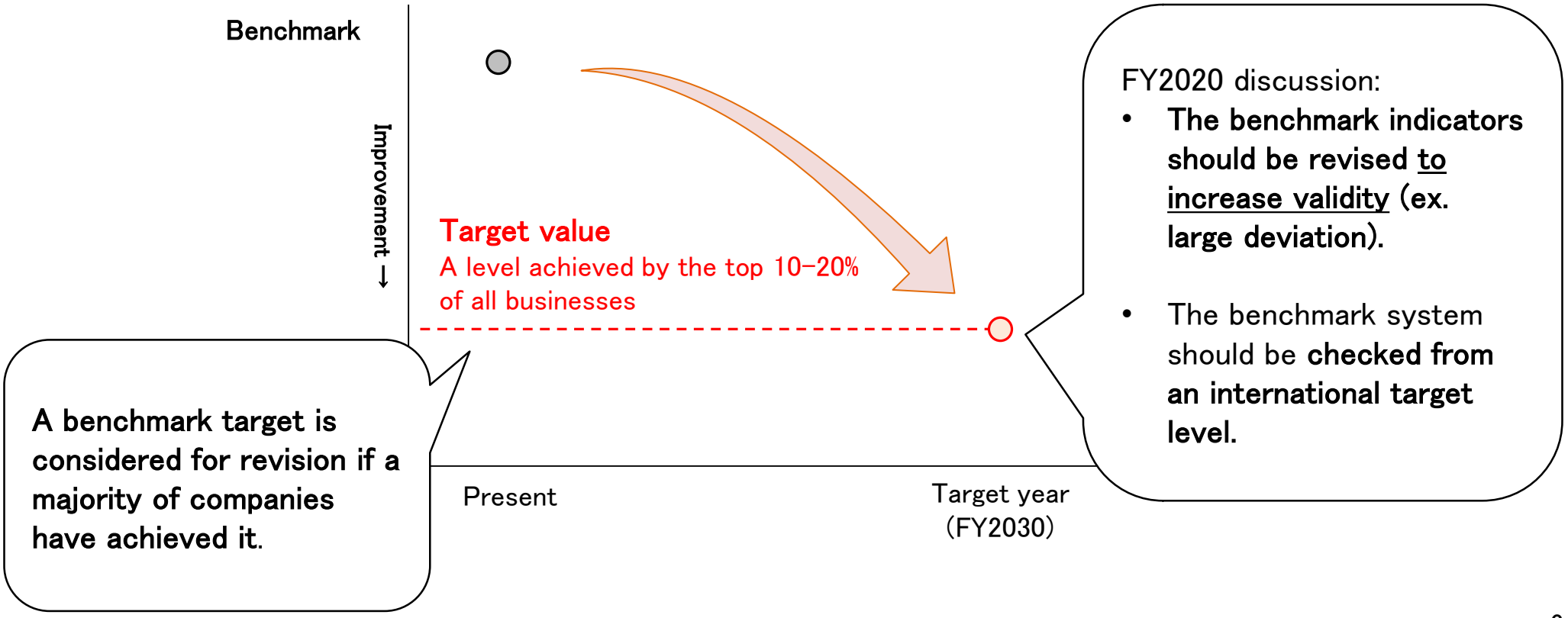
Benchmark target levels must:

1. Represent a **"Best Available Technology"**
2. Be **the top 10-20% level** based on the distribution of domestic companies
3. Be **internationally high level** (comparing with EU-ETS)

