PV Activities in Japan

Volume 25, No. 9, September 2019

Summary in August 2019 PV Highlights in Japan

Monthly PV Highlights in Japan ~August 2019~

- The Ministry of Economy, Trade and Industry (METI) requested 4.0 billion Yen (\$ 37.6 million) in the FY 2020 budget for the technology development to expand introduction of PV power generation
- Agency for Natural Resources and Energy (ANRE) under METI held the 17th meeting of the Large-volume Introduction of Renewable Energy and Next Generation Electricity Network and compiled a proposal of an interim report toward the drastic revision of the FIT program
- METI will start accepting applications for the fourth tender for commercial PV systems
- METI held the fourth meeting of the Working Group related to securing reserve funds to cover the cost of disposal, etc. of PV facilities and proposed to set the standards of the amount of reserve fund at 5 % of the capital cost.
- ANRE under METI held the 30th meeting of the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy and proposed a future direction of energy policies, and will establish two subcommittees to deal with making RE a mainstream power source and reconstruct the electricity system
- The Ministry of the Environment (MoE) will start supporting feasibility study for local public organizations concerning renewable energy utilization projects in the post-FIT period
- MoE announced its budget requests for FY 2020, including 7.5 billion Yen (\$ 70.5 million) for Project to promote introduction of facilities, etc. to control operation of equipment on the demand side toward making renewable energy a mainstream power source
- Fujioka City of Gunma Prefecture formulated the guidelines on PV facility installation projects
- Tokyo Metropolitan Government (TMG) selected three companies to receive subsidy for the service to install residential PV systems at no initial cost
- **Panasonic** joined RE100, aiming to procure all its electricity consumption with renewable energy
- Japan Photovoltaic Energy Association (JPEA) announced that the total PV module shipment for the quarter between April and June 2019 was about 1.58 GW, a 15 % increase YoY
- Tokyo Electric Power Company (TEPCO) Holdings, Inc. decided to spin off its renewable energy power generation business
- Shikoku Electric Power invested in Next Energy & Resources
- SHIZUOKA GAS Co., Ltd. achieved Japan's first electricity interchange at the condominium in Shizuoka Prefecture by utilizing the IoT technology
- Sony Corporation will start using self-wheeling of PV electricity generated from MW-scale PV power plants from February 2020
 Sumitomo Mitsui Trust Bank, Limited concluded business alliance with
- Sumitomo Mitsui Trust Bank, Limited concluded business alliance with Toshiba Energy Systems & Solutions in the sales of self-consumption type PV systems for companies

Published by RTS Corporation

Contents of This Issue

PV Highlights in Japan

PV nighlights in Japan	
Monthly PV Highlights in Japan	• 1
RTS Monthly Perspective ······	•2
RTS Trends Analysis on the Japanese PV Market	•4
RTS Monthly Focus	• 6
1. FY 2020 budget request by the Ministry of Economy, Trade and Industry (METI) and other ministries and agencies of Japan	er ·· 6
2. Third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity NW··	or 17
3. Updates on discussions at the Working Group related to securing funds to cover the cost of disposal, etc. of PV facilities	18
4. Interim report of the Subcommittee on resilience of electricity toward achieving a decarbonized society Direction of renewable energy policy.	21
5. Direction of renewable energy policy	22
6. Updates on discussions at the Working Group on Grid Connection of Renewable Energy	23
7. PV module shipments in the quarter from April to June 2019	24
Monthly PV Photo Gallery	25
Ground-mounted PV power plant	
Topics from Japan	27
PV shipments (Quarterly data updated!) ····	36
PV system price trends in Japan	39
Trends of Production Capacity and Overseas Deployment by Major PV Manufacturers in	11
	41
Topics from the World	42
Topics from the Global PV Industry	42
Trends of Production Capacity of Polysilicon Manufacturers	44
Trends of PV Module Production (Shipments, Sales) (Quarterly) by Global Major PV Manufacturers	45
Trends of Module Production Capacity by Global Major PV Manufacturers	46
© Osamu Ikki, President RTS Corporation	
Qus Hatchobori Daiichi Bldg 4F	

Qus Hatchobori Daiichi Bldg. 4F, 3-19-2 Hatchobori, Chuo-ku, Tokyo 104-0032, Japan Tel: +81-3-3551-6345 Fax: +81-3-3553-8954 E-mail: info@rts-pv.com URL: www.rts-pv.com

RTS Corporation is a consulting company specialized in PV for over three decades.

(Note) - 1 JPY = 0.0094 USD (as of September 1, 2019)

The Ministry of Economy, Trade and Industry (METI) and the Ministry of the Environment (MoE) have released their budget requests on renewable energy related items for FY 2020 (April 2019 to March 2020), respectively, toward achieving the common target of making renewable energy a mainstream power source. Following the expanding dissemination of renewable energy, the two ministries are complementing with each other in the areas of technology development. installation support, safety, support for communities and small- and medium-sized enterprises (SMEs), finance, CO₂ reduction, as well as support for developing countries, and they are trying to secure the budget as per their requests.

Furthermore, METI made the third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network and an interim report of the Subcommittee on resilience of electricity toward achieving a decarbonized society, aiming to drastically revise the Feed-in Tariff (FIT) program. Toward the 2020s, the Fifth Strategic Energy Plan of Japan will shift its focus from the pursuit of quantity in the 2010s to the pursuit of quality as an energy source. which is expected to accelerate making renewable energy a mainstream power source.

In the early 2020s, the following developments are expected: 1) construction of large-scale PV power plants which had not started operation; 2) creation of supply/ demand-integrated PV market which will be promoted by METI; 3) growth of new PV markets such as solar sharing and floating PV; 4) market growth of PV systems as off-grid power sources

including microgrid power sources generated by the accomplishments of technology development. As a result, the use of PV power generation is expected to enter the phase of diversified applications, by responding to the needs and requests from the demand side includina power generation scale, utilization forms and areas, market, value standards, etc., as shown in Figure 1. The backgrounds here are expansion of PV utilization areas and applications through policy measures, schemes and regulatory reforms by governmental ministries and agencies, as well as improvement of functions and performances of PV cells/ modules and systems through technology development, which will lead to widening of PV utilization areas. Furthermore, electricity storage has been added to power generation functions with PV, together with coupling with advanced technologies (IT, AI, IoT, robots, drones, etc.), new PV applications which had not been possible before solely by PV (including management) will become possible, equivalent to the applications with conventional energy sources. Under such circumstances, the financial industry and users (individual and industrial electricity consumers), who place emphasis on economic rationality and environmental considerations, will make consistent efforts, which will strongly contribute to expanding PV installations.

In Japan, PV installations have been driven jointly by METI and the PV industry from the perspectives of policy measures and supply, like the wheels of a vehicle. However, in the stage like now where PV has realized economic efficiency equivalent to that of conventional energy sources and entered the stage of diversified applications, it is possible for PV power generation to improve flexibility of energy supply and demand structure and resilience in local communities, added with the mobility as a distributed power source. Japan is now facing the opportunities of shifting to a new and strong dissemination framework to make PV a mainstream power source, by not only enhancing these wheels but also by adding the financial industry and the users. The front wheels are the joint activities of the PV industry and the users as a new driving force for dissemination, whereas the rear wheels are the structure supported by the national government and the financial industry, which will make PV more stable and the applications will expand, just like a four-wheel drive vehicle.

As of the end of March 2019, 1.9 million PV systems with a total capacity of 45 GW are operating in Japan under the FIT Act. Japan has the experiences of PV installations of various scales, applications. locations. and construction methods. Furthermore, the new markets such as solar sharing and floating PV markets are emerging. While the ratio of PV system components (PV modules, inverters, etc.) procured from overseas increases, it is expected that the PV development can be increased by shifting the focus from manufacturing to utilization and operation. By looking at the comping of an era of diversification of PV applications as significant opportunities, Japan should make PV a genuine mainstream power source ahead of countries. other with the ΡV development driven by four wheels as the driving force for the 2020s.



Figure 1 Coming of an era of diversification of PV applications

National Government

Governmental ministries and agencies released their budget requests for the FY 2020 budget. The Ministry of Economy, Trade and Industry (METI) requested 1.4292 trillion Yen (\$ 13.4 billion), up by 15.1 % from the initial budget of FY 2019, the Ministry of the Environment (MoE) requested 1.263 trillion Yen (\$ 11.9 billion), up by 42.3 %, the Ministry of Land. Infrastructure. Transport and Tourism (MLIT) requested 7.0101 trillion Yen (\$ 65.9 billion), up by 18.4 %, and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) requested 5.9689 trillion Yen (\$ 56.1 billion), up by 12.2 % from the initial FY 2019 budget.

Toward the drastic revision of the FIT program, METI compiled the third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network. METI will establish two subcommittees under the Strategic Policy Committee of the Advisorv Committee for Natural Resources and Energy (ACNRE), in order to promote making renewable energy a mainstream power source and realize reconstruction of the electricity system. Deliberations at the working groups have progressed, and it was proposed that the reserved fund to cover the cost of disposal, etc. of PV systems should be 5 % of the capital cost. The management scheme will be reviewed to reduce the amount of output curtailment of renewable energy. The Ministry of the Environment (MoE) selected 66 municipalities to participated in the model project of "symbiotic and recycling-based community." MoE will start supporting local public organizations to conduct feasibility studies of the projects to utilize renewable energy after the termination of the FIT power purchase period. MoE will also support establishment of the foundation for

crowd funding specific to low carbon projects.

Local governments

For the appropriation installation of PV systems, Hidaka City of Saitama Prefecture approved a proposal for a city ordinance regarding the regulation of PV system installation within the protection "special area" and immediately enforced it on the day of approval. Fujioka City of Gunma Prefecture established guidelines for the projects to install PV systems. Yaizu City of Shizuoka Prefecture put a city ordinance on the regulation of large-scale PV systems on agenda, while Kakegawa City of Shizuoka Prefecture formulated the guidelines on around-mounted PV systems. In order to promote renewable energy, Council for natural energy suggested a policy to make renewable energy a mainstream power source. Bureau of Environment of Tokyo Metropolitan Government (TMG) started accepting applications for the "Model project of visualizing renewable energy at TMG owned facilities."

Electric utilities

Tokyo Electric Power Company (TEPCO) Holdings determined a policy to spin off its renewable energy-based power generation business on around April 1, 2020. TEPCO Energy Partner plans to establish the Renewable Energy Marketing and Sales Department under the Sales Unit, effective September 1, 2019. Also, the company decided the details of the Renewable Energy Deposit Plan, a service plan after the termination the FIT power purchase period. TEPCO Ventures started operation of "Suncle", a simulation website for residential PV systems for detached houses. Tohoku Electric **Power** signed an agreement with Miyagi Prefecture on the demonstration of virtual power plant (VPP). Kansai Electric Power started accepting

applications for the new electricity bill menu called the Renewable Energy ECO Plan. **Shikoku Electric** will invest in Next Energy & Resources and consider offering a service for corporate customers to be able to install PV systems at no initial cost.

Industry trends (PV cell/ module, BOS)

In the area of PV cells and modules, Japan Photovoltaic Enerav Association (JPEA) announced the PV module shipments in the first quarter of FY 2019 (April to June 2019). Total PV module shipment was around 1.6 GW, a 15 % increase year on year (YOY), of which the domestic shipment was 1.5 GW, a 19 % increase YOY. The domestic shipment has achieved the annual growth for four guarters in a row. By application, while the shipment for residential applications increased by 19 % YOY to 280 MW, the shipment for utility-scale non-residential applications $(\geq 500 \text{ MW})$ was 650 MW, a drop of 10 %. The growth of commercial PV applications (< 500 kW) grew by as much as 88 % to 563 MW. It is assumed that the construction of large-scale FIT-approved PV projects has continued and the construction of < 500 kW PV projects newly subject to the tender scheme started ahead of schedule. From now on, it is expected that the demand for self-consumption type PV systems will increase. Among the domestic shipment, the share of imports increased, accounting for 84 % with 1.3 GW. For commercial applications, the shipment bv non-Japanese companies increased sharply. Among Japanese PV cell/ module manufacturers, the profitability of Kyocera and Kaneka improved, despite the drop of sales in the first quarter of 2019. Kyocera, Sharp and Panasonic started the sales of storage batteries for PV-equipped houses whose FIT purchase period expired, as well as the electricity service business through partnerships with third parties,

in addition to the sale of PV system-related products. Solar Frontier announced the first financial results after its merger with Idemitsu preparation Kosan. In for the partnership with GS Solar of China. announced Panasonic that it transferred the R&D business on heterojunction solar cells to a new company SOLEA, jointly established by the two companies.

There were no remarkable news regarding inverters and balance of system (BOS).

Industry trends (storage batteries)

Kyocera decided to start mass production of the low-cost next-generation lithium-ion storage batteries in the second half of FY 2020 (between October 2019 and March 2020), expecting applications mainly for residential storage batteries. Mitsubishi Heavy Industries Engine & Turbocharger (MHIET) will expand the sale of triple hybrid independent power supply system using renewable energy in Africa.

PV price trends

Model changes of PV modules have been frequently conducted, which is increasing the importance of information on the inventory, as well as schedules of receipt and delivery of aoods. Since the Japanese consumption tax is scheduled to be increased from 8 % to 10 % in October 2019, many of PV systems suppliers have already stopped accepting orders for PV systems applicable to the existing 8 % consumption tax. Among PV modules of former models, prices of some models are set below 30 Yen/W (28.2 cents/W), such as 29 Yen/W (27.3 cents/W).

PV installation trends

There was no update of data in August 2019.

PV power generation business

Environmental Impact Assessments (EIA) of large-scale PV projects have been promoted in Japan. CLEAN EARTH started public inspection of the EIA report on the approx. 26-MW Sendai Imozawa PV Project (tentative name) which it plans to develop in Sendai City, Miyaqi Prefecture, ICHIJO public inspection of a started preparatory EIA report on the approx. 20-MW Uchigo Takasaka PV Power Plant (tentative name) it plans to develop in Iwaki City. Fukushima Chiyoda Corporation Prefecture. received an order for the EPC work for the construction of two MW-scale PV projects by First Solar Japan G.K. with a total capacity of 77.3 MW. Sumitomo Trust Bank Mitsui sianed а partnership agreement with Toshiba Energy Systems & Solutions in the sale of PV systems for self-consumption for corporate customers. Sony Corporation plans to start using the self-wheeling system of PV electricity generated by MW-scale PV power plants in February 2020. JXTG Holdings made investment in Agritree, a venture capital engaged in the Agro-PV business.

Outside Japan, **Mitsubishi Corporation** will make investment in **BBOXX (UK)** which engages in the distributed power source business mainly in Africa.

PV business support service

NTT Group plans to reorganize its affiliates by October 2019. It will make Ennet (in addition to NTT Smile Energy) a subsidiary of NTT Anode Energy by October 2019, to newly deploy the smart energy business. **ORIX Corporation** will develop a system to record the production locations of renewable energy (PV, etc.) in collaboration with the University of Tokyo.

Financial issues

Overseas business expansion has been advancing. The Japan Bank for International Corporation (JBIC) plans to promote dissemination of renewable energy in Africa, whereas Sumitomo Mitsui Financial Group established the Green Bond by Ergon Perú, a Peruvian energy company engaged in electrifying rural areas in Peru. SoftBank Vision Fund invested approx. 11.5 billion Yen (\$ 108 million) in Energy Vault, a Swiss venture company engaged in the renewable business. Within enerav Japan. regional banks will enhance financing smalland medium-sized for enterprises (SMEs) to install PV systems for self-consumption.

Technology and R&D trend

Expecting the dissemination of IoT in a variety of sectors, commercialization of dve-sensitized solar cells (DSCs) which generate power even under low illuminance such as indoor lighting has been promoted. Sharp developed a beacon equipped with DSCs, which requires no replacement of batteries and delivered it to SHIMIZU the CORPORATION for sound navigation service at its construction sites for both outdoor and indoor use. Carlit Holdings developed an electrolyte solution for DSCs. TOYOBO started a joint development with the French Alternative Energies and Atomic Energy Commission (CEA) to accelerate development of power generating materials for organic thin-film PV (OPV) modules suitable for indoor PV power generation. TOYOBO plans to commercialize the technology in several years, aiming to deploy the products in the European market. Development of new products and services using DSCs and OPV modules as power sources for IoT devices and energy harvesting devices is anticipated.

1. FY 2020 budget request by the Ministry of Economy, Trade and Industry (METI) and other ministries and agencies of Japan

<Key points>

- ✓ The FY 2020 budget request for resources and energy-related items focuses on the following three pillars: 1) Acceleration of reconstruction of Fukushima; 2) Promotion of energy transition and decarbonization and 3) Enhancement of energy security and resilience
- Among the budget items related to PV power generation, the budget amounts for the following new projects have been requested for appropriation in FY 2020: "Technology development project to expand possible PV installed capacity", "Project for comprehensive utilization of energy using regional grid lines" and "Project for demonstration, etc. of establishing control technology to stabilize sophisticated power distribution to promote introduction of renewable energy"
- ✓ To realize the Fifth Basic Environment Plan, the Ministry of Environment (MoE) has strengthened the budget for introduction of PV systems and renewables

(1) Focus of METI's economic and industrial policies in FY 2020

The Ministry of Economy, Trade and Industry (METI) announced "Focus of economic and industrial policy measures (proposal)" as focused measures for FY 2020. As shown in Figure 1, METI focuses on measures for advancement of digital economy and measures to address confusion in the global politics and economy such as the U.S.-China trade dispute as major changes that Japan should tackle, and announced its economic and industrial policy toward FY 2020 based on the wheels on both sides: 1) Creation of new growth model by releasing the resources of major companies and 2) policy to enhance resilience of economy integrated with security. For the establishment of infrastructure to support creation of a new growth model, METI will promote human resources development to realize a drastic change, policy to support communities and SMEs in the era of reducing population and establishment of the environment to

create innovation. Meanwhile. METI will enhance energy security through 1) energy transition/ decarbonization and 2) Ensuring safety/ enhancement of resilience. The above-mentioned 1) includes the drastic revision of the FIT program. METI is committed to achieving further cost reduction, making PV a long-term and stable power source, and improvement of while identifying safety. the characteristics and the status quo of each power source.



