

PV Activities in Japan and Global PV Highlights



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Summary in December 2024

PV Highlights in Japan

Monthly PV Highlights in Japan ~ December 2024 ~

- The national government held the 14th meeting of the Green Transformation (GX) Implementation Council and compiled the GX 2040 Vision (draft)
- The Agency for Natural Resources and Energy (ANRE) under The Ministry of the Environment (MoE) and the Ministry of Economy, Trade and Industry (METI) compiled a draft of the Seventh Strategic Energy Plan, estimating that renewable energy will account for 40% to 50% of the energy mix in FY 2040 and that PV will account for approximately 23% to 29% of the renewable energy ratio
- ANRE under METI announced the calculation results of the power generation costs by power source as of 2040, and the power generation cost of C&I PV systems based on the basic scenario is 8.5 yen/kWh (5.42 cents/kWh)
- The Ministry of the Environment (MoE) and METI compiled a draft of the Plan for Global Warming Countermeasures, aiming to reduce GHG emissions by 60% by 2035 and 73% by 2040
- METI and MoE jointly compiled the PV Facility Recycling Scheme (draft)
- ANRE under METI discussed a scheme to support initial investment and the establishment of a new power generation facility category for perovskite solar cells (PSCs) based on the FIT and FIP programs
- MoE announced the compiled report of the Study Group on the future local decarbonization policies, setting five years from FY 2026 to FY 2030 as the period to concentrate on the implementation, as "Local Decarbonization 2.0" period
- The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) approved the Plan to promote airport decarbonization of three airports, namely Asahikawa, Iwate Hanamaki, and Mt. Fuji Shizuoka Airports
- Aomori Prefecture announced a draft outline of the ordinance of the "Prefectural Tax for Renewable Energy Coexistence," which imposes a tax on PV and onshore wind power producers
- Sekisui Chemical will start mass production (100 MW) of perovskite solar cells (PSCs) in 2027 by establishing SEKISUI SOLAR FILM
- Central Japan Railway Company (JR Tokai) and Sekisui Chemical developed a prototype of soundproof wall equipped with PSCs
- Kansai Electric Power (KEPCO) will start an offsite corporate PPA business with McDonald's Japan and KDS Solar, which develops and operates PV systems, will newly develop or acquire PV systems with a total capacity of approximately 4 MW at around 80 sites
- Kyushu Electric Power signed a comprehensive partnership agreement with Shinryo, and AGC to promote reuse and recycling of PV modules
- TOKYO GAS and its subsidiary Tokyo Gas Engineering Solutions (TGES) developed a 2,250-kW PV power plant and signed an offsite PPA with McDonald's Japan, to supply renewable power to 75 shops of McDonald's Japan
- ENERES signed an offsite PPA with Halows and AkiyamaKousan to supply power from a 2,497kWac floating PV power plant
- Sojitz Corporation plans to develop 3,000 power plants with an average output capacity of ca. 100 kW by the end of FY 2026 with the total project cost of 50 billion yen (\$ 315 million)
- Tokyo Century will enter the PV power plant business in Italy, planning to develop two PV power plants (188.8 MW in total)

Contents of This Issue

PV Highlights in Japan

Monthly PV Highlights in Japan	1
RTS Monthly Perspective	2
Highlights of the Japanese PV Market	4
RTS Monthly Focus	6
1. FY 2025 budget proposals by the ministries and agencies of Japan	6
2. The 68th meeting of the Strategic Policy Committee	15
3. The 5th meeting of the Power Generation Cost Verification Working Group	16
4. The 100th meeting of Procurement Price Calculation Committee	17
5. The 53rd meeting of the Working Group on Grid Connection of Renewable Energy	18
6. Results of the 22nd tender for PV projects	21
7. The 7th to 9th Joint Meetings of the Central Environment Council under MoE and the Industrial Structure Council under METI	22
8. Updates on approved and commissioned capacities of PV projects	23

Monthly PV Photo Gallery

Wall-mounted perovskite PV system at Sekisui Chemical's Osaka Headquarters

.....	24
Topics from Japan	26
PV shipments in Japan (Monthly data updated!)	37
PV system prices trends in Japan	40

Topics from the World

Topics from the Global PV Industry	42
Trends of Production Capacity of Polysilicon Manufacturers	45
Trends of PV Module Shipments (Quarterly) by Global Major PV Manufacturers	46
Trends of Module Production Capacity by Global Major PV Manufacturers	47

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Founded in 1983, RTS Corporation is a consulting company specialized in PV.

(Note) 1 JPY = 0.00638 USD (as of January 1, 2025)

RTS Monthly Perspective

The annual global PV installed capacity in 2024 is expected to reach the 500 GW level, and Japan needs to make a turnaround for increasing its PV installed capacity

The highlight of PV power generation in 2024, as shown in Table 1, is that the annual global PV installed capacity is expected to reach the 500 GW level. Since reaching a cumulative PV installed capacity of 1 TW in 2022, PV power generation has continued to grow

strongly, exceeding the 2-TW mark in just two years, living up to its title as the 'king'. In particular, expansion of major PV markets is expected as follows: China to 290 GW; USA to 40 GW; European Union (EU) to 65 GW and India to 30 GW. Against this backdrop,

the International Energy Agency (IEA) forecasts in its 'Renewables 2024' that the annual global PV installed capacity in 2030 will range from 701 to 835 GW, with a cumulative total of 5.8 to 6.5 TW.

Table 1 Ten most important news related to PV power generation in 2024

	Ten most important news in the world		Ten most important news in Japan
Policy	1) The IEA forecasts that the annual global PV installed capacity in 2030 will range from 701 to 835 GW, with a cumulative total of 5.8 to 6.5 TW	Policy	1) The Ministry of Economy, Trade, and Industry (METI) has finalized the draft of the Seventh Strategic Energy Plan
	2) The United States aims to strengthen its domestic production framework through the Inflation Reduction Act (IRA), with production capacity expected to exceed 30 GW/year		2) METI has formulated the Next-Generation Solar Cell Strategy and compiled the Action Plan to make renewable energy a main power source (including the Renewable Energy 100-Year Initiative)
	3) The European Union (EU) has developed the European Solar Charter to strengthen the PV supply chain and accelerate the introduction of PV power generation, and enacted the Net Zero Industry Act (NZIA)		3) The Ministry of the Environment (MoE) has set a PV installation target of 4.82 GW on local government-owned land and facilities by FY 2030
	4) Germany has passed and enacted the 'Solar Package I' bill, which is designed to accelerate the spread of PV power generation		4) MoE and METI have compiled a PV module recycling system aimed at mandating recycling
	5) China has prioritized the development of renewable energy and enacted the Energy Law to promote the energy transition		5) The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and METI have set a target for PV installations on newly built homes for FY 2027
	6) India has introduced a new 'Rooftop PV Power Generation Introduction Program', which aims to install 30 GW of PV systems in total for 10 million households, while also transitioning to become a PV exporting country	Municipalities	6) The establishment of renewable energy promotional areas, subsidy-based support programs for PV installations, PV installations on public facilities and public land through PPA scheme, and the activation of 'local production for local consumption of energy' projects utilizing PV power generation
Market	7) The annual global PV installed capacity has grown to the 500 GW level (290 GW in China, 40 GW in the US, 65 GW in EU, 30 GW in India), with a cumulative total exceeding 2 TW	Market	7) The average winning bid price of FIP tenders for the introduction of PV power generation has dropped to 8.17 Yen/kWh (5.21 cents/kWh)
	8) The price of PV modules has plummeted to below 10 cents/W due to global overproduction, and intense price competition has led to an 'involution' in China, causing the industry to be exhausted		8) The domestic PV market stagnated, and the annual PV installed capacity is estimated to decrease to the 5 GW _{DC} level, the lowest level since 2013 when annual PV installations started
Industry	9) The establishment of PV supply chain is progressing in countries and regions outside China, such as the US, Europe, India, and Southeast Asia, intensifying the push for higher efficiency in PV modules and fierce price competition	Industry	9) PPA projects, independent of the FIT and FIP programs, have become more active, marking the beginning of the transition from FIT to FIP utilizing energy storage systems
	10) The n-type TOPCon technology has become mainstream, shifting from the conventional p-type PERC technology. While the transition to heterojunction (HJT) and back-contact solar cell production is nearly complete, the global competition over the development of perovskite solar cells (PSC) is intensifying		10) New developments and businesses surrounding PV power generation, such as O&M, recycling, aggregation, demonstrations of perovskite solar cells (PSCs), and virtual PPAs, have emerged one after another

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In terms of policy, the United States has strengthened its domestic PV production framework through the Inflation Reduction Act (IRA), with production capacity expected to exceed 30 GW/year. Support for expanding PV installations has been enhanced in Europe, China, and India.

In the PV industry, intense capital

investment by PV module manufacturers has led to an oversupply, causing PV module prices to drop to levels below or at manufacturing costs, falling under 10 cents/watt. As a result of the reevaluation of the supply chain, PV cell/module factories are being planned around the world, starting with the United States, Europe, and India. If this price level continues, PV module manufacturers will start to be eliminated.

On the other hand, as the current price level becomes increasingly competitive compared to other power sources, not only will the PV installed capacity per country increase, but it will also spread to all regions of the world.

In Japan, a draft of the GX2040 Vision, which looks ahead to 2040 and significantly impacts the expansion of PV installations, as well as the drafts of

the Seventh Strategic Energy Plan and the Plan for Global Warming Countermeasures, were presented. Alongside this, relevant government ministries and agencies as well as local governments advanced measures for renewable energy based on the GX Promotion Strategy formulated in July 2023.

In formulating the Seventh Strategic Energy Plan, the outlook for the 2040 energy mix assumes a power generation amount of 1.1 to 1.2 trillion kWh, with renewable energy accounting for 40~50%, nuclear power for 20%, and thermal power for 30~40%. Renewable energy is positioned as the largest power source, surpassing thermal power. Among renewables, PV power generation is expected to account for approximately 23~29% (equivalent to 202~278GW, with the assumption of 1 kW generating 1,250 kWh/year), making it likely to become the top power source in Japan in terms of both installed capacity and generation amount, surpassing all other power sources (thermal power is not specified by fuel type). The draft of the Plan for Global Warming Countermeasures presented GHG reduction targets of a 60% reduction by 2035 and a 73% reduction by 2040 compared to 2013 levels.

METI enforced the revised Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities (Renewable Energy Act) and embarked on strengthening business disciplines aimed at ensuring

harmony with local communities in introducing renewable energy. To make renewables a stable power source and to expand the introduction of renewable energy, METI launched the Renewable Energy 100-Year Initiative and announced the Action Plan to make renewable energy a main power source, while also formulating the Next-Generation Solar Cell Strategy to build a domestic PV supply chain.

The Ministry of the Environment (MoE) has continued the Project to promote the Decarbonization Leading Areas (DLAs) and expanded support for the introduction of PV power generation by local governments and private companies. Nine new regions have been added to the DLAs, which have been expanding to a total of 82 regions across 38 prefectures and 108 municipalities, approaching the target of 100 regions. Furthermore, MoE has set a target for local governments to introduce 4.82 GW of PV systems on their owned land and facilities by 2030. In the development of inter-ministerial collaborative policies, MoE and METI formulated a recycling system aimed at mandating the recycling of PV modules, which are expected to be discarded in large quantities from PV power plants. METI and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) set a FY 2027 target for the installation of PV systems in newly built homes, aiming for 37.5% in newly built detached houses and 87.5% in custom-built detached houses. Local governments are actively establishing renewable energy promotional areas, implementing subsidy programs for PV

installations, introducing PV systems to public facilities through PPA scheme, and promoting 'local production for local consumption of energy' projects utilizing PV power generation.

In the market, although the average winning bid price in FIP tenders dropped to 8.17 Yen/kWh (5.21 cents/kWh), the stagnation of new project approvals under the current FIT and FIP programs has continued. While installations supported by subsidies from ministries and agencies as well as voluntary installations independent of the FIT and FIP programs are increasing, start of operation of the approved projects under the old FIT program has significantly declined. Consequently, Japan's annual PV installed capacity in 2024 is expected to fall to the 5 GW_{DC} level, the lowest since 2013.

In the industry, PPA projects independent of the FIT and FIP programs are becoming more active, and a shift from FIT to FIP with the use of energy storage systems is beginning. New developments and businesses, such as O&M, recycling, aggregation, virtual PPAs, and demonstrations of perovskite solar cells (PSCs), are beginning to emerge one after another.

Japan must use the Seventh Strategic Energy Plan and the new Plan for Global Warming Countermeasures as turning points to halt the decline in PV installations and make 2025 a 'year of turnaround' toward increasing the installations once again.

Highlights of the Japanese PV Market

National government

The national government held the 14th meeting of the GX (Green Transformation) Implementation Council and compiled the "GX2040 Vision (Draft)". The Ministry of the Environment (MoE) and the Ministry of Economy, Trade and Industry (METI) have compiled a draft of the Plan for Global Warming Countermeasures, aiming to reduce greenhouse gas (GHG) emissions by 60% by FY 2035 and 73% by FY 2040. METI has compiled the Seventh Strategic Energy Plan (draft) which presents its outlook that the power generation amount in FY 2040 will be about 1.1 - 1.2 trillion kWh, consisting of renewable energy accounting for about 40% - 50%, nuclear power for about 20%, and thermal power for about 30% - 40%. At the 100th meeting of the Procurement Price Calculation Committee, a concrete plan was presented for the initial investment support scheme for commercial, rooftop and residential PV systems.

Local governments

Aomori Prefecture has released the outline of a draft ordinance for the "Prefectural Tax for Renewable Energy Coexistence," which imposes a tax on PV and onshore wind power producers. From January 1, 2025, **Numazu City of Shizuoka Prefecture** will relax restrictions on the installation of PV and wind power plants in controlled areas such as farmland if a project developer in the city installs PV or wind power generation facilities for in-house power generation and meets the conditions such as not cutting down trees. **Fukuoka City of Fukuoka Prefecture** has started a call for applications to confirm whether there are participants in the "Project to commission leading introduction of next-generation solar cells (perovskite solar cells)".

Power companies

Hokkaido Electric Power (HEPCO) will participate in a project to supply PV electricity to Shin-Chitose Airport Station and Otaru Station through an off-site PPA. **Hokuriku Electric Power** will install a 1.5-MW PV power plant on

idle land in the head office factory of Pacific Rundum using the on-site PPA model. Chubu Electric Power Miraiz has signed an off-site PPA agreement with Toyoda Gosei. **Kansai Electric Power (KEPCO)** will start an off-site corporate PPA project with McDonald's Japan and KDS Taiyoko GK.

Industry trends (PV cell/ module, BOS)

In the area of solar cells, **Sekisui Chemical** has decided to start mass production of perovskite solar cells (PSCs) at a scale of 100 MW/year in 2027. The company plans to build a supply system with an annual production of 1 GW scale by 2030 through gradual expansion of investments. **Electric Works Company, Panasonic Corporation** will launch a new PV module for residential and industrial use that uses N-type back-contact solar cells.

There were no significant developments related to BOS.

Industry trends (storage batteries)

Shizuoka Gas & Power will enter the grid-scale storage battery business. **Shirokuma Power** has put into operation two grid-scale storage stations in Ota City and Kiryu City in Gunma Prefecture. **Kuriharant** has installed a storage station with an output of 1,999 kW and a capacity of 7,596 kWh adjacent to its PV power plant.

PV price trends

RTS Corporation conducted a questionnaire survey of participants in its online seminar on the price of PV modules, etc. Excluding the respondents who said they did not know, the largest number of respondents answered that the transaction price in October 2024 remained unchanged from the previous month, followed by "slightly dropped".

PV installation trends

As of the end of June 2024, the cumulative approved capacity was 74.4 GW, remained flat from the end of

March 2024, as cancellation of approvals has continued under the approval cancellation system. The cumulative commissioned (start of operation) capacity increased by 0.5 GW to 68.7 GW, which was lower in growth than before. The overall commissioning rate is 92%. The commissioned capacity from January to June 2024 is 1,184 MW (AC), down 47% year-on-year.

PV power generation business

Japan Petroleum Exploration (JAPEX) and **IINO KAIUN (IINO LINES)** have signed a basic agreement on a joint project for PV power plants, aiming for a cumulative generation capacity of approx. 30 MW by 2030. **Sojitz** will develop 3,000 small-scale PV power plants with a total capacity of 300 MW by the end of FY 2026. **ENEOS Renewable Energy (ERE)** and **H.E Energy** will collaborate on the development of low-voltage PV power plants in the Tohoku region. **Next Energy & Resources** has signed a business consignment agreement with au Renewable Energy for the development of PV power plants with off-site PPA.

In the area of power producer and supplier (PPS) and smart grids, **E-Flow** will collaborate with **RENOVA** on a virtual PPA service. **Girasol Energy** has entered the aggregator business and started a project to convert existing FIT PV power plants to FIP + storage batteries.

PV business support service

Joetsu Materials will enter the PV module recycling market. **Maruryo Automobile Transport** will enter the business of intermediate treatment and recycling of discarded PV modules.

Financial issues

Mizuho Securities, jointly with Blue Sky Asset Management conducted Japan's first private security token offering (STO) for the PV power generation business. **Fuyo General Lease** will invest in Global Ring, a PPS, and form a capital and business alliance with the PPS to collaborate on the renewable energy business centered

on storage batteries. **Mitsubishi HC Capital** has entered into a capital and business alliance with PXP, a developer of flexible solar cells.

Renewable energy user

RE Action - Declaring 100% Renewable has compiled a report on the introduction of renewable energy by 378 companies and organizations. As of FY 2023, 96 member companies and organizations have switched all of their

electricity used in their business to renewable energy. **Suzuki Motor Corporation** installed 249.6 kW of PV modules on the roof of the Suzuki Parts Center Kobe using the on-site PPA scheme. **The High Energy Accelerator Research Organization (KEK)** has started the open call for proposals for its on-site PPA project.

Technology and R&D trend

Nagoya University has started a

demonstration experiment of organic thin-film solar cells (OPVs) using carbon nanotube (CNT) electrodes as a joint research project with Osaka Metro, Denso, and others. **Sekisui Chemical**, together with MUFG Bank, will conduct demonstration experiments by installing film-type perovskite solar cells (PSCs) on the indoor side of curtain walls and on roof waterproofing sheets.

RTS Monthly Focus

1. FY 2025 budget proposals by the ministries and agencies of Japan

<Key points>

- ✓ For the realization of GX (green transformation), the Ministry of Economy, Trade and Industry (METI) has allocated the budget for renewable energy as follows: 61.0 billion Yen (\$ 389 million) for the Project to support the establishment of the GX supply chains including perovskite solar cells (PSCs); 9.8 billion Yen (\$ 62.5 million) for the Project for supporting the introduction of PV power generation and storage batteries annexed to renewable energy power sources with the initiative of consumers; 5.2 billion Yen (\$ 33.2 million) for the Project to support promotion of renewable energy introduction in Fukushima Prefecture; 3.2 billion Yen (\$ 20.4 million) for the development of technologies to expand the introduction of PV power generation, and 15.0 billion Yen (\$ 95.7 million) for supporting the introduction of grid-scale storage batteries
- ✓ The Ministry of the Environment (MoE) has allocated the budget for the maximum introduction of renewable energy as follows: 38.5 billion Yen (\$ 246 million) + FY 2024 supplementary budget of 36.5 billion Yen (\$ 233 million) for the Subsidy for promoting transition to local decarbonization and renewable energy, etc.; 2.0 billion Yen (\$ 12.8 million) + FY 2024 supplementary budget of 2.0 billion Yen (\$ 12.8 million) for the Project to promote installation of independent and distributed energy facilities to public facilities, etc.; and 3.45 billion Yen (\$ 22.0 million) + FY 2024 supplementary budget of 7.0 billion Yen (\$ 44.7 million) to a newly-established item, the Project to promote the introduction of renewable energy in harmony with local communities by private companies, etc., and 5.02 billion Yen (\$ 32.0 million) to the Project to support the implementation model of PV society with perovskite solar cells (PSCs)
- ✓ Among other ministries and agencies, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has budgeted for promoting the introduction of renewable energy in public infrastructure facilities and pursuing carbon neutrality, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has budgeted for converting school facilities into ZEBs (net zero energy buildings), and the Ministry of Agriculture, Forestry and Fisheries (MAFF) has budgeted for the introduction of renewable energy as part of promoting the Green Food System Strategy and the Project to develop agricultural and rural areas

(1) The FY 2025 budget proposals for resources and energy-related items by the Ministry of Economy, Trade and Industry (METI)

Table 1 FY 2025 budget proposals for technology development and dissemination support for renewable energy by METI (major items, mainly PV, storage batteries, and grid connection-related items) *1 (Unit: billion Yen)

	Item		FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible METI section
1	Technology development project to solve the issues of large-volume introduction of PV power generation	A	3.20	3.20	New and Renewable Energy Div., Energy Efficiency & Renewable Energy Dept., Agency for Natural Resources and Energy (ANRE)
2	R&D project to develop technology for cultivation and commercialization of seeds such as new and renewable energy	A	1.70	1.70	
3	Expenses of projects to implement special measures for the surcharge scheme under the FIT program, etc.	C	8.00	8.00	
4	Expenses to consign public relations and other businesses to promote introduction of new and renewable energy, etc.	C	0.64	0.61	
5	Project to promote appropriated introduction of renewable energy (1) Project for efficient and stable management of the FIT program, etc.	C	3.10	3.10	

	Item		FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible METI section
6	Project to support promotion of renewable energy introduction in Fukushima Prefecture	C	5.20	5.20	New and Renewable Energy Div. & Hydrogen and Ammonia Div., Energy Efficiency & Renewable Energy Dept., Energy Efficiency & Renewable Energy Dept., ANRE
7	Project to develop next-generation power control technology toward large-volume introduction of renewable energy	A	7.20	7.20	Policy Planning Office, Advanced Energy System Div., Energy Efficiency & Renewable Energy Dept., Energy Efficiency & Renewable Energy Dept., ANRE
8	Project for supporting the introduction of storage batteries annexed to PV and other renewable energy power sources with the initiative of consumers	C	10.0	9.8	New and Renewable Energy Div., Energy Efficiency & Renewable Energy Dept., Agency for Natural Resources and Energy (ANRE)
9	Project to develop human resources for working on renewable energy	C	0.75	0.75	
10	Project to promote appropriate introduction of renewable energy (2) Project to tighten renewable energy business disciplines	C	0.27 + administrative expense (New)	0.36 + administrative expense	New and Renewable Energy Div., Energy Efficiency & Renewable Energy Dept., ANRE Electric Power Safety Div., Industrial and Product Safety Group
11	Project to support the establishment of GX supply chains (including perovskite, water electrolysis device, offshore wind)	C	54.8 (New)	61.0	New and Renewable Energy Div. & Hydrogen and Ammonia Div., Energy Efficiency & Renewable Energy Dept., ANRE
12	Project to support the introduction of distributed energy resources for expanding the introduction of renewable energy	C	1.50 (New)	1.10	Advanced Energy Systems and Structure Div., Energy Efficiency & Renewable Energy Dept., Electricity Industry and Market Office, Electricity and Gas Industry Dept. ANRE
13	Project to support the introduction of power storage systems (grid-scale storage batteries, etc.) for expanding the introduction of renewable energy	C	8.50 (New)	15.0	Advanced Energy Systems and Structure Div., Energy Efficiency & Renewable Energy Dept., ANRE
14	Project to support the introduction of distributed energy resources to ensure flexibility for expanding the introduction of renewable energy	C	-	(12.7)	New and Renewable Energy Div., Advanced Energy Systems and Structure Div. & Policy Planning Office, Energy Efficiency & Renewable Energy Dept., and Electricity Industry and Market Office, Electricity and Gas Industry Dept. ANRE
15	Advanced technology development and demonstration project to promote hydrogen society (2) Demonstration project to establish a hydrogen society model towards drastic decarbonization of industrial activities, etc.	B	5.90	6.20	Hydrogen and Ammonia Div., Energy Efficiency & Renewable Energy Dept., ANRE
16	Project to promote investment in energy conservation such as supply/ demand integrated houses and buildings	C	5.70	5.50	Energy Efficiency Div., Energy Efficiency & Renewable Energy Dept., ANRE
17	Project expenses to promote optimization of energy utilization for small and medium-sized enterprises (SMEs)	C	0.99	0.61 (3.40)	
18	Subsidy for the project expenses for promoting investments in energy conservation and supporting demand structure transformation		-	76.0	