Reference: Idea behind the Revision of the Benchmark System

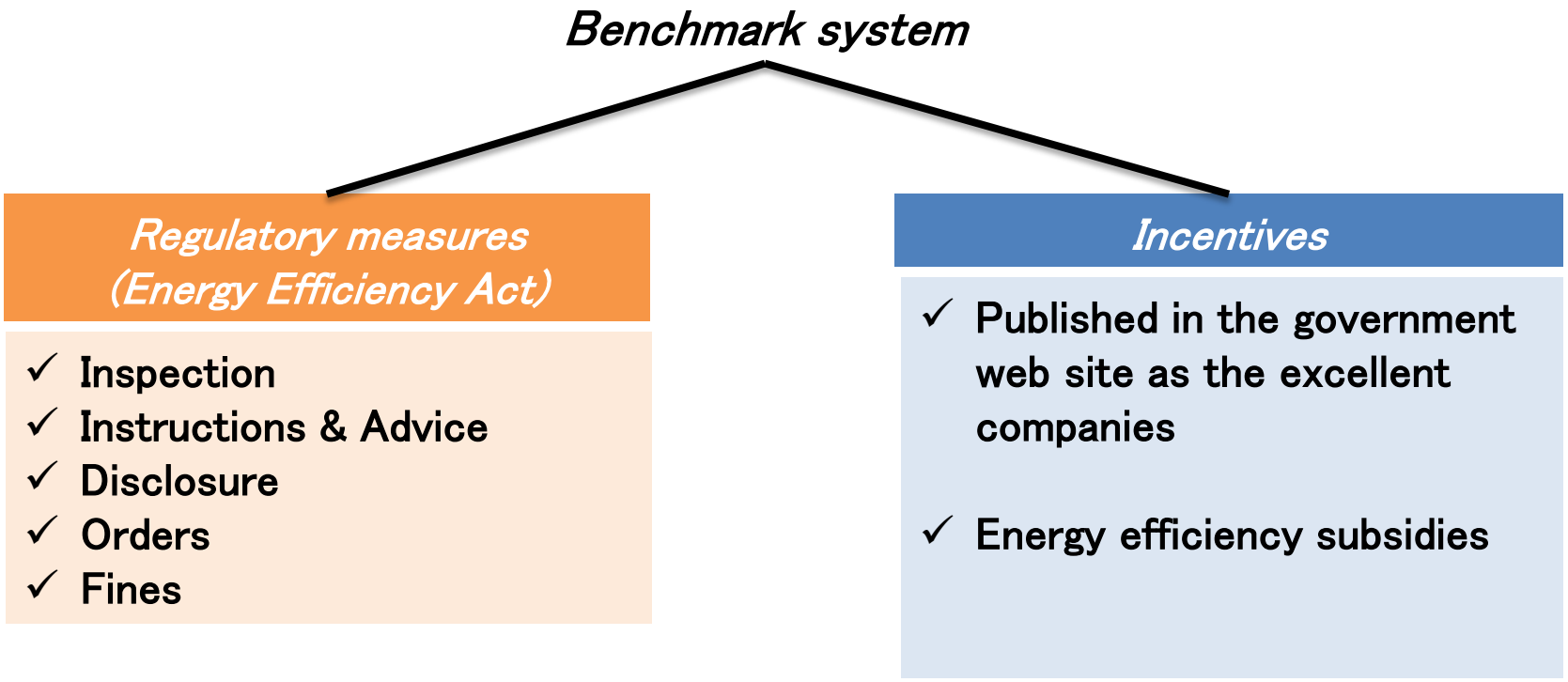
- The benchmark system **sets FY2030 as the target year** but the **target level might be revised when a majority of companies have achieved the target**.
- In 2020, **benchmark indicators were revised considering the issues in each industry.**

■Overview of the benchmark system revision



Improving Energy Efficiency Using the Benchmark System

- The benchmark system enables:
  - The government to **conduct inspections to businesses whose energy efficiency efforts are insufficient**.
  - **Energy efficiency subsidies are available** when a benchmark target is achieved.
- Japan's benchmark system, combining regulations and incentives, is comparable to those of **international energy efficiency and CO_2 reduction systems**.



Reference: Status of Achievement of the Benchmarks (1)