©RTS Corporation

Note: 1 JPY = 0.0094 USD (as of September 1, 2019)



(2) Highlights of resources and energy-related policies for FY 2020

In FY 2020, Japan's policies on resources and energy will request the budget by focusing on the following three pillars as shown in Figure 2: 1) Acceleration of reconstruction of Fukushima Prefecture; 2) Promotion of energy transition and decarbonization; 3) Enhancement of energy security and resilience, for which 114.1 billion Yen (\$ 1.07 billion), 501.5 billion Yen (\$ 4.71 billion) and 287.7 billion Yen (\$ 2.70 billion) have been requested, respectively. For acceleration of reconstruction of Fukushima. the followings will be promoted: 1) Safe implementation and steadv of measures for decommissioning and water: 2) Steady contaminated implementation of the "Basic policy to accelerate Fukushima's reconstruction from nuclear disasters": 3) Promotion of establishing a center of the renewable energy industry, etc. in Fukushima (realization of the initiative to make Fukushima a new and renewable energy-based society, etc.). For the promotion of energy transition and decarbonization, the followings will be focused: 1) Enhancement of activities to realize a hydrogen-based society; 2) Acceleration of innovation for carbon recycling; 3) Making RE a mainstream power source and establishment of distributed energy system; 4) Improvement of safety,

reliability and mobility of nuclear power and 5) Promotion of open innovation in the global clean energy sector. Among them, 216.1 billion Yen (\$ 2.03 billion) has been requested for 3) Making RE a mainstream power source and establishment of distributed energy system, accounting for 40 % of the total budget amount, aiming to strongly promote energy transition. For the enhancement of energy security and Enhancement resilience. 1) of resources securement based on international situation and 2) Enhancement of resilience of energy supply network will be focused, aiming to ensure safety.



©RTS Corporation

Note: Exchange rate: 1 JPY = 0.0094 USD (as of September 1, 2019) Figure 2 Highlights of resources and energy-related budget request for FY 2020

Highlights of FY 2020 budget request concerning PV power generation

The budget request for technology development as well as supporting introduction of PV systems and related areas cover a wide range of items as shown in Table 1.

While the FY 2020 budget request is mainly continuation of FY 2019 budget, budaet amounts have been appropriated for new projects as well: 4.0 billion Yen (\$ 37.6 million) has been appropriated for Technology development project to expand possible PV installed capacity, etc., as a new budget item for FY 2020, 2.1 billion Yen (\$ 19.7 million) for Subsidy for the expenses of projects for comprehensive utilization of energy using regional grid lines. 0.6 billion Yen (\$ 5.64 million) for Project for demonstration, etc. of establishing control technology to stabilize sophisticated power distribution to promote introduction of renewable energy, and 1.5 billion Yen (\$ 14.1 million) for Project for international ioint R&D on innovative technologies in the clean energy sector. All of them will be established in response to the progress of renewable energy dissemination. The purpose of technology development has shifted from cost reduction and improvement of reliability to expansion of possible PV installed capacity.

As for technology development and demonstration, budget requests have been made to continued projects including the following major projects: R&D project to develop technology for cultivation and commercialization of seeds such as new and renewable energy with 1.9 billion Yen (\$ 17.9 million), Project to next-generation develop power control technology toward large-volume introduction of renewable energy with 3.8 billion Yen (\$ 35.7 million), Subsidy for expenses demonstrative of projects to establish virtual power plants using consumer-side energy resources with 7.0 billion Yen (\$ 65.8 million) and Demonstration project to establish supply chain of hydrogen derived from unused energy with 14.6 billion Yen (\$ 137 million).

As for support of dissemination, 7.0 billion Yen (\$ 65.8 million) has been appropriated for Subsidy for projects to support promotion of renewable energy introduction in Fukushima Prefecture. As for foreign policies, 16.0 billion Yen (\$ 150 million) for Project to promote energy transition and decarbonization in Japan and abroad through establishing international alliance, etc. in the field of energy conservation and new and renewable energy, 1.0 billion Yen (\$ 9.4 million) for Projects for feasibility studv on overseas deployment of high-quality energy infrastructure and 4.7 billion Yen (\$ 44.2 million) for Projects to cultivate emerging markets through utilization of technology cooperation have been requested. Furthermore, for supporting for communities and smalland medium-sized enterprises (SMEs) well human resource as as development, 0.79 billion Yen (\$ 7.43 million) has been appropriated for to support Project seeds development and commercialization of renewable energy technologies companies, etc. by in disaster-stricken areas, 4.0 billion Yen (\$ 37.6 million) for Project for supporting R&D startups, 1.93 billion Yen (\$ 18.1 million) for Project to enhance the eco system for global startups, and 15.8 billion Yen (\$ 149 million) for Project expenses to investment promote future in communities.

Regarding safety and security, 0.54 billion Yen (\$ 5.08 million) has been appropriated for **Consignment expenses for projects to improve safety regulations for new and renewable energy, etc.**
 Table 1
 FY 2020 budget requests for technology development and dissemination support for renewable energy by the Ministry of Economy, Trade and Industry (METI) (mainly PV, storage batteries and grid connection-related items)
 (1/3)

(Unit: billion Yen)

	Item		FY 2019 Budget	FY 2020 Budget request	Responsible METI section	
1	Technology development project to reduce levelized cost of energy and improve reliability of PV power generation	A	3.35			
2	Technology development project to expand possible PV installed capacity, etc.	А	-	4.0 (new)		
3	R&D project to develop technology for cultivation and commercialization of seeds such as new and renewable energy	A	1.90	1.90		
4	Subsidy for expenses of projects to implement special measures for the surcharge scheme under the FIT program	С	8.20	8.20	New and Renewable Energy Div., Energy Efficiency & Renewable Energy Dept., Agency	
5	Expenses to consign public relations and other businesses to promote introduction of new and renewable energy, etc.	с	0.81	0.65	for Natural Resources and Energy (ANRE)	
6	Outsourcing expenses for efficient and stable management of the FIT program, etc.	С	2.56	4.51		
7	Subsidy for projects to support promotion of renewable energy introduction in Fukushima Prefecture	с	8.48	7.00		
8	Project to develop next-generation power control technology toward large-volume introduction of renewable energy	А	1.97	3.80		
9	Subsidy to support promotion of investment in energy conservation	С	55.18	59.53	Energy Efficiency Div., Energy Efficiency & Renewable Energy Dept., ANRE	
10	Subsidy for expenses of demonstrative projects to establish virtual power plants using consumer-side energy resources	В	6.85	7.00		
11	Subsidy for project expenses to promote installation of residential storage systems which can be used at the time of disaster	с	3.85 (new) (4.40)			
12	Project to support establishment of distributed energy systems by private entities	С	2.10		Advanced Energy Systems and Structure Div., Energy Efficiency & Renewable Energy Dept., ANRE	
13	Subsidy for the expenses of projects for comprehensive utilization of energy using regional grid lines	С	-	2.10 (new)		
14	Project for demonstration, etc. of establishing control technology to stabilize sophisticated power distribution to promote introduction of renewable energy	В	-	0.60 (new)		
15	Demonstration project to establish supply chain of hydrogen derived from unused energy	В	16.27 (2.77)	14.60	Hydrogen and Fuel Cells Strategy Office, Energy Efficiency & Renewable Energy Dept., ANRE	

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

*1: Only confirmed items

*2: 1 JPY = 0.0094 USD (as of September 1, 2019)

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

Table 1 FY 2020 budget requests for technology development and dissemination support for renewable energy by the Ministry of Economy, Trade and Industry (METI) (mainly PV, storage batteries and grid connection-related items) (2/3)

(Unit: billion Yen)

	ltem		FY 2019 Budget	FY 2020 Budget request	Responsible METI section
16	Project to promote energy transition and decarbonization in Japan and abroad through establishing international alliance, etc. in the field of energy conservation and new and renewable energy	В	16.10	16.00	International Affairs Office, Policy Planning Div.,
17	Shared expense for the International Renewable Energy Agency (IRENA)	С	0.13	0.13	Energy Efficiency & Renewable Energy Dept., ANRE
18	Contribution to the International Renewable Energy Agency (IRENA)	С	0.05	0.06	
19	Project for international joint R&D on innovative energy technologies	С	0.55		International Affairs Office, General Affairs Div.,
20	Project for international joint R&D on innovative technologies in the clean energy sector	A	-	1.50 (new)	Environment Bureau
21	Contribution to the International Energy Agency (IEA)	С	0.35	0.40	International Affairs Div.
22	Project to support seeds development and commercialization of renewable energy technologies by companies, etc. in disaster-stricken areas	С	0.79	0.79	Office for AIST, Industrial Science and Technology Policy and Environment Bureau
23	Project to develop advanced technologies for production, storage and use of hydrogen energy	A	1.40	1.80	Research and Development Div., Industrial
24	Advanced research program on new technologies contributing to solving mid- to long-term issues in the energy and environmental sector	A	3.74	4.80	Science and Technology Policy and Environment Bureau
25	Consignment expenses for implementation of the certification scheme on reduction and absorption amount of greenhouse gas emissions in Japan	С	0.38	0.38	Environmental Economy Office, Industrial Science and Technology Policy and Environment Bureau
26	Project to support cultivation of young researchers by public and private sectors in the fields of energy and the environment	С	-	0.75 (new)	Industry-University Collaboration Office, Industrial Science and Technology Policy and Environment Bureau
27	Project for supporting R&D startups	С	1.72	4.00	Industry-University Collaboration Office, Innovation and Industry-University Collaboration Div., Industrial Science and Technology Policy and Environment Bureau
28	Project to support cultivation of young researchers by public and private sectors	с	-	2.00 (new)	Medical and Assistive Device Industries Office, Commerce and Service Industry Policy Group, Industry-University Collaboration Office, Industrial Science and Technology Policy and Environment Bureau
29	Research program to lead new technologies toward creation of new industries	A	0.79	1.60	Industrial Science and Technology Project Promotion Office, Industrial Science and Technology Policy and Environment Bureau
30	Project to develop infrastructure technology for practical realization of innovative storage battery	А	3.40	3.80	Automobile Div., Manufacturing Industries Bureau
31	Project to develop evaluation technology of energy-saving electronic device materials	A	2.31	3.05	Material Industries Div./ Automobile Div./ Chemical Management Policy Div., Manufacturing Industries Bureau

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

*1: Only confirmed items

*2: 1 JPY = 0.0094 USD (as of September 1, 2019) Source: Ministry of Economy, Trade and Industry (METI), arranged by ©RTS Corporation

Table 1 FY 2020 budget requests for technology development and dissemination support for renewable energy by the Ministry of Economy, Trade and Industry (METI) (mainly PV, storage batteries and grid connection-related items) (3/3)

(Unit: billion Yen)

	ltem		FY 2019 Budget	FY 2020 Budget request	Responsible METI section	
32	Consignment expenses for R&D projects to improve efficiency of technologies for wireless power transmission and reception in space PV	A	0.25	0.25	Space Industry Office, Manufacturing Industries Bureau	
33	Subsidy for projects to advance and promote understanding of the conversion of energy structure	С	5.62	7.50	Nuclear Facilities Development and Nuclear Fuel Cycle Industry Div., ANRE	
34	Projects for feasibility study on overseas deployment of high-quality energy infrastructure	с	0.91	1.00		
35	Projects for feasibility study on overseas deployment of high-quality infrastructure	С	0.70	1.20	Trade Promotion Div., Trade and Economic Cooperation Bureau	
36	Project to investigate and demonstrate export business models of small- and medium-sized enterprises (SMEs)	В	-	0.50 (new)		
37	Consignment expenses for projects to investigate establishment of infrastructure for acquisition of the Joint Crediting Mechanism (JCM), etc.	С	0.98	1.25	Global Environment Partnership Office, Industrial Science and Technology Policy and Environment Bureau	
38	Projects to cultivate emerging markets through utilization of technology cooperation	с	4.40	4.70	Technical Cooperation Div.,	
39	Projects to support human resource development to export low-carbon technology	С	0.92	0.92	Trade and Economic Cooperation Bureau	
40	Project to enhance the eco system for global startups	С	0.80	1.93	Startup and New Business Promotion Office, Economic and Industrial Policy Bureau/ Information Economy Div., Commerce and Information Policy Bureau/ Innovation and Industry-University Collaboration Div., Industrial Science and Technology Policy and Environment Bureau	
41	Project expenses to promote future investment in communities	с	15.86	15.80	Regional Business Innovation Promotion Div., Regional Economic and Industrial Policy Group Technology and Innovation Division, Small and Medium Enterprise Agency	
42	Project to promote new business and creation of business in harmony with local communities and corporations.	С	-	1.00 (new)	Regional Industrial Infrastructure Div., Regional Economic and Industrial Policy Group/ Startup and New Business Promotion Div./ Technology and Innovation Div./ Retail and Wholesale Commerce Division, Small and Medium Enterprise Agency	
43	Grant for the operating expenses of the Japan External Trade Organization (JETRO)	с	24.96	27.10	Policy Planning and Coordination Div., Trade Policy Bureau	
44	Project to establish infrastructure to promote the Fukushima innovation Coast Initiative	с	0.93	1.02	Fukushima New Industries and Employment Promotion Office, Fukushima Reconstruction Promotion Group Industrial Machinery Div., Manufacturing Industries Bureau	
45	Project expenses for establishment of energy supply bases in communities in preparation for disasters	С	12.03 (5.58)	2.40	Petroleum Distribution and Retail Div., Natural Resources and Fuel Dept., ANRE	
46	Consignment expenses for research on measures towards advancing energy supply and demand structure, etc.	с	1.92	2.85	Policy Planning and Coordination Div., ANRE	
47	Consignment expenses for projects to improve safety regulations for new and renewable energy, etc.	с	0.58	0.54	Industrial 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 confirmed items

*2: 1 JPY = 0.0094 USD (as of September 1, 2019) Source: Ministry of Economy, Trade and Industry (METI), arranged by ©RTS Corporation

(3) FY 2020 budget proposal concerning PV power generation and renewable energy by other ministries and agencies

As shown in Table 2, other ministries and agencies including the Ministry of the Environment (MoE), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Ministry of Internal Affairs and Communications (MIC) have also included the projects concerning introduction of renewable energy in their budget proposals.

MoE, toward the third year of the Fifth Basic Environment Plan, will challenge broad policies to realize the "virtuous circle of the environment and growth" based on the spirit of "protecting humans and the environment." MOE's focused policy measures are based on "simultaneous the solution of environmental, economic and social issues" and "creation of symbiotic and recycling-based community." Regarding PV power generation, MoE had made the budget request to promote

dissemination of renewable energy. from a wide range of perspectives from support for installation, CO₂ reduction, support with the initiative of local communities, finance and support for developing countries. Among the major continued budget items, 5.0 billion Yen (\$ 47.0 million) for **Project to promote** self-sustainable dissemination of renewable energy-based electricity and thermal energy. 6.35 billion Yen (\$ 59.7 million) for Project to support establishment of net zero energy houses (ZEHs) at detached houses, 9.65 billion Yen (\$ 90.7 million) for Project to establish symbiotic and recycling-based community with innovation for decarbonization. 9.0 billion Yen (\$ 45.5 million) for Project to promote ZEBs and CO₂ saving in commercial buildings, etc., 9.25 billion Yen (\$ 23.4 million) for Project to promote CO₂ saving in newly built collective housing and existing houses, etc., 11.6 billion Yen (\$ 109 million) for Project to promote installation of independent and distributed energy facilities which realize disaster prevention and reduction as well as low carbonization of local communities

in parallel. 4.8 billion Yen (\$ 45.1 million) for Project of fund to promote investment in decarbonization of local communities, 10.1 billion Yen (\$ 94.9 million) for the subsidy for projects under the Project to support funds for the Joint Crediting Mechanism (JCM) and infrastructure improvement projects, and 6.5 billion Yen (\$ 61.1 million) for Technology development and demonstration projects to encourage enhancement reduce of measures to CO2 emissions have been appropriated.

Among new budget items for FY 2020, 7.5 billion Yen (\$ 70.5 million) for has been allocated to the **Project to promote introduction of facilities, etc. to control operation of equipment on the demand side toward making renewable energy a mainstream power source**, based on the necessity of new development toward FY 2020.

While MLIT, MEXT, MAFF and MIC have also allocated budget to promote the use of renewable energy in their policy measures, the scale of the budget amount is not so significant.

