

Renewable Electricity Procurement Guidebook - Digest Edition -



Renewable Energy Institute

Objective and Background

- Content of this guidebook is compiled for helping corporate energy users and local governments to procure renewable electricity in efficient ways in Japan.
- Activities for mitigating climate change and environmental destruction have been accelerating renewable electricity demand globally.
- With reducing fossil fuels and nuclear power dependence, corporate users can maintain sustainable business while local governments can revive economy by utilizing renewables.
- This digest edition explains methods of procurement in Japan and criteria of selection with referring international standards and guidelines.

Benefits of Renewables

- ① Not exhaustible
- ② No emission of carbon dioxide and radioactive waste
- ③ No need of fuels (except bioenergy using renewable fuels)
- ④ Predictive costs in a long term
- ⑤ Distributed power generation using local resources

Generation of Renewable Electricity

Technology	Generation mechanism	Features
Solar	Photovoltaic cells generate electron from light energy. Amount of solar radiation determines quantity of generation.	<ul style="list-style-type: none">▪ No sound and vibration▪ Generating electricity only daytime▪ Output affected by weather
Wind	Blades receive wind power and rotate turbine/generator. Size of blade and wind velocity determines quantity of generation.	<ul style="list-style-type: none">▪ Requiring certain level of wind speed▪ Output affected by weather▪ Sound and vibration in adjacent area
Hydro	Water flow rotates turbine/generator. Amount of water and height of flow determines quantity of generation.	<ul style="list-style-type: none">▪ Output controllable by water flow▪ Environmental issue of large hydro▪ Small hydro with existing water flow recommended

Generation of Renewable Electricity

Technology	Generation mechanism	Features
Geo thermal	Vapor from underground rotates turbine/generator. Hot water with vapor may be used. Amount and temperature of vapor/water determines quantity of generation.	<ul style="list-style-type: none">▪ Consistent output▪ Warm water after generation can be used as secondary energy▪ Environmental issue in case of digging underground
Bio	Vapor or thermal by burning bio fuels rotate turbine/generator. Fuels can be solid, liquid or gas. Amount of thermal by fuels determines quantity of generation.	<ul style="list-style-type: none">▪ Carbon dioxide from bio fuels offset by biological origin▪ Thermal after generation can be used as secondary energy▪ Environmental issue by sustainability of fuels

Criteria of Renewable Electricity

Criteria	Requirement	Inappropriate examples
Basic	Generate electricity by renewable energy. No emission of carbon dioxide and radioactive waste.	<ul style="list-style-type: none"> > Fossil fuel power plant emitting carbon dioxide and toxic materials > Nuclear power plant emitting radioactive waste
Environmental Impact	Low environmental impact in constructing and operating power plant.	<ul style="list-style-type: none"> > Solar power plant developed in the forest > Large hydro power plant using dam > Bioenergy power plant using fuels leading to destruction of forest and farm
Additionality	Generate new renewables to replace fossil fuel/nuclear power plant	<ul style="list-style-type: none"> > Old renewable power plant
Locality	Developed and/or agreed by local community	<ul style="list-style-type: none"> > Power plant without local agreement and involvement

Major Procurement Methods in Japan

Method	Description	Features
On-site Generation	Construct renewable energy power plant and consume generated electricity internally	<ul style="list-style-type: none"> ▪ Initial investment required ▪ Low-cost renewable electricity secured ▪ Environmental aspects of power plant identified ▪ Risks of trouble in operation
Green Product	Purchase renewable electricity from retailer	<ul style="list-style-type: none"> ▪ Short-time contract available ▪ Specific power sources unidentifiable (some cases) ▪ Higher tariff than standard products (many cases)
Renewable Energy Certificate	Purchase certificate derived from renewable electricity	<ul style="list-style-type: none"> ▪ Separated from physical procurement ▪ Specific power sources identifiable ▪ Additional cost on top of electricity procurement
Long-term Investment (PPA)	Invest renewable energy development and receive electricity and/or attribute	<ul style="list-style-type: none"> ▪ New renewable electricity added ▪ Retailer involved in 3-way contract for PPA ▪ Environmental aspects of power plant identified ▪ Business risks of long-term investment