- In 2021, Government of Japan revised 1B, 1C, 4A, 4B, 7, and 12

Cat.	Sector	Benchmark performance indicator (summary)	Benchmark target	Introduced in:	Number of companies that achieved the BM (FY2019 report)
1A	Steel manuf., blast furnace	Energy consumption per unit of crude steel	0.531 kl/t or less	FY2009	0 / 4 (0.0%)
1B	Electric furnace (ordinary steel)	Sum of energy intensity for upstream (energy consumption per unit of crude steel) and downstream (energy consumption per unit of steel rolled)	0.143 kl/t or less	FY2009	5/31 (16.1%)
1C	Electric furnace (special steel)	Sum of energy intensity for upstream (energy consumption per unit of crude steel) and downstream (energy consumption per unit of shipment)	0.36 kl/t or less	FY2009	5/16 (31.3%)
2	Electricity supplier	Thermal power plant efficiency benchmark A Thermal power plant efficiency benchmark B	BM A: 1.00 or more BM B: 44.3% or more	FY2009	36/85 (42.4%) *Both A & B achieved
3	Cement manufacturing	Sum of energy consumption per unit output (shipment) in the raw material, incineration, finishing, and shipment processes	3,739 MJ/t or less	FY2009	5/16 (31.3%)
4A	Paper manufacturing	Energy consumption in the paper manufacturing process per unit of paper produced	6,626 MJ/t or less	FY2010	3/18 (16.7%)
4B	Paperboard manufacturing	Energy consumption in the paperboard manufacturing process per unit of paperboard produced	4,944 MJ/t or less	FY2010	7/32 (21.9%)
5	Oil refining	Energy consumption per standard energy consumption for the oil refining process (sum of the oil throughput of each device in the relevant process multiplied by factors deemed appropriate)	0.876 or less	FY2010	3/8 (37.5%)
6A	Petrochemical product manufacturing	Energy consumption of an ethylene production facility per unit ethylene output	11.9 GJ/t or less	FY2010	4/9 (44.4%)
6B	Soda industry	Sum of energy consumption per unit weight of caustic soda from the electrolytic bath in the electrolysis process and the heat from steam used per unit weight of caustic soda in the concentration process	3.22 GJ/t or less	FY2010	8/22 (36.4%)

*Blue font: achievement rate of 40% or more

Reference: Status of Achievement of the Benchmarks (2)

Cat.	Sector	Benchmark performance indicator (summary)	Benchmark target	Introduced in:	Number of companies that achieved the BM (FY2019 report)
7	Convenience store business	The total electricity consumption by the relevant store divided by its total sales	845 kWh/million yen or less	FY2016	9/19 (47.4%)
8	Hotel business	The energy consumption of the relevant hotel divided by the average energy consumption of a hotel similar in size, services, and operational conditions	0.723 or less	FY2017	41/231 (17.7%)
9	Department store business	The energy consumption of the relevant department store divided by the average energy consumption of a department store similar in size and sales	0.792 or less	FY2017	22/81 (27.2%)
10	Foods Supermarket business	The energy consumption of the relevant store divided by the average energy consumption of a store similar in size, operational conditions, and facility conditions	0.799 or less	FY2018	59/288 (20.5%)
11	Shopping center business	The energy consumption of the relevant facility divided by its total floor area	0.0305 kl/m^2 or less	FY2018	13/113 (11.5%)
12	Office lease business	The energy efficiency improvement potential of the relevant office calculated by a special tool for estimating energy efficiency potential	15% or less	FY2018	35/216 (16.2%)
13	Universities	The weighted average of the energy consumption of each campus obtained by dividing the energy used for the relevant business at the relevant campus by the sum of ① and ② ① the area used by humanities and other faculties multiplied by 0.022 ② the area used by science and medical faculties multiplied by 0.047	0.555 or less	FY2019	–
14	Pachinko parlor business	The weighted average of the energy consumption of each store obtained by dividing the energy consumption of the relevant store by the sum of ① through ③ ① the total floor space multiplied by 0.061 ② the number of pachinko machines multiplied by 1/1000 of the total operating hours of the store and then by 0.061 ③ the number of slot machines multiplied by 1/1000 of the total operating hours of the store and then by 0.076	0.695 or less	FY2019	–
15	National public services	The weighted average of the energy consumption of each office obtained by dividing the energy consumed for relevant services at the relevant office by the sum of ① and ② ① the floor area multiplied by 0.023 ② the number of workers multiplied by 0.191	0.700 or less	FY2019	–