	Item		FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible METI section
	Project of contribution and assessed contribution to international organizations (5) Contribution to the International Energy Agency (IEA)	C	0.50	0.55	International Affairs Div., Commissioner's Secretariat, ANRE
20	Project of contribution and assessed contribution to international organizations: (9) Contribution to the International Renewable Energy Agency (IRENA) (Voluntary contribution to IRENA)	C	0.07	0.08	
21	Project of contribution and assessed contribution to international organizations: (10) Assessed contribution to the International Renewable Energy Agency (IRENA)	C	0.16	0.17	
22	Consignment expenses for projects to contribute to decarbonization and energy transformation in emerging countries, etc.	C	0.76	0.70	
23	International demonstration project of Japan's technology contributing to decarbonization and energy transition	B	-	4.50 (New)	
24	Advanced research program on new technologies contributing to solving mid- to long-term issues in the energy and environmental sector	A	4.80	4.70	Energy and Environment Innovation Strategy Office, GX Group, International Affairs Office, Innovation and Environment Bureau
25	Consignment expenses for implementation of the certification scheme on reduction and absorption amount of greenhouse gas emissions in Japan	C	0.42	0.47	GX Promotion Planning Office, GX Group
26	Project to cultivate and establish foundations of frontiers to create innovation (3) Project to support discovering young researchers by public and private sectors	C	1.30	1.00	Industry-University Collaboration Office, Innovation and Environment Bureau
27	Project to support deep-tech startups in the GX sector	C	41.0 (New)	30.0	Innovation Creation and New Business Promotion Division, Innovation Policy Div. and Innovation and Environment Policy Bureau, Environmental Policy Division, GX Group
28	Project to support discovering young researchers by public and private sectors in the fields of energy and the environment	C	0.96	0.85	Industry-University Collaboration Office, Innovation and Environment Bureau
29	Project to accelerate the growth-oriented resource self-sustaining economy	C	2.50	3.80	Resource Efficiency and Circular Economy Div., GX Group International Exhibitions Promotion Office, Commerce and Service Industry Policy Group, IT Industry Div., Commerce and Information Policy Bureau Metal Industry Technology Office, Mineral and Natural Resources Div., Metal Industry Technology Office, Metal Industries Div., Manufacturing Industries Bureau , ANRE
30	Project to promote certification of standards for advanced energy demand and supply structure	C	2.50	2.30	Standards and Conformity Assessment Policy Div., Innovation and Environment Policy Bureau

	Item		FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible METI section
31	Project to promote Joint Crediting Mechanism (JCM) (2) Project for international deployment of low-carbon technologies through Joint Crediting Mechanism (JCM), etc. led by the private sector	C	0.70	1.20	GX Group, Global Environmental Affairs Office
32	Project to promote Joint Crediting Mechanism (JCM) (1) Consignment expenses for projects to investigate establishment of infrastructure for acquisition of the Joint Credits, etc.	C	0.88	0.99	
33	Development project of innovative storage batteries for EVs	A	2.40	2.20	Automobile Div., Manufacturing Industries Bureau Battery Industry Office, Commerce and Information Policy Bureau
34	Subsidy for promoting the introduction of charging and filling infrastructure, etc. toward promoting dissemination of clean energy vehicles	C	10.0	10.0 (3.60)	Automobile Div., Manufacturing Industries Bureau Hydrogen and Ammonia Div., Energy Dept., Energy Efficiency & Renewable Energy Dept., ANRE
35	Project of advanced technology development and demonstration toward promoting a hydrogen society (1) Technology development project for the establishment of competitive supply chains of hydrogen, etc.	A	8.60	8.30	Hydrogen and Ammonia Div., Energy Efficiency & Renewable Energy Dept., ANRE
36	Subsidy for the project expenses for promoting energy conservation in the residential sector by promoting the introduction of high-efficiency water heaters	C	-	(58.0)	Energy Efficiency Div. & Hydrogen and Ammonia Div., Energy Efficiency & Renewable Energy Dept., ANRE
37	Project to develop evaluation and basic technologies for next-generation all-solid-state battery materials	A	1.80	2.00	Material Industries Div. & Automobile Div., Manufacturing Industries Bureau Battery Industry Office, Commerce and Information Policy Bureau
38	Subsidy for project expenses to advance and promote understanding of the conversion of energy structure	C	7.20	7.90	Office for Regional Relations for Nuclear Facilities and Nuclear Energy Public Relations Office, Electricity and Gas Industry Dept., ANRE
39	Project of the development related to energy-saving semiconductors (3) Technology development project toward enhancing manufacturing infrastructure of energy-saving electronics	A	2.40	2.00	IT Industry Div., Commerce and Information Policy Bureau
40	Project of the development related to energy-saving semiconductors	A	12.0	9.80	
41	Project to support enhancing resilience of supply chain for the manufacturing of storage batteries	C	-	(177.8)	Battery Industry Office, IT Industry Div., Commerce and Information Policy Bureau Automobile Div., Material Industries Div. & Metal Industries Div., Manufacturing Industries Bureau
42	Project to establish and demonstrate infrastructure to improve sustainability of products such as storage batteries	B	1.70 (New)	1.50	Battery Industry Div. and Digital Economy Div., Commerce and Information Policy Bureau

	Item		FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible METI section
43	Projects for promoting overseas businesses and export	B	0.59	3.20	Policy Planning and Coordination Div. and Economic Partnership Div. of Trade Policy Bureau Trade Promotion Div. Office for supporting overseas expansion of Small and Medium Enterprise Agency, Trade Promotion Div. of Trade Policy Bureau
44	Projects to cultivate emerging markets through utilization of technology cooperation	C	3.80	3.70	Technical Cooperation Div. and Asia and Pacific Div. of Trade Policy Bureau
45	Project to support interest payment to promote transition toward achieving carbon neutrality	C	0.40	0.40	Industrial Finance Div., Economic and Industrial Policy Bureau Environmental Finance Office, GX Group
46	Project to establish infrastructure to promote the Fukushima Innovation Coast Initiative	C	0.87	0.87	Fukushima New Industries and Employment Promotion Office, Fukushima Reconstruction Promotion Group
	Subsidy for establishment, etc. of facilities to promote the Fukushima Innovation Coast Initiative	C	4.50	4.50	
48	Project expenses for establishment of energy supply bases in communities in preparation for disasters	C	0.67	0.67	Fuel Distribution and Retail Office, Natural Resources and Fuel Dept., ANRE
49	Consigned research on measures towards advancing energy supply and demand structure and the realization of GX	C	3.30	3.30	Policy Planning and Coordination Div., Commissioner's Secretariat, ANRE, Environmental Policy Div., GX Group
50	Project to improve safety regulations (1) Project to improve safety regulations for new and renewable energy, etc.	C	0.34	0.31	Industrial Safety Policy Div., Industrial and Product Safety Group
51	Project to comprehensively support the improvement of safety capabilities of small-scale power generation facilities	C	0.28	0.27	Electric Power Safety Div., Industrial and Product Safety Group

Note: A: Technology development, B: Demonstrative research, C: Dissemination/ support, investigation, institutional framework, public relations and others

*1: Only the confirmed items are listed.

*2: 1 JPY = 0.00638 USD (as of January 1, 2025)

Source: Ministry of Economy, Trade and Industry (METI), compiled by RTS Corporation

(2) Budget proposals for renewable energy by the Ministry of the Environment (MoE)

Table 2 FY 2025 budget proposals for renewable energy by MoE *1

(Unit: billion Yen)

	Item	FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible MoE section
1	Project to support the introduction of perovskite solar cells (PSCs) toward the creation of a social implementation model of PSCs (in collaboration with METI)	-	5.02 (new)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau
2	Project to promote the introduction renewable energy in harmony with local communities by private companies, etc. (formerly Project to promote making renewable energy a main power source/ strengthening of resilience by private companies, etc.)	-	3.45 (new) (7.00)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau

	Item	FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible MoE section
3	Project to promote the use of hydrogen derived from renewable energy, etc. in local communities (partly in partnership with METI)	-	3.774 (new)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau, Office of Decarbonized Mobility, Mobility Environmental Policy Div., Environmental Management Bureau
4	Project to consider acceleration of renewable energy introduction in harmony with local communities through environmental conservation and optimized utilization	0.72 (new)	0.93	Environmental Impact Assessment Div., Director-General's group for comprehensive environmental policy, Minister's Secretariat National Parks Div. and Office for Promotion of Biodiversity Strategy, Biodiversity Policy Div. of Nature Conservation Bureau
5	Project for the investigation on carbon pricing (part of Project to improve infrastructure for information related to greenhouse gases)	Included in 0.761	Included in 0.686	Office of Market Mechanisms, Environment and Economy Div., Director-General's Group for Comprehensive Environmental Policy, Minister's Secretariat
6	Promoting the improvement of sophisticated use of recycled resources such as PV modules and small-sized home electric appliances	0.251	0.380	Office for Resource Recycling Business Promotion, Office for Recycling Promotion, Policy Coordination Div. and, Environmental Regeneration and Material Cycles Bureau
7	Project to promote investment in advanced resource recycling (in partnership with METI)	5.00 (new)	15.0	Policy Coordination Div. Industrial and Hazardous Waste Management Div., and Proper Waste Disposal Promotion Div. of Environmental Regeneration and Material Cycles Bureau
8	Project to promote the introduction, etc. of advanced equipment for decarbonization of the value chain of plastic and metal resources	3.761	4.28 (1.70)	Packaging and Plastic Resource Recycling Office, and Office for Resource Recycling Business Promotion, Policy Coordination Div., Environmental Regeneration and Material Cycles Bureau
9	Project to promote the establishment of a decarbonized circular economy system (Supplementary budget: Survey project on the establishment of resource circulation networks and the strategic development of hubs)	4.672	4.00 (1.00)	Office for Recycling Promotion, and Office for Resource Circulation of Container Packaging and Plastic Resources, and Resource Circulation Business Promotion Office of Policy and Coordination Div., Industrial and Hazardous Waste Management Div. and Proper Waste Disposal Promotion Div. of Environmental Regeneration and Material Cycles Bureau Office of Policies against Marine Plastics Pollution, Marine Environment Div., Environmental Management Bureau
10	Project to accelerate CO ₂ reduction at factories and offices with decarbonization technologies, etc. (SHIFT project)	-	2.786 (new) (3.00)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau
11	Project to promote dissemination and expansion of green finance	0.32	0.70	Environmental Finance Office, Environment and Economy Div., Director-General's Group for Comprehensive Environmental Policy, Minister's Secretariat

	Item	FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible MoE section
12	Expenses, etc. for projects of natural parks, etc.	8.235	8.234 (4.79)	Natural Environment Div., Policy Planning Div., National Parks Div., Natural Environment Planning Div. & Wildlife Div., Nature Conservation Bureau
13	Project to promote social implementation of advanced system toward decarbonization of the transportation sector (partly in partnership with MAFF/MLIT)	1.165 (New)	1.415	Office of Decarbonized Mobility, Mobility Environmental Policy Div., Environmental Management Bureau
14	Project to promote decarbonization of industrial vehicles (partly in partnership with METI/MLIT)	1.822	1.162	Office of Decarbonized Mobility, Mobility Environmental Policy Div., Environmental Management Bureau Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau
15	Project to promote CO ₂ saving in collective housing (in partnership with METI)	3.45	2.95 (included in 0.94)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau
16	Project to support establishment of net zero energy houses (ZEHs) at detached houses, etc. (in partnership with METI/MLIT)	7.55	5.55 (included in 0.94)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau, etc. National Parks Div., Nature Conservation Bureau
17	Project to support the introduction of decarbonization-oriented housing (in collaboration with METI/MLIT)		(50.00)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau, etc. National Parks Div., Nature Conservation Bureau Promotion Office for Decarbonization of Houses and Buildings
18	Project to accelerate the realization of ZEB and CO ₂ reduction in buildings, etc. (partly in partnership with MAFF/ METI/ MLIT)	4.719 (New)	3.82 (4.80)	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau, etc.
19	Subsidy for promoting local decarbonization (subsidy for local decarbonization transition and promotion of renewable energy, subsidy for acceleration of decarbonization transition in designated regions, etc.)	42.52	38.521 (36.50)	Local Decarbonization Projects Promotion Div., Councillors' Group for Local Decarbonization, Minister's Secretariat
20	Project to promote installation of independent and distributed energy facilities to public facilities, etc. which realize resilience and decarbonization of local communities at the same time	2.00	2.00 (2.00)	Local Decarbonization Projects Promotion Div., Councillors' Group for Local Decarbonization, Minister's Secretariat Office for Promotion of Johkasou, Proper Waste Disposal Promotion Div., Environmental Regeneration and Material Cycles Bureau
21	Project to support planning for the maximum introduction of renewable energy toward achieving local decarbonization	0.758	0.711 (0.918)	Environmental Strategy Div., Minister's Secretariat Director's Office for Coordination of Local Decarbonization Policy, Environmental Impact Assessment Div.
22	Financing by the Japan Green Investment Corp. For Carbon Neutrality (JICN)	60.0	60.0	-
23	Project to promote local decarbonization investment and financing in collaboration with the Japan Green Investment Corp. For Carbon Neutrality (JICN)	0.071	0.051	Director's Office for Coordination of Local Decarbonization Policy, Councillors' Group for Local Decarbonization, Minister's Secretariat

	Item	FY 2024 budget	FY 2025 budget proposal (FY 2024 supplementary budget)	Responsible MoE section
24	Project to promote “decarbonization x reconstruction town development”	0.50	0.50	Office for Promotion of Fukushima Regeneration and Future-Oriented Project, Office for Director of Environmental Restoration Projects, Environmental Regeneration and Material Cycles Bureau
25	Project to accelerate social implementation and dissemination of components and materials to realize innovative reduction of CO ₂ emissions	3.80	3.70	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau
26	Technology development and demonstration project on community co-creation and cross-sectoral carbon neutrality (partly in partnership with MLIT/ MAFF)	4.98	4.98	Office of Strategy on Climate Change, Climate Change Policy Div., Global Environment Bureau
27	Project to promote the Joint Crediting Mechanism (JCM) toward transition to decarbonization	14.345	14.286 (0.150)	Office of Director for International Cooperation for Transition to Decarbonization and Sustainable Infrastructure, Global Environment Bureau
28	Expenses to promote international cooperation on the environment and infrastructure strategies	0.463	0.463	Office of Director for International Cooperation for Transition to Decarbonization and Sustainable Infrastructure, Global Environment Bureau
29	Project to promote decarbonization of septic tank systems	1.80	1.80	Office for Promotion of Johkasou, Office of Waste Disposal Management, Environmental Regeneration and Material Cycles Bureau

*1: Only the confirmed items are listed.

*2: 1 JPY = 0.00638 USD (as of January 1, 2025)

Source: Materials obtained by RTS Corporation, compiled by RTS Corporation

(3) Budget proposals for PV power generation and renewable energy by other ministries and agencies

Table 3 FY 2025 budget proposals for renewable energy by MLIT, MEXT, MAFF, MIC and Cabinet Office *1

(Unit: billion Yen)

	Project name		FY 2024 budget (FY 2023 supplementary budget)	FY 2025 budget proposal (FY 2024 supplementary budget)
MLIT *2	City Bureau	GX for town development - Deepening and accelerating the area-wide use of energy (use of renewable energy and efficiency increase in urban energy utilization)	82.8	Yes Amount unknown
	Housing Bureau	Project to comprehensively promote carbon neutrality for housing and buildings - Project for comprehensive improvement, etc. of rental housing stock for specific measures - Project to promote energy-saving renovation of housing and buildings - Project to support green housing for rearing children	Included in 44.71	Included in 37.34 (225.0)
	Civil Aviation Bureau	Promotion of decarbonization in the airport sector - Establishment of production bases of renewable energy (introduction of PV power generation)	Included in 7.4	Included in 6.8
	Road Transport Bureau	Realization of a decarbonized society through promotion of GX - Greening of road traffic	Yes Amount unknown	Yes Amount unknown
Creating safety, security, and liveliness in road spaces - Promoting the third stage of “Michi no eki” (roadside rest areas)		Yes Amount unknown	Yes Amount unknown	

	Project name	FY 2024 budget (FY 2023 supplementary budget)	FY 2025 budget proposal (FY 2024 supplementary budget)	
	Railway Bureau	Acceleration of investment in GX and DX in the railway sector - Study on the acceleration of carbon neutrality, including the introduction of renewable energy - Support for the survey on implementation of railway decarbonization facilities, etc. - Promotion of the development of decarbonized railway facilities	Included in 0.246 0.015 (included in 0.025) Included in 1.495	Included in 0.189 0.012 In partnership with MoE
	Government Buildings Dept.	Promotion of the improvement of governmental office buildings toward realization of decarbonization - Promotion of ZEB, etc. at governmental office buildings	Included in 6.017	Yes Amount unknown
	National Spatial Planning and Regional Policy Bureau	Support for revitalization of remote islands - Demonstration research for promotion of smart islands	0.139	0.111
	Water and Disaster Management Bureau	Promotion of GX in dams and sewage systems - Expansion of renewable energy use	Included in 10.8	Included in 9.0
	Hokkaido Bureau	Deployment of measures toward realization of Zero Carbon Hokkaido, etc. - Activities to expand introduction of renewable energy and decarbonization, etc.	Yes Amount unknown	Yes Amount unknown
MEXT ^{*3}	Dept. of Facilities Planning and Administration, Minister's Secretariat	Improvement of public school facilities (including turning school facilities into ZEB)	Included in 68.3 (155.8)	Included in 68.1 (207.6)
		Improvement of facilities of national universities and technical colleges (including establishment of ZEB and energy generation)	Included in 36.3 (60.3)	Included in 36.4 (62.4)
		Promotion of improvement of private school facilities and equipment	Included in 9.30 (10.9)	Included in 9.10 (12.9)
	Science and Technology Policy Bureau	R&D contributing to the realization of carbon neutrality - Development of advanced decarbonization technologies - The area of "Realization of low-carbon society," a global issue - Advanced research programs for climate change prediction	1.640 1.012 0.548	2.24 0.73 0.548
MAFF ^{*4}	Minister's Secretariat, etc.	Comprehensive measures for promoting the Green Food System strategy	Included in 0.650 (2.706)	0.612 (3.80)
		Enhancement of the function of fishing ports - Utilization of renewable energy in infrastructure of fishing ports	0.45 (1.000)	0.15 (0.50)
		Project to develop agricultural and rural areas - Promotion of energy conservation and use of renewable energy	Included in 332.6 (included in 177.7)	Included in 333.1 (included in 203.7)
MIC ^{*5}	Enhancement of human resources who contribute to local communities - Support for "Local 10,000 Projects"	0.60	0.62 (2.11)	
	Strengthening the resilience of communication and broadcasting infrastructure - Strengthening the resilience of mobile phone base stations	-	2.40 (new)	
Cabinet Office	Project to promote Okinawa model of clean energy introduction - Support for clean energy demonstration projects	0.73	0.919	

*1: Only the confirmed items are listed.