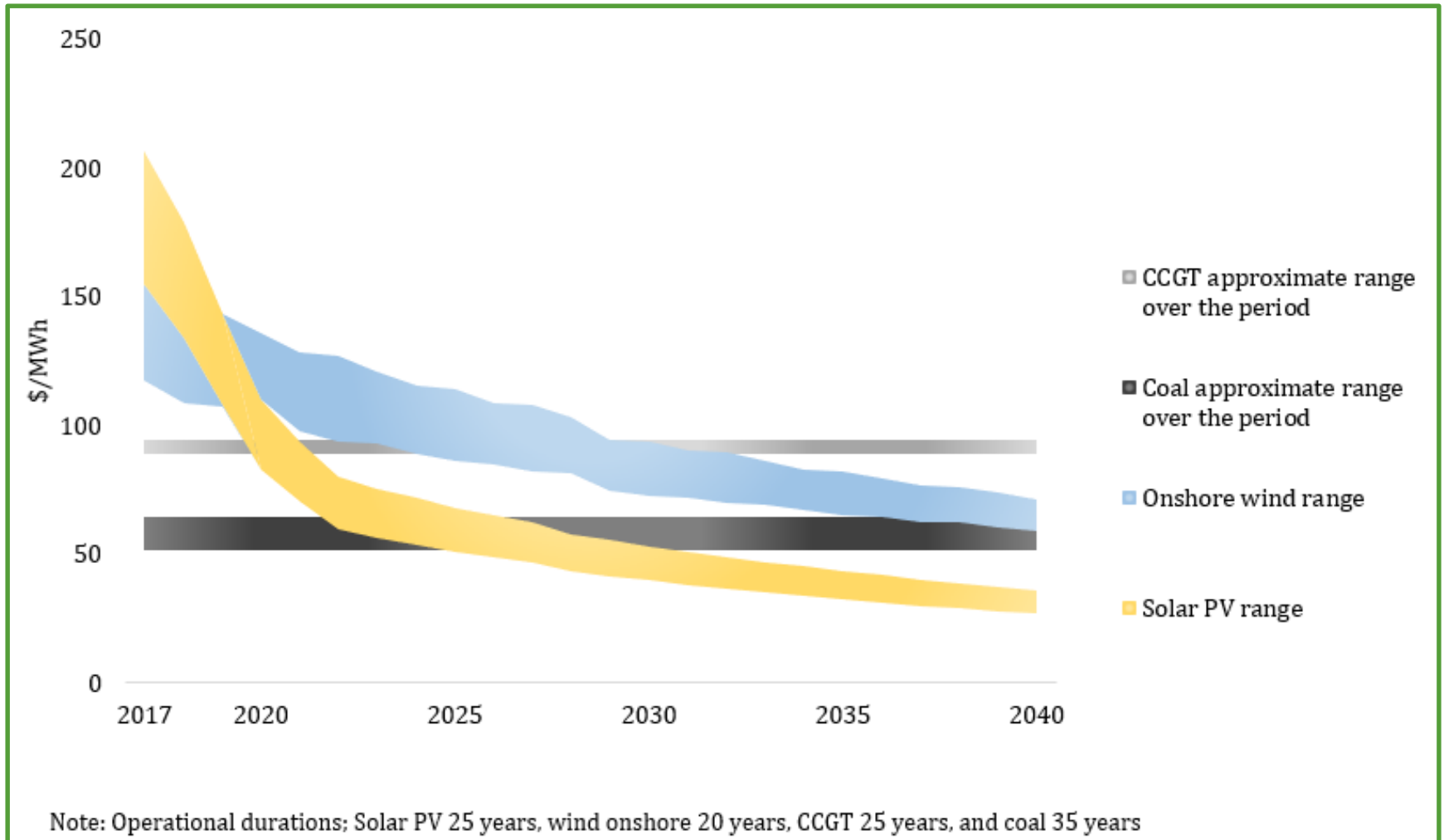
Renewable Electricity Certificates

	Green Electricity Certificate	J-Credit (renewable-origin)	Non-fossil Certificate (Feed-in-tariff)
Issuer	Green Electricity Certificate Issuer	Government	Green Investment Promotion Organization
Technology	Solar, Wind, Hydro, Geothermal, Bio (mostly bio)	Solar, Wind, Hydro, Geothermal, Bio (mostly solar)	Solar, Wind, Hydro, Geothermal, Bio (mostly solar)
Purchaser	Any Entity	Any Entity	Only Electricity Retailer
Purchasing Method	Direct from Issuer	Auction or from credit owner/broker	Auction at Non-fossil Value Trading Market
Issue Amount	0.4 TWh (FY 2017)	1.2 TWh (FY 2017)	53 TWh (Apr-Dec, 2017)
Price	Ave. JPY 3-4/kWh for bulk purchase (FY 2017)	Approx. JPY 0.9/kWh (auction in Apr 2018)	JPY 1.3-4.0/kWh (auction in FY 2018)

Generation Cost and Procurement

	Short-term (- 2020)	Mid-term (2020 - 2030)	Long-term (2030 -)