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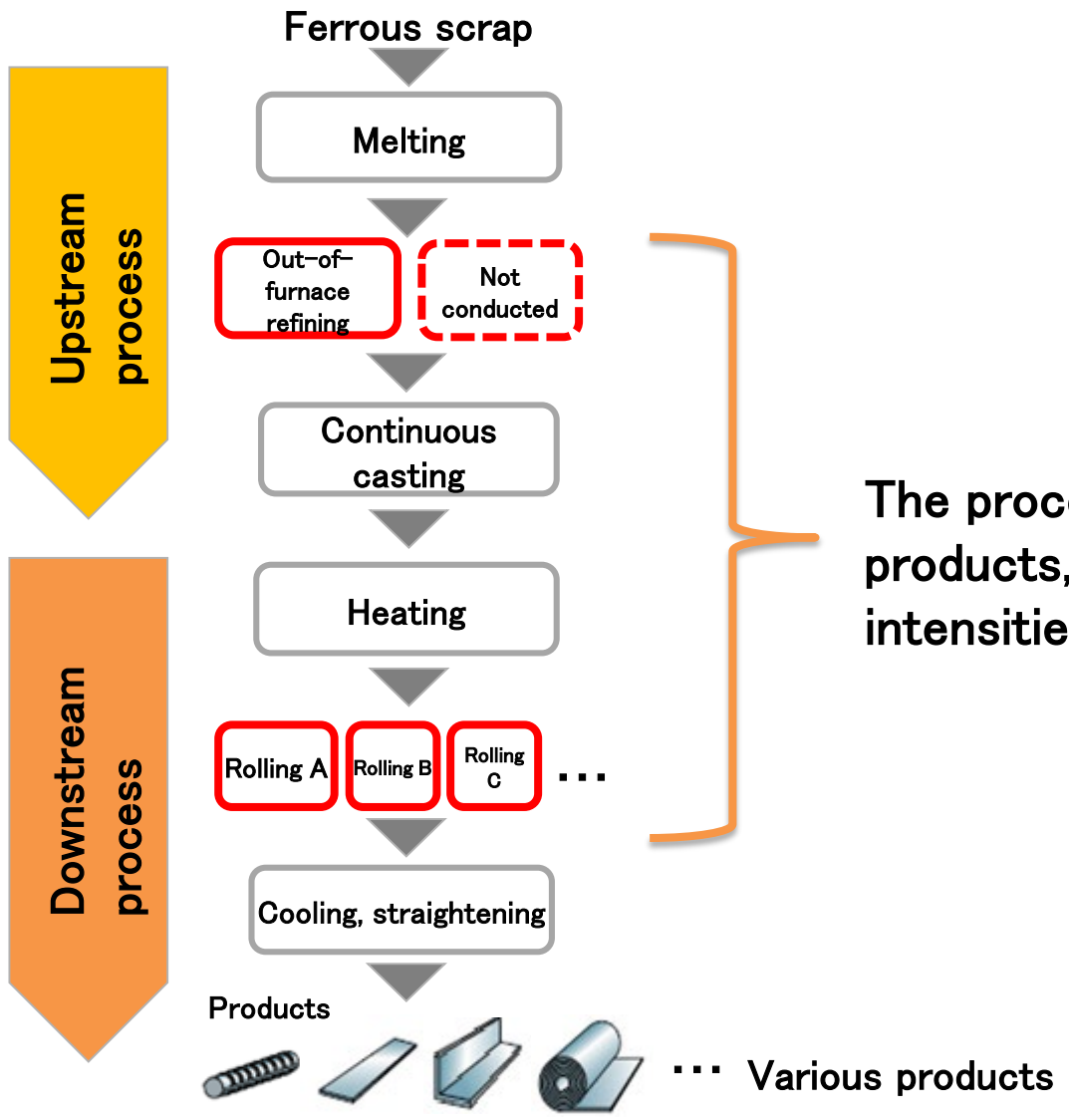
Issues with the Benchmark (electric furnaces for ordinary steel)

- For ordinary steel production with electric furnaces, **production processes vary by products, and energy intensities vary as a result.**