*2: Ministry of Land, Infrastructure, Transport and Tourism

*3: Ministry of Education, Culture, Sports, Science and Technology

*4: Ministry of Agriculture, Forestry and Fisheries

*5: Ministry of Internal Affairs and Communications

*6: 1 JPY = 0.00638 USD (as of January 1, 2025)

Source: Materials obtained by RTS Corporation, compiled by RTS Corporation

2. The 68th meeting of the Strategic Policy Committee (December 25, 2024)

<Key points>

- ✓ The Ministry of Economy, Trade and Industry (METI) presented the draft of the Seventh Strategic Energy Plan and a range of energy supply and demand projections for FY 2040, using multiple scenarios
- ✓ The power generation amount in FY 2040 is estimated to be approximately 1.1 to 1.2 trillion kWh, consisting of renewable energy accounting for around 40% - 50%, nuclear power around 20%, and thermal power around 30% - 40%. Among renewable energy sources, PV is expected to constitute 23% - 29% and wind power 4% - 8%
- ✓ It is planned that the contents of the draft of the Seventh Strategic Energy Plan will be agreed, followed by public comments solicitation

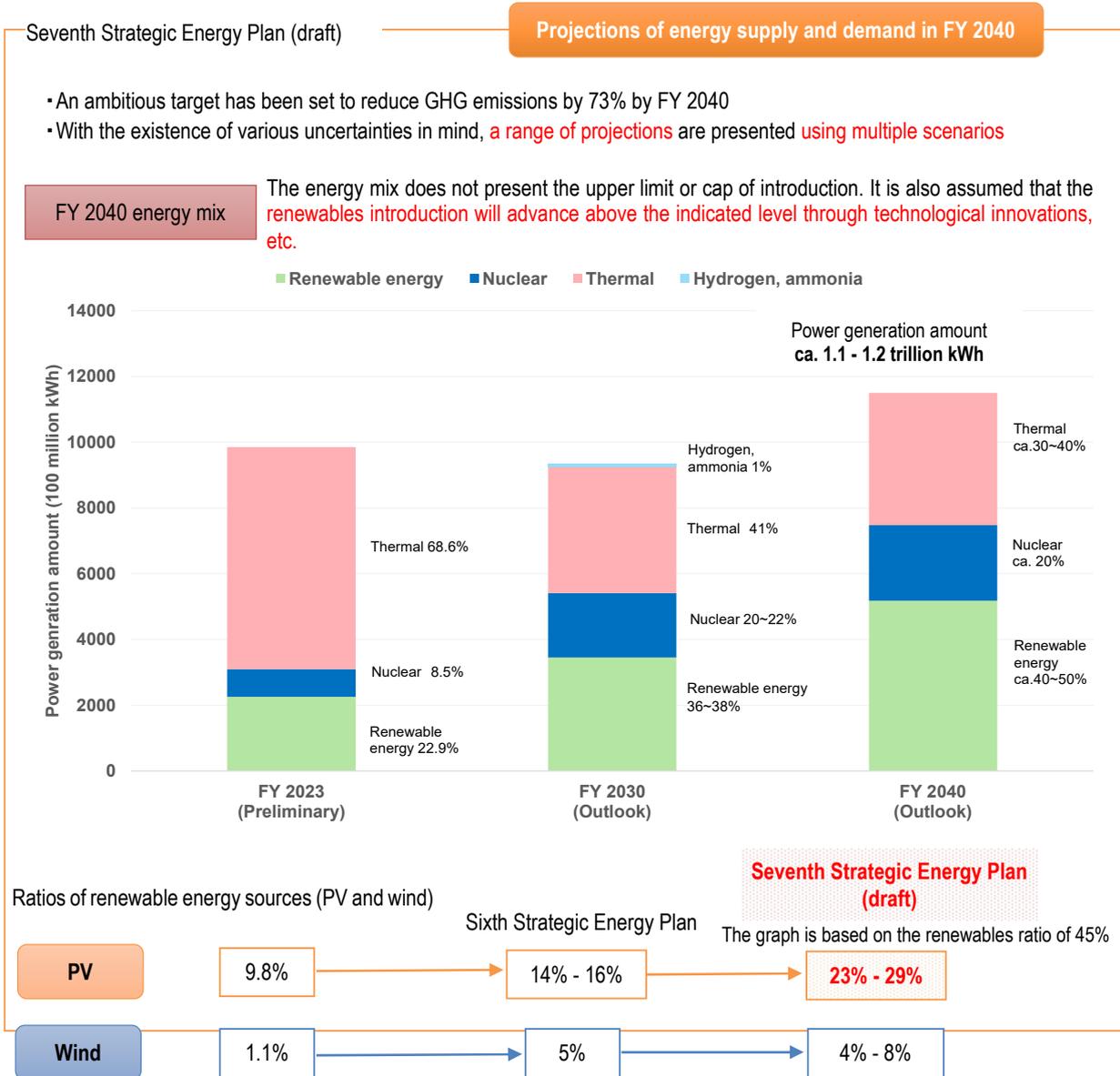


Figure 1 Japan's energy mix in FY 2040 presented in the draft of the Seventh Strategic Energy Plan
 Source: Materials of the 68th meeting of the meeting of the Strategic Policy Committee (Dec. 25, 2024), compiled by RTS Corporation

3. The 5th meeting of the Power Generation Cost Verification Working Group (Dec. 16, 2024)

<Key points>

- ✓ A draft summary of discussions regarding the verification of power generation cost was presented. It showed the estimation results of power generation cost for 2040 using the model plant method, with commercial and industrial (C&I) PV systems at 7.0 - 8.9 yen/kWh (4.47 - 5.68 cents/kWh) (including policy costs), being the lowest among the power sources, and residential PV systems at 7.8 - 10.7 yen/kWh (4.98 - 6.83 cents/kWh). As a reference, the power generation cost for perovskite solar cells (PSCs) was estimated at 16.5 yen/kWh (10.53 cents/kWh)
- ✓ Power generation costs considering a part of the integration cost was also presented. Under three scenarios with the ratio of variable renewable energy sourced capacity at 40%, 50%, and 60%, the power generation cost of C&I PV systems showed a significant increase, ranging from 15.3 - 36.9 yen/kWh (9.76 - 23.5 cents/kWh)
- ✓ The draft summary was agreed and the Working Group reported it to the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy, which discusses the Strategic Energy Plan

Summary of discussions on the power generation cost (draft)

Part of the estimation results (provisional)

The verification of power generation costs aims to clarify the **cost-related characteristics and structures of each power source**, to serve as a **reference for discussions on energy policy toward 2040**, such as which power sources are to be prioritized in policy and how to achieve the balance

Power source	Power generation cost under the model plant method (yen/kWh)* Results of estimation for 2040 (1 yen = 0.00638 cents/kWh)		Power generation costs that consider a part of the integration cost (yen/kWh)**
	With policy costs (basic scenario)	Without policy cost (basic scenario)	
PV (Commercial & Industrial)	7.0 - 8.9 (8.5)	6.6 - 8.4 (7.9)	15.3 - 36.9
PV (Residential)	7.8 - 10.7 (10.2)	7.6 - 10.4 (9.9)	-
Perovskite solar cells (PSCs)	16.5 (reference)	15.3 (reference)	-
Onshore wind	13.5 - 15.3 (15.3)	10.1 - 11.6 (11.6)	19.5 - 25.2
Offshore wind (fixed bottom)	14.4 - 15.1 (14.8)	9.5 - 10.1 (9.8)	18.9 - 23.9
Offshore wind (floating)	22.5 (reference)	14.9 (reference)	-
Nuclear	12.5 - (12.5 ~)	11.2 - (11.2 ~)	16.4 - 18.9
LNG (single fuel firing)	16.0 - 21.0 (19.2)	15.9 - 20.9 (19.2)	20.2 - 22.2
LNG (10% hydrogen co-firing)	16.8 - 22.2 (20.3)	16.8 - 22.2 (20.3)	20.9 - 23.0
LNG thermal with CCS	17.1 - 21.1 (19.2)	17.0 - 21.0 (19.1)	19.9 - 22.2
Coal thermal with CCS	26.6 - 2.2 (27.6)	26.5 - 32.2 (27.6)	29.3 - 30.3

* The cost per kWh when constructing and operating a new power generation facility was estimated based on a certain calculation formula

** - The power generation costs were estimated under three scenarios with the ratio of variable renewable energy sourced capacity at 40% (PV: 122.5 GW, wind: 36.3 GW), 50% (PV: 175.1 GW, wind: 51.8 GW), and 60% (PV: 210.1 GW, wind: 62.2 GW)

- The committee member who conducted the analysis explained that **the cost increase is more pronounced** for variable renewable energy sources, compared to nuclear and thermal power, since **output curtailment and charging/ discharging losses increase as installed capacities of renewable energy expand**

Results of estimation in 2023

The power generation cost of C&I PV systems is at 10.9 yen/kWh (6.95 cents/kWh) (with policy costs), the lowest among other power sources

The draft summary was agreed and Chairperson Akimoto of the Working Group reported it to the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy

Figure 1 Summary of discussions on the verification of power generation costs (draft)

Source: Materials of the 5th meeting of the Power Generation Cost Verification Working Group (December 16, 2024), compiled by RTS Corporation

4. The 100th meeting of Procurement Price Calculation Committee (December 17, 2024)

<Key points>

- ✓ A scheme for supporting initial investment was presented, with the support price for C&I rooftop PV systems set at approx. 19 yen/kWh (12.1 cents/kWh) for an investment support period of five years, and a stepped pricing system is designed to ensure business continuity
- ✓ The support price for residential PV systems was set at approximately 24 yen/kWh (15.3 cents/kWh) for a shorter initial investment support period of four years to maximize the effect of accelerating the investment recovery period
- ✓ Regarding the creation of a new power generation facility category, it was decided to continue discussions on initiating support when the generation cost of perovskite solar cells (PSCs) falls below the electricity tariff level

Initial investment support scheme

Promoting the introduction of rooftop PV systems that are easier to ensure harmony with local communities, are self-consumption-based, and have low grid load

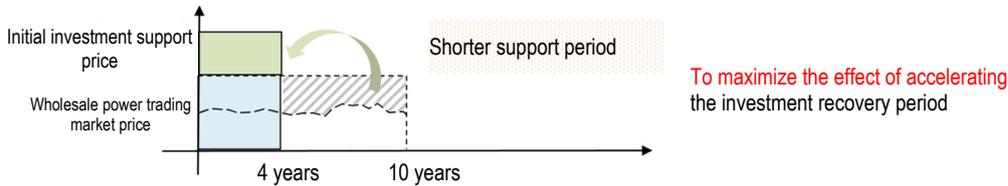
C&I rooftop PV systems

Initial investment support price: **ca. 19 yen/kWh (12.1 cents/kWh)**
Initial investment support period: **5 years**



Residential PV systems

Initial investment support price: **ca. 24 yen/kWh (15.3 cents/kWh)**
Initial investment support period: **4 years**



Assumption

Based on the assumption of promoting self-consumption and suppressing the burden on citizens, the electricity tariff level will be set to the assumed value* of self-consumption benefits for the FY 2025 pricing, and measures will be taken to ensure that the price during the initial investment support period does not exceed this level, etc.

* Electricity tariff levels: C&I 19.56 yen/kWh (12.5 cents/kWh), residential 27.31 yen/kWh (17.4 cents/kWh)

It was pointed out that if the initial investment support scheme is applied from FY 2026, there could be an incentive for business operators to delay the timing of approval**, as the purchase prices, etc., for FY 2025 have already been set

** If the FY 2024 purchase price, etc., of ≥ 10 kW rooftop PV systems is set at 12 yen/kWh (7.66 cents/kWh), it will also be applied to the purchase price in the second half of FY 2023

Study on the creation of a new category of power generation facilities

Perovskite solar cells (PSCs)

Discussions will be continued aiming to start the support through the new category at the point when the power generation cost falls below the electricity tariff level

Many of the assumed values for setting FY 2026 prices for C&I (not subject to tender) and residential PV systems will remain unchanged

Figure 1 Specific proposals, etc., of the initial investment support scheme

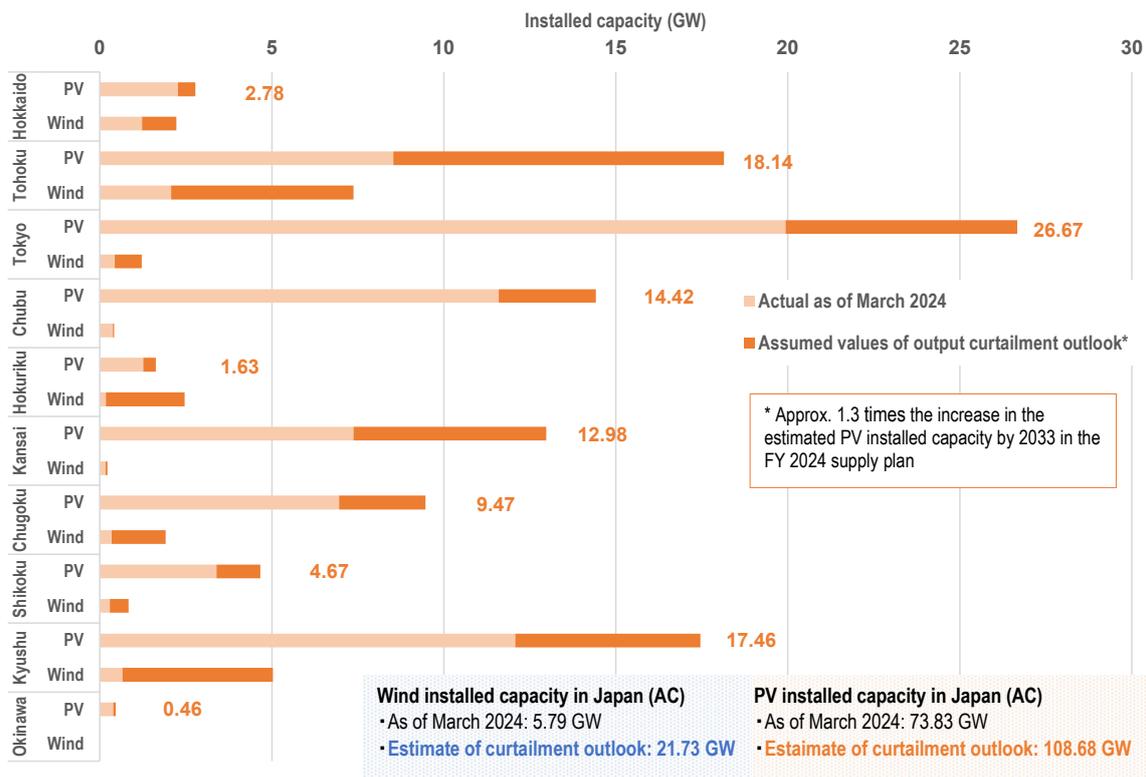
Source: Materials of the 100th meeting of the Procurement Price Calculation Committee (December 17, 2024), compiled by RTS Corporation

5. The 53rd meeting of the Working Group on Grid Connection of Renewable Energy (December 2, 2024)

<Key points 1>

- ✓ Regarding the long-term outlook for renewable energy output curtailment by general power transmission and distribution operators, the estimated installed capacities of PV and wind power generation based on assumptions and the actual values were presented
- ✓ The estimated PV installed capacity is 108.68 GW, which is the total of the actual installed capacity (73.83 GW) as of March 2024 and 1.3 times the increase in the estimated PV installed capacity by 2033 in the FY 2024 supply plan (34.85 GW)
- ✓ As a measure to reduce the output curtailment of renewable energy, conditions were set for demand measures, supply measures, and grid measures, and the effect of reducing the output curtailment rate for each measure was estimated

Actual and estimated PV and wind installed capacities in the long-term outlook for renewable energy output curtailment



Measures to reduce renewable energy output curtailment

Estimates are made on the assumption that demand measures, supply measures, and grid measures will be implemented

- For 10% of the minimum demand in each area, it is assumed that the storage batteries will generate demand for 6 hours of capacity (**demand measures**)
- It is assumed that the minimum output of existing thermal power generation facilities, etc., is 30% (thermal power) and 50% (biomass) (**supply measures**)
- In addition to the strengthening of the interregional interconnection lines currently under construction, it is assumed that the interregional interconnection lines, which were identified to have strong need for strengthening in the master plan, have been strengthened (**grid measures**)

(Hokkaido → Tohoku + 2 GW, Tohoku → Tokyo + 2 GW, Hokkaido → Tohoku + 0.3 GW, Kyushu → Chugoku + 1 GW, Tohoku → Tokyo + 4.55 GW, Chubu ↔ Kansai + 3 GW)

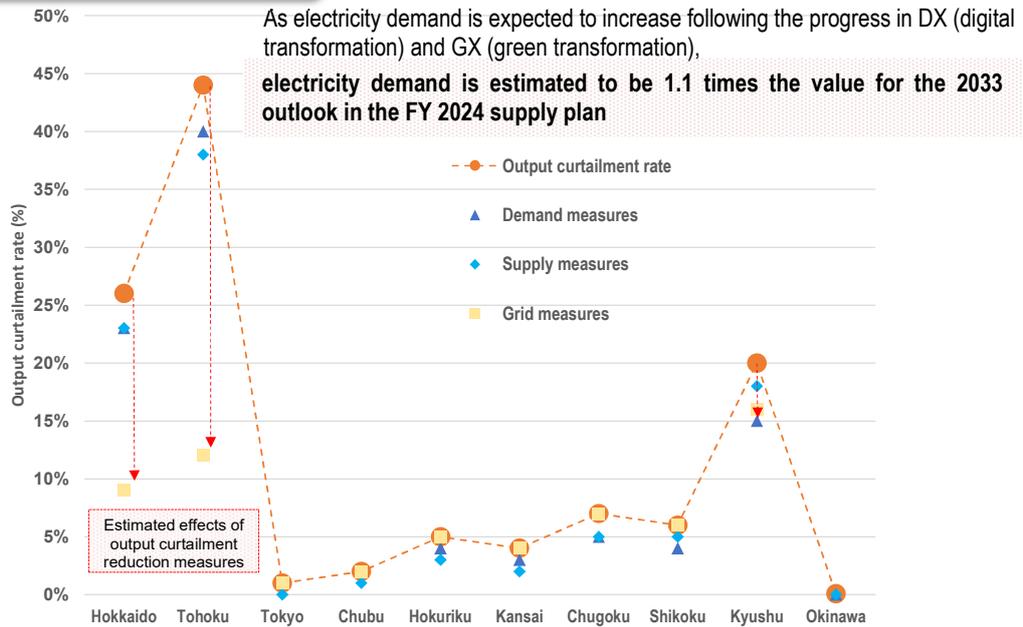
Figure 1 Assumed and actual values of installed capacity under the long-term outlook of renewable energy output curtailment
Source: Materials of the 53rd meeting of Working Group on Grid Connection of Renewable Energy (December 2, 2024), compiled by RTS Corporation

<Key points 2>

- ✓ As a result of calculating the output curtailment rate, although the rate was high in the Tohoku (44%) and Hokkaido (26%) regions, the effect of reducing output curtailment due to grid measures was large, and significant decrease was made in the Tohoku, Hokkaido, and Kyushu regions
- ✓ The output curtailment rate after the revision of the priority dispatch rules was calculated on a trial basis. When setting the FIP ratio at 25%, the output curtailment rate increased for the FIT systems, which are curtailed first, but significantly decreased for the FIP systems
- ✓ The change of the order of output curtailment will start in FY 2026 to FY 2027, from the area where the system renovation is completed

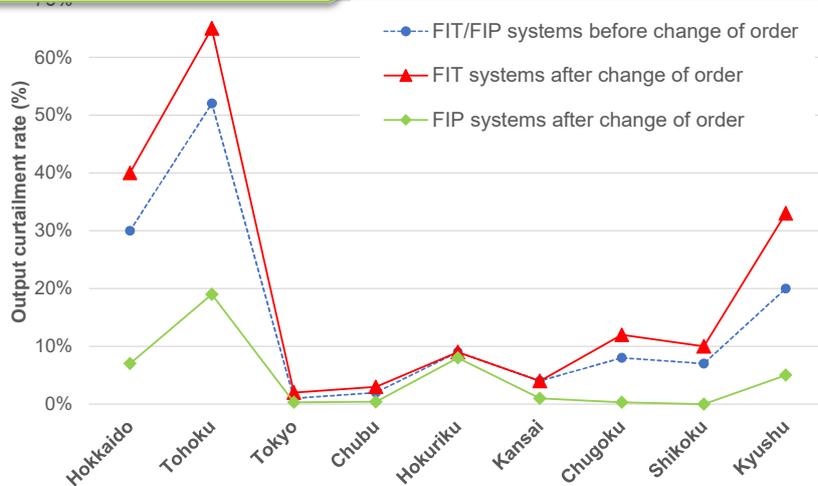
Long-term outlook of renewable energy output curtailment (calculation results)

Output curtailment rates of PV and wind power under the rules of unlimited and uncompensated curtailment



Results of calculation after the revision of the priority dispatch rules

PV output curtailment rate when setting the FIP rate to 25%



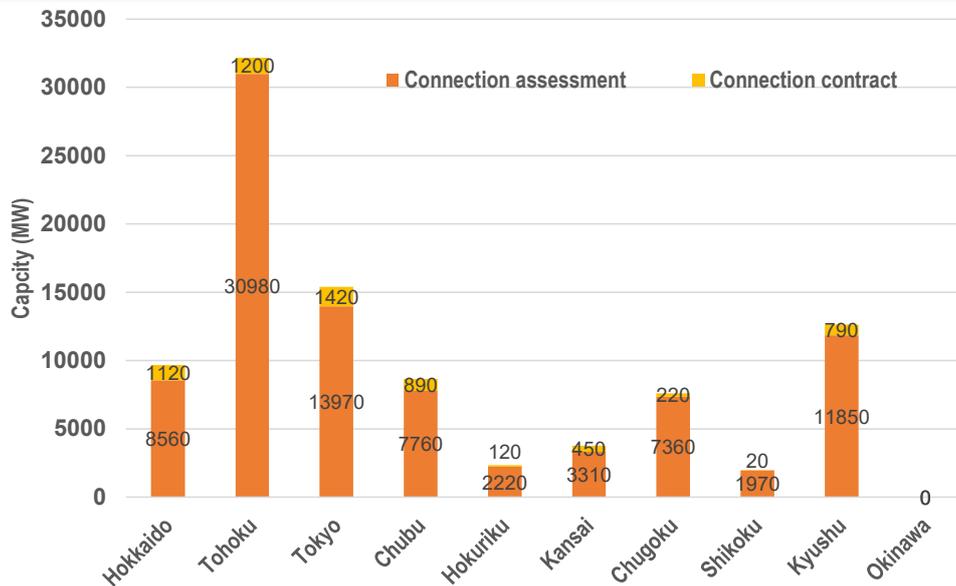
The change of order of output curtailment will start in FY 2026 or FY 2027 from the areas where the system renovation is completed

Figure 2 Summary of calculation results, etc., of the outlook for renewable energy output curtailment
 Source: Materials of the 53rd meeting of Working Group on Grid Connection of Renewable Energy (December 2, 2024), compiled by RTS Corporation

<Key points 3>

- ✓ As of September 30, 2024, approx. 88 GW of grid-scale storage batteries applied for grid connection assessment nationwide, and approx. 6.2 GW applied for grid connection contracts. Compared to May 31, 2023, the volume of applications for grid connection assessment increased by about 8 times.
- ✓ Discussions are made whether to target bulk power systems and local grids for additional measures for early grid connection and whether the storage battery installation contractors bear the cost burden, and the policy is to begin implementation in April 2025

The status of applications for grid connection assessment and grid connection contract for grid-scale storage batteries (as of September 30, 2024)



Grid connection assessment (national): 11.89 GW (as of May 31, 2023) → 87.98 GW (as of Sep. 30, 2024)
Grid connection contracts (national): 1.12 GW (as of May 31, 2023) → 6.23 GW (as of Sep. 30, 2024)

Considerations to realize additional and provisional measures for early grid connection

Measures to allow grid connection without grid reinforcement will be introduced, if grid strengthening can be avoided under the premise that restriction of recharging is agreed during certain periods, etc.

Item	Summary of discussions
Positioning of additional measures for early grid connection	Additional measures shall be applied only when the grid still needs to be strengthened even though existing measures (N-1 charging stop devices, etc.) are applied
Applicable grids and power sources (voltage class)	Bulk power systems and local grids, grid-scale storage batteries and storage batteries, annexed to renewable energy generation facilities, for grid charging
Applicable grids (grid characteristics)	General power transmission and distribution operators determine whether or not to apply the measures from a technical point of view
Method to restrict recharging	Storage battery installation contractors possess systemic safety means that restricts charging
Cost burden	The cost of implementing the measures shall be borne by the storage battery installation contractors (including the operators)

Consideration will be accelerated, and **additional measures for early grid connection are planned to be applied from April 2025**

Figure 3 The status of applications for grid connection assessment and grid connection contract of grid-scale storage batteries, etc.