Generation Cost (est.)	Solar: JPY 15-20/kWh Wind: JPY 15/kWh	Solar: JPY 7-14/kWh Wind: JPY 10-15/kWh	Solar: below JPY 7/kWh Wind: below JPY 10/kWh
New Policy	FY 2019 and beyond: Solar houses will finish feed-in-tariff and provide low-cost renewable electricity.	FY 2020: Utilities must unbundle transmission/distribution business to drive competition of generation and retail.	FY 2032 and beyond: Large-scale renewable plants will finish feed-in-tariff and provide low-cost electricity.
RE in Japan (est.)	16% (actual, FY 2017) 20% or higher (FY 2020)	30% or higher (FY 2030) *22-24% in FY 2030 by government target	50% or higher (2040's)
Major Procurement Method	Green Product, RE Certificate	Green Product, On-site Generation, Long-term Investment	Green Product, Long-term Investment, On-site Generation

Generation Cost Outlook in Japan



Source: Bloomberg NEF

Procurement Policy Options

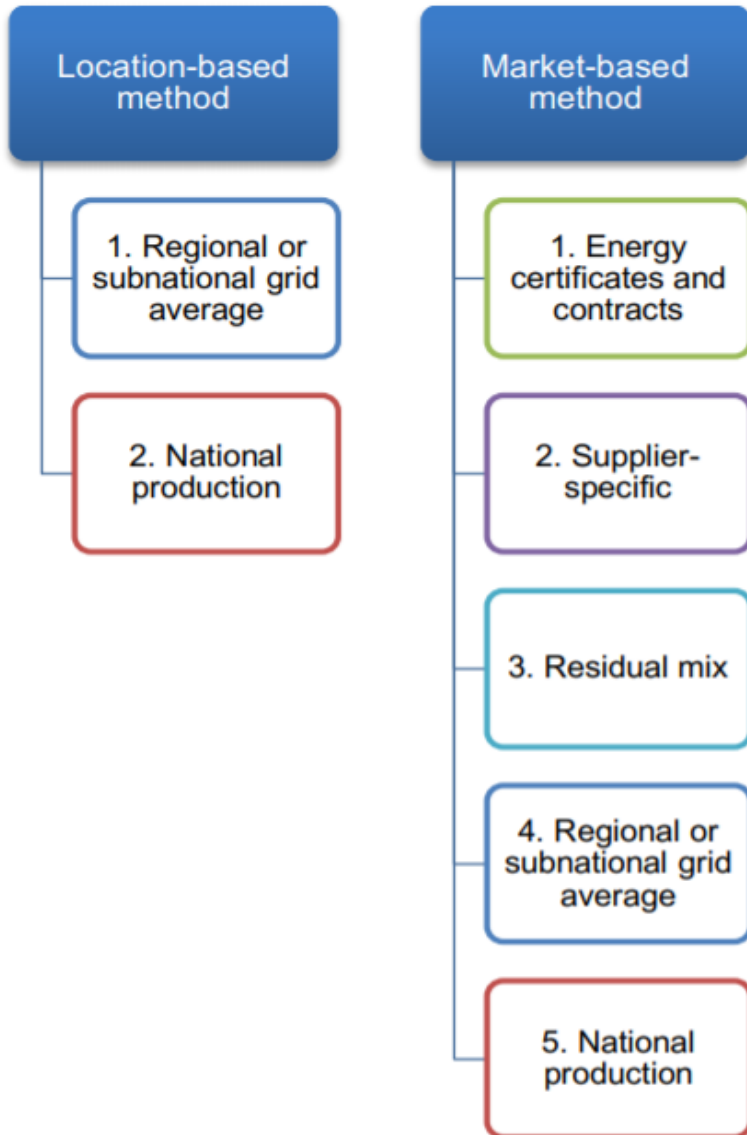
[Select by technology]