Table 2	FY 2020 budget request for promotion of new and renewable energy by MoE, N	ILIT, MEXT, MAFF	and MIC (Confirmed
	items only)*1 (1/4)		
			(Unit: hillion Von)

	Project name	FY 2019 budget	FY 2020 budget request
	Project to promote self-sustainable dissemination of renewable energy-based electricity and thermal energy (partly in partnership with METI/MLIT) - Support for self-sustainable dissemination of renewable energy for self-consumption and for local production and local consumption	5.00	5.00
	Project to promote introduction of facilities, etc. to control operation of equipment on the demand side toward making renewable energy a mainstream power source - Support for CO ₂ -saving facilities, etc. to control operation of equipment on the demand side toward making variable renewable energy (PV, wind, etc.) a mainstream power source	-	7.50 (new)
	Project to support establishment of net zero energy houses (ZEHs) at detached houses (in partnership with METI/ partly MLIT) - Subsidy for those who newly construct detached houses (made-to-order/ ready-made) meeting the requirements to receive subsidy for ZEH - Subsidy of a fixed amount to the owners of the houses meeting the above-mentioned requirements who will install storage batteries	6.45	6.35
	Project to establish symbiotic and recycling-based community with innovation for decarbonization (partly in partnership with Ministry of Health, Labour and Welfare (MHLW), METI and MLIT) - Project to create models of establishing decarbonized communities - Project to support establishment of independent and distributed energy systems in communities - Project to support establishment of decarbonized transportation models in communities	6.00	9.65
MoE *2	 Project to promote ZEBs and CO₂ saving in commercial buildings, etc. (partly in partnership with METI/ MLIT/ MHLW) Demonstrative project on advanced energy-saving buildings to achieve zero-energy buildings (ZEB) Project to support renovation for CO₂ saving in existing buildings, etc. Project to support renovation for CO₂ saving of dormitories in national parks Project to support renovation for CO₂ saving in water supply and sewage facilities 	5.00	9.00
	Project to promote CO ₂ saving in newly built collective housing and existing houses, etc. (in partnership with METI) - Support for new construction and renovation of newly built collective housing and existing houses for energy conservation and CO ₂ saving	3.35	9.25
	 Project to promote a hydrogen society using renewable energy, etc. Project to evaluate and examine the impacts, etc. of CO₂ reduction by using hydrogen Project to demonstrate low-carbon hydrogen technology through partnership among local communities 	3.48	3.98
	 Project to establish social infrastructure using hydrogen (partly in partnership with MLIT) Project to establish an independent/ distributed energy system using hydrogen Project to promote the use of fuel cells in industrial vehicles, etc. to realize a hydrogen-based society Project for maintenance and inspection of regional hydrogen stations using renewable energy 	0.60	3.00
	 Project to promote installation of independent and distributed energy facilities which realize disaster prevention and reduction as well as low carbonization of local communities in parallel Project to install renewable energy facilities in public facilities (evacuation facilities, disaster prevention centers, etc.), facilities to utilize unused energy, and their accompanying facilities (storage batteries, own electric lines, etc.), which contribute to disaster prevention and reduction Project to install renewable energy facilities in private facilities (evacuation facilities, goods supply bases, etc.), facilities to utilize unused energy, and their accompanying facilities (storage batteries, own electric lines, etc.), which contribute to disaster prevention and reduction 	3.40 (new) 21.0 (FY 2018 second supplementary budget)	11.6

1: This table was prepared based on the materials obtained by RTS Corporation. Data on ministries and agencies other than those described above are unknown.

*2: Ministry of the Environment

*3: 1 JPY = 0.0094 USD (as of September 1, 2019) Source: Materials obtained by RTS Corporation, arranged by ©RTS Corporation

Table 2 FY 2020 budget request for promotion of new and renewable energy by MoE, MLIT, MEXT, MAFF and MIC (Confirmed items only)*1 (2/4)

(Unit: billion Yen)

	Project name	FY 2019 budget	FY 2020 budget request
	 Project to establish information for environment-friendly introduction of renewable energy Establishment of sites to send information on the potential of renewable energy, etc. Collection of basic information on the environment in general marine areas and establishment of database 	0.744	0.744
MoE*2	Project to promote SBT (corporate version of 2 °C target) (Science Based Targets, companies targeting to keep the temperature rise by up to 2 °C from the pre-industrial-revolution levels) and 100 % renewable energy (RE 100 %) - Project to promote SBT (corporate version of 2 °C target) and RE 100 % target for small- and medium-sized enterprises (SMEs) - Project to support establishment of a framework of environmental management for SMEs to reduce CO ₂ emissions	0.22	0.24
	 Project to promote voluntary measures at households, etc. through sending information (nudge) to urge the changes in low carbon-oriented behaviors Project to promote voluntary measures in the residential, commercial and transport sectors by using nudge, etc. Model project to create value of CO₂ reduction by renewable energy with block chain technology 	3.00	3.00
	 Project to promote ESG finance step-up program Project to collect and analyze information related to international green finance Project to consider survey on the introduction of ESG finance in Japan Project to operate award scheme and high-level panel of ESG finance Survey on the trends of innovation and its finance, consideration of national level collaboration measures 	0.30 (new)	0.30
	Project of fund to promote investment in decarbonization of local communities - Support by investment in low-carbon projects with potential of profitability	4.60	4.80
	Model project to install an entity to promote decarbonization of local communities - Subsidize part of expenses regarding commercialization by entities engaging in low carbonization by the utilization of renewable energy in local communities	0.10	0.10

*1: This table was prepared based on the materials obtained by RTS Corporation. Data on ministries and agencies other than those described above are unknown.

*2: Ministry of the Environment

*3: 1 JPY = 0.0094 USD (as of September 1, 2019)

Source: Materials obtained by RTS Corporation, arranged by ©RTS Corporation

Table 2	FY 2020 budget request for promotion of new and renewable energy by MoE, MLIT, MEXT, MAFF and MIC (Confirmed
	items only)*1 (3/4)

	Project name	FY 2019 budget	FY 2020 budget request
	FS project on decarbonization and resource-cycling "creation of towns and living" - Effective use of renewable energy and promotion of introduction of decarbonization technologies, revitalization of local communities	0.40	0.40
	Expenses to discuss promotion of making the taxation system greener as a whole	0.035	0.032
	Project for feasibility study on introduction of carbon pricing	0.25	0.25
	Project to support funds for the Joint Crediting Mechanism (JCM) (portion of ADB fund) - Supporting developing countries to shift to cutting-edge low-carbon society and reduced emissions will be counted as JCM credits	1.00	1.00
	 Project to support funds for the Joint Crediting Mechanism (JCM) (subsidy for projects) Supporting developing countries to shift to cutting-edge low-carbon society and introduce facilities and equipment to reduce CO₂ emissions Project to create and disseminate decarbonization technologies for developing countries by co-innovation 	8.10	10.1
	Expenses to promote international cooperation on the environment and infrastructure strategies - Promotion of overseas deployment of the environmental infrastructure - Support for implementing SDGs through partnership among cities	0.327	0.472
MoE*2	 Investigation expenses to consider measures for mid- to long-term reduction of greenhouse gas emissions, following the long-term strategies, etc. Consideration of measures to achieve and advance reduction targets Consideration of CO₂ reduction effects by the expansion of renewable energy introduction Consideration of measures to realize decarbonization of social and transportation systems Consideration of measures to reduce energy demand by the change of consumption format (sharing economy, etc.) 	0.702	0.702 (General account) 0.69 (Special account)
	Technology development and demonstration projects to encourage enhancement of measures to reduce CO ₂ emissions - Development and demonstration of technologies which have excellent CO ₂ reduction effects	6.50	6.50
	 Technology innovation project to create society and lifestyle ideal for the future Technology development and demonstration to realize thorough reduction of energy consumption of various devices embedded in electrical equipment 	2.50	2.50
	Project to promote introduction of facilities for sophisticating CO ₂ -saving recycling, etc. - Subsidy for CO ₂ -saving facilities (top runner) for sophisticated recycling of plastics, low-carbon products, etc.	3.33	7.83
	Project to promote advancement of utilizing circulative resources through reinforcement of recycle system integration - Cross-sectional advancement/ optimization of the recycle process - Efforts taking advantage of characteristics of various recycle systems	0.262	0.275
	Project to promote project to fully enjoy national parks, etc.	11.173	16.032
	Project concerning natural parks, etc. - Projects to improve facilities at national parks, citizens' parks, etc., projects for nature restoration and measures to lengthen the lifespan of the parks will be conducted, and support the projects for facilities, etc. conducted by local public organizations in the national parks and quasi-national parks	11.641	13.234

(Linit: hillion Yen)

*1: This table was prepared based on the materials obtained by RTS Corporation. Data on ministries and agencies other than those described above are unknown.

*2: Ministry of the Environment

*3: 1 JPY = 0.0094 USD (as of September 1, 2019) Source: Materials obtained by RTS Corporation, arranged by ©RTS Corporation

Table 2	FY 2020 budget request for promotion of new and renewable energy by MoE, MLIT, MEXT, MAFF and MIC (Confirmed
	items only)*1 (Confirmed items only)*1 (4/4)

				(Unit: billion Yen)
		Project name	FY 2019 budget	FY 2020 budget request
	City Bureau	Enhancement of support for town development using new technologies and data - Survey on the demonstration of smart city		0.30
	Housing Bureau Promotion of achieving energy-saving and longer lifespan of houses and buildings - Project for green housing in local communities - Project to promote utilization of the environment and stock		22.983	24.942
Γ*2	Road Transport Bureau	Promotion of dissemination of next-generation environment-friendly vehicles toward achieving greener transportation in local communities	0.53	0.79
MLI	Land Economy and Construction Industries Bureau	Establishment of infrastructure for real estate information - Promotion of cadastral establishment	Included in 10.978	Included in 12.029
	Hokkaido Bureau Promotion of use of renewable energy and hydrogen through partnership among industrial, academic and governmental circles		Yes	Yes
	Japan Coast Guard	Sophistication of maintenance and disaster prevention measures for aids to navigation	5.47	5.92
	National Spatial Planning and Regional Policy Bureau	Support for revitalization of remote islands - Support for smart islands	1.579	1.893
	Department of Facilities Planning	Improvement of public school facilities	Included in 66.72	Included in 232.269
	and Administration, Minister's Secretariat	Promotion of improvement of national university facilities	Included in 34.693	Included in 91.312
T *3		Promotion of improvement of private school facilities and equipment	Included in 10.911	Included in 50.578
MEX	Science and	Realization of clean and economic environment-friendly energy systems - Next-generation R&D on semiconductors, contributing to realization of energy-saving society	1.55	1.55
	Technology Policy Bureau	 Project to create future society (high risk and high impact R&D) Project to promote research on strategic creation (Advanced Low Carbon Technology Research and Development Program (ALCA)) Initiative of strategies for adapting to climate change 	0.854 4.886 1.281	1.74 3.751 1.667
MAFF *4	Food Industry Affairs Bureau	Promotion of introduction of renewable energy	Included in 0.8	Included in 1.80
MIC*5	Promotion of job cre resources - Grant for projects and distributed ener	eation and expansion of consumption in local communities by utilization of local to create circular flow of regional economies (Promotion of local 10,000 project gy infrastructure projects)	Included in 1.0	Included in 1.45

*1: This table was prepared based on the materials obtained by RTS Corporation. Data on ministries and agencies other than those described above are unknown.

*2: Ministry of the Environment *3: 1 JPY = 0.0094 USD (as of September 1, 2019) Source: Materials obtained by RTS Corporation, arranged by ©RTS Corporation

2. Third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network

<Key points>

- The Ministry of Economy, Trade and Industry (METI) released the third interim report illustrating direction towards drastic revision of the FIT program
- ✓ METI summarized discussions on the scheme responding to the characteristics of power sources, proper business discipline, next generation electricity network to support large-volume introduction of renewable energy and responses the current issues
- ✓ As for the scheme responding to the characteristics of power sources, two power source models were presented towards making renewable energy a mainstream power source
- Basic direction of the drastic revision of the FIT program was presented and further detailed consideration is expected to progress



Figure 1 Overview of the third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network

Source: Third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network (August 20, 2019), compiled by RTS Corporation

3. Updates on discussions at the Working Group related to securing funds to cover the cost of disposal, etc. of PV facilities (August 26, 2019)

<Key points 1>

- ✓ Started detailed consideration on a scheme to secure making reserve funds to cover the cost of disposal, etc.
- ✓ Released calculation result of the cost of disposal, etc. based on survey through questionnaires. Cost of concrete foundation, screw foundation, and disposal of only PV module and supporting structures was 13,700 Yen/kW (\$ 129 /kW), 10,200 Yen/kW (\$ 95.9 /kW) and 5,700 Yen/kW (\$ 53.6 /kW), respectively as the median values
- ✓ Considering possibility of future reduction of disposal cost, considerable amount of actual fee will be covered by expected cost of disposal, etc. (5 % of the capital cost) within calculation of feed-in tariff
- Standard of the amount of reserve fund for projects with FIT decided already will be 5 % of capital cost as before. Policy
 for projects with FIT to be decided in future will be decided considering the results of hearing etc.

Standard of the amount of reserve fund

С	alculation result of the cost of disposal, etc. bas	(Yen/kW)		
		Minimum	Median	Maximum
	When disposing concrete foundation	8,000 (\$ 75.2)	13,700 (\$ 129)	74,100 (\$ 697)
	When disposing screw foundation	7,200 (\$ 67.7)	10,200 (\$ 95.9)	62,300 (\$ 586)
	When not removing foundation*	3,500 (\$ 32.9)	5,700 (\$ 53.6)	48,000 (\$ 451)

* Disposal of only PV module and supporting structures

Expected cost of disposal, etc. within the calculation of feed-in tariff (5 % of the capital cost)

Approved in FY 2012 (40 Yen/kWh (37.6 cents/kWh) project: 17,000 Yen/kW (\$ 160 /kW) to Approved in FY 2019 (14 Yen/kWh (13.2 cents/kWh) project): 10,000 Yen/kW (\$ 94 /kW)

Considering possibility of reduction of disposal cost through establishment of disposal technology, etc. in the future

Considerable amount of actual fee will be covered by expected cost of disposal, etc. (5 % of the capital cost)

Comparison

Making t	the amount of expected cost of disposal within calculation of FIT equivalent to the level of total amount of reserve funds
With further reduction of general Meanwhile, it is uncertain whe	ation cost and Fill expected in the future, amount of 5 % of capital cost will decrease. ther the cost of disposal, etc. will decrease at the same pace as the generation cost.
For projects with FIT decided already	 For the projects approved by the end of FY 2019, in principle, expected cost of disposal, etc. within the calculation of FIT will be equivalent to the level of total amount of reserve funds For projects subject to the tender scheme, the standard will be set equivalent to that of the projects NOT subject to the tender scheme within the same Fiscal Year of approval.
For projects with FIT to be decided in the future	 Procurement Price Calculation Committee will decide FITs after the Working Group decides the cost of disposal, etc. considering results of hearing, etc. The cost of disposal, etc. decided as above will be set at the level of the total reserve funds. Also, for the projects subject to the tender scheme, tender participants decide the tender price based on the cost of disposal, etc. expected in the Procurement Price Calculation Committee, and the above-mentioned cost of disposal, etc. will be set as the total amount of reserve funds.

Figure 1 Overview of detailed consideration of the standard amount of reserve funds

Source: Materials from the 4th meeting of the Working Group related to securing funds to cover the cost of disposal, etc. of PV facilities (August 26, 2019), compiled by RTS Corporation

<Key points 2>

- It was proposed that the unit price of reserve fund should be on a kWh base and the frequency of accumulation should be equivalent to the frequency of FIT payment or subsidy (monthly)
- Planning to apply the unit price of gross power sales to the unit price of the sales of surplus electricity.
- Accumulation period will be considered in future taking in account of the following: 1) starting accumulation of reserve funds ASAP, 2) accumulate the funds as long as possible, 3) considering fairness of burden among operators 4) fear of increase in management cost, etc. due to the complication of the scheme.

Unit price of reserve fund

It was proposed to accumulate the funds at the **unit price on a kWh base**

- The cost of disposal, etc. tends to increase proportionally to the scale of facility. Therefore, it is desirable to set unit price, so that the fixed amount can be accumulated based on the capacity of the facility (kW base)
- Meanwhile, the system of those who are obliged to purchase generated electricity is established based on payment of FIT in accordance with generated electricity (kWh base)
- Demanding fixed amount of accumulation even when power generation output is low and power sales income is less can easy influence the financial status of power producers

- Considering that power generation amount increases proportionally to the capacity of the facility, it is adequate to accumulate the reserve fronds on a kWh base to balance certainty of fund securement and minimizing the social cost

Planning to apply the unit price of gross power sales to the unit price of the sales of surplus electricity

Frequency of accumulation

To accumulate the reserve funds by a pay-as-you-go method, it was proposed to set the frequency of accumulation equivalent to the **frequency of FIT payment or subsidy provision** (monthly under the current system)

Period of accumulation

Opinions expressed so far

- There is a necessity to consider choices such as setting accumulation period same as the purchase period of 20 years for wide and shallow accumulation

- It is one of the options to set two patterns. One as accumulation of 10 years as latter half for operating projects* and the other as accumulation of 20 years for projects starting operation in future

1) To respond to concerns of derelict and illegal disposal, it is essential to start accumulation ASAP

2) Accumulation as long as possible should be made considering the impacts on the financial status of power producers

3) It is necessary to consider fairness of burden among operators since it will influence the PV project business plan.

4) There is a fear of increase in the management cost and creating confusion due to the complication of the system with a wider variety.

Taking in account of 1) to 4) of the above, setting of accumulation period will be considered to make it possible to secure funds more reliably as of the end of the power generation business

* In order to accumulate reserve funds for the latter 10 years, it is necessary to start the accumulation scheme no later than July 2022 which is 10 years from the start of the FIT program.