Source: Materials of the 53rd meeting of Working Group on Grid Connection of Renewable Energy (December 2, 2024), compiled by RTS Corporation

6. Results of the 22nd tender for PV projects

<Key points>

- ✓ The 21st and 22nd tenders for PV projects, which were held in FY 2024 were sluggish, with bidding capacity falling below the tender target capacity. The average winning bid prices were on the 8 yen/kWh (5.10 cents/kWh) level. Zero-yen bids, which were previously seen, have disappeared
- ✓ In the 21st tender, 34 MW of projects were awarded while the tender target capacity was 107 MW, where as in the 22nd tender, 56 MW of projects were awarded while the target capacity was 93 MW
- ✓ The lowest winning bid price of the 22nd tender was 7.50 yen/kWh (4.79 cents/kWh), bid by miyagi motoyoshi solar

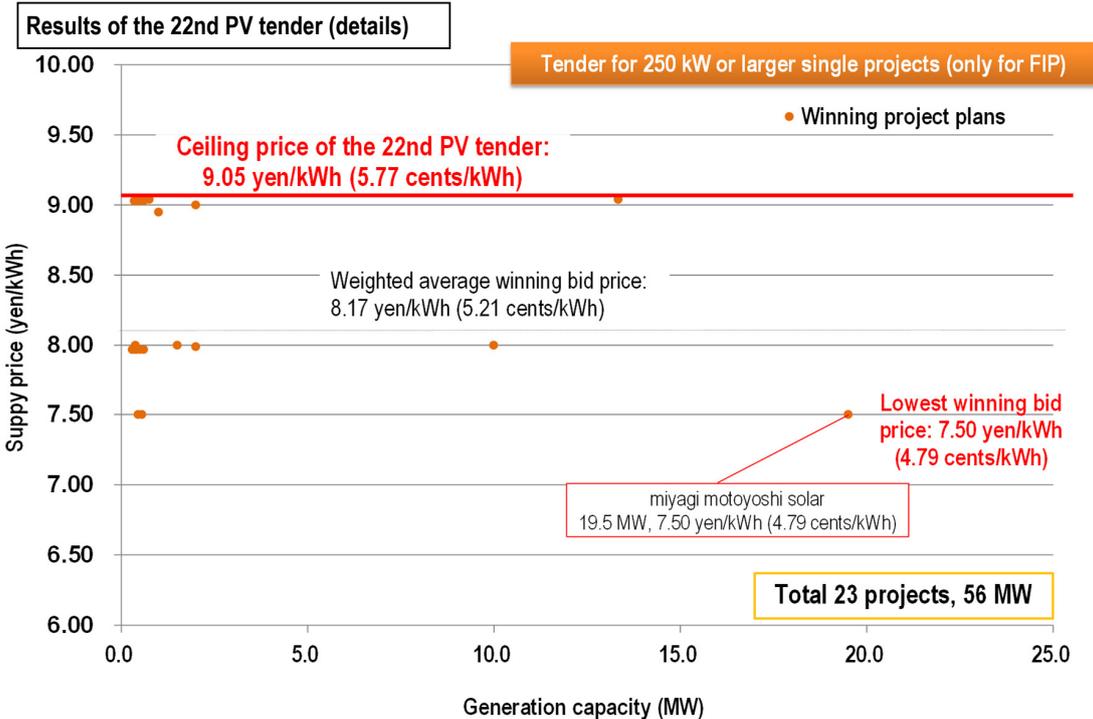
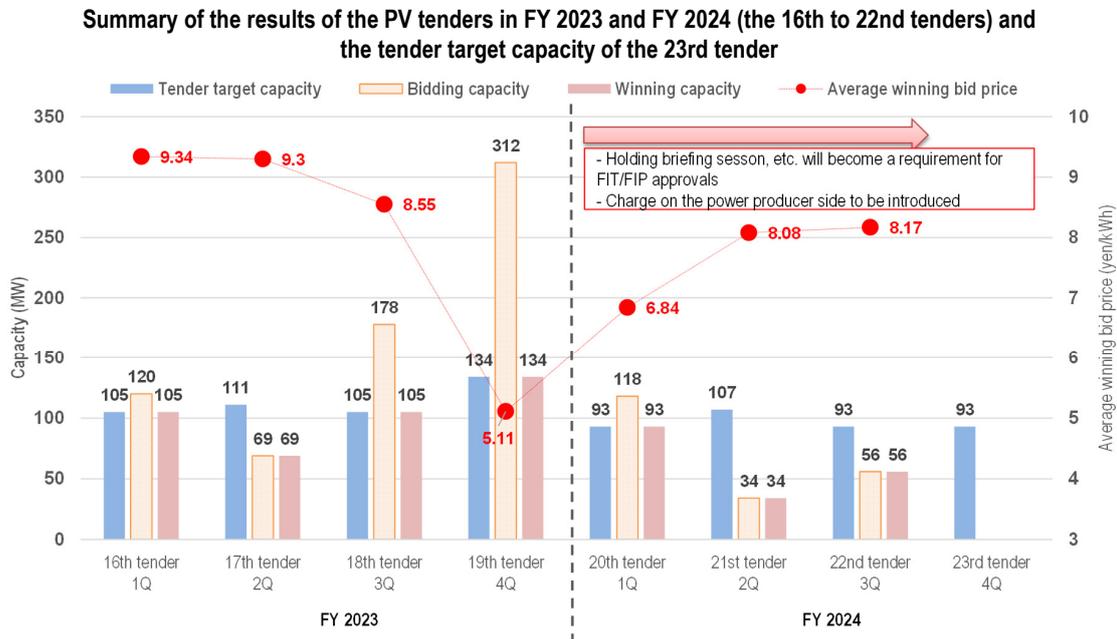


Figure 1 Summary of the tenders in FY 2023 and the detailed results of the 22nd tender for PV projects
Source: Results of the 22nd tender (the third tender of FY 2024) for PV projects announced by the Organization for Cross-regional Coordination of Transmission Operators, JAPAN (OCCTO), etc., compiled by RTS Corporation

7. The 7th to 9th Joint Meetings of the Central Environment Council under the Ministry of the Environment (MoE) and the Industrial Structure Council under the Ministry of Economy, Trade and Industry (METI) (December 2024)

<Key points>

- ✓ Intensive discussions were made at the seventh to ninth joint meetings of the Central Environment Council under Ministry of the Environment (MoE) and the Industrial Structure Council under the Ministry of Economy, Trade and Industry (METI), held over three days on December 19, 20 and 24, 2024. Although a common understanding was reached, opinions were divided regarding the pathway between a 46% reduction by 2030 and achieving net zero by 2050
- ✓ Since the gathering of public comments on multiple pathways is difficult, the councils will seek public opinions on the draft of the Plan for Global Warming Countermeasure, which specifies the council secretariat's proposal of a 60% reduction by FY 2035 and a 73% reduction by FY 2040

Draft of the next-term reduction target of greenhouse gas (GHG) emissions

Next-term NDC levels

- During the second half of the sixth joint meeting on November 25, 2024, a linear pathway toward achieving net zero by 2050 (a 60% reduction by FY 2035 and a 73% reduction by FY 2040), which was proposed by the secretariat, was broadly agreed upon and was decided to be discussed deeply
- It was later pointed out that some members, including those who were unable to participate in the sixth joint meeting due to their attendance in COP29, did not have an opportunity to express their opinions. Consequently, intensive discussions were held over three days - December 19, 20, and 24, 2024

Summary of opinions at the joint meetings (draft)

<p><Common Understanding></p> <ul style="list-style-type: none"> ▪ Set ambitious targets and pathways to achieve the 1.5°C goal globally ▪ Aim to achieve decarbonization and economic growth simultaneously ▪ Strive for a 46% reduction by 2030 and net zero by 2050 (However, there are three differing opinions regarding the pathway in between) and so on
<p>Pathway 1: A linear approach to net zero by 2050, with a 60% reduction by FY 2035 and a 73% reduction by FY 2040 (proposed by the secretariat)</p> <ul style="list-style-type: none"> ▪ This pathway is ambitious, aligned with the 1.5°C goal ▪ Efforts will be advanced with predictability, to simultaneously achieve emissions reductions and economic growth, as well as to ensure a fair transition
<p>Pathway 2: A more steep reduction pathway compared to Pathway 1 (linear), with a reduction of ≥66% by FY 2035</p> <ul style="list-style-type: none"> ▪ A message of being more ambitious can be sent to the international community ▪ A greater responsibility can be fulfilled to the future generations who are concerned about the climate crisis
<p>Pathway 3: A more gradual reduction pathway compared to Pathway 1 (linear)</p> <ul style="list-style-type: none"> ▪ The current on-track progress is influenced by production decline, and the development and dissemination of innovative technologies will require considerable time ▪ The prices of products and services contributing to decarbonization are high in the initial stage, and public understanding is required for widespread adoption, including adoption by individuals

- Several members requested that the draft Plan for Global Warming Countermeasure includes a comparison of the three pathways. However, the secretariat responded that **it is difficult to gather public comments on multiple pathways** and wants to **emphasize the need to focus on a single pathway** and **summarize the opinions from the joint meetings in a separate document**
- Chairperson Ohashi stated that the scope of this meeting is limited to providing technical advice. He proposed that the **linear pathway be included as the draft plan and positioned as an option for the next steps**

Plan for Global Warming Countermeasure (draft)

A 60% reduction by FY 2035 and a 73% reduction by FY 2040 will be included

It was agreed to **conduct public comments to gather public opinions**. Several members requested that a joint meeting be held after the public comment period to further discuss the matter

Figure 1 Summary of deliberations on the next-term reduction target of greenhouse gas emissions (GHG)

Source: Materials of the 7th to 9th Joint Meeting of the Central Environment Council and the Industrial Structure Council (December 2024), compiled by RTS Corporation

8. Updates on approved and commissioned capacities of PV projects

<Key points>

- ✓ As of June 30, 2024, cumulative approved capacity of PV projects was 74.4 GW, remaining flat from the data as of March 31, 2024, because the approval cancellation of the projects under the approval cancellation scheme continued. Cumulative commissioned capacity as of June 30, 2024 was 68.7 GW with a slowed growth, up by 0.5 GW from March 31, 2024. The overall commissioning rate was 92%
- ✓ For the quarter from April to June 2024, by capacity range, commissioned capacity of ≥ 2 MW projects was the largest with 151 MW, followed by < 10 kW PV projects with 146 MW, 50 - < 500 kW projects with 64 MW, and 1 - < 2 MW projects with 58 MW
- ✓ From January to June 2024, the commissioned capacity was 1,184 MW (AC), down by 47% year on year, with a significant decrease in 10 kW or larger projects, despite the steady growth of the < 10 kW capacity range

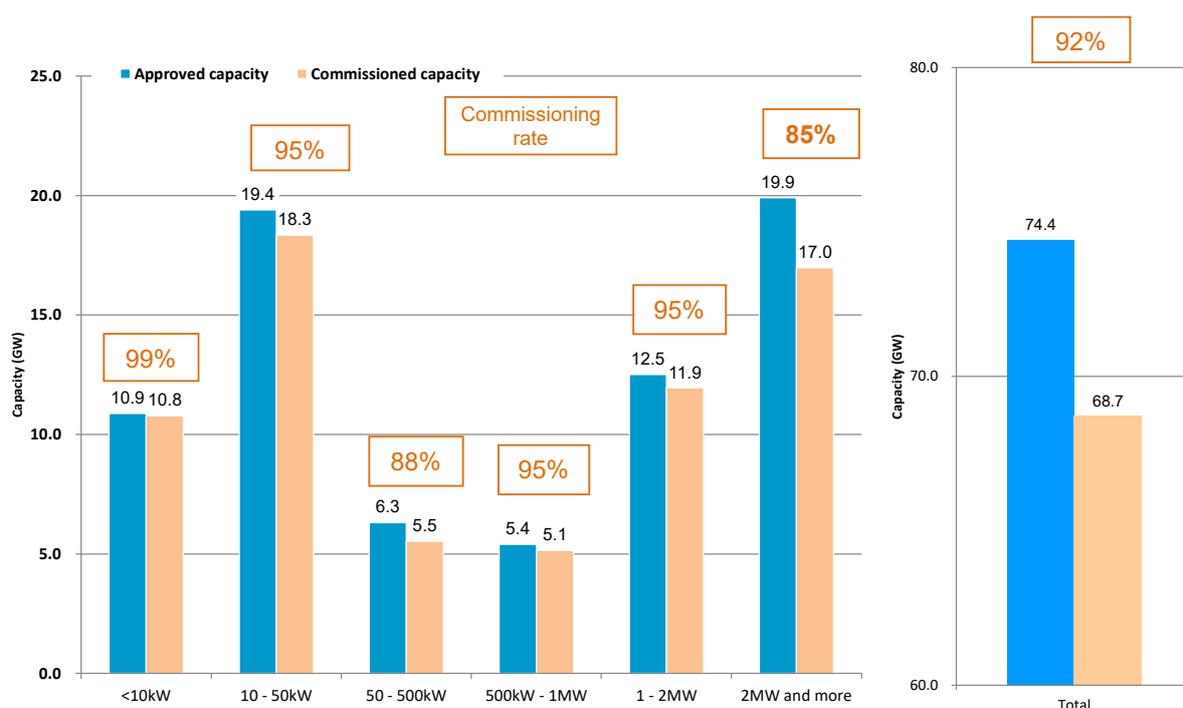


Figure 1 Approved and commissioned capacities of PV projects as of June 30, 2024 (by capacity range)

Table 1 Approved and commissioned capacities of PV projects as of June 30, 2024 (by capacity range)

(Unit: MW)

		< 10 kW	10 - < 50 kW	50 - < 500 kW	500 kW - < 1 MW	1 - < 2 MW	≥ 2 MW	Total
Approved capacity	Mar. 31, 2024	10,824	19,435	6,350	5,400	12,516	19,940	74,465
	Jun. 30, 2024	10,880	19,393	6,307	5,401	12,515	19,914	74,409
Commissioned capacity	Mar. 31, 2024	10,634	18,303	5,467	5,111	11,883	16,829	68,228
	Jun. 30, 2024	10,780	18,343	5,531	5,149	11,941	16,980	68,724

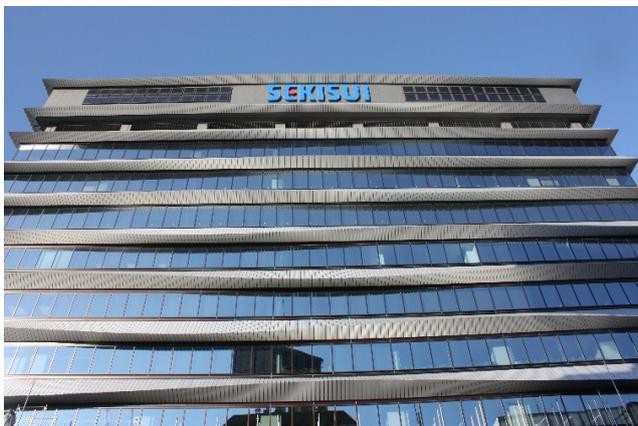
Source: Materials from METI, compiled by RTS Corporation

Monthly PV Photo Gallery

Wall-mounted perovskite PV system at Sekisui Chemical's Osaka Headquarters



PV system on the Osaka Headquarters building of Sekisui Chemical (1/7)



PV system on the Osaka Headquarters building of Sekisui Chemical (2/7)



PV system on the Osaka Headquarters building of Sekisui Chemical (3/7)

Location:

Nishi-Tenma, Kita Ward, Osaka City, Osaka Prefecture

Equipment:

PV modules: 48 PV modules with film-type perovskite solar cells by Sekisui Chemical

Storage battery unit: Sekisui Chemical

Intervers: Tribrid inverters by Nichicon

Start of Operation:

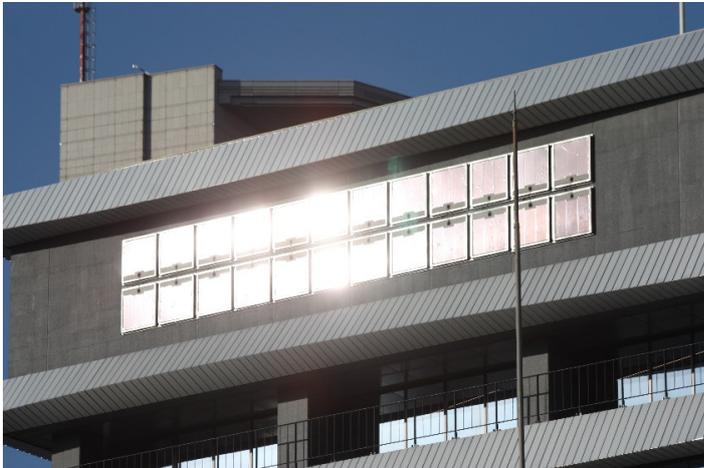
October 2023

Overview:

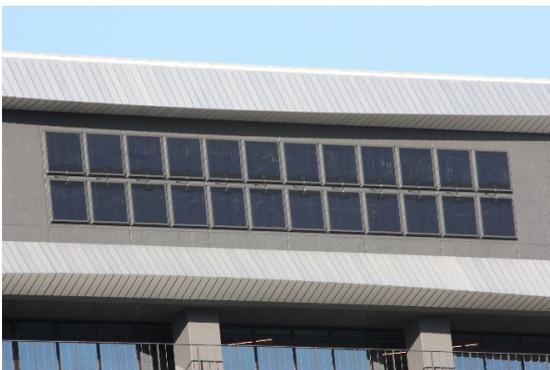
In October 2023, Sekisui Chemical became the first company in Japan to install film-type perovskite solar cells (PSCs), by installing PSCs on the south wall of the 12th floor of the Dojima Kanden Building, where its Osaka headquarters are located. The company and its affiliate Sekisui Jushi jointly examined an "installation method that can withstand wind loads equivalent to 20 years on the 12th floor above ground and maintain stable power generation performance" and completed the PV system with 48 pieces of PV modules (about 1 m² each) with film-type perovskite solar cells (PSCs) as building materials. Sekisui will proceed with the measurement of power generation effects, verification of predicted values, examination of installation methods, and evaluation of changes over time, with the aim of commercialization in 2025. In addition, in July 2024, storage battery units and inverters were additionally installed, and the PV system began operation to use the generated electricity in the building. The PV system can also be used as an emergency power source in the event of a power outage. The company plans to begin mass production of PSCs in 2027. In collaboration with the Development Bank of Japan, Sekisui Chemical plans to establish Solar Film, a new company to design, manufacture, and sell PSCs, and will take over the buildings, power supply and cooling facilities of Sharp's headquarters factory, and work on the introduction of production facilities for PSCs. The company plans to start operations of a 100-MW production line in 2027 and build a supply framework of 1 GW/year by 2030 through gradual expansion of investments.



PV system on the Osaka Headquarters building of Sekisui Chemical (4/7)



PV system on the Osaka Headquarters building of Sekisui Chemical (5/7)



PV system on the Osaka Headquarters building of Sekisui Chemical (6/7)



PV system on the Osaka Headquarters building of Sekisui Chemical (7/7)

Topics from Japan

1. Government

☀️ **The national government** held the 14th meeting of the Green Transformation (GX) Implementation Council and compiled the GX 2040 Vision (draft) which serves as a national strategy aiming at realizing both a decarbonized society and industrial promotion. The government aims to introduce renewable energy to the maximum as a main power source and aims to achieve the well-balanced energy mix.

The national government held the 10th meeting of the Working Group of Experts for the Realization of GX and compiled a proposed revision of the Investment Strategy by Sector. The government included the contents to flesh out and accelerate its efforts such as the addition of next-generation geothermal power generation to the next-generation renewable energy sector and the introduction and promotion of perovskite solar cells (PSCs) starting from FY 2025.

☀️ **The Ministry of the Environment (MoE) and the Ministry of Economy, Trade and Industry (METI)** held the ninth joint meeting of the Central Environment Council and the Industrial Structure Council and compiled a draft of the Plan for Global Warming Countermeasures. The greenhouse gas (GHG) emission reduction targets were set at 60% by FY 2035 and 73% by FY2040 from the FY 2013 level, respectively. The Councils proposed to reduce the GHG emissions by 74% to 83% in the business sector, 64% to 82% in the transportation sector, 71% to 81% in the residential sector, and 57% to 61% in the industrial sector by FY 2040 from the FY 2013 level, respectively. The Council also included the reduction measures in the proposed revision, which will be submitted to the United Nations by February 2025.

☀️ **METI and MoE** held the eighth joint meeting of the Working Group for PV Facility Recycling (METI) and the Subcommittee for PV Facility Recycling Scheme (MoE) and compiled the PV Facility Recycling Scheme (draft) toward the mandatory recycling of PV modules. The draft covers the following concrete measures: making PV as a long-term stable power source; the promotion of the reuse and recycling; the establishment of measures against abandoned PV modules and illegal dumping, the securing of the demolition costs, etc. and recycling costs, the ascertaining of necessary information and management, and third-party organizations which intensively manage the costs and information necessary for the Scheme. The financial burdens are imposed on the facility owners as for the demolition costs, etc., the manufacturers as for the recycling costs, and those who import PV modules manufactured overseas as for the recycling costs of these modules. METI and MoE plan to submit a related bill to the ordinary Diet session in 2025.

☀️ **The Agency for Natural Resources and Energy (ANRE)**

under **METI** held the 68th meeting of the Strategic Policy Committee under the Advisory Committee for Natural Resources and compiled a draft of the next Strategic Energy Plan. On the premise that the power generation amount in FY 2040 will increase to 1.2 trillion kWh, or up to 20% compared to FY 2023, the Plan estimates that renewable energy accounts for 40% to 50%, thermal for 40%, nuclear for approximately 20% of the energy mix target. PV is estimated to account for approximately 23% to 29% of the renewable energy ratio. The Committee also indicated the results of a five-scenario analysis of the outlook of energy supply and demand in FY 2040. The result showed that technology development in the scenarios would fail to achieve the 73% reduction compared to FY 2013. ANRE aims to make a cabinet decision by the end of FY 2024.

☀️ **ANRE under METI** held the 100th meeting of the Procurement Price Calculation Committee and discussed a scheme to support initial investment and the establishment of a new power generation facility category for perovskite solar cells (PSCs) based on the FIT and FIP programs. In the scheme to support initial investment, the introduction of commercial and industrial (C&I) rooftop PV systems and residential PV systems will be supported through the raise of the purchase prices and the shortening of the purchase period. ANRE indicated its policy to start offering support according to the new category at the time when the power generation cost of PSCs falls below the standard electricity bills.

☀️ **ANRE under METI** announced the calculation results of the power generation costs by power source as of 2040 at the fifth meeting of the Power Generation Cost Verification Working Group. ANRE set three patterns of the installed capacity of variable renewable energy at 40%, 50%, and 60% to calculate the power generation cost per kWh in the case of newly installing renewable energy power sources in 2040. The power generation cost of C&I PV systems based on the basic scenario is 8.5 yen/kWh, (5.42 cents/kWh) (with the support of policy expenses) which is the lowest of all the power sources, but according to the calculations considering a part of the integration cost, the power generation cost of PV (C&I) was between 15.3 yen/kWh (9.76 cents/kWh) and 36.9 yen/kWh (23.5 cents/kWh), showing the greatest gap of more than twofold depending on the setting of the renewable energy introduction ratio either at 40% or 60%.

ANRE under METI held the 53rd meeting of the Working Group on Grid Connection of Renewable Energy and presented its policy to start a tentative additional measure toward prompt grid connection of grid-scale storage batteries. ANRE approves early interconnection on the condition that storage battery installers install a device which restricts charge during specific time period at their own expense. The policy will be started from April 2025.