Procure renewable electricity, including Feed-in-tariff-applied, in terms of actual CO2 emission factor regardless of the effectiveness of official reporting to the government and international initiatives.

[Select by CO2 emission]

Procure renewable electricity with zero or low CO2 emission factor effective for reporting to the government and international initiatives, allowing combination of renewable energy certificate and non-renewable electricity.

International Criteria of CO2 emission



CO2 emission from electricity consumption calculated by Location-based and Market-based method

[Location-based]
Apply grid or national average CO2 emission factor

[Market-based]
Apply CO2 emission factor by each procurement method

Source: CDP

Comparison of CO2 emission etc.

Electricity/Certificate purchased	Plant/Technology	CO2 emission (by Japanese law)	Environmental Impact	Additionality
FIT-certified electricity (by PPA)	Selectable	National average	Low	Yes
Electricity with non-fossil certificate	Not selectable (some certificates selectable)	Zero/almost-zero (depending on electricity)	Depending on electricity	No
FIT-certified electricity (by PPA) with non-fossil certificate	Selectable	Zero	Low	Yes
Renewable electricity without FIT	Selectable	Zero (certification required)	Depending on plant	Yes
Hydro 100% product	Hydro (plant not selectable)	Zero	Not always low (in case of large hydro included)	No
Green Electricity Certificate	Selectable	national average reducible	Low	Yes
J-Credit	Selectable	national average reducible	Low	Yes

Class of Renewable Electricity

	Requirement	Examples	International guideline
Class 3	Generated by renewable energy	> FIT-certified electricity	-
	Zero CO2 emission	> Non-fossil certificate > Hydro 100% product	CDP
Class 2	Plant identifiable	> Renewable electricity without FIT	RE100
	Low environmental impact certified	> Green electricity certificate > J-credit > Non-fossil certificate with attribute	
Class 1	Additionality for more renewable energy	> Green electricity certificate (new project) > J-credit (new project) > Non-fossil certificate with FIT electricity PPA	Green-e (North America)
	Reducing CO2 emission physically	> On-site generation/consumption > Renewable electricity by investment	

* Class 1 is most desirable.

RE certificate outside Japan

Certificate	Country / Region	Certification System
Guarantee of Origin (GO)	EU (28 countries), Iceland, Norway, Switzerland	EECS (European Energy Certification System) or national system
Renewable Energy Certificate (REC)	United States, Canada, Puerto Rico	Regional system
International Renewable Energy Certificate (I-REC)	Brazil, Chili, China, Columbia, Guatemala, Honduras, India, Israel, Jordan, Malaysia, Mexico, Philippines, Saudi Arabia, Singapore, South Africa, Taiwan, Thailand, Turkey, UAE, Uganda, Vietnam	National system

[Contact]

Renewable Energy Institute

DLX Building, 1-13-1 Nishi-Shimbashi, Minato-ku,
Tokyo 105-0003

TEL: +81-3-6866-1020 FAX: +81-3-6866-1021

E-mail: info@renewable-ei.org



Renewable Energy Institute