Figure 2 Overview of detailed consideration of the unit price, frequency and period of reserve fund accumulation

Source: Materials from the 4th meeting of the Working Group related to securing funds to cover the cost of disposal, etc. of PV facilities (August 26, 2019), compiled by RTS Corporation

<Key points 3>

- ✓ To prevent diversion of funds besides disposal, it is necessary to have a certain screening when recouping accumulated reserve funds
- ✓ Policy to approve prior recoup of reserved funds with requirement to submit contracts etc. with demolition contractors.
- Policy to approve recoup of reserved funds in proportion to the ratio of disposed PV modules to the entire PV system when continuing the power generation business after the end of purchase period with exchange or disposal of PV modules



while taking measures to prevent diversion of deposit

Exchange of facilities to continue the power generation business after the end of FIT the purchase period

It was proposed to approve recouping of reserved funds under certain conditions not only when terminating the power generation business but also when exchanging or disposing a part of the facility for long-term stable power generation.

Policy to approve recou	to the entire PV system
When exchanging or disposing a part of PV modules	For example, when disposing 50 % of total PV modules, allow recoup of maximum of 50 % of accumulated funds and secure the rest of the funds for disposal of the remaining PV modules
When exchanging or disposing all the PV modules	To encourage continuation of the power generation business through the exchange of PV modules, it is adequate to return the entire amount of the accumulated funds regardless of removal of foundation or supporting structures

To prevent increase of system management cost, it should be limited to the cases when ratio or amount of disposed PV modules exceed a certain range.

The cost of disposal, etc. of new PV modules after the exchange is excluded from this system. Disposal of PV modules including non-FIT projects will be continuously discussed in cooperation with the Ministry of Environment (MoE).

When disposed by entities other than powers producer

For example, there is a possibility of disposal of PV systems by local authorities in case of disasters, etc. When disposed by entities other than power producers based on legal provisions, accumulated reserve funds should be recouped on behalf of power producers.

Figure 3 Overview of detailed consideration on the conditions etc. to recoup accumulated reserve funds

Source: Materials from the 4th meeting of the Working Group related to securing funds to cover the cost of disposal, etc. of PV facilities (August 26, 2019), compiled by RTS Corporation

4. Interim report of the Subcommittee on resilience of electricity toward achieving a decarbonized society (August 20, 2019)

<Key points>

- ✓ METI compiled the results of discussions related to network policy from various perspectives such as large-volume introduction of renewable energy, resilience, and digitalization
- ✓ Items to consider, such as establishment of network, reform of wheeling charge system, and transition to the next generation network were organized under the basic policy to minimize the total cost of "generation plus network"
- ✓ Toward making renewable energy a mainstream power source, it is necessary to consider not only the network policy but also integrally the network policy with the policy on the generation side including the FIT program. Concentrated discussions will be continued

		Summary	y of interim report and items to consider for the future
	Structural change	Large-volume digitalization,	e introduction of renewable energy, enhancement of resilience, progress of etc.
	Transition to	the next gene	eration network is necessary to achieve an even higher level of 3E
	Basic p	olicy: Aim for	minimization of total cost of generation cost and network cost
1)	Reform of establis network	shment of	 Establishment of systematic/ active grid considering the introduction potential of renewable energy, consideration on master plan, consideration based on analysis of cost-effectiveness Make effective use of EV and resource on the demand side, improve efficiency of grid establishment/ operation
2)	Suppression and to of cost	fair sharing	Reinforcement cost of inter-regional grid will be shared across the nation in principle and reinforcement cost for renewable energy will follow the FIT surcharge method, etc.
3)	Reform of the whe charge system	eeling	 Consideration on introducing incentive regulation (revenue cap, etc.) in order to save cost Set up an investment environment aiming for advancement of network such as measures towards renewable energy, etc. (separation of necessary investment costs)
4)	Transition to the n generation models	ext	Widen the range of power transmission and decentralize power distribution (create various business models)
5)	Enhancement of measures for disa	esilience/ sters	 Consideration on system to evenly secure cost for recovery from disaster, etc. Organize division of roles of operators and consumers in case of disaster
	 Toward makir network polic Concentrated establishmen 	ng renewable y but also inte discussions t of concrete s	energy a mainstream power source, it is essential to consider not only power egrally consider policy on the generation side including the FIT program will be made at appropriate places in the future, and will lead to systems

Figure 1 Summary of the interim report of the Subcommittee on resilience of electricity toward achieving a decarbonized society Source: Materials from the interim report of the Subcommittee on resilience of electricity toward achieving a decarbonized society (August 20, 2019), compiled by RTS Corporation

5. Direction of renewable energy policy (30th meeting of the Strategic Policy Committee on August 26, 2019)

<Key points>

- ✓ METI shared the contents of the interim reports by the subcommittees related to energy policy and issues to be considered
- METI plans to deepen discussions specifically on making renewable energy a mainstream power source and reconstruction of the electricity network.
- METI also established two new subcommittees to provide a place to discuss the total system reform including the revision of the FIT program.

Contents of interim reports by the subcommittees related to energy policy and issues to be considered were shared Basic perspective towards formulation of the "Strategy on security of new resources and energy" - Explained detailed measures shown in the report by the Natural Resources and Fuel Committee - Way of new resource diplomacy and measures to include emerging countries Issues towards construction of sustainable electricity system (1) Towards making renewable energy a mainstream power source and sustainable investment in power sources - Explained the future direction shown in the third interim report of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network - Construction of system corresponding to the characteristics of power sources and adequate business discipline (2) Reconstruction of electricity network Explained main issues to be considered in future shown in the interim report of the Subcommittee on resilience of electricity toward achieving a decarbonized society Reform of the wheeling charge scheme and transition to the next generation network Promotion of innovation towards achieving a decarbonized society Technological roadmap of carbon recycling, consideration of drastic innovative strategy on the environment Suggestion from Mr. Sakakibara, Chairperson of the Subcommittee on future consideration Especially on the issues of making renewable energy a mainstream energy and reconstruction of the electricity system, it is desirable to establish a place to discuss the total system reform including the revision of the FIT program under the Strategic Policy Committee

Established on August 27, 2019

- Subcommittee on System Reform for Renewable Energy as Main Power Source - Subcommittee for Sustainable Power Systems

Figure 1 Summary of discussions on the direction of energy policy

Source: Materials from the 30th meeting of the Strategic Policy Committee (August 26, 2019), compiled by RTS Corporation

6. Updates on discussions at the Working Group on Grid Connection of Renewable Energy

<Key points>

- ✓ Online control is effectively utilized to reduce the amount of renewable energy output curtailment. Amount of output curtailment is allotted to offline control first, and it was discussed that it is fair even if offline control is conducted more times than online control
- ✓ The guideline on fairness should be revised ASAP, and the new operation of output curtailment is planned to start from the point when practical measures can be taken
- Reports were made on the status of the tender process to secure the grid connection capacity in the Northern Tohoku Area, as well as trial efforts towards expansion of renewable energy introduction considering the congestion of the mainstream grid in the direction of Chiba Prefecture, etc.



Figure 1 Highlights of discussions at the Working Group on Grid Connection of Renewable Energy Source: Materials from the 22nd meeting of the Working Group on Grid Connection of Renewable Energy (August 1, 2019), compiled by RTS Corporation

7. PV module shipments in the quarter from April to June 2019 (1st quarter of FY 2019)

<Key points>

- The Japan Photovoltaic Energy Association (JPEA) announced the PV module shipment statistics in the quarter from April to June 2019 (first quarter of FY 2019)
- ✓ Total module shipments increased to 1,585 MW, a 15 % increase year on year (YOY), and the recovering trend is maintained since the quarter of July to September 2018
- ✓ Domestic shipment increased to 1,493 MW, a 19 % increase YOY. By application, the shipment for residential applications increased to 280 MW, a 19 % increase YOY, commercial applications greatly increased to 563 MW, an 88 % increase YOY, and utility-scale applications decreased to 650 MW, a 10 % decrease YOY
- Construction of large-scale projects with the FIT approval and < 500 kW projects that are not subject to the tender scheme progressed. Demand for self-consumption type projects that do not depend on the FIT program is expected to increase in the future



Breakdown of total shipments

©RTS Corporation

Figure 1 Japan's total shipments of PV modules by quarter



Domestic shipment by application

©RTS Corporation

Figure 2 Japan's domestic shipments of PV modules by application by quarter

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

* The numbers shown in the figures above are rounded off to the first decimal place.

Monthly PV Photo Gallery

Ground-mounted PV power plant

(Hijidenki Solar Park Fujiwara Yurino PV Power Plant)



Hijidenki Solar Park Fujiwara Yurino PV Power Plant (South site)



Northern hillside slopes were transformed into terraced fields to install PV modules (South site)



PV modules are installed above the reservoir at the height of approximately 1 m from the ground (South site)

Location:

4881-103 Yurino, Fujiwara, Hiji Town, Hayami County, Oita Prefecture

Generation Capacity:

PV module capacity: 14.42 MW Grid capacity: 10 MW

Facilities:

Module: REC Solar Japan Inverter: TMEIC Optimizer: Ampt EPC, O&M: Hijidenki

Start of Operation:

July 29, 2016

Overview:

Hijidenki started commercial operation of Fujiwara Yurino PV Power Plant in Hayami County, Oita Prefecture in July 2016 and FIT is 40 Yen/kWh (37.6 cents/kW). The plant's south site had originally been slated for a golf course. When a cessation during the planning phase before construction began, Hijidenki purchased the site and developed a large-scaled PV power plant. The company raised the business feasibility of the PV power plant by confirming 1.4 times of overpanelling rate with PV modules of 4.4 MW more than the grid capacity of 10 MW. The plant was constructed by transforming the hillside slopes into steps like terraced fields and arraying PV modules in the leveled areas. The plant largely consists of the south site and the north site with the PV module capacity of 9.5 MW and 4.9 MW, respectively. The plant introduced string optimizers and the company took a measure to decrease an influence of reduced grid capacity by shadow. The string optimizers are installed for the 500 kW capacity of the 2 MW sub-plant. The installation cost is reclaimed by the increase of the output capacity for nearly 2 years. After that, the power plant will start gaining an income. Moreover, the monitoring function of string optimizers will contribute to reducing the O&M cost of the power plant.



By setting up string optimizers, the plant supplies maximum output power even if there is shadow (North site)



Shadow starts falling over PV modules (North site)



String optimizers (North site)

(Photographs: ©RTS Corporation)

Topics from Japan

1. Government

CThe Ministry of Economy. Trade and Industry (METI) announced its budget requests for FY 2020 with 1.4292 trillion Yen (\$ 13.4 billion), a 15.1 % increase from the initial budget for FY 2019. METI requested 501.5 billion Yen (\$ 4.71 billion) for promoting energy conversion and decarbonization and 287.7 billion Yen (\$ 2.7 billion) for strengthening energy security and resilience. It newly requested 4 billion Yen (\$ 37.6 million) for technological development project toward the expansion of possible PV installed capacity. METI will develop innovative lightweight PV system technology which enables installation on mobile objects such as automobiles and drones as well as building wall surfaces and factory roofs whose weight is restricted. METI also requested 2.1 billion Yen (\$ 19.7 million) for Subsidy for the expenses of projects for comprehensive utilization of energy using regional grid lines, as a new item. METI will support the establishment of regional microgrid, which will utilize renewable energy, get the grasp of and control the power flow of lower-level power grid at normal time and independently supply electricity at the time of wide-scale power outages caused by disasters.

Agency for Natural Resources and Energy (ANRE) under METI held the 17th meeting of the Large-volume Introduction of Renewable Energy and Next Generation Electricity Network and compiled a proposal of an interim report toward the drastic revision of the Feed-in Tariff (FIT) program scheduled at the end of FY 2020. This proposal clearly distinguishes competitive power sources, which are expected to be independent from the FIT program, from regional power sources, which provide political support in view of regional conditions and characteristics. Large-scale commercial PV and wind power systems are categorized as competitive power sources, and renewable energy power producers themselves basically sell electricity through the electricity market. When the sales price falls below the basic price set by the national government, the loss is expected to be covered by the government. Residential and small-scale commercial PV systems and small-scale geothermal power generation systems are categorized as regional power sources. Considering that they are disaster-resilient distributed power sources as well as the effect of local production and local consumption of energy, ANRE maintains a framework of the FIT program and aims for a synergy effect with the regional industry.

★ METI held the fourth meeting of the Working Group related to securing reserve funds to cover the cost of disposal, etc. of PV facilities and proposed to set the standards of the amount of reserve fund at 5 % of the capital cost. The procurement price for FY 2019 is 14 Yen/kWh (13.2 cents/kWh) and the capital cost is 199,500 Yen/kWh (\$ 1880 /kW), and 10,000 Yen/kW (\$ 94 /kW) or 5 % of the capital cost is circulated as the total amount of the cost of disposal, etc. Since the power generation business will continue for a long period of time after the termination of the FIT purchase period, METI accepts that power producers can recoup their reserve fund under certain conditions when they replace and dispose part of their facilities. When municipalities and entities other than power producers dispose facilities at the time of disasters, METI will help power producers recoup their reserve funds.

☆ **METI** will start accepting applications for the fourth tender for commercial PV systems. From the viewpoint of enhancing further competitiveness, METI will expand the scope to include ≥ 500 kW PV systems. The target tender capacity is set at 300 MW, and a ceiling tender price will be publicized after the tender opening just as the previous time. The application period is until August 23, 2019 and the result will be publicized on September 3, 2019. At the previous third tender, the bidding capacity for the first time exceeded the target tender capacity by approximately 100 MW. As a result, entities who tendered at the same price as the ceiling price (15.50 Yen/kWh (14.6 cents/kWh)) were unable to win the tender due to capacity exceedance, and the effect of pushing the price down was also confirmed.

ANRE under METI held the 30th meeting of the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy (ACNRE) and proposed a future direction of energy policies. In the electric power area, ANRE confirmed that it will deepen discussions on sustainable power source investment securing the predictability of power producers. Toward the drastic revision of the FIT program, ANRE introduced the overview of overseas support schemes and stressed that the transition to the Feed-in Premium (FIP) program focusing on market integration is promoted in the European Union (EU). To achieve both expansion of renewable energy introduction and curtailment of public burden, ANRE suggested that appropriate price support system which will promote investment and power generation focusing on electricity values in the market should be considered in Japan. While considering the independence from the FIT program, ANRE also proposed to verify the influence on long-term investment in power sources including conventional power sources and take necessary measures.

ANRE under **METI** will establish the Subcommittee on System Reform for Renewable Energy as Main Power Source and the Subcommittee for Sustainable Power Systems under the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy (ACNRE) and start discussions in September 2019. the Subcommittee on System Reform for Renewable Energy as Main Power Source focuses on discussions toward the drastic revision of the FIT program whose direction was proposed in a council which is the original body of the new subcommittee. ANRE aims for the transition to a system focusing on market integration, promoting power generation at the time of the soaring wholesale power market, and will work on the details by reference to the FIP program in the EU countries, which adds a certain amount to the market price. In the Subcommittee for Sustainable Power Systems, based on a wide-area blackout in the Hokkaido Eastern Iburi Earthquake in 2018 as well as the rising geopolitical risks such as growing tension in the Middle East, ANRE will seek a measure to establish a consistent electricity system covering from power generation to power transmission and distribution. ANRE will promote creating a scheme to prevent investment in power sources and transmission and distribution networks from being played down, and also work on the detailed design of the wheeling charge system reform.

Electricity Gas Market Surveillance The and Commission (EGC) held the 40th Meeting for System Design and four Power Producer and Suppliers (PPSs) (JXTG Nippon Oil & Energy, Looop, Idemitsu Kosan, and Osaka Gas) reported their efforts toward expanding options for the PV systems which will face the termination of the FIT purchase period. EGC will enclose the power purchase menu offered by PPSs in the notification letters to PV system owners from former General Electricity Utilities, which already started sending the letters to help them compare the information on the power purchase. As for the contents of the leaflet, the Liaison council of business operators purchasing post-FIT electricity, which is soon to be established, confirms the validity based on the perspective of consumer protection and personal information protection. EGC will invite the participation of PPS to the Liaison council, and fairly share the burden of operation cost.

The Ministry of the Environment (MoE) announced its budget requests for FY 2020 with 1.263 trillion Yen (\$ 11.9 billion), a 42.3 % increase from the initial budget for FY 2019. MoE requested 7 billion Yen (\$ 65.8 million) for the Project to support charging and discharging facilities which can control operation from offsite, as a new project toward making renewable energy a mainstream power source. In addition, MoE requested 9.65 billion Yen (\$ 90.7 million) for Project to establish symbiotic and recycling-based community with innovation for decarbonization, 250 million Yen (\$ 2.35 million) for Project for feasibility study on introduction of carbon pricing, 6.5 billion Yen (\$ 61.1 million) for the Technology development and demonstration projects to encourage enhancement of measures to reduce CO2 emissions, 6.45 billion Yen (\$ 60.6 million) for Project to support establishment of net zero energy houses (ZEHs) at detached houses, and 9 billion Yen (\$ 84.6 million) for the Project to promote ZEBs and CO₂ saving in commercial buildings, etc. MoE also proposed the establishment of the Decarbonization business promotion office in the Climate Change Policy Division, Global Environment Bureau, aiming to actively promote the dialogue between companies and financial institutions toward the efforts of companies on achieving Sustainable Development Goals (SDGs) and ESG management. MoE also requested to hire approximately 30 more employees in the Ministry, to enhance the structure of

the Environmental Impact Assessment (EIA) examination for \ge 30 MW PV power plants which will start in FY 2020.

MoE will start supporting feasibility study for local public organizations concerning renewable energy utilization projects after the termination of the FIT purchase period. As the efforts for the Project to establish symbiotic and recycling-based community with innovation for decarbonization, MoE started accepting applications for the following three types of projects: 1) Utilization of renewable energy: 2) Decarbonization to significantly reduce CO₂ emissions, and 3) Operation of council with the participation of residents, and received 93 applications. MoE selected 66 projects on renewable energy utilization research after the termination of the FIT purchase period, resource recycling such as recycling of secondary batteries, and information transmission for obtaining consensus among local residents. As for renewable energy-related area, MoE selected the project to supply electricity to public facilities by aggregating electric power generated in PV power plants in Ikoma City of Nara Prefecture and the project aiming to achieve 100 % renewable energy through a public-private partnership utilizing various energy sources such as PV, onshore wind, and waste power generation in Kaga City of Ishikawa Prefecture.