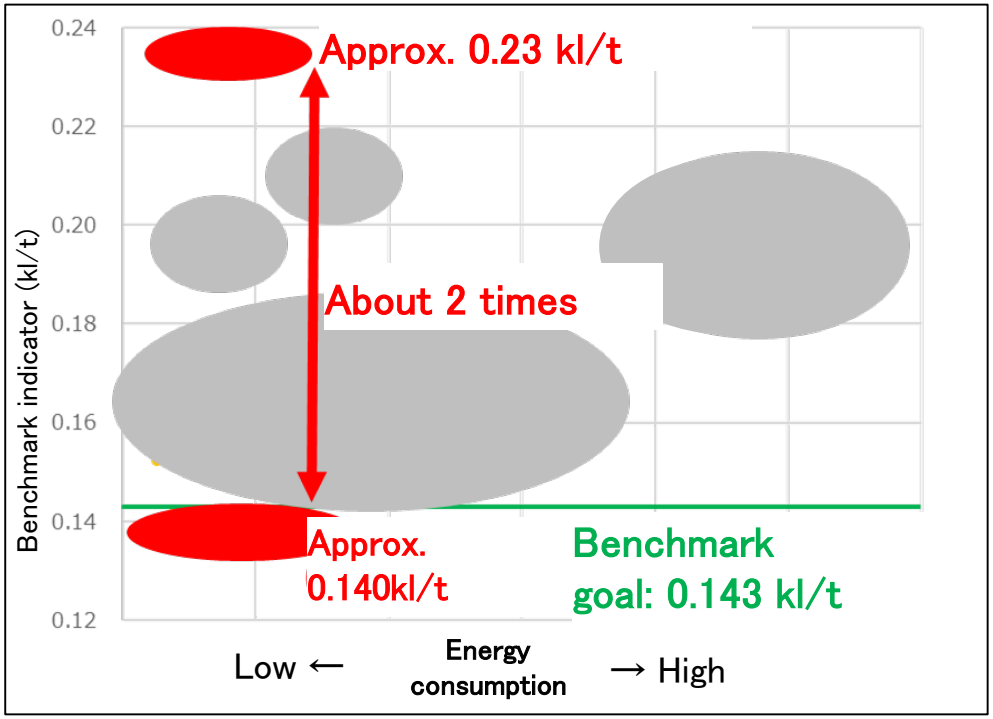


Status of Achievement of the Benchmarks by Electric Furnace Steel-makers

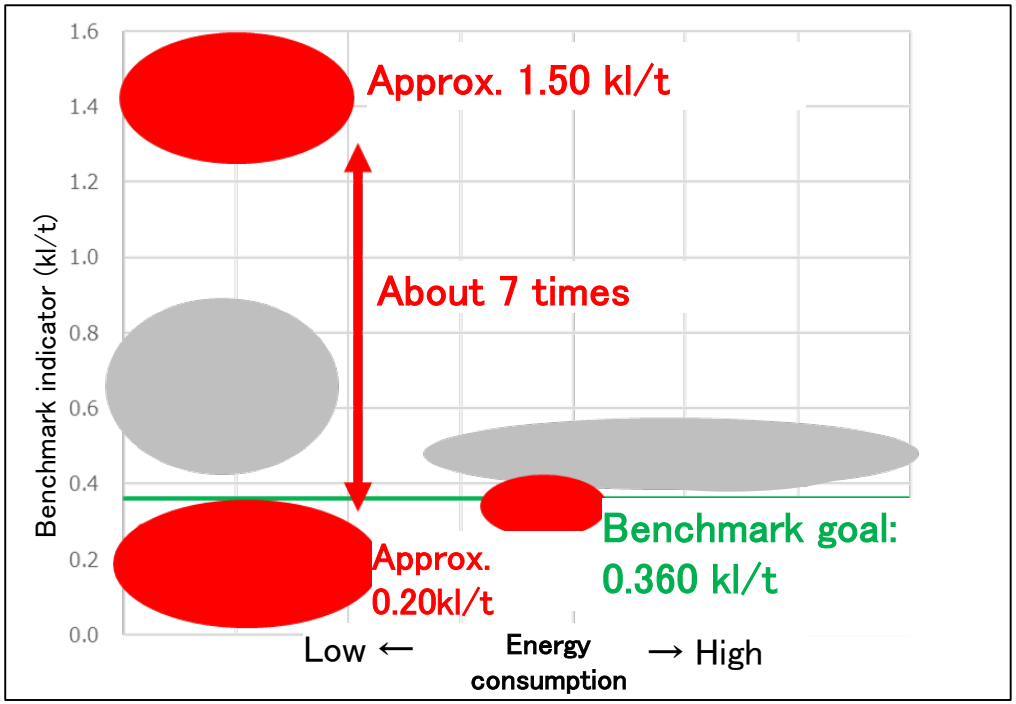
- **The differences in production process between products result in gaps in energy intensity** due to factors other than energy efficiency efforts.