ANRE under METI announced that it will start to apply the

revised rules for priority dispatch which stipulate the order of output curtailment between FY 2026 and FY 2027. The rules were scheduled to be applied during FY 2026, but because several improvements were planned to deal with the change of other related schemes, etc., ANRE will swiftly apply the rules in sequence to the area where these improvements are completed. Under the new rule, the output of FIT power sources will be curtailed first and then FIP power sources, and thus FIP power sources are not subject to the curtailment for the meantime.

The National Institute of Technology and Evaluation (NITE) announced the analysis results of electrical accidents caused by ice and snow, using a database of fault information concerning electric facilities based on the Electricity Business Act. The results found that the damages of PV systems due to accumulated snow increased in a year when heavy snow was observed and 88% of the ice and snow-related accidents caused the damages of mounting structures. From the analysis results, NITE points out the importance of the appropriate designing of mounting structures and the reduction of burden on mounting structures by removing snow.

☀ **MoE** announced the compiled report of the Study Group on the future local decarbonization policies. MoE newly positions the five years between FY 2026 and FY 2030 as the period to concentrate on the implementation and calls for the promotion of creative and original local decarbonization efforts utilizing renewable energy according to the regional characteristics as the Local Decarbonization 2.0.

MoE selected TOA Road Corporation at the Evaluation and Demonstration Project for Renewable Energy Promotion Technologies for Simultaneous Realization of Nature Positive and Carbon Neutral Energies (of which, solar pavement technology related) for FY 2024. The project is named the Verification on the installation of PV systems on the surfaces of paths through the garden in harmony with natural landscapes. MoE will verify the harmony between the natural landscape and the PV systems on the road surfaces in the Shinjuku Gyoen National Garden.

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) appropriated 2.2478 trillion yen (\$ 14.3 billion) for the proposal of the supplementary budget for FY 2024. Toward achieving carbon neutrality, MLIT appropriated 225 billion yen (\$ 1.44 billion) for supporting energy-saving houses. MLIT positions the energy-saving houses largely exceeding the ZEH standards as the GX-oriented houses and will establish a new support scheme, utilizing 50 billion yen (\$ 319 million) of GX Economy Transition Bonds. The subsidy amount is 1.6 million yen/house (\$ 10,200 /house) and MLIT expects to provide support for approximately 30,000 houses.

☀ **MLIT** approved the Plan to promote airport decarbonization of three airports, namely Asahikawa Airport, Iwate Hanamaki Airport, and Mt. Fuji Shizuoka Airport. MLIT aims to reduce CO₂ emissions by 48% by 2030 in Asahikawa Airport, 60% by 2030 in Iwate Hanamaki Airport, and 46.6%

by 2030 in Mt. Fuji Shizuoka Airport, compared to the 2013 level. As the main measures, these three airports plan to introduce PV systems in the airport facilities and replace vehicles used at the airports with electric vehicles (EVs), etc.

MLIT compiled the Policy Manifesto Ver. 1.0 for the Decarbonization of the Road Sector toward promoting the efforts of decarbonization on the road. In this policy manifesto, targets and roadmaps to promote the efforts are set according to four Basic Policy Pillars, such as the creation of road spaces to support the greening of road traffic. As the targets for FY 2030, MLIT aims to achieve 100% LED road lighting and introduce PV systems in 122 locations on the road maintained by the national government.

2. Local governments

☀ **Aomori Prefecture** announced a draft outline of the ordinance of the "Prefectural Tax for Renewable Energy Coexistence," which imposes a tax on PV and onshore wind power producers. The tax is imposed on ≥ 2 MW PV systems and ≥ 500 kW onshore wind power systems. The tax amount is calculated according to the tax rate set by the area and by the facility based on the total power generation capacity as of January 1 every year. The tax amount for PV is 110 yen/kW (70.2 cents/kW) in the coordination area and 410 yen/kW (\$ 2.62 /kW) in the conservation and protection areas.

Annaka City of Gunma Prefecture signed a Memorandum of Understanding (MOU) with TOKYO GAS for the joint research project on technology to forecast PV power generation highly accurately, which fluctuates depending on weather conditions, by ground-based weather observations. The city provides public facilities as the installation locations of meteorological sensors and the TOKYO GAS Group will develop the technology utilizing the Annaka City PV Power Plant (the maximum capacity of 63.2 MW), one of the largest PV power plants in the Kanto area which the group owns in the city.

Tokyo Metropolitan Government (TMG) conducted a general competitive tender for the construction of Solar Carport PV Systems in the Oifuto Central Seaside Park and selected Toho Electrical Construction with 757 million yen (\$ 4.83 million) (excluding tax). The project covers the construction work of PV systems and power receiving and transforming facilities, etc. in the first and second parking lots in the park. The construction period is until February 26, 2027.

Sumida Ward of Tokyo completed the installation of storage battery systems that can charge smartphones, etc. in 39 designated evacuation facilities in the ward. The ward introduced 1.44 kWh of storage battery systems, which can charge approximately 100 general smartphones. The ward also installed PV modules that can charge storage batteries, and thus PV electricity is generated on sunny days.

Zushi City of Kanagawa Prefecture conducted a public call for proposals to accept applications from business operators who introduce PV systems, etc. to Zushi Elementary School through a PPA scheme. The project covers the onsite surveys of PV systems to be introduced, the consideration of the installed capacity, operation and maintenance (O&M) services, electric power supply, and the removal of PV systems. The operation period is up to 20 years and the city will introduce these PV systems by the end of March 2026.

Hiratsuka City of Kanagawa Prefecture conducted a public call for proposals to accept applications from those who want to be a joint business operator of the Project to introduce PV systems in public facilities in Hiratsuka City based on a PPA scheme. The applicable facilities include Fujimi Elementary School, and the city works on efficient and effective design, installation, operation, and O&M services of PV systems and storage battery systems, etc. through the PPA scheme. The project period is up to 20 years upon starting operation and the maintenance period is until January 14, 2026.

Nagano Prefecture conducted a public call for proposals to accept applications from those who need electricity to be supplied from the Kosumo No Shizuku Power Plant, (Iizima Town, Nagano Prefecture) which is scheduled to start power generation on July 1, 2025. The electricity will be supplied to the consumers who need renewable energy-based electricity through the PPA scheme. The power supply period is three years between July 1, 2025 and June 30, 2028 and the amount of electricity supply is estimated to be 16.488 GWh in the three years.

Shizuoka Prefecture announced that the Plan to promote airport decarbonization of Mt. Fuji Shizuoka Airport was decided to be approved by MLIT. The prefecture set the targets of reducing greenhouse gas (GHG) emissions by 46.6% by FY 2030 from the FY 2013 level and achieving zero emissions by FY 2050, and it will promote the suppression of solar radiation in terminal buildings, the introduction of LED lighting, and the expanding installations of PV systems, etc. The prefecture will introduce PV systems on the land on the south side of the airport as well as parking lots and promote the increased installations of PV systems by FY 2030 and the consideration of introducing storage battery systems, etc. by FY 2050.

Numazu City of Shizuoka Prefecture mitigates the installation regulations of PV and wind power systems in the restricted areas from January 1, 2025. The installation regulations in the restricted areas such as agricultural land will be mitigated when the business operators in the city satisfy the condition that PV and wind power systems are installed for their private power generation without causing any deforestation. The city ordinance regulates the facility installation on $\geq 10,000$ m² of the project area in the restricted areas, but the city approves the facility installation on $\geq 10,000$ m² of the area when the projects help promote zero carbon measures as a result of the revision of the regulation and the renewable energy facilities do not negatively affect the natural

environment.

Kitakyushu City of Fukuoka Prefecture signed a partnership agreement with two companies, Hamada and Shinryo, to solve the problem of PV module disposal. Hamada collects the used PV modules, installs the reusable ones, and generates electricity. The generated electricity is sold to Kitakyushu Power. Shinryo accepts the disposed PV modules for recycling. The city plans to install the reusable PV modules to one public facility during FY 2024.

Fukuoka City of Fukuoka Prefecture started accepting applications to confirm the participants of the Project to commission the active introduction, etc. of next-generation solar cells (perovskite solar cells (PSCs)). The selected business operator will procure domestically produced film-type PSCs (≥ 15 kW) and install them on the metal roofs of the gymnasiums of municipal schools, and takes charge of the consideration of the O&M method after installation as well as the acquisition of installation technology of local business operators, etc.

3. Utilities

Hokkaido Electric Power Co., Inc. (HEPCO) will participate in a project to supply PV power to Shin-Chitose Airport Station and Otaru Station, under the offsite PPA framework. HEPCO will supply, as an electric retailer, the power generated at two PV power plants with a total capacity of approximately 2,800 kW in Kita-hiroshima City, owned by HARE-bare LLC, to Hokkaido Railway Company (JR Hokkaido). Certificates will also be added to achieve net zero CO₂ emissions.

Tohoku Electric Power Network Co., Inc. started operating a demand-supply control system by combining the existing internal combustion power plant, PV systems, storage batteries, energy management systems (EMS), and such, on Sado Island, Niigata Prefecture. Optimized charge-discharge control of storage batteries and adjustment of internal combustion power generation output will be realized and contribute to the expanded introduction of renewable energy on the island. The newly installed EMS will control operations of the 1,500 kW PV power plant, Hikari no Chikara Kurinoe, the existing Ryotsu Thermal Power Plant Unit No. 5 to 9 having total output capacity of 40,000 kW, and a 5,000 kW storage battery system installed at the Ryotsu Thermal Power Plant.

Chubu Electric Power Co., Inc. started commercial operation of the PV power plant, Shinsei Joka Center Solar in Moots City, Gifu Prefecture. The plant having an output capacity of 250 kW is expected to generate approximately 336,000 kWh/year. The generated power and environmental value of the plant will be provided to specific customers through the offsite PPA service of Chubu Electric Power Miraiz. This is the first PV project for the Chubu Electric Power to utilize a public facility.

Chubu Electric Power Miraiz Company, Incorporated, WasteBox, and Cenergy Co. will start supplying CO₂-free power to Aioi Nissay Dowa Insurance, from December 2024, by combining non-fossil certificates and international renewable energy certificates (I-RECs). This is said to be the first case in Japan to supply CO₂-free power by combining non-fossil certificates and I-RECs. Chubu Electric Power Miraiz will procure power from the Nagato Farm Mega-Solar Power Plant (module output capacity: 18.7 MW) commissioned in January 2018 by Cenergy, and supply the power as Green Denki (green power), in combination with FIT non-fossil certificates, to the Aioi Nissay Dowa Insurance's Nagoya Mei-eki Building.

Chubu Electric Power Miraiz Company signed an offsite PPA with Toyota Gosei. Toyota Gosei will purchase 1,629 MWh/year of renewable energy-derived power from a floating PV power plant, planned to be installed in Mie Prefecture and expected to start operation in June 2025, for 20 years. The effect of CO₂ emission reduction will be approximately 740 tons/year.

Hokuriku Electric Power Company will install a 1.5 MW PV system on unused land at the premises of the Pacific Rundum's headquarters factory under the onsite PPA framework and will start operations in January 2025. 3,520 units of PV modules will be installed on a 14,400 m² unused land, to cover approximately 15% of the factory's annual power demand.

☀️ **Kansai Electric Power Co., Inc. (KEPCO)** will start an offsite corporate PPA business with McDonald's Japan and KDS Solar GK. KDS Solar, which develops and operates PV systems, will newly develop or acquire PV systems with a total capacity of approximately 4 MW at around 80 sites for the project. KEPCO will supply the generated PV power, as an electric retailer, to around 130 McDonald's restaurants in the Kansai area.

KEPCO established a wholly owned subsidiary, Kansai Energy Solutions Indonesia (KESI), in Indonesia, to handle businesses such as PV system rental. The project to install PV modules at local factories and lease them out was adopted for the Project to subsidize facilities as part of the funding support program by the Joint Crediting Mechanism (JCM) for FY 2024, by the Ministry of the Environment (MoE). The project is expected to reduce CO₂ emissions by approximately 12,000 tons in a period of 17 years.

☀️ Five group companies of **Kyushu Electric Power Co., Inc.** signed a comprehensive partnership agreement with Mitsubishi Chemical Group's affiliate Shinryo, and AGC to promote reuse and recycling of PV modules. The company will collaborate with AGC, which recycles sheet glass from PV modules mainly in the Kyushu area, and Shinryo, which has the technology to recover materials such as glass and silver by thermal decomposition, to create a mechanism to integrate disposal, reuse, and recycling of PV modules.

Okinawa New Energy Development Co., Inc., a group company of Okinawa Electric Power (OEPC), installed a PV system under an onsite PPA framework at the city hall of Nanjo City, Okinawa Prefecture. A 105 kW PV system and a 13.5 kWh storage battery were installed free of charge and the PV-derived power will be sold for a period of 15 years. Approximately 20% of the annual power demand at the city hall is expected to be switched to PV-derived power.

Cenergy Co. installed a 1.4 MW PV system at YAMAHA's Kakegawa Factory, under an onsite PPA framework. The expected annual power generation is approximately 1,600 MWh, equivalent to approximately 9% of the power consumption at the factory. Approximately 600 tons/year CO₂ emission is expected to be reduced.

Japan Electric Power Exchange (JEPX) announced the results of its second trade on the non-fossil value trading market in FY 2024. Among the non-fossil certificates derived from non-FIT power sources, the contract capacity for those without renewable energy designation was 134,855,094 kWh, decreased by 48.6% compared to the first round of FY 2024, while the contract capacity for those with renewable energy designation was 1,166,278,083 kWh, decreased by 32.7% compared to the first round of FY 2024. The contract price was 0.6 yen/kWh (0.383 cent/kWh), or the lower limit, for both with and without renewable energy designation. The contract capacity for the renewable energy value trading market, where FIT certificates are traded, was 11,647,557,628 kWh. Although it was a 19.0% decrease from the record high in the first round of FY 2024, the trading continues to be active. The lowest contract price was 0.4 yen/kWh (0.255 cent/kWh), or the lower limit, and the highest was 0.6 yen/kWh (0.383 cent/kWh).

4. PV material, component and manufacturing equipment

JX Nippon Oil & Gas Exploration Corporation plans to ramp up the production of iodine, a key raw material for perovskite solar cells (PSCs), in response to the growing demand for PSCs. The company will expand the production system by the end of 2025, increasing the annual production of the Nakajo Oil Factory to the level of 300 tons/year, an approximately 60% increase from the actual production in FY 2023.

Kurabo Industries Ltd. was reported to be considering the ramp-up of the production capacity of functional films used for encapsulating solar cells. The plan is to upgrade the production equipment of the existing line at Mie Factory, which had been expanded to an annual capacity of approximately 6,000 tons in FY 2023, to further increase the capacity by approximately 10% by the end of FY 2024. The company is also viewing the addition of new production lines depending on the circumstances.

5. PV cell/ module manufacturing

Kyocera Corporation plans to commercialize a new 410 W PV module designed as a system for use in heavy snow regions and to start its sales from March 2025. The module will be installed using a patented fixing method which shows high load-bearing performance of resisting snow accumulation load of 7,500 Pa, equivalent to a vertical snow load of 2.5 m. The module having the double glass configuration employs highly-durable sealing technology which prevents intrusion of moisture.

Electric Works Company, Panasonic Corporation will launch new PV modules for residential and industrial uses. The modules come in three types: standard modules with an output of 265 W, half-size modules with an output of 130 W, and large modules with an output of 470 W, and have conversion efficiencies ranging from 20.6% to 23.5%. The new n-type back contact modules have a nominal maximum output capacity increased by 14% compared to the current modules, show suppression of decrease in generation performance during summer and have simple appearance.

Next Energy & Resources Co., Ltd. will start selling two models of PV modules for the rooftops of small houses, using N-type solar cells, in January 2025. The roof area can be efficiently used by combining the main module and sub-module, each requiring an area of 56% and 31% of the current models, respectively, compared to conventional modules. The modules come with a 15-year product warranty and a 30-year linear output warranty.

☀️ **Sekisui Chemical Co., Ltd.** will start mass production of perovskite solar cells (PSCs) in 2027. The company will establish SEKISUI SOLAR FILM in collaboration with the Development Bank of Japan. The new company will design, manufacture, and sell PSCs. The company will take over Sharp's headquarters factory building and the power supply and cooling facilities, and will make efforts to install production equipment. The company plans to start operating a 100 MW/year production line in 2027 and to establish a supply system of 1 GW/year level by 2030 with a step-by-step investment in capacity expansion. The estimated total investment is 341.5 billion yen (\$ 2.18 billion), half of which will be covered by government subsidies.

Sekisui Chemical Co., Ltd., will install film-type PSCs at the facilities of MUFG Bank to conduct a demonstration experiment of the PSCs in collaboration with the Bank. The PSCs installed on the inner side of the curtain walls of the Bank's Ooi branch will be evaluated for their power generation performance and durability when installed on an indoor window side. The PSCs installed on the rooftop of the MUFG Global Learning Center, alongside crystalline silicon PV modules, will be evaluated for their durability and weather resistance when installed on a rooftop waterproofing sheet. The Bank will share the effectiveness and challenges of PSCs

studied through the experiment within the organization and will make the use of the information in the financial support services to facilitate the customers' implementation of PSCs.

PXP Corporation procured 1.5 billion yen (\$ 9.57 million) in a Series A round fundraising led by SoftBank. Softbank acquired 29.9% of the company's shares by investing approximately 1 billion yen (\$ 6.38 million). The company is exploring various applications of its self-developed perovskite, such as using high-efficiency perovskite/ chalcopyrite tandem solar cells to operate data centers.

6. Balance of systems (BOS)

Sumitomo Electric Industries Ltd. delivered a redox flow battery system having an output of 1,000 kW and a capacity of 8,000 kWh to Kashiwazaki IR Energy, and received new orders for a similar-sized battery system. The battery system will be installed at the premises of Kashiwazaki City's Shizen Kankyo Joka Center and will contribute to promoting the use of renewable energy and enhancing energy security of the city.

NGK Insulators, Ltd. received an order for two units of container-type NAS battery system having a total output of 500 kW and a total capacity of 2,900 kWh, from Greenergy Holding, a renewable energy company in Hungary. The system will be installed at a PV power plant owned by Greenergy Holding and scheduled to start operation in June 2025 to mitigate grid congestion.

KOBELCO LOGISTICS, LTD. received its first order from Solid for the import custom clearance and installation works of grid-scale storage battery units (over 27 ton class) and their ancillary equipment, which will be used to store renewable energy. The company handled the import procedures, storing, inland transportation, and installation of the four storage battery units and their ancillary equipment, including their delivery to the destination in Kiryu City, Gunma Prefecture, by transporting with a low-floor trailer from Kawasaki Port in Kanagawa Prefecture, where the battery units, etc., were loaded.

Hokuriku Electric Power Transmission & Distribution Company started to make a public call for business operators that will install and operate grid-scale storage batteries at the premises of the company's substation site by renting the site. The company aims to expand the use of grid-scale storage batteries as a dispatching capability in response to the expansion of renewable energy introduction and is recruiting business operators for three substations at four locations (two locations at Funahashi substation, one location each at Funan substation and Togo substation) where grid connection is relatively easy.

Kansai Electric Power Co., Inc. (KEPCO) and **Orix Corporation** started operating the Kinokawa Storage Plant, which will be the first storage plant for the two companies. The

Plant will be owned by a 50/50 joint venture of the two companies and operated by Orix. The Plant, in which 64 lithium-ion battery systems manufactured by TMEIC are installed, has a rated output of 48,000 kW and a rated capacity of 113,000 kWh, and is one of the largest storage plants in Japan. The generated power will be traded in the wholesale power market, supply and demand adjustment market, and capacity market through E-Flow, a subsidiary of KEPCO.

Osaka Gas Co., Ltd. will enter the business on storage batteries annexed to renewable energy power plants. The company will support the utilization of 100% renewable electricity by storing surplus power in the storage batteries annexed to renewable energy sources owned by the gas company or other companies. Osaka Gas, which announced full-scale entry into the grid-scale storage battery business in June 2023, will utilize the knowledge of supply and demand adjustment gained from the grid-scale storage battery business to the storage batteries annexed to renewable energy sources. The company aims to achieve an increase of approximately 100,000 kW/year by FY 2026, by combining the grid-scale storage batteries and the annexed storage batteries.

SHIZUOKA GAS AND POWER, an electricity business company of the Shizuoka Gas group, will enter the grid-scale storage battery business leading to the supply-demand balancing and the effective use of power, by trading renewable energy-derived power stored due to varied generation depending on the time of day, on the market. Works for installation of the batteries will start at the Shizuoka branch of Shizuoka Gas by the end of FY 2025, aiming to start operation by the end of FY 2027. 20 units of container-type storage battery modules having an expected capacity of 46,900 kWh will be installed.

Kurihalant Co., Ltd. started the commercial operation of a storage plant constructed in Kimitsu City, Chiba Prefecture, at a site adjacent to the company's 1,999 kW Kurihalant Chiba Futtsu No. 2 PV Power Plant. The plant has a rated output of 1,999 kW, an installed capacity of 7,596 kWh, and the total cost of the project is approximately 700 million yen (\$ 4.47 million). E-Flow will act as an aggregator, including the trade of power from the storage plant, and arbitrage trading has started through the Japan Electric Power Exchange (JEPX).

Sharp Energy Solutions Corporation (SESJ) announced that it will start the demonstration of demand response (DR) remote control of residential storage batteries manufactured by Sharp on December 27, 2024, in collaboration with Tokyo Electric Power Company Holdings, TEPCO Energy Partner, and Energy Gateway. The amount of the dispatching ability created will be verified by remote control through the information and communications infrastructure for distributed energy, via public power hub (PPH).

XSOL Co., Ltd. will take measures to address the use of aluminum cables and installation of signboards during the construction of new PV power plants, as part of efforts to combat the increasing theft damages at PV power plants in

recent years. The company aims to reduce theft incidents by using aluminum cables which cost about one-sixth the price of copper cables, and by using signboards to publicize the use of aluminum cables. The company will provide support against theft damages through a PV power plant evaluation service, along with a plan that includes five years of disaster compensation, covering theft incidents.

7. PV systems

7-1. Residential PV systems (houses/ apartments)

Rezil Inc. has started providing its first Disaster Prevention Service for Condominiums, a service that installs and operates PV modules, storage batteries and other equipment in apartment houses at no initial cost, at a 14-story condominium located in Osaka Prefecture. Only one storage battery system with a capacity of 61.4 kWh was installed in this property. The initial investment and other costs will be collected within the charges for the high-voltage bulk power receiving service.

7-2. PV systems for public and industrial applications

 **Central Japan Railway Company (JR Tokai)** and **Sekisui Chemical Co., Ltd.** have signed a joint development agreement for a soundproof wall equipped with perovskite solar cells (PSCs) and developed a prototype. The two companies will start a demonstration experiment in January 2025 at JR Tokai's Komaki Training Facility in Komaki City, Aichi Prefecture to study the feasibility of practical application. They have developed a prototype of a soundproof wall with easily detachable PSCs, assuming that solar cells alone would be replaced for maintenance purposes due to the long life of the soundproof wall. They have also developed a method of fixing PSCs by inserting them from the bottom and applied for a patent for this method.