MoE selected four projects including a project by Toyota Motor Corporation for the Program to support facility installation under the funding support program of the Joint Crediting Mechanism (JCM) in FY 2019. Toyota Motor will construct a 37-MW PV system, etc. in Vehicle & Engine Factory in Thailand. MoE will subsidize up to one-half of initial investment cost and expects to reduce a total of 88,000 t/year of CO_2 emissions through these four projects. The total amount of GHG emission reduction during the period of the statutory useful life is expected to be approximately 1.2 million t.

2. Local governments

☆ Fujioka City of Gunma Prefecture formulated the guidelines on PV facility installation projects, which request power producers to provide local residents with prior explanation and submit necessary documents to the city. The guidelines are applied to the projects which newly install PV modules and incidental facilities on ≥ 1,000 m² land. Applicable power producers should hold briefing sessions for local residents and submit necessary documents such as a land use planning map no later than 30 days before starting the project.

Hidaka City of **Saitama Prefecture** unanimously approved and enforced on the same day a proposal of an ordinance to regulate PV facility installation in the special protection area in the ad hoc meeting of the city council. This will be the first enactment of an ordinance concerning PV facility installation in Saitama Prefecture. The ordinance aims to prevent the occurrence of disasters and preserve good environment and landscape. The followings areas are categorized as special protection areas: 1) Area where landslide and natural disasters may occur, 2) Area where natural environment is preserved and recognized as valuable resources, and 3) Forest preservation area, etc. PV power producers need to obtain an agreement from the mayor, but the mayor will not accept projects when all or part of the project area is included in the special protection area. Although the construction of a MW-scale PV power plant with a project area of approximately 15 ha is planned in the Koma Hongo district in the city, the city council passed a resolution opposing the construction areas designated by the ordinance.

Tokyo Metropolitan Government (TMG) selected TEPCO HOMETECH, TRENDE, and Daito Trust Construction as companies to receive subsidy for the service to install residential PV systems at no initial cost. With a subsidy of 100,000 Yen/kW (\$ 940 /kW) as seed money, they will reduce monthly service charges and offer cash back, and full refund to homeowners. TMG started accepting applications from August 1, 2019. The subsidized project period is planned to be two years and the budget scale for the initial fiscal year is 700 million Yen (\$ 6.58 million). The numbers of projects to receive the subsidy is expected to be 1,000 projects for detached houses and 300 projects for collective housing, and a total installed capacity is estimated to be 7 MW.

The Bureau of the Environment of TMG started accepting applications for the Model project for visualizing renewable energy in TMG-owned facilities toward the dissemination of environment-conscious technology including new pavement-type PV modules. To expand the introduction of renewable energy, TMG will take initiative in introducing and visualizing new renewable energy technology in an early stage of dissemination and raise awareness for disseminating the technology. TMG will introduce vibration power generation such as floor power generation, which utilizes vibration caused by the motion of pedestrians as well as pavement-type PV modules called the solar road, which are installed on the pavement surface. TMG will install these facilities during FY 2019 and measure the effect in FY 2020. They will be installed in Tokyo Big Sight and the implementation period is until March 31, 2021.

Kakegawa City of **Shizuoka Prefecture** formulated the guidelines on ground-mounted PV facilities. Targeted facilities are commercial facilities with a land area of \geq 500 m² or with a capacity of \geq 50 kW and divided projects are also included. The city requests power producers to have discussion with the city prior to the launch of power generation project, submit notification at the start of and after the completion of the project, and report reserve fund conditions to cover the removal cost at the end of every fiscal year. The guidelines also indicate the areas inappropriate for installation to regulate installation for disaster prevention and environment preservation.

Yaizu City of **Shizuoka Prefecture** will submit the Ordinance concerning harmony between natural environment and installation of renewable energy-based power generation facilities to the city assembly. As for MW-scale PV power plants covering the area of \geq 1,000 m², the city regulates the PV system installation in scenic spots and places with rich natural environment, etc. The city obligates project developers to provide prior explanation to local residents and file a notification to the city and will publicize the names of the project developers if they fail to follow the regulation.

3. Utilities

Tohoku Electric Power Co., Inc. signed an agreement with Miyagi Prefecture on the demonstration project of P2P power transaction and virtual power plant (VPP). In the demonstration test, they will install equipment to measure the power generation amount and electricity demand, etc. in PV facilities in seven government buildings in Miyagi Prefecture (a total of 322 kW). They will record the measured values with block-chain technology and verify them to make sure that the traceability of power sources is secured. They will also verify the feasibility of P2P power transaction and load levelling through virtual electricity interchange among government buildings. Through the remote monitoring and optimal control of storage batteries (44 kWh) installed in the Kesennuma government building as VPP, they will verity the improved life of storage batteries and utilization possibility as adjustment function of electricity supply-demand balance. The demonstration period is until the end of March 2021, and they will start demonstration during the second half of FY 2019 following on-site survey and system development.

TEPCO Energy Partner, Inc. will establish Renewable Energy Marketing and Sales Department under the Sales Unit as of September 1, 2019. The company consolidates the renewable energy related business, which it had worked on separately for corporations and households and aims to create a new organization which responds to customer needs concerning renewable energy. To deal with different customer needs, the company will provide optimal plans combining various menus such as Aqua Premium plan, an electricity plan which uses only electricity generated from non-carbon-emitting hydropower sources, Green Electricity Certificates, a the certificate of environmental values of renewable energy, and energy service with renewable energy facilities for supporting investments in renewable energy power generation facilities.

TEPCO Energy Partner, Inc. decided the details of the renewable energy deposit plan, which will be offered after the termination of the FIT purchase period. It is a plan which, without installing storage batteries, surplus electricity is regarded as deposited to the company and used in another time zone, and the service charge is purchased at 4,000 Yen/month (\$ 37.6 /month) (including consumption tax). Up until 250 kWh/month, the company will purchase electricity

with the price equivalent to the cost of electricity consumed by customers in descending order of unit cost. As for surplus electricity exceeding 250 kWh as well as surplus electricity exceeding power consumption of \leq 250kWh, the company will purchase at 8.5 Yen/kWh (7.99 cents/kWh), the same amount as the renewable energy purchase standard plan. The targeted areas are Tochigi, Gunma, Ibaraki, Saitama, Chiba, Kanagawa, Yamanashi, and Shizuoka Prefectures (east of Fujikawa River), and Tokyo (except for islands).

TEPCO Ventures, Inc. started operation of Suncle, a simulation website for PV systems for detached houses. With the technology of Google Project Sunroof, PV simulation provided by Google, the website provides 20-year income and expense simulation based on the entered address, considering the power generation amount, power sales revenues and subsidies, and the users can instantly understand their economic efficiency when they install PV systems. The company introduces up to three out of 41 partnering installation companies nationwide to customers who wish to receive an estimate and earns revenues from commission fees from these installation companies. The company aims to achieve the sales of 300 million Yen (\$ 2.82 million) by 2020.

Tokyo Electric Power Company (TEPCO) Holdings, Inc. decided to spin off its renewable energy power generation business on April 1, 2020. The company will establish a wholly owned subsidiary as a succeeded company in October 2019 and signed an absorption-type company split agreement with the new company in November 2019. To promote its effort to make renewable energy a mainstream power source and to aim to achieve the total development scale of 6 to 7 GW both at home and abroad, the company aims for specialization in renewable energy sources, clarification of responsibility and authorization for prompt decision-making on collaboration with domestic and overseas partners as well as large-scale investment, etc. and flexible fundraising to support these efforts. After the spinning off, the company will seek these purposes, expand the business scale and revenues, and aims for the profit target of 100 billion Yen (\$ 940 million) for FY 2030.

Kansai Electric Power Co., Inc. (KEPCO) and WASSHA Inc. agreed to form a business alliance on electric power service for non-electrified areas in Africa. WASSHA formed a business tie up with distributors called kiosks, shops selling daily commodities, in the non-electrified areas in Tanzania and installs lanterns which can be charged from PV modules and provides service to lend them to residents in the non-electrified areas. In the business alliance, KEPCO will procure equipment including lanterns to lend WASSHA and WASSHA will increase the number of kiosks as local partners and introduce lent equipment to kiosks, aiming to expand the business.

KEPCO started to accept the Renewable energy ECO plan, a new electricity bill menu, from August 8, 2019. KEPCO also offers two types of special contract menu associated with the electricity bill menu, Renewable energy ECO plan for extra-high voltage and high voltage and Renewable energy ECO plan for low voltage. These are electricity bill menus which adds environmental values of renewable energy-derived non-fossil fuel energy certificates to the electricity delivered to its customers. Customers who join the service can use virtually renewable energy-derived CO₂-free electricity.

Chugoku Electric Power Co., Inc. will start a new service called Gutto Zutto Green Fit from November 2019. It is a service to add points by purchasing surplus electricity generated from residential PV systems after the termination of the FIT purchase period. In addition to the purchase plan purchasing surplus electricity at 7.15 Yen/kWh (6.72 cents/kWh), the company will provide the electricity deposit plan. It is a plan that the company virtually receives surplus electricity from customers even if they do not install storage batteries, and their daytime surplus electricity is regarded as allocated to their nighttime electricity use as in the case of installing storage batteries, and one energia point per kWh is allocated to the customers. It also provides such service as the Yumeka plan and WAON plan, for which a premium point equivalent to 1 Yen/kWh (0.94 cents/kWh) is provided by offering environmental values to a specific company.

Shikoku Electric Power Co., Inc. invested in Next Energy & Resources Co., Ltd. The investment amount is 100 million Yen (\$ 940,000) and is allocated to build IoTT platform and develop new storage batteries. Through the investment, the company considers working on collaboration toward effective use of new technology as well as provision of service which corporate customers can install PV systems without bearing the burden of the initial cost.

Central Research Institute of Electric Power Industry (CRIEPI) developed a system which can predict insolation for the next six hours by 10-minute intervals utilizing the Himawari-8 meteorological satellite. This system improves the accuracy by using two types of images, visible image and infrared image, and combines these data to calculate insolation. Depending on regional climates, the system can change the calculating formula and can theoretically predict insolation in almost all areas nationwide. The accuracy of predicted values is confirmed by the demonstration conducted in the Kyushu region throughout 2017 and, when commercialized, the system will improve forecast accuracy of PV power generation amount and greatly contribute to proper output curtailment.

Japan Electric Power Exchange (JEPX) publicized the trading results, for the first time in FY 2019, on non-fossil value of FIT power sources generated between January and March 2019. The contract volume reached 106,376,433 kWh, exceeding 100,000,000 kWh for the first time. This time, participants increased by just two companies from the previous time to 20 companies, but the contract volume showed a sharp increase of more than 30 times, which is approximately three times as much as the entire volume throughout FY 2018 The maximum contract price was 2 Yen

(1.88 cents) and the minimum contract price was 1.3 Yen (1.22 cents), and the weighted average price was also the same as the minimum tender price of 1.3 Yen (1.22 cents). Unsold certificates will be carried over to the next and subsequent transactions.

Familynet Japan Corporation (FNJ) of **TEPCO Energy Partner group** signed a purchase commission contract of surplus electricity with Sekisui House, Ltd. FNJ was selected as a power purchase and supply partner in the East Japan region of the Sekisui House Owner Denki, a nationwide service which Sekisui House purchases surplus power. FNJ will purchase PV electricity of Sekisui House customers after the termination of the FIT purchase period and the purchased electricity will be supplied to business offices and factories of Sekisui House by TEPCO Energy Partner, etc.

4. PV material/ component

Carlit Holdings Co., Ltd. developed the electrolytic solution for dye-sensitized solar cells (DSCs). This electrolytic solution is the halide ion solution, which generates power when it is applied on the transparent conductive glass and placed between electrodes. It is possible to generate electricity even under the illuminance as low as 10 lux. As it is also possible to generate power again using the light turned on with the generated power, the development enables the Energy Harvesting Technologies which realize circulation and conservation of energy.

5. PV cell/ module manufacturing

Panasonic Corporation joined RE100, an international initiative which aims to change all the electricity used for business activities to renewable energy sourced electricity. In addition to the efforts of energy conservation at the factories, the company will promote the installation of renewable energy power generation facilities such as PV systems in the bases of the company and the procurement of 100 % renewable energy sourced electricity at the CO₂ zero model factory in California in the US, as a part of its efforts to fully utilize renewable energy. Hereafter, Panasonic will further enhance the introduction of renewable energy by installing renewable energy power generation facilities in its bases and the external procurement of renewable energy, under the goal of expanding the use of renewable energy, which is one of the goals of Green Plan 2021, Panasonic's environmental action plan toward 2021.

Panasonic Corporation will transfer the research and development business of hetero-junction solar cells, which is scheduled to be sold to GS-Solar (China), to a newly established company SOLEA, as of October 1, 2019. The stocks of SOLEA will be transferred as of November 1, 2019 and will be held 90 % by GS-Solar and 10 % by Panasonic, according to the rate of investment.

Sharp Corporation developed "Resbee®" (translator's note: English name is unknown), a beacon which is powered by dye-sensitized solar cells (DSCs) and does not require battery replacement. Sharp delivered the product for the indoor and outdoor voice guidance navigation service of Shimizu Corporation in the end of July 2019. The product eliminated the necessity of battery replacement by adopting DSC as a power source.

Sharp Corporation developed a technology to make analog meters such as pressure gages into IoT. Two magnetic sensors read the changed angles of pointers, on which permanent magnets are attached. Since the technology is powered by dye-sensitized solar cells (DSCs), it can be used anywhere without maintenance for about ten years. Sharp is implementing demonstration tests in cooperation with utilities and steel manufacturers. As a new technology which saves patrol visual inspection works, Sharp will start selling the product in Japan by the end of FY 2019.

KYOCERA Corporation announced that the sales amount of Life & Environment Segment which includes solar energy business declined by 5 % YoY to 17.8 billion Yen (\$ 167 million) in the financial results for the guarter between April and June 2019 (1st guarter of FY 2019) due to the declined orders of PV modules, etc. Although profit and loss of the segment is a deficit of 2.6 billion Yen (\$ 24.4 million), the range of deficit shrunk owing to the progress of business structural reform in the solar energy business which had been implemented in FY 2018. Sharp expects the PV cell/ module sales volume of 700 MW for FY 2019, which exceeds the sales volume in FY 2018. In FY 2019, the company will enhance the electricity service business in addition to the expansion of devices and systems such as PV systems, storage batteries and fuel cells. The segment will turn into black after FY 2020.

Idemitsu Kosan Co., Ltd. announced the financial results for the quarter between April and June 2019 (1st quarter of FY 2019). Due to the merger with Showa Shell Sekiyu, the segmentation of the financial reports were reorganized into five segments such as "Electricity/ Renewable Energy," which includes SOLAR FRONTIER, TOA Oil, RS Renewables and Ohgishima Power. The power generation capacity of the segment is 800 MW (including 200 MW of renewable energy) and the production capacity of PV cells/ modules is 1 GW/year. The sales amount of the segment was 29.3 billion Yen (\$ 275 million), a 501.8 % increase YoY and the profit of the segment was 800 million Yen (\$ 7.52 million), a 176.7 % increase YoY.

XSOL Co., Ltd. will start selling two kinds of high-output single-crystalline silicon (sc-Si) PV modules XLM144-425L and XLM120-355L from September 2019. By adopting half-cut cells, which reduce electric resistance inside cells, for the PERC structure, which reduces power generation loss, the module conversion efficiency achieved 19.1 %, the highest class in comparison with the products of the same size. As well as for the new projects, these products are the best choices for the projects which have not started

operation to optimize the profitability by changing PV modules. XLM120-355L (355 W) will be sold for 234,300 Yen (\$ 2,200) and XLM144-425L (425 W) will be sold for 280,500 Yen (\$ 2,640), excluding tax.

6. Balance of systems (BOS)

KYOCERA Corporation fixed the policy to mass produce low-cost next generation lithium ion batteries (LiB) in the latter half of FY 2020. The product will be manufactured to be used as storage batteries for home mainly. The new LiB is the semi-solid type, the clay like paste, in which electrolytic solution is kneaded in electrodes. It will reduce production cost by more than 30 % from the conventional products. KYOCERA developed the product based on the technology of 24M, a US venture company which KYOCERA invests in. KYOCERA will start the preparation for the mass production by installing the trial manufacturing lines by the end of 2019. KYOCERA will promote the business which utilizes renewable energy with its main products for power generation and storage, including solar cells which it manufactures in-house.

Mitsubishi Heavy Industries Engine & Turbocharger, Ltd. (**MHIET**) will expand sales of EBLOX, a triple hybrid standalone power supply system with renewable energy, in Africa. MHIET signed the Memorandum of Understanding (MOU) with Calik Enerji Sanayi ve Ticaret A.S. (Turkey) toward the expansion of sales. EBLOX is a system to redeem the deficit of renewable energy which is easily influenced by weather; EBLOX absorbs the power fluctuation using storage batteries to level power and generates electricity using diesel and gas engines as a backup. Focusing on the areas in Africa where the power supply network is not yet established enough, MHIET aims to disseminate EBLOX as a distributed power source with the support from Calik Enerji Sanayi ve Ticaret A.S., which has a firm connection with the markets in the area.