■Distribution of performance in view of the benchmarks

(Electric furnace for ordinary steel)



(Electric furnace for special steel)



Revision of Benchmarks for Electric Furnace Steel Industry

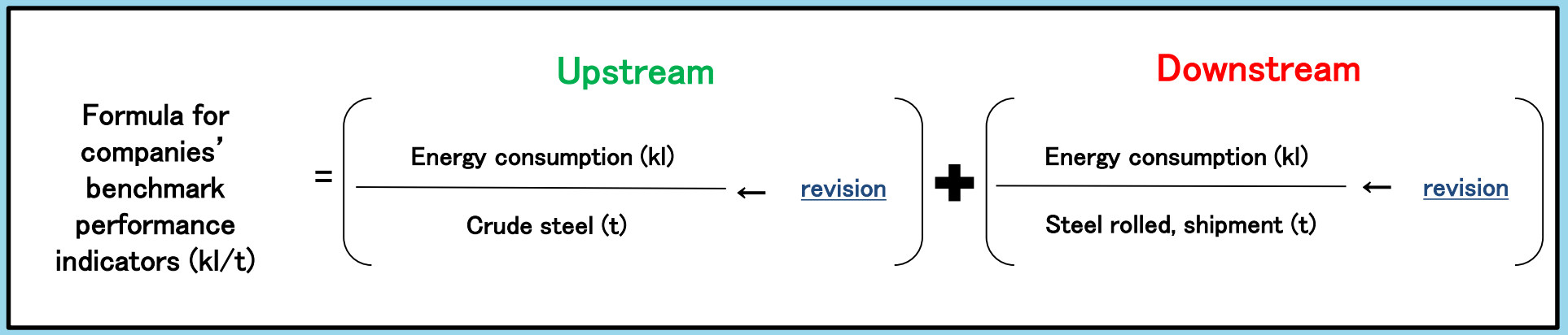
- To prevent the worsening of energy intensity due to factors unrelated to energy efficiency efforts, such as various product line-up, and **to correctly evaluate such efforts of companies**, the **benchmark indicators were revised** as follows.

Electric furnaces for ordinary steel

- **Considering the differences in production processes, the formula for benchmark performance indicator was revised.**

Electric furnaces for special steel

- **The additional energy consumption processes that only some products go through were removed or adjusted.**



- For revising the benchmark, **surveys were sent to the manufacturing companies of the benchmark system and necessary information was collected.**

① Survey

- A **survey was distributed** to target companies regarding **the output and energy consumption of each type of product etc.**
  Electric furnace, ordinary steel: **32 companies** (28 valid respondents)
  Electric furnace, special steel : **16 companies** (13 valid respondents)

② Analysis

- Based on the survey, the energy intensity per product and energy consumption per process were **analyzed.**
- **Interviews** were conducted **to collect additional information.**

③ Discussion

- **The expert working group decided** on the proposed revisions to the benchmarks.
- A decision was made to apply the new benchmarks **starting with the energy consumption report for 2021.**