TOKYO GAS Co., Ltd. has developed a new method of installing thin and lightweight PV modules on roofs made of slate, a material that is considered difficult to install PV modules on. Utilizing the new method, TOKYO GAS will expand the scope of its service of installing PV systems for corporate customers to include customers who have slate roofs. The new method uses an adhesive to attach thin and lightweight PV modules to slate roofs. No drilling of holes in the roof is required. TOKYO GAS will introduce the new method to its HINATAO SOLAR service, which allows customers to install PV modules within the framework of an onsite PPA.

Panasonic Corporation has started a demonstration experiment at Panasonic Manufacturing UK (PMUK) to supply the factory with renewable energy by linked control of combined three types of batteries: pure hydrogen fuel cells, solar cells and storage batteries. PMUK has installed 21 units

of 5-kW pure hydrogen fuel cells, 760 kW of PV modules and 1 MWh of storage batteries, while using part of the PV modules (372 kW) at the factory, aiming to cover 100% of its annual electricity consumption of approx. 1 GWh with the generated electricity. PMUK will use green hydrogen derived from wind power procured from a partner company in Wales, UK.

Heating & Ventilation A/C Company, Panasonic Corporation has installed a PV system with an output capacity of 5.2 MW at the factory of Panasonic Appliances Air-Conditioning Malaysia (PAPAMY) in Malaysia. The system is expected to generate approx. 5,900 MWh/year of electricity and reduce CO₂ emissions by approx. 3,912 tons/year, allowing PAPAMY to cover approx. 20% of its electricity consumption with PV power. The Panasonic Group has set a target of achieving virtually zero CO₂ emissions at its own sites by 2030 for all of its operating companies.

Next Energy & Resources Co., Ltd. has started selling new models of rear-support type solar carports. In addition to the conventional model designed for six cars, the company has released models for four, eight and twelve cars. The models for eight and twelve cars are designed specifically for parking lots with two rows of cars parked back-to-back. The company has adopted N-type bifacial PV modules with a maximum nominal output capacity of 635 W for the products.

Anabuki Kosan Inc. has signed a business partnership agreement on renewable energy with RICOH JAPAN and will sign an off-site corporate PPA by around January 2025. ANABUKI CONSTRUCTION will construct a PV power plant with an output capacity of 3,100 kW (DC) in Sanuki City, Kagawa Prefecture, and RICOH JAPAN will supply renewable energy electricity as an electricity retailer to the offices of both companies, group companies and RICOH JAPAN's supply chain companies starting in April 2025.

7-3. Ground mounted, large-scale PV systems

Next Energy & Resources Co., Ltd. has signed an outsourcing agreement with au Renewable Energy for the development project of PV systems for offsite PPAs. Next Energy & Resources will develop, construct and maintain PV power plants. au Renewable Energy will acquire the PV power plants developed by Next Energy & Resources and supply electricity derived from renewable energy sources to consumers.

KIKUSUI Co., Ltd. has developed a non-FIT PV power plant, the Gojo City Nishikawachi Town Power Plant, to be completed by the end of December 2024 in Gojo City, Nara Prefecture. The plant with an output capacity of 677.1 kW is expected to generate 736,454.5 kWh/year.

7-4. Floating PV (FPV) systems

SMFL MIRAI Partners Company, Limited, a subsidiary of Sumitomo Mitsui Finance and Leasing, has acquired Suiden Mizuumi One, a subsidiary of Ciel et Terre Group, jointly with SHIZEN ENERGY, and took over 12 operational floating PV (FPV) power plants. The total output capacity of 18.6 MW will make it one of the largest-scale FPV power plants in Japan. The company will expand its PV power generation business by embarking on FPV projects utilizing reservoirs and dams, as the available land suitable for PV power generation in Japan has been decreasing.

7-5. PV systems on farmland

TOYOTA BOSHOKU CORPORATION has invested in Agritree, a company engaged in PV power generation on farmland (Agro PV). This investment will enable the company to further promote the use of renewable energy by considering the use of its technology and the purchase of electricity generated on farmland.

7-6. PV business support service

Eurus Technical Service Inc. has started offering a 24-hour Manned Monitoring Service to support safe and stable operation of power plants for wind and PV power producers in Japan. Dedicated staff members monitor power plants 24/7/365, including visual checks, and respond to calls in the event of accidents or other emergencies to support safe and stable operation of power plants.

ACSL Ltd. will collaborate with Environmentally Friendly Holdings (EFH) to realize real-time monitoring and maintenance for renewable energy facilities. The companies aim to improve operational efficiency through the early detection of defective PV modules and the streamlining of periodic maintenance and inspections by introducing ACSL's drone technology. They will start introducing the service from power generation facilities equivalent to approx. 143 MW under EFH's management.

Joetsu Materials Corporation will enter the PV module recycling market. The company will apply for a permit to install a recycling facility from Niigata Prefecture. Upon receiving the permit, the company will install a blast-type facility that sprays granular projection material onto the module cover glass to separate the glass from the back sheet containing valuable materials such as copper and silver. The facility is capable of processing 20 to 30 PV modules per hour, with a daily capacity of nearly 100 PV modules.

Maruryo Automobile Transport Co., Ltd. is entering the

business of intermediate processing and recycling of disposed PV modules. An intermediate processing facility built with an investment of 350 million yen (\$ 2.23 million) removes aluminum frames from PV modules and heats the surface glass to separate the glass from back sheets, with a daily processing capacity of 200 modules. The company plans to sell the frames and sheets as valuable materials and will consider ways to reuse the glass, such as mixing it with roadbed material.

7-7. Various products

Japan Shield Technical Research Co., Ltd. has developed *Metus*, an intimidation and alert device that detects people and vehicles approaching large-scale PV power plants at night and emits a strong light and warning sound and has installed the first unit at a MW-scale PV power plant in Fukushima Prefecture. The device works in conjunction with *VIGILA*, the company's unmanned warning system. The price is about 1.2 million yen (\$ 7,660).

Edison Co., Ltd. has developed a vertical PV power generation pole. A dedicated mounting structure was developed and placed around a 35 cm-diameter concrete pole, to which single-crystalline silicon (sc-Si) PV modules were mounted. An output capacity of the standard 8 m-tall pole is 6.15 kW with 15 units of PV modules (410 W each) and that of a 12 m-tall pole is about 10 kW. The power generation amount of vertical PV systems is smaller than that of ground-mounted ones, however, vertical systems require small space for installation, shorter installation time and easier maintenance, and generated electricity can be transmitted using overhead wiring. The installation cost for the product with 1-kW output capacity is about 180,000 yen (\$ 1,150), and the company is also considering installing a small wind turbine generator of about 10 kW on the top of the pole.

8. PV power generation businesses

8-1. Power producers

☀️ **TOKYO GAS Co., Ltd.** and its subsidiary Tokyo Gas Engineering Solutions (TGES) signed a comprehensive collaboration agreement with McDonald's Japan in October 2024 to help McDonald's Japan reduce its environmental impact. The 75 shops operated by McDonald's Japan in the Kanto region will be gradually supplied with PV electricity by TOKYO GAS Group starting in December 2024. TOKYO GAS will supply electricity generated by 2,250 kW of PV systems within the framework of an off-site PPA. TGES will serve as the distributor of the electricity.

Osaka Gas Co., Ltd. signed a collaboration agreement with Kobe City, Hyogo Prefecture to promote local decarbonization. Osaka Gas and others will be co-proposers, and will support the introduction of renewable energy and energy-saving facilities to

realize the Decarbonization Leading Area of Kobe City selected by the Ministry of the Environment (MoE) in September 2024. The plan is to decarbonize the medical industrial area and the surrounding port area, introducing approximately 6 MW of PV systems, etc.

Osaka Gas Co., Ltd. acquired a 40% stake in the operational Tanabu PV Power Plant and Hirono PV Power Plant (approx. 26 MW and 14 MW, respectively) from Sonnedix Power Holdings, UK. This is the sixth power plant owned by Sonnedix in which Osaka Gas has invested, with a total output capacity exceeding 200 MW. All electricity generated by the two power plants will be taken over by Osaka Gas through a specified wholesale supply and supplied to customers in combination with FIT non-fossil fuel energy certificates.

Keiyo Gas Co., Ltd. formulated a three-year medium-term management plan targeting consolidated ordinary income of 6 billion yen (\$ 38.3 million) in the fiscal year ending December 2027 (2.4 billion yen (\$ 15.3 million) in the fiscal year ending December 2023) and return on equity (ROE) of 4.5%. In the energy area, the company will promote decarbonization initiatives in collaboration with local governments. Keiyo Gas intends to expand development of PV power plants and other renewable energy sources in Japan and abroad, increasing to a cumulative total of 80 sites by 2027.

Okayama Gas Co., Ltd. will start the PPA business of PV power generation for households in January 2025. The name of the service is Okagas Solar, and the company will install PV systems in houses free of charge, and will receive a fee from the customers for their own consumption of the PV electricity. The rates are expected to be 22-32 yen/kWh (14.0-20.4 cents/kWh), which is cheaper than purchasing from an electric power company. The contract period is for 15 years, at the end of which the PV systems are transferred to the customers free of charge. The company also offers a menu of storage batteries that can be leased as a set with the PV system.

SAIBUGAS CO., LTD., SAIBUGAS KUMAMOTO CO., LTD., Kumamoto Prefecture, Mashiki Town in Kumamoto Prefecture, Nishitetsu Shizen Energy GK, Higo Bank., and The Kumamoto Bank, Ltd. signed a partnership agreement to supply renewable electricity to the area surrounding Aso Kumamoto Airport. The seven parties will establish a regional energy company as early as in January 2025, and SAIBUGAS will supply electricity from April 2025 as a retail electricity provider, expecting semiconductor-related companies and others as customers. Approximately 20 MW (planned value) of power sources for supply, such as PV, woody biomass, and biogas, will be developed by Nishitetsu Shizen Energy and others.

ENEOS Renewable Energy Corporation (ERE) and H.E. Energy will collaborate on the development of low-voltage PV power plants in the Tohoku area. Through Bulk Scheme, in which multiple power plants are developed and constructed simultaneously, they will sequentially work on the construction of 50 power plants with a total capacity of 5 MW, which are scheduled to begin the operation by the end of 2025. ERE Group

will take over the PV power plants developed and constructed by H.E. Energy, and H.E. Energy will be responsible for operation and management.

Japan Petroleum Exploration Co., Ltd. (JAPEX) and IINO KAIUN KAISHA, LTD. signed a basic agreement on a joint project for a PV power plant. The two companies will cooperate to study the installation of a PV power plant, aiming for a cumulative output capacity of approximately 30 MW by 2030. They will also consider reducing greenhouse gas emissions associated with electricity use by supplying the environmental value created from the electricity generated to IINO KAIUN's buildings.

SMFL Mirai Partners signed an agreement with KITZ CORPORATION for the installation of on-site self-consumption PV power generation services at its Chino Factory in Nagano Prefecture, and began operation. SMFL Mirai Partners will install 3,400 PV modules (module capacity: 1.989 MW) at the Chino Factory and supply all electricity generated to the factory. The estimated annual output is 1,971 MWh, which is equivalent to 24% of the factory's electricity consumption while reducing CO₂ emissions by 829 t/year.

TOKYU CONSTRUCTION CO., LTD. newly entered the PV off-site PPA business. The company will acquire 20 low-voltage PV power plants totaling 1.7 MWDC in the service area of Chugoku Electric and provide off-site PPA services. Future asset management and operation of the power plants will be outsourced to Clean Energy Connect.

☀️ **Sojitz Corporation** will shift its development focus from MW-scale PV power plants to small ones, planning to develop 3,000 power plants with an average output capacity of about 100 kW by the end of FY 2026. The total project cost is 50 billion yen (\$ 315 million) and Sojitz will manage all the power plants together and sell electricity directly to the companies. The company plans to continue to engage in MW-scale PV power plant projects, but its main focus will be on small power plants.

Prologis, Inc. started construction of a renewable energy-powered containerized data center on the site of its Prologis Park Ogori logistics facility in Ogori City, Fukuoka Prefecture, and will begin providing services in April 2025. The data center will be 100% powered by renewable energy, with approximately 30% of its power consumption supplied directly from a PV system installed on the roof of the logistics facility. If there is a surplus of electricity, it will be used to power the warehouse of FUKUOKA LOGISTIC SYSTEMS, the tenant customer.

☀️ **Tokyo Century Corporation** will enter the PV power plant business in Italy. The company will invest in a PV project that a Swiss asset management company Capital Dynamics is working on in Italy, and will acquire a portion of the development interest. Two PV power plants (planned output capacity of 188.8 MW in total) will be constructed in Sicily, Italy, with the aim of starting operation in July 2025. The generated power will be supplied to a major IT company with whom they have signed a corporate PPA. A French investment bank Natixis will provide project

financing.

8-2. PPS

☀️ **ENERES Co., Ltd.** signed an off-site PPA with Halows and AkiyamaKousan to sell electricity to Halows' 11 stores in the Shikoku area. ENERES will supply Halows with renewable energy generated by two non-FIT floating PV (FPV) power plants installed by AkiyamaKousan on reservoirs in Kagawa Prefecture for 10 years from December 2024. The two power plants will have an output capacity of 1,750 kWac and 747.32 kWac, respectively, and are expected to generate a total of 3.4 GWh per year and reduce CO₂ emissions by approximately 1,449 t/year. ENERES will be the specified wholesale supplier (aggregator) and Eneres Power Marketing (EPM) will be the retail electricity supplier.

Octopus Energy Group Limited began offering Solar Initial Zero Plan, a service that installs PV modules on residential roofs at no initial cost and sells the generated electricity nationwide, excluding Okinawa Prefecture. This service is available for both new and existing houses, and for existing houses, the customer pays the cost of scaffolding. Electricity generated by the PV modules will be sold at 24 yen/kWh (15.3 cents/ kWh), and Octopus Energy will utilize the electricity that was not fully used up. During the hours when the PV modules do not generate electricity, Octopus Energy will provide a tariff plan that pursues decarbonization.

E-Flow LLC will collaborate with RENOVA on virtual PPA services. They trade only the environmental value in PV-derived renewable energy. RENOVA will develop and operate non-FIT PV power plants exclusively for its customers, and E-Flow will act as an aggregator to manage supply and demand and other operations. E-Flow signed an agreement with RENOVA-funded Daini Taiyokohatsuden GK for renewable energy aggregation services.

Girasol Energy initiated a project to convert an existing PV power plant under the FIT program to the FIP program and install storage batteries along with it for optimal operation and control. EAST ENGINEERING will be a partner in the project, selecting the existing PV power plants, designing, installing, and maintaining the battery storage systems. Girasol Energy will forecast power generation amount, formulate and submit power generation plans to the Organization for (the Organization for Cross-regional Coordination of Transmission Operators, JAPAN (OCCTO)), and control the recharge and discharge of storage batteries. Girasol has been registered as an aggregator.

8-3. Green hydrogen

JERA Co., Inc. started supplying electricity generated by its hydrogen single-fired engines and other equipment to TOHO's film studio. This is the first commercial use of electricity

generated by a hydrogen engine in Japan. JERA will install one 320 kW hydrogen engine generator and two 35 kW fuel cell units in the Sodegaura Thermal Power Plant in Chiba Prefecture, and supply the generated electricity to the filming studio off-site. The company will convert to domestically produced green hydrogen by around 2030 and combine it with 1,380 kW of PV system installed in the TEPCO Power Grid's service area to supply 24/7 Carbon-Free Electricity.

9. Finance-related business

The Yamanashi Chuo Bank, Ltd. has executed the Yamanashi Chuo Bank Positive Impact Finance, a loan program for corporations working on the SDGs, to Mr. Dream, a company engaged in the design and Installation work of PV systems. The loan of 127 million yen (\$ 810,000) will be used as business capital. Mr. Dream has set the target to double the current capacity of PV power plants under its management to 30 MW by FY 2030, among other SDGs goals.

Mitsubishi HC Capital Inc. has formed a capital and business alliance with PXP, a developer of flexible solar cells. The alliance is based on the Innovation Investment Fund, established in FY 2023 by Mitsubishi HC Capital for startups. The companies aim to establish a new business model utilizing PXP's flexible solar cells.

Mizuho Securities Co., Ltd. has conducted the Japan's first private Security Token Offering (STO) in the PV power generation business, utilizing the blockchain infrastructure of BOOSTRY, in which Blue Sky Asset Management and Nomura Holdings have invested. An LLC, with its assets managed by Blue Sky Asset Management, owns eight PV systems in the Kanto and Chugoku regions, with an approx. output capacity of 9.5 MW in total. Of the total 4 billion yen (\$ 25.5 million) fund, nearly 1 billion yen (\$ 6.38 million) will be raised through digital securities and the rest will be covered by loans. The fund will be managed by Blue Sky Asset Management.

Fuyo General Lease Co., Ltd. has invested in and formed a capital and business alliance with Global Engineering, a Power Producer and Supplier (PPS), in the renewable energy business focused on storage batteries. The companies will jointly install grid-scale storage batteries in Chikushino City, Fukuoka Prefecture, planning to start their operation in July 2025. This will be the Fuyo General Lease Group's first grid-scale storage battery project independent of government subsidies and other support.

MS&AD Insurance Group Holdings, Inc. has newly added the construction of new PV, onshore wind and biomass power plants in Japan to the list of projects subject to its Environmental and Social Risk Assessment, which is used to check the impact on the environment and local communities before underwriting insurance or making an investment or offering a loan. After carefully judging the feasibility of a

transaction, the company will propose solutions of issues, if any.

Mitsui Sumitomo Insurance Company, Limited will start selling PV modules through its insurance agents throughout Japan. In addition to PV modules, the agents will sell garages equipped with PV modules, as well as storage batteries, and the items will be procured from Panasonic EW Smart Energy. The company has already started pre-sales in October 2024 in the Kanto region (Tokyo and six prefectures) and will expand the sales nationwide from January 2025. The sales will be handled by approx. 1,600 insurance agents with an aim to conclude about 100 contracts a year to begin with.

10. R&D and technology development

Kyoto University, through the joint research with the University of Oxford (UK), the Institute for Molecular Science and RIKEN, has developed a method for controlling the interface structure of Sn-Pb perovskite semiconductors containing tin. An all-perovskite 4-junction perovskite tandem solar cell using perovskite layers obtained by this method as the bottom cell achieved a high open circuit voltage of 4.94 V and a photoelectric conversion property of 27.9%.

Nagoya University has started a demonstration experiment of organic thin-film PV (OPV) modules using carbon nanotube (CNT) electrodes as the joint research project with Osaka Metro, DENSO and other partners. Thirty pieces of 10-cm square OPV modules were installed on the window surface of a subway car exhibited at eMETRO Mobility Town, a theme park for experiencing future mobility in Osaka City, Osaka Prefecture. The research team will record the amount of electricity generated, durability, etc. of the modules to consider the installation on the walls of buildings and the window surfaces of vehicles.

AGC Inc. was selected by Yokohama City (Kanagawa Prefecture) for the project of the Next-Generation Solar Cell Demonstration Experiment Using Public Facilities and started a demonstration experiment of Retrofit Sunjoule, a PV power generation glass that can be installed on existing windows, at the atrium of the Yokohama City Hall on December 4, 2024. The product can be installed from the interior side of the window glass, making it possible to reduce costs and construction time. The company has also started test sales of the product in December 2024.

Clean Energy Connect, Inc. plans to start a demonstration project of supplying electricity without CO₂ emissions at all times, aiming for 24/7 Carbon Free Energy (CFE), in FY 2025. The demonstration project will start at TD Terrace Utsunomiya (Utsunomiya City, Tochigi Prefecture), a building which houses the offices of the Dai-ichi Life Insurance Company and the Toho Bank. The project will increase the real-time share of renewable energy from less than 30% to 90% of the electricity used in the building by combining storage batteries

with a PV power plant located outside the premises of the building. ITOCHU will provide the storage batteries, Azbil will monitor the electricity demand of the building and control the storage batteries, while ENERES will cooperate in tracking the environmental value.

AEONMALL Corporation has started a demonstration experiment using PV modules installed on the road surface of the parking lot aisles of its shopping mall, AEONMALL Hinode (Hinode Town, Tokyo), aiming to verify durability, etc. of the modules. This demonstration experiment is conducted in collaboration with MIRAI-LABO, the developer of the PV modules, and will be run until August 2027. Combining the PV modules with batteries recycled from electric vehicles (EVs), the generated electricity during the daytime is used for illumination of the plantings at night.

11. End users and other topics

The High Energy Accelerator Research Organization (KEK) has started the procedure for publicly soliciting proposals for the on-site PPA project, which will utilize a subsidy from the Ministry of the Environment (MoE). KEK will install solar carports in the parking lots of its Tsukuba Campus and supply electricity to KEK's facilities for 20 years as an on-site PPA project. Power generation capacity of the project is expected to be about 1 MW based on the total rated output capacity of inverters.

Suzuki Motor Corporation has installed PV modules with an output capacity of 249.6 kW on the rooftop of the Suzuki Parts Center Kobe (Kobe City, Hyogo Prefecture) using an on-site PPA model. A total of 141,890 kWh of generated electricity will be used annually by the Suzuki Parts Center and a store of Suzuki Motor Sales Hyogo on the same premises. Approximately 51% of the electricity consumption will be replaced by renewable energy-derived electricity, which is expected to reduce CO₂ emissions by approx. 60 tons per year.

NOHMI BOSAI LTD. has installed a solar carport with a disaster response function in the outdoor parking lot of its Menuma Factory of the Menuma West Office located in Kumagaya City, Saitama Prefecture. The carport is equipped with a disaster response panel that can supply PV electricity to power outlets in the event of a power outage, as well as an EV charging system.

RTS Corporation has published the Overseas PV Markets Report 2024 (a report in Japanese). The report analyzes major global markets, including USA, Europe, China and India. It also summarizes industry trends in markets in Southeast Asia, the Middle East, Africa, Latin America, etc. where future growth is anticipated.