7. PV systems

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

Sharp Corporation, jointly with Sharp Energy Solutions Corporation and Marubeni Solar Trading Corporation, will start providing the SHARP Plan from November 2019 to purchase surplus electricity generated by residential PV systems after the end of the FIT purchase period. Sharp will offer the storage battery premium plan with the purchase price, which is 4 Yen/kWh (3.76 cents/kWh) higher than that of the SHARP Plan, for one year for customers who newly purchase residential storage batteries made by Sharp. The purchase price of the SHARP plan is 9.5 Yen/kWh (8.93 cents/kWh) in the service areas of Tokyo Electric Power Company (TEPCO) but the company purchases surplus electricity at 13.5 Yen/kWh (12.7 cents/kWh) for one year from customers who join the storage battery premium plan. The company aims to receive approximately 30,000 orders during FY 2019.

TOKAI Holdings Corporation started selling the OTS House from July 23, 2019, which realizes self-sufficiency in water and electricity completely. Adding three functions including house to protect water, house to protect electricity and house to protect living to its pillars, the company set the concept of the OTS House, to protect family, for the structure and layout, etc. Since the OTS House is equipped with PV modules (9.36 kW) and storage batteries (48 kWh) as a house to protect electricity, it can supply up to 10-kvA electricity (equivalent to 100 A) inside the house in case of power outage. The company will sell the OTS House mainly in the sales areas of its group companies such as Shizuoka Prefecture.

🔆 SHIZUOKA GAS Co., Ltd. achieved Japan's first electricity interchange among dwelling units of the condominium at CHALIER Nagaizumi GRAND MARKS in Nagaizumi Town, Shizuoka Prefecture by utilizing the IoT technology. The electricity interchange system is developed and operated by SHIZUOKA GAS. The control panels of the residential fuel cell cogeneration system (CGS) called ENE-FARM, which is installed in all dwelling units, are connected to IoT. When the electricity interchange system finds a dwelling unit using more electricity than its own output capacity of its ENE-FARM and covering the shortage of electricity with the electricity from an electric utility, it instructs all the ENE-FARMs to generate electricity and dwelling units with remaining power of electricity generation send electricity to the dwelling units with insufficient electricity. Dwelling units which sell electricity have the advantage of earning income.

7-2. PV systems for public and industrial applications

JXTG Holdings, Inc. invested in Agritree, a venture company working on the business of PV systems on farmland. As Agritree has been dealing with the spread of PV systems on farmland, the new business form which enables both farming and PV power generation at the same time and promoting the alliance with domestic companies, organizations and local governments, the company received an outstanding performance award for the accelerator program of FY 2018. These companies will co-create the new business, aiming for the mutual utilization of JXTG's stable electricity sales channel and Agritree's technology and know-how of PV systems on farmland.

NTT SMILE ENERGY CO., LTD. was selected as a business operator to install PV systems for free and supply electricity to DoCoMo mobile phone shops operated by NTT DOCOMO. Out of the allocated 368 shops, NTT SMILE ENERGY will install a PV system with an average output capacity of about 15 kW towards March 2020 on each shop which is possible to be equipped with PV systems and has an agreement with shop owners and building owners. The PV systems will be transferred to the owners of the buildings after NTT SMILE

ENERGY has supplied electricity for 17 years as an on-site power producer. DoCoMo mobile phone shops can not only provide charging services in the event of a disaster but also use cheap electricity which does not require charges for FIT program.

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

Chiyoda Corporation received two orders for Engineering, Procurement and Construction (EPC) of MW-scale PV power plants for First Solar Japan GK. An approximately 60.5-MW PV power plant will be constructed in an area which extends over Minamiyamashiro Village, Kyoto Prefecture and Iga City, Mie Prefecture for Solar Japan Project 6 GK and a 16.8-MW PV power plant will be constructed in Tsukuba Mirai City, Ibaraki Prefecture for Solar Japan Project 18 GK. For both of the projects, Chiyoda Corporation will install the latest high-performance PV modules called Series 6 manufactured by First Solar of USA.

7-4. PV business support service

Orix Corporation, in cooperation with the University of Tokyo, will develop a system to record areas of renewable energy generation such as PV power generation. The system records locations of electricity generation and power producers on the blockchain, where data cannot be altered, and issues digital certification records to businesses which purchase electricity. Orix Corporation plans to put the system into practical use within a few years and will support the environmentally conscious management.

7-5. Various products

Nothing special to report.

8. PV power generation businesses 8-1. Power producers

JR West will work on the energy harvesting by improving the Sanin Main Line Higashihama Station, where the sightseeing train TWILIGHT EXPRESS Mizukaze stops, as a net zero energy station (ZES). JR West will install a PV system (13 kW) and storage batteries (22 kWh) near the Higashihama Station to supply electricity to passenger facilities such as lighting only with natural energy consisting of PV systems and storage batteries. As to energy harvesting, JR West will collaborate with sensingnet and Shizuoka University to verify microbial power generation and power generation of environmental vibration. The new technology has a low environmental impact and can supply electricity for a long time without charging or the battery replacement. If it is used as a power source for low electric power devices such as sensors, it is expected in the future that the new technology can be applied to tunnels, which are not suitable for PV power generation, and train lines, where it is difficult to secure power sources. JR West will begin these initiatives in phases from November 2019.

Sony Corporation, jointly with TEPCO Energy Partner, Inc., will start using self-wheeling of PV electricity generated from MW-scale PV power plants from February 2020. An approximately 1.7-MW PV system will be installed on the roofs of a warehouse building for Sony products in Shizuoka Prefecture. By supplying surplus electricity to manufacturing facilities in the prefecture through the Chubu Electric Power's transmission and distribution network, all the electricity generated by the Sony group will be used for self-consumption. Sony will realize equalizing the amounts of generated electricity, electricity for self-wheeling and the demand at an instant by building and introducing for the first time a system which utilizes the technology of highly-accurate electricity generation forecasting and demand forecasting by the TEPCO group. Joining RE100 in September 2018, Sony plans to expand self-wheeling of PV electricity, etc.

CLEAR EARTH started public inspection of the report on the environmental impact assessment (EIA) on the Sendai Imozawa PV project (tentative name) planned in Sendai City, Miyagi Prefecture. Expecting the output capacity to be approximately 26 MW, the company will install approximately 86,000 multi-crystalline silicon (mc-Si) PV modules in an approximately 119.4-ha site. The construction and operation are scheduled to start in FY 2022 and FY 2024, respectively.

8-2. PPS

Daiwa House Industry Co., Ltd. will start the Daiwa House Denki service from November 2019 to purchase surplus electricity and sell electricity for owners of residential PV systems after the termination of the FIT purchase period. The company offers the PREMIUM plan with the purchase price of 11.5 Yen/kWh (10.8 cents/kWh) and the PREMIUM storage battery plan with 22 Yen/kWh (20.7 cents/kWh) for the owners of houses built by Daiwa House Industry and the GENERAL plan with the purchase price of 10 Yen/kWh (9.4 cents/kWh) for the owners of houses built by the other housing companies. As to electricity sales, Daiwa House Industry offers a sales plan with the selling price, which is 3 % lower than that of the electric utilities, for the owners of detached houses built by Daiwa House Industry and a sales plan for the owners of detached houses built by the other housing companies. The non-fossil value of surplus electricity, which Daiwa House Industry purchases, will be sold to businesses participating in the RE100 initiative and owners of detached houses. Also, it will be used at factories and offices of Daiwa House group effectively.

Marubeni Solar Trading Corporation partnered with TRUSTBANK for a service to purchase surplus electricity from residential PV systems after the termination of the FIT

purchase period. Marubeni Solar Trading will start a service nationwide from November 2019 to offer local specialty products for a consideration. Marubeni Solar Trading Corporation plans to sell surplus electricity, which the company purchases, to Japan Electric Power Exchange (JEPX), etc. TRUSTBANK will adjust specialty products for gift by utilizing the know-how which it has cultivated through the operation of the website for *Furusato nozei* ("benefit-your-locality" tax scheme; a system in which taxpayers can choose to divert part of their residential tax to a specified local government), etc.

SHIZUOKA GAS Co., Ltd. will increase the purchase price from 7 Yen/kWh (6.58 cents/kWh) announced in March 2019. to 8.3 Yen/kWh (7.8 cents/kWh) for a service to purchase surplus electricity generated from residential PV systems after the termination of the FIT purchase period. The service covers the entire area of Shizuoka Prefecture and some parts of Nagano Prefecture and Yamanashi Prefecture and the company will provide the premium unit price for the premium menu. The premium menu has five requirements as follows: 1) city gas contract; 2) electricity contract; 3) purchase or lease of Eco Cute, a highly-efficient heat pump; 4) purchase or lease of inverter; and 5) provision of home energy usage data with HEMS. The premium unit price is 0.2 Yen/kWh (0.188 cents/kWh) for each condition. Therefore, the purchase price can be up to 9.3 Yen/kWh (8.74 cents/kWh) when all the requirements are satisfied.

PPS Oita will start offering a service to purchase surplus electricity generated from residential PV systems from November 2019 after the termination of the FIT purchase period. The purchase price is 10 Yen/kWh (9.4 cents/kWh) (10 % consumption tax included), and the amount paid for surplus electricity will be offset by the electricity bill. The service is applicable to heat pump water heaters (Eco Cute, etc.) which consume relatively large amounts of electricity generated from PV systems is the prerequisite. The contract period of the service is from the day after the expiration of the purchase period to the day before the meter reading date in April of the following year. The contract is automatically renewed every year thereafter.

Minna Denryoku will start offering a service to purchase surplus electricity generated from residential PV systems from November 2019 after the termination of the FIT purchase period by using the electricity trading platform. Households with surplus electricity choose operators among renewable energy consumers contracting with Minna Denryoku and supply electricity through the platform. Then, Minna Denryoku offers the purchase price of 8 Yen/kWh (7.52 cents/kWh), or goods, coupons or other gifts equivalent to the purchase price. As to the service to purchase surplus electricity from homes, the company aims to build a network of 500 to 1,000 customers in 2019 and to increase the number of electricity sales contracts to 5,000 by the end of FY 2019 by targeting all traditional power producers and all households with surplus PV electricity as renewable energy sources.

SMART TECH will revise the purchase prices for some regions for its service to purchase surplus electricity generated from residential PV systems after the termination of the FIT purchase period. Previously the purchase prices were set at 10 Yen/kWh (9.4 cents/kWh)(including tax) uniformly for six regions including Tokyo, Tohoku, Chubu, Kansai, Chugoku, and Kyushu regions, but the company decided to increase the purchase prices in Tohoku and Tokyo regions to 11.5 Yen/kWh (10.8 cents/kWh)(including tax).

CO-OP Sapporo will start offering a service to purchase surplus electricity generated from residential PV systems through a Power Producer and Supplier (PPS) Todock electricity, an affiliate of Co-op Sapporo, from November 1, 2019. The purchase prices are 11 Yen/kWh (10.3 cents/kWh) for users of Coop's electricity plan, 13.5 Yen/kWh (12.7 cents/kWh) for users of Coop's electricity plan + Coop's kerosene plan and users of Coop's electricity plan + Coop's gas plan and 15 Yen/kWh (14.1 cents/kWh) for users of Coop's gas plan. The purchase area is Hokkaido Prefecture excluding remote islands.

CHUKAI CABLE TELEVISION will start offering a service to purchase surplus electricity generated from residential PV systems from November 2019. The company's service covers the western area of Tottori Prefecture. The company will set the purchase price in August 2019, which will be higher than Chugoku Electric Power's purchase price of 7.15 Yen/kWh (6.72 cents/kWh). In order to cultivate new customers, the company will publicize benefits for new subscribers of its cable TV service, its main business, etc. in addition to the purchase price.

Sunjunior will start offering a service to purchase surplus electricity generated from residential PV systems from November 1, 2019 after the termination of the FIT purchase period. The purchase prices are 9 Yen/kWh (8.46 cents/kWh) for PV systems installed by the company and 8 Yen/kWh (7.52 cents/kWh) for PV systems installed by the other companies. The purchase service is for the owners of <10 kW PV systems after the end of the FIT purchase period. The company aims to receive 100 orders for the first fiscal year.

9. Finance-related business

Japan Bank for International Cooperation (JBIC) will support dissemination of renewable energy in Africa and intends to provide 400 billion Yen (\$ 3.76 billion) scale finance over three years until FY 2021. As decarbonization has been gaining momentum globally, the bank will counter China which is becoming more influential with its huge amounts of economic assistance, by starting joint financing with The Export-Import Bank of Turkey and The Export-Import Bank of India. Sumitomo Mitsui Trust Bank, Limited concluded business alliance with Toshiba Energy Systems & Solutions Corporation in the sales of self-consumption type PV systems for companies. The alliance will support companies aiming to achieve a goal of AFFORDABLE AND CLEAN ENERGY, one of the goals of Sustainable Development Goals (SDGs), when they install PV modules on the rooftop of their factories and in idle lands. If companies that consume large amounts of electricity switch to in-house power generation, they can not only reduce the burden of electricity cost but also contribute to dissemination of environmentally friendly clean energy including a significant reduction of carbon dioxide.

SoftBank Vision Fund L.P. invested \$ 110 million in Energy Vault, a renewable energy venture in Switzerland. This is the first time for the company to invest in a start-up company in the energy storage business.

Regional banks will enforce financing for small- and medium-sized entities (SMEs) to install self-consumption type PV systems. 20 banks including Bank of Yokohama and The Nishi-Nippon City Bank, Ltd. launched the Kokoro (heart) Project from July 2019, cooperating with West Holdings Corporation, a leading PV project developer. While the banks will introduce companies that have interest in PV power generation to West Holdings and finance the installation cost, the companies that install PV systems can lower their electricity cost to less than that of existing contracts by covering the electricity consumption with PV power generation. The most significant feature is that the amount of CO2 reduction will be sold and cashed using the J-Credit Scheme by the national government, and the profit raised will be donated to local childcare support and afforestation projects.

Sumitomo Mitsui Financial Group, Inc. created and issued a green bond (environmental bond) for Ergon Perú, an energy company that handles business to bring electricity to rural areas of Peru. The amount is \$ 222 million (about 24 billion Yen), the period is 15 years, and the yield is expected to be around 4 % to 5 %. The demands from US infrastructure funds, life insurance companies, and pension funds, etc. are expected. The funds raised will be used to install PV systems to rural areas.

10. R&D institutions

Okinawa Institute of Science and Technology Graduate University (OIST) achieved conversion efficiency of 18 % on perovskite solar cells using inorganic perovskite material, in a joint research with Shanghai Jiao Tong University and Swiss Federal Institute of Technology in Lausanne (EPFL). They successfully repaired structural cracks by treating cesium-lead-iodine (CsPbl3) material, with choline iodide solution. This facilitated the delivery of electrons, so that the conversion efficiency of solar cells improved from the existing rate of 15 % to 18 %, up by three percentage points.

11. End users and other topics

 Japan Photovoltaic Energy Association (JPEA) announced that the total PV module shipment for the guarter between April and June 2019 (1st guarter of FY 2019) was 1,584,909 kW, a 15 % increase YoY, of which the domestic shipment was 1,493,277 kW, a 19 % increase YoY and the overseas shipment was 91.632 kW, a 24 % decline YoY. By application. shipments for both residential and non-residential applications increased; the shipment for residential applications was 280,318 kW, a 19 % increase YoY and the shipment for non-residential applications was 1,212,144 kW, a 19 % increase YoY. Among the non-residential applications, the shipment for utility-scale applications was 649,590 kW, a 10 % decline YoY and the shipment for commercial applications was 562,554 kW, an 88 % increase YoY.

RTS Corporation published the Overseas PV Markets Report 2019, in which the current status and the forecast of PV markets in leading countries and emerging countries in the world are compiled. The report includes the data provided by the national governments and related organizations and the papers on the latest international conferences and exhibitions. The global PV market in 2018 grew slightly from the previous year to 100 GW, due to the market growth in Southeast Asia, Australia, Middle East, etc., despite the shrinkage of the market in China. The global market is expected to grow in 2019 as well to the level between 105 GW and 128 GW which exceeds the result of 2018, driven by the countries such as China, India and the US.

Fuji Keizai Co., Ltd. announced that the market of renewable energy power generation systems in Japan will be 1,052.1 billion Yen (\$ 9.89 billion) in FY 2030, a 47.9 % decline from FY 2017. Although PV has led the market so far, it is expected to shrink to less than 30 % of the scale in FY 2018 due to the circumstances such as the revision of the FIT program. On the other hand, the markets of wind power and hydropower are expected to become active. The cumulative installed capacity of renewable energy power generation systems will grow from 71,830,000 kW of FY 2018 (estimate) to 126,870,000 kW in FY 2030, among which PV will be 97,300,000 kW.

Renewable Energy Institute released a report which introduces advanced efforts of RE100 member companies, etc. Introducing the trends and activities of companies in Japan and the world from the four fields of IT/ Electronics, Consumer goods/ Services, Construction/ Real estate and Automobile, the report sorted out the important points and requirements of procuring renewable energy by the methods of procurement, such as self-consumption and the purchase of certificates. The report points out that the promotion of introducing renewable energy could improve profitability and expand transactions.

PV Shipments in Japan

(1) Total Shipments



Breakdown of Total Shipments



(2) Domestic Shipments





Domestic shipments by technology

* No data by techology is available from July 2018 onwards.