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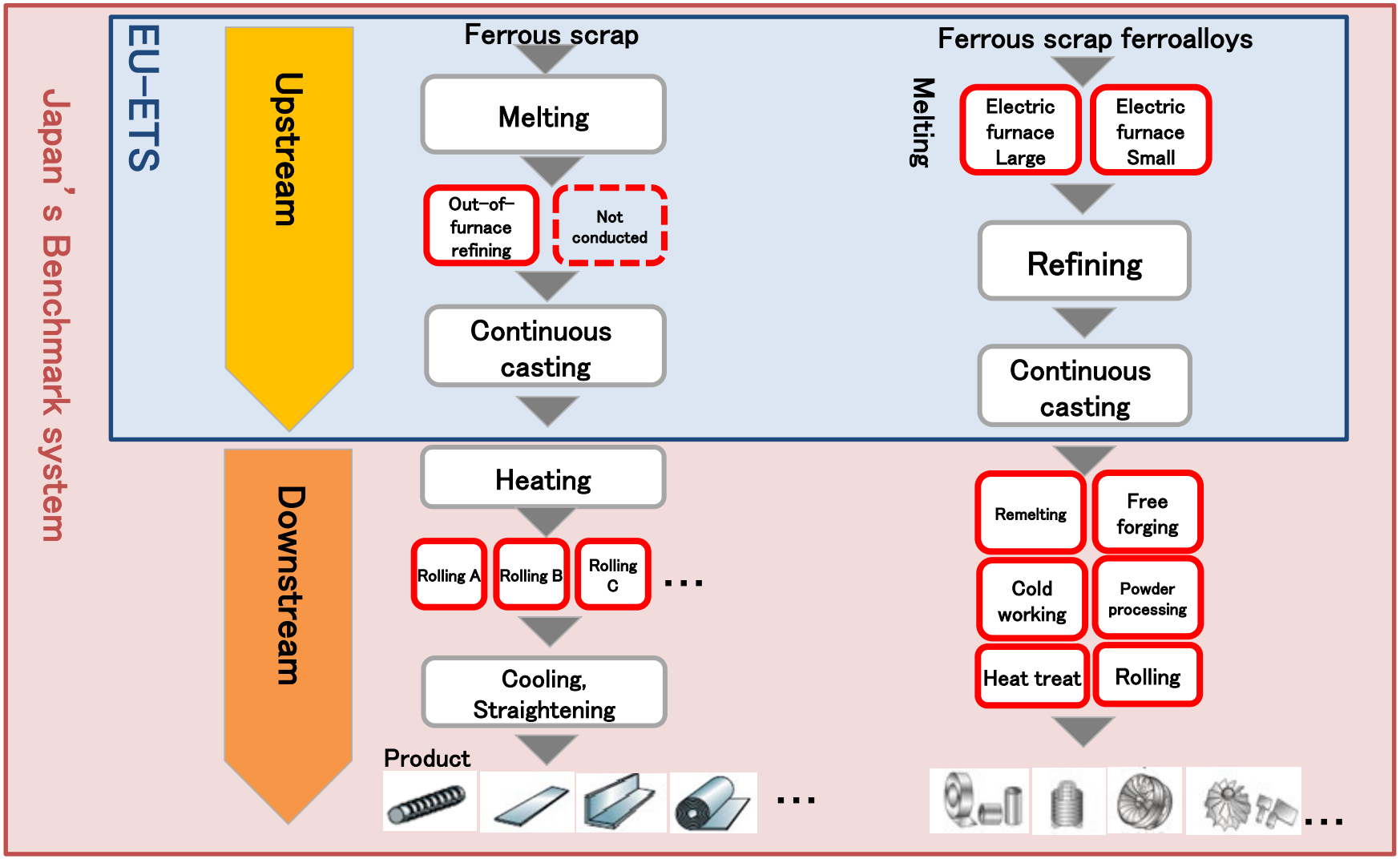
Comparison with EU-ETS (1)

- Compared to the product benchmarking for electric furnace steel-making under EU-ETS, the **Japan's benchmarks cover a wider scope, applying to both the upstream and downstream processes**. Meanwhile, **the gaps between companies are wider**.



Comparison with EU-ETS (2)

- Japan's energy efficiency benchmarks are **comparable to the values for EU-ETS (Phase 3)**.

■Electric furnace, ordinary steel

	EU-ETS	Japan
Benchmark	0.283 tCO_2/tonne (Phase 3 value)	0.221 tCO_2/tonne (value for upstream only)

■Electric furnace, special steel

	EU-ETS	Japan
Benchmark	0.352 tCO_2/tonne (Phase 3 values)	0.338 tCO_2/tonne (value for upstream only)

- Japan's benchmarks for electric furnaces for ordinary and special steels are based on energy intensity (kl/t), and so were converted into tCO_2 intensity adopted by EU-ETS. The factors for converting thermal values into tCO_2 were obtained from the values for electric furnaces in the General Energy Statistics of Japan.
- As Japan's benchmarks and EU-ETS's product benchmark do not overlap completely in terms of output and energy boundaries, the comparison is for reference only.

Reference: Guidance Document No. 9 on the harmonized free allocation methodology for the EU-ETS post 2012 Sector-specific guidance
https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/gd9_sector_specific_guidance_en.pdf