Yano Research Institute Ltd. has compiled a report on domestic market trends and future prospects of perovskite

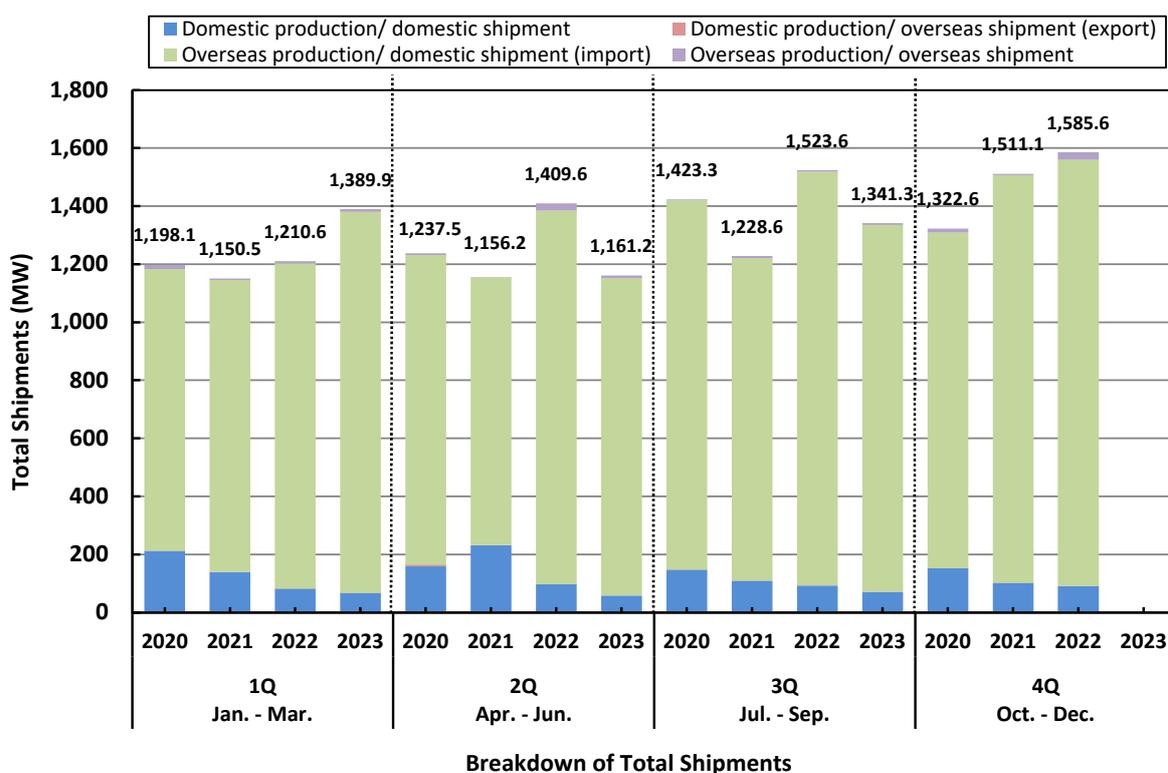
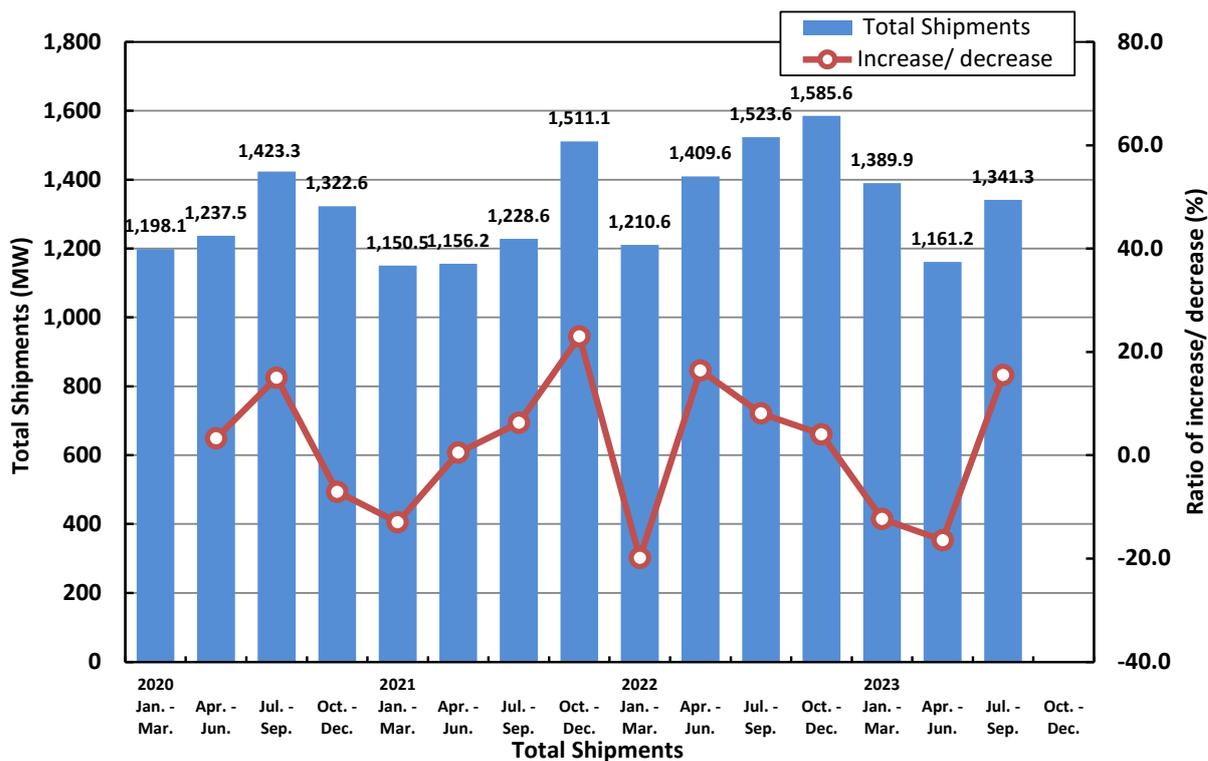
solar cells (PSCs). It estimates that the introduction of PSCs would be 1.5 GW in FY 2040 (19.5% of new installations) and more than 3 GW in FY 2050. The report points out that, in order to cultivate PSCs as an industry with high added value, it is necessary to develop applications and markets where the advantages of PSCs can be utilized.

The RE Action – Declaring 100% Renewable has compiled a report on the status of the introduction of renewable energy by 378 companies and organizations surveyed in FY 2023. 96 member companies and organizations have switched to renewable energy for all electricity used for their business operations as of FY 2023. Many members have achieved 100% renewable energy, accounting for 25.4% of the total. In FY 2023, the most common means of procuring renewable energy was the use of PV power generation, with 101 cases. There were 92 contracts for the purchase of renewable energy electricity and 58 cases of procurement of certificates that can be counted as the use of renewable energy.

PV Shipments in Japan

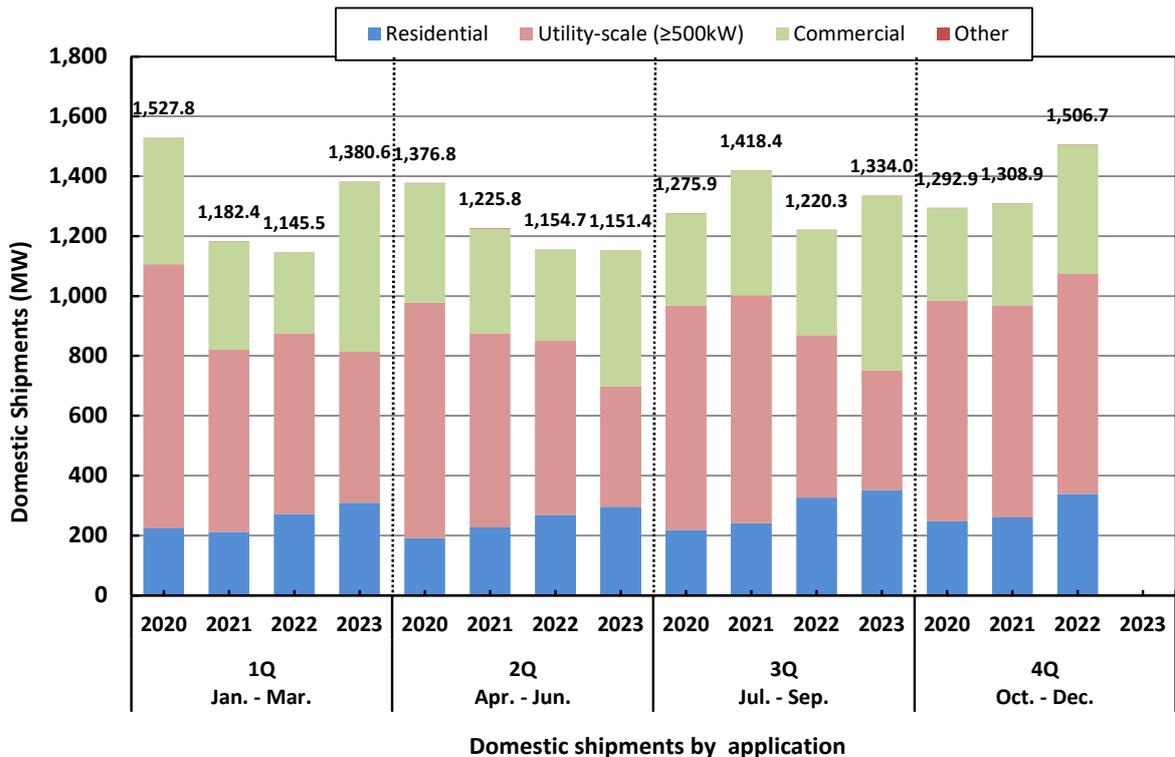
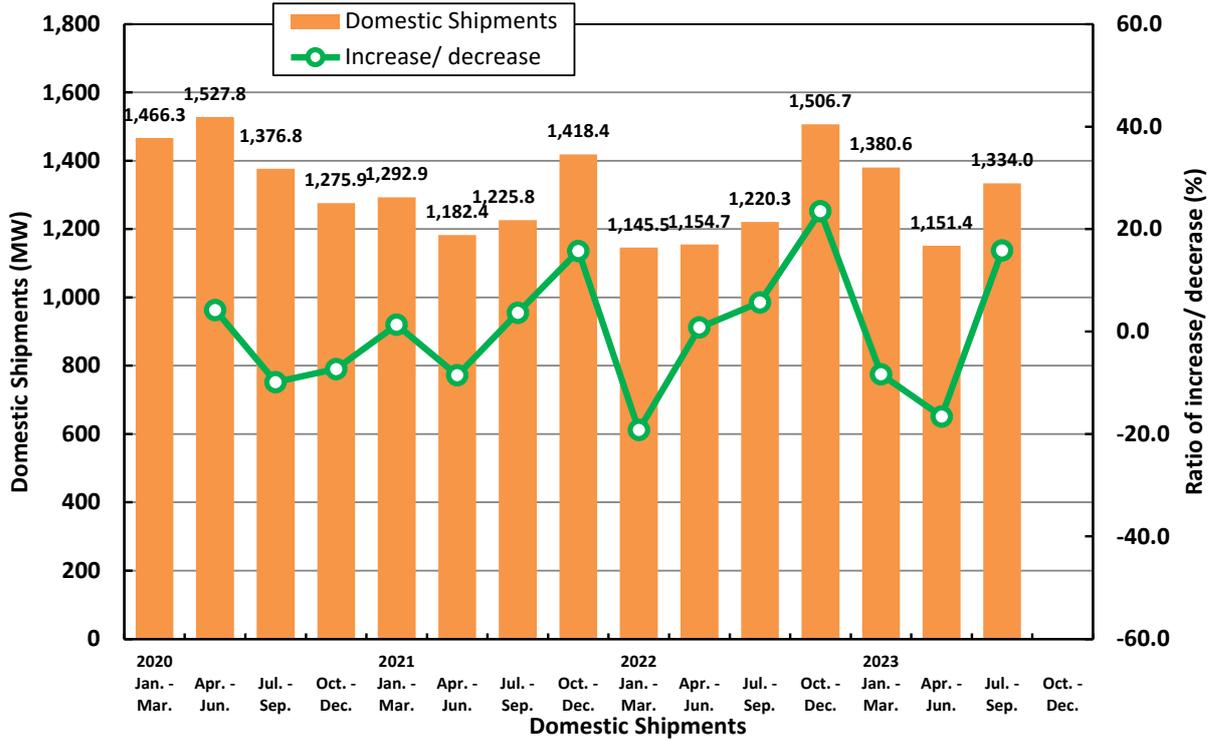
As of November 28, 2024

(1) Total Shipments



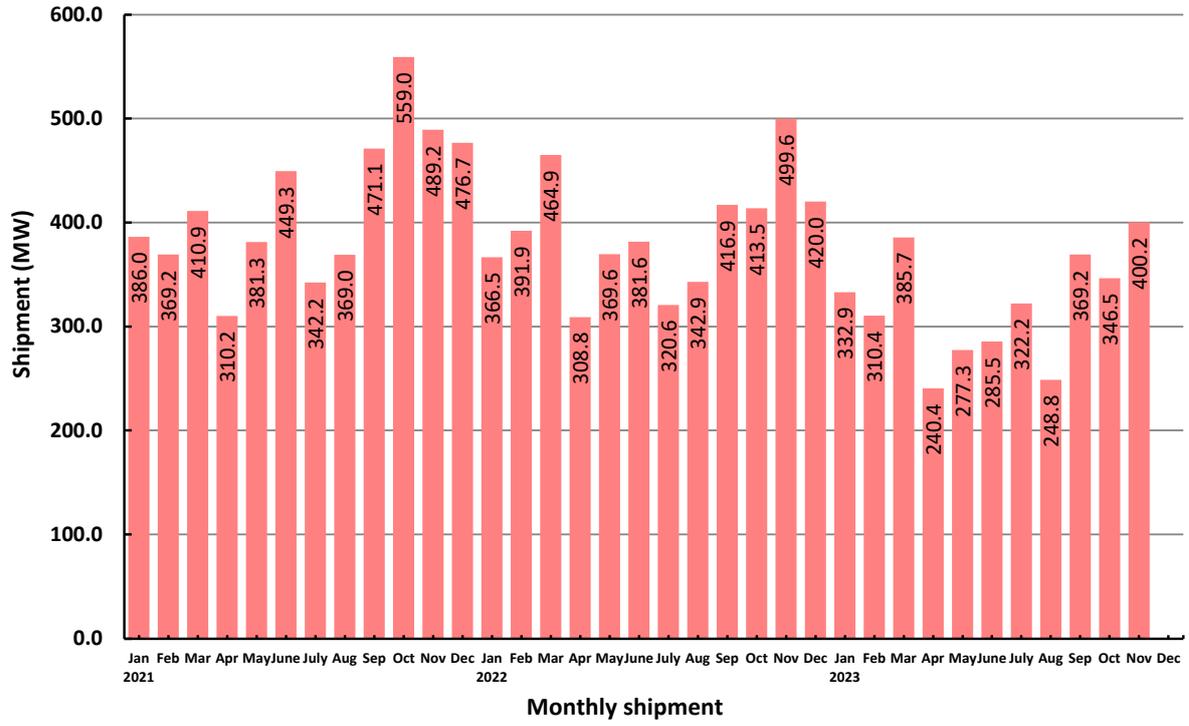
Source: Materials from Japan Photovoltaic Energy Association (JPEA), compiled by ©RTS Corporation

(2) Domestic Shipments



Note: "Commercial" includes PV systems for offices, factories, schools, hospitals, city offices, public facilities, etc. (≥ 500 kW ground-mounted systems included)
 "Utility-scale" PV systems are ≥ 500 kW generation equipment designed for power sales
 Source: Materials from Japan Photovoltaic Energy Association (JPEA), compiled by ©RTS Corporation

(3) Preliminary figures of monthly total shipments of PV modules

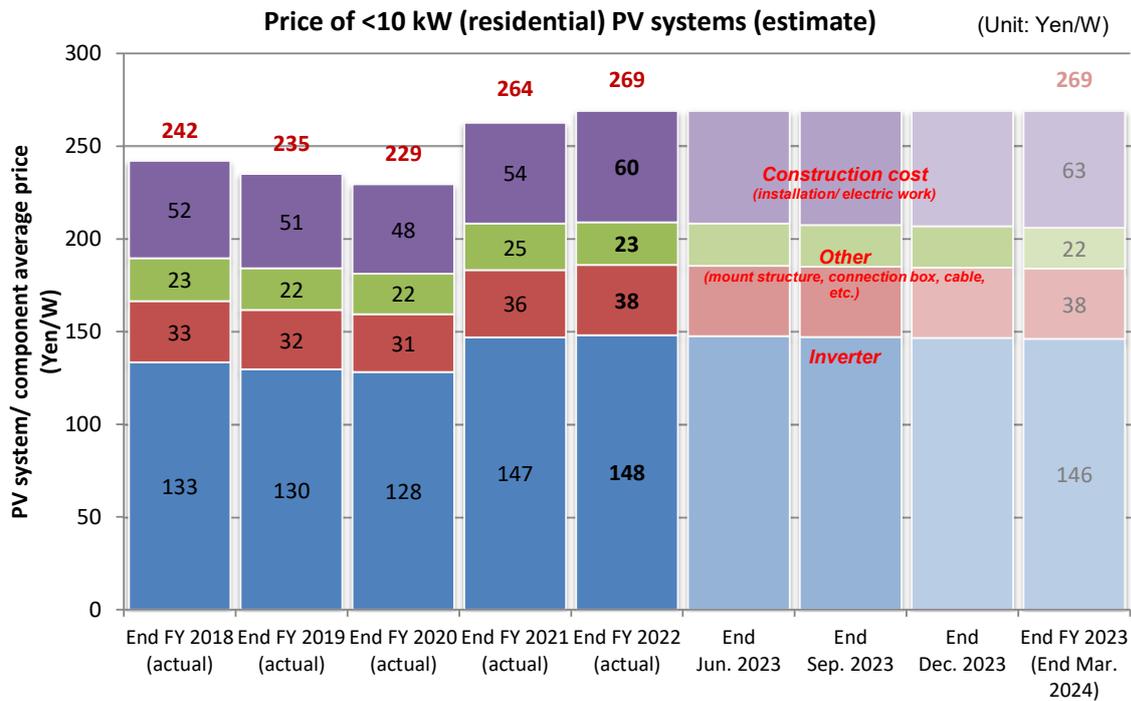


Source: Materials from Japan Photovoltaic Energy Association (JPEA), compiled by ©RTS Corporation

PV system prices trends in Japan (tax excluded)

As of August 22, 2023

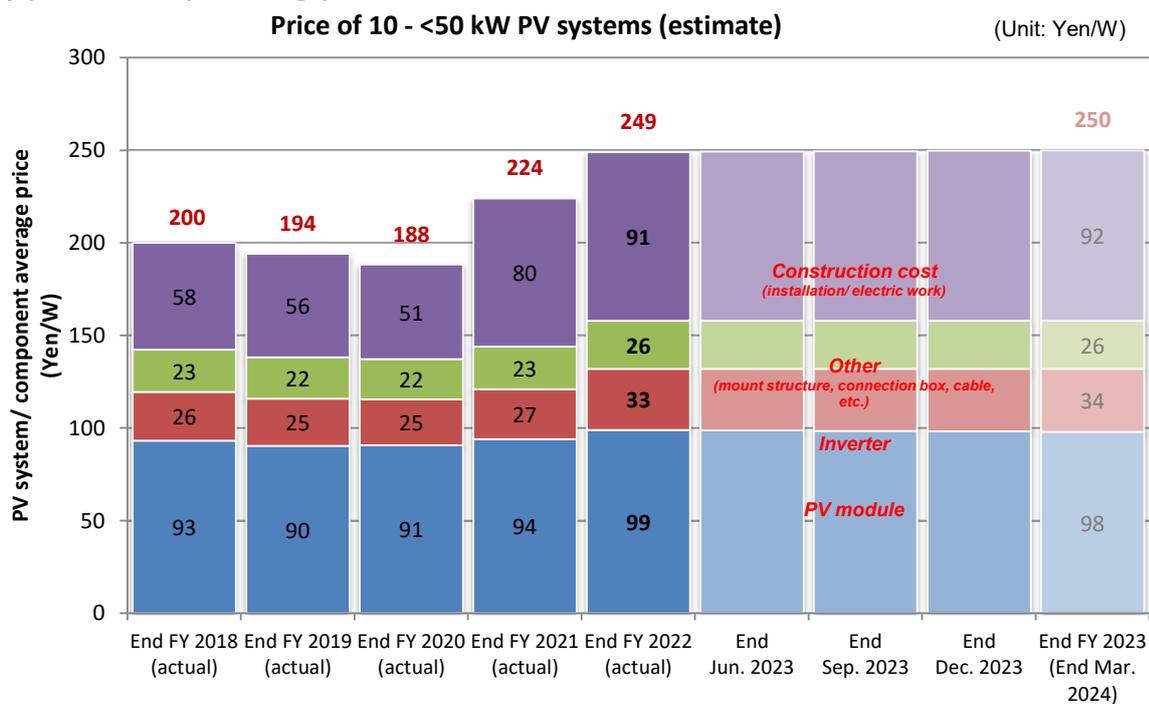
(1) <10 kW (residential)



* Expenses are included in the PV module price.

Source: ©RTS Corporation

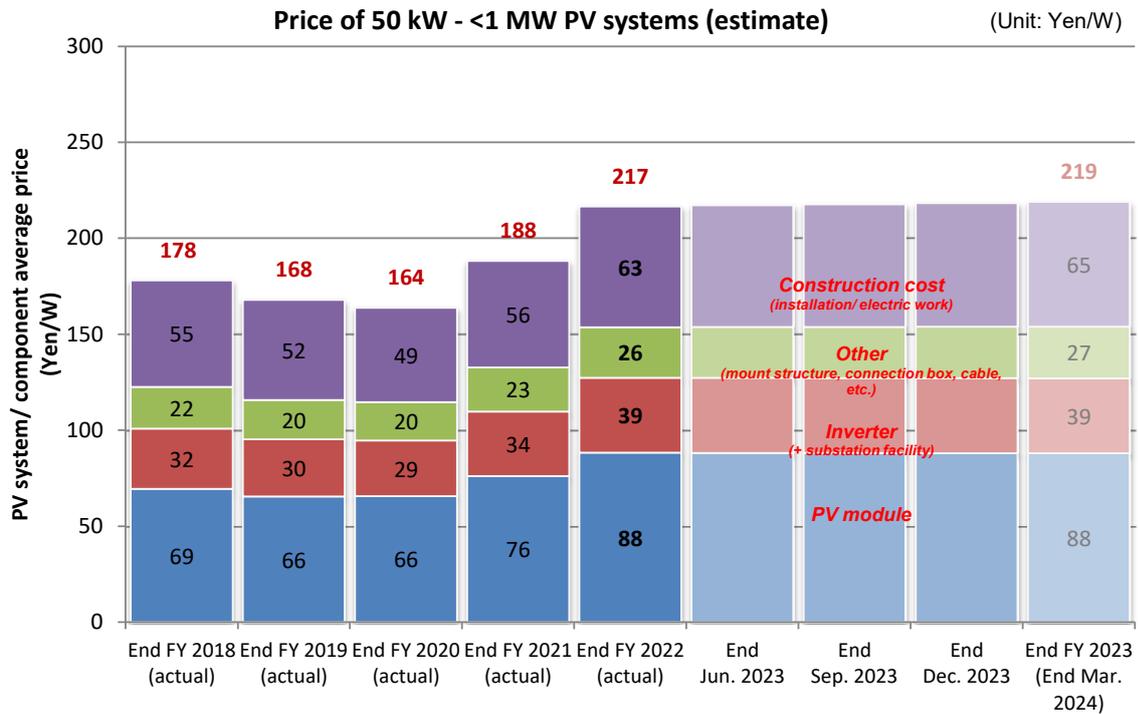
(2) 10 - <50 kW (Low voltage)



* Expenses are included in the PV module price.