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



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



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

Monthly shipment

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

PV system price trends in Japan (tax excluded)

(1) <10 kW (residential)



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*

Trends of Prod	Juction (Capacit	ty and C	Versea	IS Depl	oyment	t by Majo	or PV Mai	nufactu	rers in Japan (E	estimated capacity at the end of each y	ear) (As of August 30, 2019) (Unit: MW/year)
PV cell/ module	Tachnology			Ce	II Capacit	y (Domes	tic Plant)			Dom	estic Plant	Oversease Dlant
Manufacturer	Icuilludy	2013	2014	2015	2016	2017	2018	2019 Current	2019 Plan	Cell	Module	
Kyocera	ы С	1,000	1,200	1,200	1,200	1,400	600	600	600	Higashioumi (formerly Yokaichi), Shiga (stopping production by the end of December 2017 →Yasu plant in 2018) Yasu, Shiga	Mie (stopping production by the end of March 2017 → China plant and Outsourced production) Higashioumi (formerly Yokaichi), Shiga (stopping production by the end of December 2017 →Yasu plant in 2018)	 PV module plant in Tianjin, China: 360 PV module plant in Tijuana, Mexico: 240 (stopping production) PV module plant in Kadan, Czech Republic: 560 (stopping production) PV module plant in San Diego, USA: 30 (stopping production)
Solar Frontier	CIS	1,080	1,080	1,150	1,110	1,050	1,050	1,050	1,050	Tano, Miyazaki (20) (suspended, shi Kiyotake, Miyazaki (60) (stopping pro Kunitomi, Miyazaki (900) Ohira, Miyagi (150) (suspend operat	fited to a research facility, sold) duction by the end of December 2017) ion in the end of September 2017)	- Planning overseas Plant in USA, Middle East etc.
Panasonic (SANYO Electric)	 ب	600	600	600	680	620	620	620	620	Nishikinohama, Osaka (suspend operation) Shimane (300)	Nishikinohama, Osaka Shiga (plan to stop production by the end of March 2018)	 PV cell/module plant in Kedah, Malaysia: 360 (plan to transfer to GS Solar) PV Si ingot plant in Oregon, USA: (plan to stop production in October 2017, dose in March 2018) PV cell/module plant in N.Y., USA FV cell/module plant in N.Y., USA FV module plant in Monterrey, Mexico: 75 stopped production in 2012) PV module plant in Dorog, Hungary: 315 (closed n March 2014)
	a-Si	5	5	5	5	5	5	5	5	Fukushima		
Sharp	c-Si	200	200	210	210	210	210	210	210	Sakai, Osaka (210) (Nara (550) sale of equipment and withdrawal)	Sakai, Osaka (Yao, Osaka/ Nara/ Tochigi sale of equipment and withdrawal)	 PV module plant in Memphis, Tennessee in USA: 100 (withdrawal by the end of March 2014) PV module plant in Wrexham, UK: 500 (withdrawal by the end of 2014)
	TF Si	160	160	160	Production Stopped	•	•	•		Nara (160) TF Si: sale of equipment (Sakai, Osaka (160) stop production	and withdrawal (ongoing III-V Solar cells) after finishing current order)	- TF silicon PV module plant in Italy: 160 (withdrawal in 2014)
Mitsubishi Electric	c-Si	300	300	330	330	330	Production Stopped	•		Nagano	Kyoto (530)	
Kaneka	a-Si TF Si Hybrid	- 120	- 120	- 120	120	120	120	120	120	Hyogo * c-Si: Pilot production		 PV module plant in Olomouc, Czech Republic: 30 (withdrawal in 2012)
Choshu Industry	c-Si	30	30	30	30	30	30	30	30	Yamaguchi	Yamaguchi (180) Outsourced production (20)	
F-WAVE Company	Flexible TF Si	(24)*	24	24	24	24	24	24	24	Kumamoto *Transfer from Fuji Electric on March 31, 2014	Kumamoto (10) (plan to start production BIPV - resin roof materials in Kumamoto)	
Module manufactu	rers (c-Si)			Module C	apacity (I	Domestic	Plant)					
Fujiprean	۲	112	112	120	120	9	9	9	9	Hyogo		
Denkasin	<u>ki</u>		12	12	12	12	12	12	12	Ehime		
S Power Towada So	- -	20	20 15	20 60	20	20 60	20 60	20 60	20 60	Yamagata		
Japan Solar (II	NFINI)	2	2	80	80	180	120	120	120	Tochigi (80), Fukushima (120)		
Energy Ga Source: Press relea	ap ìses, mater	rials from i	internation	al confere	snces, coi	200 mpanies á	200 201 interviev	500 ws, etc., con	500 npiled by ©	Kagosnima) RTS Corporation		

Trends of Production Canacity and Overseas Denloyment by Maior DV Manufacturers in Janan

Topics from the World

Topics from Global PV Industry

1. New Entry

Nothing special to report.

2. New Technologies Entry

Nothing special to report.

3. Expansion of Sites

Nothing special to report.

4. Production Capacity Expansion Plan

Country	Organization	Areas	Activities
UK	Oxford PV	Solar cells/ modules (thin- film/ other)	Plans to start mass production of n-type c-Si/perovskite tandem solar cells by the end of 2020
China	Solargiga Energy	Solar cells/ modules (c-Si)	Announced that its 600-MW/year sc-Si ingot and wafer factory in Qujing City, Yunnan province, China was completed and started operation
Taiwan	Taiwan Solar Energy (TSEC)	Solar cells/ modules (c-Si)	Announced that it will expand its PV module production capacity to 850 MW/year by the first quarter of 2020

5. Withdrawal/ Restructuring

Country	Organization	Areas	Activities
Germany	Solibro GmbH	Solar cells/ modules (thin- film/ other)	Reportedly it will file for insolvency
China	China Power Clean Energy Development	Large-scale ground- mounted PV system	Delisting from Hong Kong Stock exchange was approved
China	Hanergy Thin Film Power group (HTF)	Solar cells/ modules (thin- film/ other)	Plans to sell a 3-GW hydropower project through the auction

6. Joint Venture/ Business Partnership/M&A

Country	Organization	Areas	Activities
Canada	Power Energy	Finance related business	Acquired Nautilus Solar Energy (USA)
Germany	BayWa r.e.	Large-scale ground- mounted PV system	Acquired National Solar Distributors (Canada) as a part of North American expansion
France	Ciel et Terre International	Inverters/ supporting structures	Signed a memorandum of understanding (MOU) with Thai petrochemical company SCG to jointly develop floating PV systems on hydropower plants in Thailand
China	GS Solar	Solar cells/ modules (thin- film/ other)	Signed a strategic partnership comprehensive contract with Shanxi Coal International Energy Group (China) to establish a 10- GW/year heterojunction solar cell factory
Malaysia	IL Energy	Finance related business	Formed a partnership with Shun Hing Overseas Investment (Hong Kong) to jointly participate in the 500-MW PV project auction
Malaysia	Pestech International	Large-scale ground- mounted PV system	Signed a memorandum of understanding (MOU) with Sungrow Power Supply (China) to jointly develop floating PV systems
Singapore	REC Solar	Solar cells/ modules (thin- film/ other)	Agreed to form a strategic partnership on heterojunction PV modules with Meyer Burger Technology (Switzerland)

7. Orders/ Supply Agreements

Country	Organization	Areas	Activities
China	Daqo New Energy	Si feedstock	Signed an agreement to supply 112,800 t of polysilicon to LONGi Green Energy Technology (China)

8. Financing/ Investment

Country	Organization	Areas	Activities
USA	Sunnova Energy International	Residential PV systems (houses/ collective housing)	Listed on New York Stock Exchange
USA	United States Trade and Development Agency (USTDA)	Government and policy measures	Agreed to finance a feasibility study for a 150-MW hybrid PV, wind and storage project in northern Zambia
Germany	German Government	Government and policy measures	Provided € 156 million of low interest loan to develop renewable energy in Bangladesh
Spain	Renovalia	Large-scale ground- mounted PV system	Secured € 29.7 million of finance from Banco Sabadell (Spain)
Thailand	Agility	Other	Announced that it has invested \$ 18 million in green supply chain technologies through its subsidiary Agility Ventures (Thailand)
Australia	Australia and New Zealand Banking Group (ANZ)	Finance related business	Added its loan facility amount for clean energy finance program by \$100 million to \$250 million

Trends of Production Capacity of Polysilicon M	lanufacturers	(Estimated	I capacity at	t the end of	each year, ii	ncluding sol	ar-grade sil	icon (SOG-	Si), etc. (A:	s of August	30 2019) (Ui	nit: t/year)
Company	Droduction Site	2012	2013	2014	2015	2016	2017	2018	2019	2019	2020	2021
Company		7177	2010	4107	C1 07	5010	7117	7010	(Current)	(Plan)	(Plan)	(Plan)
Tier 1 manufacturers (7 companies)												
	China (Xuzhou City, Jiangsu)	65,000	65,000	65,000	75,000	75,000	75,000	70,000	70,000	60,000	55,000	55,000
JUL-Park Energy Holaings	Criina (Xinjiang Uygnur Autonomous Region)		ı	ı	·	·		20,000	48,000	60,000	80,000	80,000
Marker Chemie (Marker Polysilicon)	Germany (Nünchritz)	52,000	52,000	52,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	USA (Charleston, Tennessee)	•	,	•	20.000	20.000	20.000	20.000	20.000	20.000	20,000	20.000
OCI Promonic	Korea (Gunsan)	42,000	42,000	42,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000
	Malaysia (Sarawak)	-	-	-	-	-	13,800	20,000	27,000	27,000	48,000	48,000
Hemlock Semiconductor Corporation	USA (Hemlock, Michigan)	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
REC Silicon (ASiMI: Advanced Silicon Materials) REC Silicon (SGS: Solar Grade Silicon)	USA (Butte, Montana) ILISA (Moses Lake, Washington)	21,500	20,000	20,000	20,000	20,000	20,000	20,000	20,000	2,000	2,000	2,000
Shaanxi Non-Ferrous Tian Hong REC Silicon Materials (Yulin	China (Yulin, Shaanxi)			-			-	19,300	19,300	19,300	19,300	19,300
Tokuvama Comoration	Japan (Shunan, Yamaquchi)	9,200	11,000	6,200	6,200	8,500	8,500	8,500	8,500	8,500	8,500	10,000
	<u>Malaysia (Sarawak)</u>		6,200	13,800	13,800	13,800		•				
SunEdison (former MEMC Electronic Materials) 🕁 GCL	USA (Pasadena, Texas)	8,000	8,000	8,000	8,000	8,000	8,000					
Other major non-Tier 1 manufacturers												
DSAKA Titanium technologies	<u>Japan (Kishiwada, Osaka)</u>	3,900	3,000	3,000	3,000	3,000	3,000	3,000		,		ı
Mitsubishi Materials Corporation	Japan (Yokkaichi, Mie)	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Mitsubishi Polycrystalline Silicon America Corporation (MiPSA)	USA (Theodore, Alabama)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Hankook Silicon (HK Silicon)	Korea (Yeosu)	3,200	3,200	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Hanwha Chemical	Korea (Yeosu)		10,000	10,000	10,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
KINTE ENERGY/ TBEA Xinjiang Sunoasis	China (Xinjiang Uyghur Autonomous Region)	3,000	6,000	18,000	22,000	30,000	30,000	36,000	72,000	80,000	80,000	80,000
(Chongqing) Daqo New Energy	China (Shihezi, Xinjiang Uyghur Autonomous Region)	4,300	6,000	12,150	12,150	12,150	20,000	30,000	35,000	35,000	70,000	100,000
	China (Leshan, Sichuan)	4,000	4,000	4,000	12,000	15,000	20,000	55,000	55,000	55,000	55,000	70,000
Yongxiang Polysilicon (Tongwei Group) *included LONGi JV	China (Baotou, Inner Mongolia Autonomous Region)			ı			·	25,000	25,000	25,000	25,000	50,000
China Silicon Corporation-SINOSICO	China (Luoyang, Henan)	10,000	10,000	10,000	15,000	15,000	18,000	20,000	20,000	20,000	20,000	20,000
Asia Silicon	China (Qinghai)	5,000	5,000	5,000	12,000	12,000	15,000	20,000	20,000	20,000	20,000	20,000
East Hope Group	China (Xinjiang Uyghur Autonomous Region)						15,000	30,000	30,000	30,000	30,000	30,000
-DK Solar	China (Xinyu, Jiangxi)	17,000	17,000	19,200	10,000	10,000	10,000					
nner Mongolia DunAn Photovoltaic Science and Technology	China (Inner Mongolia Autonomous Region)				8,000	8,000	10,000	10,000	10,000	15,000	15,000	15,000
Combo (Jiangsu)	China (Yangzhou, Jiangsu)						10,000	10,000	10,000	10,000	10,000	10,000
Others (Japan)		3,780	3,000	3,000	3,000							
Others (China)		18,000	14,000	30,000	30,000	30,000	47,000	44,000	44,000	47,000	57,000	57,000
Others (Korea)		6,100	0	13,500	13,500	13,500	13,500					
Middle East		1	,				8,000	8,000	8,000	8,000	8,000	8,000
Others (Europe (including Russia))		2.450			-	- 170 050	- 100	- 10 100				
lotal (Estimate)	· · · · · · · · · · · · · · · · · · ·	325,730	332,700	387,150	457,950	4/3,250	544,100	648,100	/21,100	/21,100	802,100	8/3,600
This table includes only the production facilities which are assumed	d to be in operation and NOT include th	iose out of pr	oduction.									

* Other UMG-Si supplier candidates: Elkem Solar (Norway, 7,500 t, production), Silicor Materials (Iceland (Headquarter: USA), 19,000 t, scheduled to start operation in 2019) * Other supplier candidates: GCL/Essel (India, polysilicon ~ PV module 5GW/y, completion schedule 2020), Saudi Basic Industries Corporation (SABIC)/Schmid (Saudi Arabia), Solargise Canada (11N Poly Silicon and MgSi, Under planning)

Trends	of PV Module Proc	Juction (Shipments, S	àales) (Q	uarterly	v) by Glt	obal Maj	jor PV N	Aanufactur	ers			A)	s of August	30, 2019) (Unit: MW)
2018 Decline	PV cell/ module	Counter.	Tochesology	2017			2018					2019			
Kanking **	Manufacturer	Country	recrimology	Total	Jan Mar.	Apr Jun.	Jul Sep.	Oct Dec.	Total	JanMar.	AprJun.	JulSep.	OctDec.	Target	DO N
-	JinkoSolar	China	c-Si	9,807	2,015	2,794	2,953	3,618	11,380	3,037	3,386	3,200- 3,500**		14,000- 15,000**	Module Shipments
7	JA Solar	China	с-Si	7,143	ı	ı		ı	8,500	I					Module Shipments
с	Trina Solar	China	с- Si	9,000	ı	,			7,537						Module Shipments
4	Canadian Solar	Canada	с- Si	6,828	1,374	1,700	1,590	1,951	6,615	1,575	2,143	2,200- 2,300**		8,400- 8,500**	Module Shipments
5	LONGi Green Energy Technology	China	с. S	3,507	3,2	32	3,34	49	6,581	3,1	93			9,500**	Module Shipments
9	Hanwha Q CELLS	Korea	с-Si	5,438	'				5,600		-				Module Shipments
2	GCL System Integration Technology (GCLSI)	China	N S	4,840	5.3	40	2,2,	28	4,568	1				6,500- 7,000**	Module Shipments
ω	Risen Energy	China	c-Si	2,806	1,4	94	1,8{	57	3,350	2,7	'80			6,000- 8,000**	Module Shipments
6	Shunfeng International Clean Energy (SFCE)	China	с-Si	2,403	1,3	66	1,9(03	3,301						Module Shipments
10	Chint Electrics	China	c-Si	2,403	-		•		3,094	ı					Module Shipments
** Prelim	inary figure, Compiled	by ©RTS	Corporation												

Trends of N	<u>Nodule Producti</u>	on Capac	sity by Global	Major PV I	<u>Manufactu</u>	rers					(As	of August 30 2019) (Unit: MW/year)
2018	PV cell/ module				Annual	Production Ca	apacity			Plan		
Ranking (Preliminary)	Manufacturer	Country	Technology	End of 2014	End of 2015	End of 2016	End of 2017	End of 2018	End of 2019	End of 2020	End of 2021	Manufacturing Site
~	JinkoSolar	China	c- <u>Si</u>	3,200	4,000	6,500	8,000	10,800	16,000	16,000	16,000	China, Malaysia, USA
3	JA Solar	China	c-Si	2,800	3,900	5,500	7,000	8,500	9,500	9,500	9,500	China, Malaysia
2	Trina Solar	China	c-Si	4,000	5,000	6,000	6,757	7,027	8,000	8,000	10,000	China, Thailand, Vietnam, Malaysia
4	Canadian Solar	Canada	c-Si	2,600	4,330	6,170	8,110	8,880	12,220	12,220	12,220	China, Canada, Brazil, South East Asia, Taiwan
5	LONGi Green Energy Technology	China	c-Si	300	1,500	5,000	6,600	8,800	16,000	16,000	30,000	China, Malaysia
9	Hanwha Q-Cells	Korea	c-Si	2,200	4,300	5,700	8,000	8,400	10,700	10,700	10,700	Korea, China, Malaysia
7	GCL System Integration Technology (GCLSI)	China	c-Si	100	3,700	5,000	5,400	5,400	5,400	5,400	5,400	China, Vietnam
8	Risen Energy	China	c-Si	Ι	1,800	3,100	6,600	8,600	14,100	14,100	16,500	China, Mexico
б	Shunfeng International Clean Energy (SFCE)	China	c-Si	2,400	2,400	2,000	2,200	3,000	I	I	I	China (Expected to sell production subsidiary)
10	Chint Electrics	China	c-Si	Ι	1,300	1,663	2,500	3,400	4,800	4,800	7,600	China

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

"PV Activities in Japan and Global PV Highlights"



- RTS flagship monthly report -

Price: 96000 JPY/year

Executive Editor: Osamu IKKI, President, RTS Corporation

RTS Corporation has been publishing "PV Activities in Japan and Global PV Highlights" since 1995. This flagship monthly report provides the latest information on PV activities in Japan and highlights of global PV activities. It covers monthly trends of all the sectors related to PV in Japan ranging from national government to project developers. The report also covers topics from Japan including this PV shipments and price trends. Global topics are also covered in the report such as quarterly trends of solar cell production by global top PV manufacturers. This report has been acquiring an international reputation.

To order, please fill out the order form on the reverse side and send via facsimile to +81-3-3553-8954 or e-mail to order@rts-pv.com.

PV Highlights in Japan:

- Monthly PV Highlights, summary of the national PV budget, summary of Japan's PV related programs and policy concerning PV, domestic PV conferences & exhibitions, PV cell/ module shipment volume, etc.

- **RTS Monthly Perspective**
- RTS Trends Analysis on the Japanese PV Market

- RTS Monthly Focus

Global PV Highlights:

Major PV conferences & exhibitions, installed capacity of PV systems in the world, global solar cell production, etc.

Contents

Monthly PV Photo Gallery:

Interesting photographs of PV systems recently installed in Japan and overseas with descriptions: residential PV systems, PV systems for public, commercial and industrial facilities, MW-scale PV power plants, etc.

Topics from Japan:

News from the national and local governments, utilities, PV material/ component manufacturers. PV cell/ module manufacturers, balance of systems (BOS) manufacturers, PV systems (residential/ public/ industrial/ large-scale), PV manufacturing equipment and measuring device manufacturers, financial institutions, R&D institutions, and end users

PV Shipments, PV Price Trends

Topics from the World:

- Topics from global PV industry covering new entry, new business/ technologies entry, expansion of sites, expansion of production capacity, joint venture/ business partnership, M&A/ restructuring, order/ supply agreements, financing
- Trends of production capacity of polysilicon manufacturers
- Trends of solar cell, module production (shipments, sales) by global top 10 PV manufacturers
- Trends of production capacity by global top 10 PV manufacturers

RTS Corporation is a Japanese consultancy exclusively engaged in photovoltaic (PV) power generation. Our research and investigation capabilities contribute to Ministry of Economy, Trade and Industry (METI), New Energy and Industrial Technology Development Organization (NEDO), National Institute of Advanced Industrial Science and Technology (AIST), Japan Photovoltaic Energy Association (JPEA), leading PV cell/ module manufacturers in Japan and overseas, major electric utilities, developers of utility-scale PV projects, major silicon manufacturers, users of PV systems, equipment companies and a wide range of PV players in Japan and overseas. Our monthly report "PV Activities in Japan and Global PV Highlights" has been acquiring an international reputation.



RTS Corporation

Qus Hatchobori Daiichi Bldg. 4F, 3-19-2, Hatchiobori, Chuo-ku, Tokyo 104-0032, Japan TEL: +81-3-3551-6 3 4 5 FAX: +81-3-3553-8 9 5 4 e-mail: info@rts-pv.com URL: www.rts-pv.com





FAX: +81-3-3553-8954 / E-mail: order@rts-pv.com Monthly Report "PV Activities in Japan and Global PV Highlights" <u>ORDER FORM</u>

- Subscription rate: 96000 JPY per year (ANNUAL Subscription ONLY)

* Japanese consumption tax will be added for companies located/operating in Japan.

Please fill in block letters.		Date:	/	/	
			(YY/	/MM/DD)	
First Name Prof. / Dr. / Mr. / Ms. (please circle)	Family Name				
			1 1		
Title					
Company / Organization					
Address					
City	State				
			1 1		
Postal code	Country				
	-				
Telephone	Facsimile				
			1 1		
E-mail					
Media (please check the box below):					
If you subscribe the PDF version of PV Activities in Jap 1) Duplication of the publication (e.g., by printing, photocom)	ian and Global PV	Hignlight	S: artvie pro	ohihited	
2) Circulation of the original printed version or the PDF versi	on outside of your d	livision of t	he organi	ization is prohibit	ed.
I agree with the conditions and want to receive a P	DF version via E	-mail.	-		
\Box Lagree with the conditions and want to receive a p	rinted version via	airmail			

I agree with the conditions and want to receive a printed version via airmail.

□ I agree with the conditions and want to receive both of a PDF version via E-mail and a printed version.

Payment Options:

□ Credit Card* (□ VISA or □ Master Card) *For international customers only

* If you would like to pay by credit card, please kindly contact us when sending us an order form.

Bank Transfer* (Customer is responsible for the bank transfer fee.)

* If you would like to pay through a bank transfer, we will send you an invoice with our bank account details.

Paypal* (Customer is responsible for the bank transfer fee.)



RTS Corporation

"PV Market in Japan 2018"

Current Status and Future Prospects -

(Published in September 2018)

This report provides a comprehensive analysis of the PV market in Japan, one of the key PV markets in the world with outstanding opportunities for PV players thanks to the generous government incentives and the nation's high motivation for renewable energy after the Great East Japan Earthquake in 2011 and the Fukushima nuclear disasters. Details of Japan's Feed-in Tariff (FIT) program featured by the revision of the FIT Act and statistics of approved & installed projects under FIT, will help you better understand the Japanese PV market. The report covers support programs for the PV systems with an overview of PV-related regulations, standards, codes and certification. Outlook of PV market in Japan provides an overview of introduction potential. Corporate profiles of PV manufacturers and inverter manufacturers are covered. In addition, PV players including developers, EPCs and financial institutions are listed in tables. RTS is pleased to help you enter and increase the presence in the Japanese PV market with this all-inclusive report.

As an OPTION, RTS offers a list of MW-scale PV projects commissioned and in the pipeline in Japan. Since the FIT program started in Japan on July 1, 2012, development of MW-scale PV projects sharply increased. The list provides you with details of over 2,700 MW-scale PV projects conducted by a variety of operators as of the end of September 2018. The list will be updated 3 times in December 2018, March and June 2019 and be provided to purchasers of this report.

To order, please fill out the order form on the reverse side and send via facsimile to +81-3-3553-8954 or e-mail to order@rts-pv.com.

Format: Printed Copy + PDF (CD-ROM)

Table of Contents

- 1 Executive Summary: Overview of the Japanese PV Market
- Status of the Japanese Market in 2017
- Status of PV Module Shipments in Japan
- PV Dissemination Measures in Japan
- 2 Feed-in Tariff (FIT) Program for Renewable Energy in Japan
- Overview of the Feed-in Tariff (FIT) Program in Japan
- Feed-in Tariffs (FITs)
- Surcharge for the FIT Program
- Revision of the FIT Program under the Revised FIT Act
- Statistics of Approved & Installed PV Projects under the FIT Program
- Large-scale PV Systems in Japan

3 Outlook of the Japanese PV Market

- RTS Outlook on the Japanese PV Market
- Long-term Energy Supply-demand Outlook by METI
- Possible Installation Capacity and Potential of PV Introduction by MoE
- Feasibility of RE Introduction for 2050 by MoE
- Outlook by NEDO
- JPEA PV Outlook
- Outlook of the Energy Mix and Power Generation Volume by OCCTO

4 Current Topics

- Japan's National Policy on PV Power Generation
- Efforts by the METI, MoE, MAFF, MOFA
- Discussions at the Working Group on Grid Connection of RE
- Interim Review of the Subcommittee for Large-volume Introduction of Renewable Energy and Next Generation Electricity Network
- Result of the First Tender in FY 2017
- PV Power Generation in the FY 2018 Power Supply Plan by Electric Utilities
- Calculation of Possible Grid Connection Capacity and Outlook of Output Curtailment in Each Electricity Supply Area - The First Auction of Non-Fossil Value Trading Market
- Proposal for Development of PV Industry (PV 150) by RTS Corporation
- Suggestions Related to the Energy Strategy for 2050 by the Round Table
- for Studying Energy Situations
- PV Module Shipments in 2017
- Trends of Storage Batteries for PV Systems
- List of FY 2018 Budget to Support Self-Consumption and Storage by the
- Ministries - Measures Related to Dissemination of ZEH for FY 2018

5 Overview of Programs for Introduction of PV systems

- Overview of Support Programs by the National Government
- Overview of Support Programs by Local Governments
- Overview of Tax Credit
- FY 2018 Budget for PV
- 6 Installed Capacity of PV Systems in Japan
- Cumulative and Annual Installed Capacity of PV Systems
- Trends of Market Segment in Japan

7 Price of PV Systems

- Price of Residential PV Systems
- Price of PV Systems for Public and Industrial Applications

8 PV Industry in Japan

- PV Cell/ Module Production by Manufacturer
- PV Module Shipment by JPEA Data
- PV Production and Shipment Statistics in Japan by METI Data
- Trends of Production Capacity and Oversea's Deployment by Major PV Manufacturers in Japan
- Shipments of PV Inverters in Japan

9 Overview of Japanese PV Players

- Structure of the PV Industry and Major PV Players in Japan
- Lists of PV Players in Japan by Sector
- Solar Cell/ PV Module, Inverter Manufacturers
- New Financing Model in the PV Market in Japan
- New PV Applications
- Secondary Market and Replacement Market of PV Power Plants
- Refurbishment and Repowering of PV Power Plants

10 Overview of the Codes and Standards Related to PV in Japan

- Codes and Standards related to PV in Japan
- JET Certification of PV Modules, Inverters and O&M
- Related Regulations, Standards, Codes, Certification and Organizations

11 PV Activities in Japan in 2017

Appendix

- 1: Irradiation Map of Japan: Annual Irradiation for Optimal Tilted Angle
- 2: Output of PV System by Prefecture (Map)
 - 3: Basic Information of Japan
 - 4: PV Systems in Japan (Photo Gallery)
 - 5: PV Activities in Japan in 2017/ 2018 by Sector (PDF only)

RTS Corporation is a Japanese consultancy exclusively engaged in PV power generation. Our research and investigation capabilities contribute to METI, NEDO, AIST, JPEA, leading PV manufacturers, inverter and other balance of system (BOS) suppliers, PV project developers, EPCs, financial institutions, major electric utilities, polysilicon and other material manufacturers, manufacturing equipment companies and a wide range of PV players in Japan and overseas. Our monthly report "PV Activities in Japan and Global PV Highlights" has been acquiring an international reputation.



RTS Corporation

FAX: +81-3-3553-8954 / E-mail: order@rts-pv.com **"PV Market in Japan 2018"**

Current Status and Future Prospects -

(Published in September 2018)

10000 JPY/copy DISCOUNT for subscribers of "PV Activities in Japan and Global PV Highlights"

ORDER FORM

DD / MM / YY

Please fill in block letters.	Date: • •
First Name Prof. / Dr. / Mr. / Ms. (please circle)	Family Name
Title	
Company / Organization	
Address	
City	State
Postal code	Country
Telephone	Facsimile
E-mail	

Order: (Please check and fill the blanks)

- 1) Duplication of the publication/data (e.g., by printing, photocopying) for the benefit of a third party is prohibited.
- 2) Circulation of the original printed version or the electronic version outside of your division of the organization is also prohibited.
 - □ I agree with the conditions and purchase of a copy of "PV Market in Japan 2018" (Hard copy with a CD-ROM including electronic data of the report)
 - (60000 JPY/copy, including shipping cost)

*Japanese consumption tax will be added <u>for companies located/operating in Japan</u>

I agree with the conditions and purchase of the List of MW-scale PV projects in Japan
 (30000 JPY/list with 3 updates, delivery in Microsoft Excel format by E-mail, as an option for the purchase of "PV Market in Japan 2018")

*Japanese consumption tax will be added <u>for companies located/operating in Japan</u> Since my company subscribes "PV Activities in Japan and Global PV Highlights",

10000 JPY/copy discount should be applied.

□ The sample issues of *"PV Activities in Japan and Global PV Highlights"* for 3 months (free of charge)* * Purchasers of "PV market in Japan 2018" are eligible for sample issues.

"PV Activities in Japan and Global PV Highlights", which has been issued since August 1995, is covering the monthly trends of all the sectors related to PV in Japan, ranging from national government to project developers.

Payment Options:

□ Credit Card (□ VISA or □ Master Card)

*for international customers only

* If you would like to pay by credit card, please tick the credit card type (VISA or Master Card) above.

Bank Transfer* (Customer is responsible for the bank transfer fee.)

* If you would like to pay through a bank transfer, we will send you the invoice with our bank account details.



RTS Corporation

RTS annual report "Forecasting PV installed capacity in Japan toward FY 2030" (2018-2019 Edition)

(Published in October 2018) Outlook of the Japanese PV market - Toward making PV a mainstream power source -

With the Cabinet Approval of the Fifth Strategic Energy Plan, Japan is now committed to promoting efforts to making PV a mainstream power source. Meanwhile, despite the exponential growth of PV installations under the Feed-in Tariff (FIT) program, Japan's target PV installed capacity in FY 2030 remains unchanged in the Fifth Strategic Energy Plan. In early 2018, RTS Corporation published a recommendation to realize 150 GW PV installations in Japan by FY 2030. With this recommendation as one of the encouraging factors, the momentum calling for the revision of PV's position in the energy mix is increasing both in and out of the PV industry.

In this report, RTS forecast the PV market in Japan toward FY 2030 from various aspects, taking into account of social backgrounds and cost reduction of PV systems by market segment (residential, industrial and MW-scale PV systems, etc.).

We highly recommend this report as a guidebook to promote PV-related businesses for PV system manufacturers and distributors, power producers, EPCs, manufacturers of inverters, supporting structures, measurement/ monitoring/ power conversion equipment, components manufacturers, financial institutions, insurance companies, O&M service providers, mass media, policy makers and others engaged in the PV business.

Table of Contents	Future outlook	Foreca applicatio	ast by n/ region	Cost forecast	Analysis of factors
 Various premis forecasts Basic directions conditions for disse classification of P program, market s outlook of output company, forecast f assumptions of so major calculation differences from FY of diversifying busin PV system price f - Forecast of PV sys LCOE comparison (Summary of PV i toward FY 2030 Forecast of PV ins (DC/AC)/ electric of scenarios) PV installed cap BAU/ accelerated scenarior range/application/e approval, PV insta program (BAU/ accelerated scenarior) Domestic PV ma accelerated scenarior 	and premises of emination, calculation V systems under egments, current static to curtailment by for the residential Physiciety and market conditions for for 2017 forecast, class models and so forecasts tem/ module, system BAU/ accelerated so installed capacity by fit company (BAU/ accelerated so installed capacity under electric company, fo led capacity under elerated scenarios) instic PV market so rket size in amount os)	capacity forecast, on bases, the FIT catus and electric / market, changes, recasting, sification on em price/ cenarios) forecasts iscal year celerated ased on capacity precast of the FIT size nt (BAU/	 6. Forecomarked Forecomarked Forecomarked Forecomarked Prospilation Appendi Appendi Appendi Factors toward Appendi Factors toward Appendi Surchari Appendi Surchari Appendi Surchari Appendi Ap	ast on the future- t in Japan ast on the growth t in Japan (BAU/ acc ects of the global ast of PV installed of RTS outlook), foreca ix dix-1 es, etc. of installed of dix-2 for forecasting PV FY 2030 dix-3 ng business models n dix-4 rge of each fiscal yea dix-5 t on PV installed ca os dix-6 otion of the size ted markets in Japar dix-7 es of forecast on the	oriented new PV of the PV-related elerated scenarios) market apacity toward FY ast by region apacity forecasts installed capacity replacing the FIT ar (FY) pacity under other of future-oriented n global PV market

How to order

Please fill out the form below and send it to RTS Corporation by fax +81-3-3553-8954 or by e-mail to order@rts-pv.com.

How to pay

RIS

RTS Corporation will issue an invoice for payment by bank transfer or by credit card (VISA or Master Card). Bank account details are described in the invoice. Payment by credit card is only applicable for customers located/ operating in countries other than Japan.

To: RTS Corporation

	Date (DD/MM/Y	<u>Y): /</u>	/	
"Forecast	ing PV install	ed capacity in J	apan toward	
	FY 2030" ((2018-2019 Edition))	
Special offer for and clients of R	subscribers of "PV IS consulting service	Activities in Japan and G e	lobal PV Highlights"	
(1) Report (printed copy and PDF copy)92,500 JPY/copy(2) Report (printed copy and PDF copy) + presentation145,000 JPY/copy				
For other customers(3) Report (printed copy and PDF copy)15(4) Report (printed copy and PDF copy) + presentation20			150,000 JPY/copy 200,000 JPY/copy	
Note: This report is for your company's internal use only. Travel expenses required for presentation will be invoiced separately. For customers located/ operating in Japan, Japanese consumption tax will be added to the above-mentioned prices.				
I am ordering the contact in	() copy/copie	es of item No.()at livery as below.	oove by filling out	
Company:				
Department:				
Name: Dr./ Mr./ Ms.	(please circle)	Job title:		
Address:				
Telephone No.:		FAX No.:		
E-mail:		@		
Remark:				
How did you get to k	now this report? (please	e tick the box)		
□ RTS website	□ DM from RTS	□ Received a leaflet	□ RTS colleague	
Contact	RTS Corporation Kyoko Miyazaki (Ms URL: http://www.r Address: Qus Hatc	s.) E-mail: <u>order@rts-pv</u> ts-pv.com/en/ hobori Daiichi Bldg. 4F, 3	. <u>com</u> 3-19-2, Hatchobori,	

Chuo-ku, Tokyo 104-0032, Japan

Tel: + 81-3551-6345/ Fax +81-3-3553-8954