Source: ©RTS Corporation

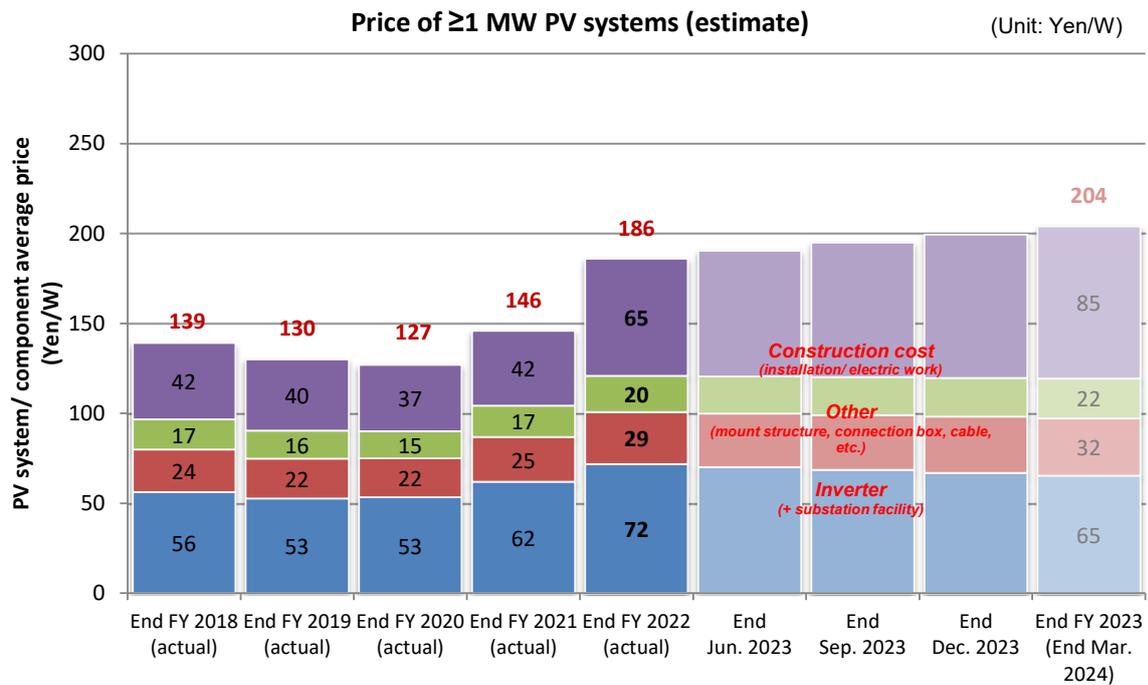
(3) 50 kW - <1 MW



* Cost of substation facilities are included in the inverter price. Grid connection cost is NOT included.

Source: ©RTS Corporation

(4) ≥1MW



* Cost of substation facilities are included in the inverter price. Grid connection cost is NOT included.

Source: ©RTS Corporation

Topics from the World

Topics from Global PV Industry

1. New Entry

Country	Organization	Areas	Activities
USA	NuVision Solar	Solar cells/ modules (c-Si)	Plans to construct a 2.5 GW/year Heterojunction (HJT) PV module factory in the U.S.
Oman	Sheida Industries	Solar cells/ modules (c-Si)	Plans to establish a new 50 MW/year PV module factory in Sohar, northern Oman

2. New Technologies Entry

Country	Organization	Areas	Activities
China	Shijing Technology	Solar cells/ modules (c-Si)	Obtained approval from Xuancheng City, Anhui Province, China, for an environmental impact assessment for the construction of a new PV module factory with a production capacity of 10 GW/year

3. Expansion of Sites

Country	Organization	Areas	Activities
China	Shanghai HIUV New Materials	Module materials	Announced plans to establish a subsidiary, HIUV Applied Materials, in the U.S.
China	Ningbo Deye Technology	Solar cells/ modules (c-Si)	Established a subsidiary in Malaysia

4. Production Capacity Expansion Plan

Country	Organization	Areas	Activities
USA	Imperial Star Solar	Solar cells/ modules (c-Si)	Started production at a PV module factory in Houston, Texas, U.S.
India	Insolation Green Energy	Solar cells/ modules (c-Si)	Plans to build a new 4GW/year PV module factory, a 3GW/year solar cell factory, and an aluminum frame factory with a capacity of 24,000 tons/year in India
Singapore	EliTe Solar	Solar cells/ modules (c-Si)	Established a new solar cell factory in Indonesia
France	Reason Solar	Solar cells/ modules (c-Si)	Commenced operations of a 200 MW/year PV module factory in France
China	Tongwei Group	Silicon feedstock	Commenced operations of a 200,000 tons/year polysilicon factory in the Inner Mongolia Autonomous Regions (IMAR), China
China	Yonz Technology	Module materials	Plans to build a new aluminum frame factory for solar cells with a production capacity of 100 GW/year in Baotou City, IMAR, China
China	Suzhou Maxwell Technologies	Manufacturing equipment (including measuring equipment for research and production lines)	Established a new HJT solar cell factory in Wujiang City, Jiangsu Province, China
China	JA Solar Technology	Solar cells/ modules (c-Si)	Plans to construct a 6 GW/year solar cell factory and a 3 GW/year PV module factory in Oman

5. Withdrawal/ Restructuring

Country	Organization	Areas	Activities
Israel	SolarEdge Technologies	Inverters, mounting structures	Announced the closure of the utility-scale energy storage division
Norway	NorSun	Silicon feedstock	Closed an ingot and wafer factory in Norway
Taiwan	Sino-American Silicon Products (SAS)	Solar cells/ modules (c-Si)	Announced that the operation of the solar cell factory in Yilan County, Taiwan will be suspended from January 7 to February 4, 2025
China	Suzhou Intermediate People's Court	Local government-related policies	Approved business restructuring plans of six subsidiaries of Jiangsu Zhongli Group
China	LONGi Green Energy Technology	Solar cells/ modules (c-Si)	Postponed start of operation of the second phase of the PV module factory in Wuhu City, Anhui Province, China to June 2026

6. Joint Venture/ Business Partnership/ M&A

Country	Organization	Areas	Activities
USA	Unimacts	Module materials	Partnered with Origami Solar to supply U.S.-made steel frames
USA	Solar Plus Technology Texas	Solar cells/ modules (c-Si)	Becomes a subsidiary of Toyo Solar, planning to build a new PV module factory in the U.S.
USA	Walmart	Residential PV systems (detached houses and apartment buildings)	Agreed to develop 31 community solar projects totaling more than 120 MW in five U.S. states
USA	Peabody	Large-scale ground-mounted PV systems	Plans to develop a 5.5-GW PV + energy storage plant at a former coal mine site, in partnership with RWE of Germany
Italy	Fimer	Inverters, mounting structures	Acquired by MA Solar Italy
India	Waaree Energies	Solar cells/modules (thin-film and others)	Announced a partnership with the Indian Institute of Technology Bombay (IIT Bombay) to support R&D on perovskite solar cell (PSC)
India	ReNew Energy Global	Specialized PV power producers, IPP	Received a non-binding takeover bid from a group of investors led by Masdar, United Arab Emirates (UAE)
Australia	Sundrive Solar	Solar cells/ modules (c-Si)	Partnered with Capral Aluminium (Australia) to establish a PV supply chain in Australia
Oman	OQ Alternative Energy	Large-scale ground-mounted PV systems	Signed development agreements with TotalEnergies (France) for three projects, including a 100 MW PV project in Oman
New Zealand	Nova Energy	Large-scale ground-mounted PV systems	Signed a non-binding agreement worth NZ\$ 542 million (US\$ 338.9 million) with a New Zealand utility Meridian Energy
Philippines	Manila Electric (Meralco)	Electric power companies and related businesses	Signed an EPC agreement with PowerChina (China) for a 1,050-MW PV project
China	TCL Zhonghuan Renewable Energy Technology	Solar cells/ modules (c-Si)	Plans to acquire sales and marketing operations outside the U.S. from Maxeon Solar Technologies (Singapore)
China	TCL Zhonghuan Renewable Energy Technology	Solar cells/ modules (c-Si)	Obtained an approval by the Committee on Foreign Investment in the United States (CFIUS) for the plan to increase the stake in Maxeon Solar Technologies (Singapore) to more than a majority
China	CNBM (Chengdu) Optoelectronics Materials	Solar cells/modules (thin-film and others)	Signed an agreement to establish a 300 MW/year CdTe thin-film PV glass factory

7. Orders/ Supply Agreements

Country	Organization	Areas	Activities
USA	Solarcycle	Module materials	Signed a supply agreement with Genesis Alkali (U.S.) for the supply of natural soda ash 'Ecosoda' for the production of glass for solar cells
USA	Imperial Star Solar	Solar cells/ modules (c-Si)	Signed a strategic sales agreement to procure solar cells from Suniva (U.S.)
USA	First Solar	Solar cells/modules (thin-film and others)	Signed a supply agreement with Juniper Green Energy (India) for 1 GW of CdTe thin-film PV modules
USA	Nexttracker	Inverters, mounting structures	Made the first delivery of trackers that comply with the local content requirements of the Inflation Reduction Act (IRA)
USA	D.E. Shaw Renewable Investments (DESRI)	Large-scale ground-mounted PV systems	Signed two power purchase agreements (PPAs) with Meta for a total of 400 MW of PV power generation
Italy	Ecoprogetti	Solar cells/ modules (c-Si)	Delivered a 300 MW/year double-glass TOPCon PV module production line to SAEL (India)
India	Solar Energy Corporation of India (SECI)	Government related policies	Held a tender for a 2 GW PV + 1 GW/4 GWh energy storage project
Canada	Silfab Solar	Solar cells/ modules (c-Si)	Signed an agreement to supply PV modules to Nexamp, a major community solar developer in the U.S.
China	Hangzhou Microquanta Semiconductor	Solar cells/modules (thin-film and others)	Shipped perovskite tandem PV modules for a demonstration project conducted by China Three Gorges (China)
China	Hangzhou Microquanta Semiconductor	Solar cells/modules (thin-film and others)	Shipped 50 MW of perovskite/Si tandem PV modules to China Huaneng Group (China)

8. Financing/ Investment

Country	Organization	Areas	Activities
USA	IceBrick Energy Assets	Other BOS (storage batteries, etc.)	Secured up to ca. \$ 300 million in loan guarantee from the U.S. Department of Energy (DOE) for an ice energy storage project in California, U.S.
Switzerland	Meyer Burger Technology	Solar cells/ modules (c-Si)	Announced that it has secured a \$ 39.48 million bridge loan facility from existing creditors
Czech Republic	Czech Electric Power (CEZ)	Electric power companies and related businesses	Secured a € 400 million loan from the European Investment Bank (EIB) for a project to strengthen and expand Czech electricity grid
Germany	KfW Development Bank	Green hydrogen	Offered a € 24 billion bridge financing for hydrogen network projects under Germany's National Hydrogen Strategy
Bangladesh	Muktagacha Solartech Energy	Large-scale ground-mounted PV systems	Raised \$ 24.3 million for the development of a 20 MW grid-connected PV power plant
Bulgaria	Tenevo Solar Technologies EAD	Large-scale ground-mounted PV systems	Raised € 103 million for the construction of a 237.6 MW PV power plant
Belgium	Powernaut	PV business support services (evaluation/measurement equipment, O&M)	Raised € 2.4 million for grid orchestration software
Malaysia	OCK Group	Large-scale ground-mounted PV systems	Invested \$ 79.1 million in PV portfolio
Korea	Qcells	Solar cells/ modules (c-Si)	Secured \$1.45 billion in loan guarantee from the U.S. Department of Energy (DOE) for a solar cell factory in Georgia, U.S.
China	China Huaneng Group	Electric power companies and related businesses	Raised a total of 15 billion yuan (\$ 2.1 billion) for its renewable energy subsidiaries from China's five major state-owned enterprises
China	Kunshan GCL Optoelectronic Material	Solar cells/modules (thin-film and others)	Secured ca. 500 million yuan (ca. \$ 68.85 million) in C1 round funding led by Goldstone Investment (China)

Trends of Production Capacity of Polysilicon Manufacturers

(Estimated capacity at the end of each year. As of December 31, 2024) (Unit: t/year)

Company	Production Site	2021	2022	2023	2024 (Current)	2024 (Plan)	2025 (Plan)	2026 (Plan)
Tier 1 manufacturers (6 companies)								
GCL Technology (formerly GCL-Poly Energy Holdings)	China (Xuzhou City, Jiangsu)	75,000	105,000	80,000	80,000	80,000	80,000	80,000
	China (Leshan, Sichuan)	-	60,000	100,000	100,000	100,000	100,000	100,000
	China (Baotou, Inner Mongolia Autonomous Region)	-	20,000	160,000	160,000	220,000	220,000	220,000
	China (Hohhot, Inner Mongolia Autonomous Region)	-	20,000	160,000	160,000	220,000	220,000	220,000
	China (Wulagai, Inner Mongolia Autonomous Region)	-	-	80,000	80,000	100,000	100,000	100,000
	Saudi Arabia	-	-	-	-	-	-	120,000
Wacker Chemie (Wacker Polysilicon)	Germany (Munich)	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Germany (Burgthausen)	20,000	20,000	20,000	20,000	20,000	20,000	20,000
	USA (Charleston, Tennessee)	3,000	3,000	4,700	4,700	7,200	7,200	10,200
	Korea (Gunsan)	30,000	35,000	35,000	35,000	35,000	35,000	35,000
	Malaysia (Sarawak)	-	-	-	-	-	-	8,000
OCI	Tokuyama Corporation / OCI JV	18,000	18,000	18,000	18,000	18,000	18,000	18,000
	Hemlock Semiconductor Corporation	2,000	1,600	1,600	1,600	Production stopped	-	-
	REC Silicon (ASMI: Advanced Silicon Materials)	18,000	18,000	18,000	16,000	16,000	16,000	16,000
	REC Silicon (SGS: Solar Grade Silicon)	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Tokuyama Corporation	-	-	-	-	-	-	-	-
Other major non-Tier 1 manufacturers								
High-Purity Silicon Corporation (transferred from Mitsubishi Materials Corporation to SUMCO at the end of March 2023)	Japan (Yokkaichi, Mie)	2,800	2,800	2,800	2,800	2,800	2,800	2,800
	USA (Theodore, Alabama)	1,500	1,500	1,500	1,500	1,500	1,500	1,500
High-Purity Silicon America Corporation	China (Leshan, Sichuan)	101,000	131,000	291,000	291,000	291,000	291,000	291,000
	China (Baotou, Inner Mongolia Autonomous Region)	30,000	80,000	110,000	310,000	310,000	310,000	310,000
	China (Baotou, Inner Mongolia Autonomous Region)	30,000	30,000	50,000	230,000	230,000	230,000	230,000
	China (Ordos, Inner Mongolia Autonomous Region)	-	-	-	-	-	-	200,000
	China (Urumqi, Xinjiang Uyghur Autonomous Region)	66,000	100,000	100,000	100,000	200,000	200,000	200,000
	China (Baotou, Inner Mongolia Autonomous Region)	-	100,000	100,000	100,000	200,000	200,000	200,000
	China (Zhuozhou, Xinjiang Uyghur Autonomous Region)	-	-	100,000	100,000	100,000	100,000	100,000
	China (Shihezi, Xinjiang Uyghur Autonomous Region)	105,000	105,000	105,000	105,000	105,000	105,000	155,000
	China (Baotou, Inner Mongolia Autonomous Region)	-	-	100,000	200,000	201,000	201,000	201,000
	China (Xining, Qinghai)	-	50,000	150,000	150,000	150,000	150,000	150,000
Daqo New Energy	China (Xinjiang, Qinghai)	70,000	70,000	130,000	130,000	130,000	130,000	130,000
	China (Xinjiang, Qinghai)	19,000	19,000	100,000	100,000	100,000	100,000	100,000
	China (Haidong, Qinghai)	-	-	-	-	250,000	250,000	250,000
	China (Wuhai, Inner Mongolia Autonomous Region)	-	-	-	-	250,000	250,000	250,000
	China (Ningxia Autonomous Region)	-	-	50,000	130,000	130,000	130,000	130,000
East Hope Group	China (Xining, Qinghai)	19,000	19,000	100,000	100,000	100,000	100,000	100,000
	China (Haidong, Qinghai)	-	-	-	-	100,000	200,000	200,000
	China (Xinjiang Uyghur Autonomous Region)	60,000	60,000	60,000	60,000	80,000	80,000	80,000
Jiangsu Runey New Energy Technology	China (Xinjiang Uyghur Autonomous Region)	-	-	50,000	130,000	130,000	130,000	130,000
	China (Xining, Qinghai)	19,000	19,000	100,000	100,000	100,000	100,000	100,000
Asia Silicon (Hongshi Group)	China (Haidong, Qinghai)	-	-	-	-	100,000	200,000	200,000
	China (Xinjiang Uyghur Autonomous Region)	60,000	60,000	60,000	60,000	80,000	80,000	80,000
Xinjiang Goens Energy Technology (formerly Xinjiang GCL New Energy Materials Technology)	China (Xinjiang Uyghur Autonomous Region)	-	-	50,000	50,000	50,000	50,000	50,000
	China (Inner Mongolia Autonomous Region)	-	-	50,000	50,000	50,000	50,000	50,000
HY Solar (formerly HOYUAN Green Energy)	China (Inner Mongolia Autonomous Region)	19,300	18,300	18,300	18,300	18,300	18,300	18,300
	China (Yulin, Shaanxi)	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Shaanxi Non-Ferrous Tian Hong REC Silicon Materials (Yulin JV)	China (Inner Mongolia Autonomous Region)	12,000	12,000	12,000	12,000	12,000	12,000	12,000
	China (Inner Mongolia Autonomous Region)	-	-	-	-	50,000	150,000	150,000
Risen Energy/Jiuguang Silicon Industry	China (Inner Mongolia Autonomous Region)	12,000	12,000	12,000	12,000	22,000	22,000	22,000
	China (Inner Mongolia Autonomous Region)	12,000	12,000	12,000	12,000	112,000	212,000	212,000
Erdos Polysilicon	China (Inner Mongolia Autonomous Region)	20,000	130,000	284,700	394,700	814,700	1,024,700	1,124,700
	China (Inner Mongolia Autonomous Region)	8,000	8,000	8,000	8,000	8,000	108,000	108,000
Others (China)								
Middle East								
Total (estimate)		823,100	1,310,700	2,483,100	3,171,100	4,403,000	5,258,000	5,619,000

* This table includes only the production facilities which are assumed to be in operation and NOT include those out of production.

* Other UMG-Si supplier candidates: REC Solar Norway (formerly Elkem Solar (Norway, 5,000 t/y, suspended)), Elkem (Norway, 3,000 t/y), United Solar Polysilicon (FZC) (Oman, 100,000 t/y), scheduled to start operation in 2025, included in the table a

* Other supplier candidates: Aurinko Photovoltaic Group (Spain, UMG-Si, Under constructing), Emirates Global Aluminium (EGA) (UAE), Solquartz (Australia), Highland Materials (USA), GCL Technology (UAE), Indian vertically integrated factories,

Qinchai I than Semiconductor Materials (Anzola)

Trends of PV Module Shipments (Quarterly) by Global Major PV Manufacturers

(As of December 31, 2024) (Unit: MW)

2023 Ranking	PV cell/ module Manufacturer	Country	Technology	2022		2023				2024				Note		
				Total		Jan.-Mar.	Apr.-Jun.	Jul.-Sep.	Oct.-Dec.	Total	Jan.-Mar.	Apr.-Jun.	Jul.-Sep.		Oct.-Dec.	Total
1	JinkoSolar	China	c-Si	44,520		13,038	17,763	21,384	26,335	78,520	19,990	23,822	23,838	22,300-32,300**	90,000-100,000**	
2	LONGI Green Energy Technology	China	c-Si	46,760		26,640		16,890		67,519	12,890	18,450	19,890			
3	Trina Solar	China	c-Si	43,090		27,000	27,000	27,499		65,215	34,000		-		80,000-90,000**	
4	JA Solar Technology	China	c-Si	39,750		11,700	12,250	13,680	0	55,302	16,059	21,941	19,000		85,000-95,000**	
5	Tongwei Group	China	c-Si	7,940		8,960		22,150	0	31,110	18,670		-			
6	Canadian Solar	Canada	c-Si	21,100		6,100	8,200	8,300	8,200	30,700	6,300	8,200	8,400	8,000-8,500**	30,000-35,000**	
7	Chint New Energy Technology	China	c-Si	13,500		-	-	-	-	28,000-30,000***	-	-	-			
8	Risen Energy	China	c-Si	13,500		8,371		10,619	0	18,990	7,916		-			
9	DAS Solar	China	c-Si	4,415		6,070		6,000***	-	18,000-20,000***	-	-	-			
10	GCLSI	China	c-Si	6,636		-	-	-	-	16,420	10,000**		-			

** Preliminary figure, *** reported unofficial value. Compiled by © RTS Corporation

Trends of Module Production Capacity by Global Major PV Manufacturers (As of December 31, 2024) (Unit: MW/year)

2023 Preliminary Ranking	PV cell/ module Manufacturer	Country	Technology	Annual Production Capacity					Plan			Manufacturing Site
				End of 2020	End of 2021	End of 2022	End of 2023	End of 2024	End of 2025	End of 2026		
1	JinkoSolar	China	c-Si	31,000	45,000	90,000	120,000	130,000	138,000	152,000	China, Malaysia, USA	
2	LONGi Green Energy Technology	China	c-Si	50,000	60,000	85,000	120,000	120,000	140,000	160,000	China, Malaysia, Vietnam, USA	
3	Trina Solar	China	c-Si	22,000	50,000	65,000	95,000	115,000	125,000	125,000	China, Thailand, Vietnam, Indonesia	
4	JA Solar Technology	China	c-Si	23,000	40,000	50,000	95,000	100,000	105,000	120,000	China, Malaysia, Vietnam, USA	
5	Tongwei Group	China	c-Si	1,700	2,966	14,000	75,000	90,000	100,000	100,000	China	
6	Canadian Solar	Canada	c-Si	16,100	23,900	32,200	57,000	61,000	66,000	71,000	China, Canada, Brazil, Vietnam, Thailand, Indonesia, Taiwan, USA	
7	Chint New Energy Technology	China	c-Si	5,250	6,500	20,000	55,000	76,000	76,000	76,000	China, Thailand, Vietnam	
8	Risen Energy	China	c-Si	14,100	19,100	25,000	35,000	46,000	69,000	69,000	China, Malaysia	
9	DAS Solar	China	c-Si	—	1,100	4,100	14,482	30,000	33,000	33,000	China	
10	GCLSI	China	c-Si	7,200	22,200	30,000	29,600	30,000	40,000	40,000	China	

Source: Press releases; materials from international conferences; companies and interviews; etc., compiled by © RTS Corporation

