



RENEWABLE
ENERGY
INSTITUTE

Corporate PPA

Latest Trends in Japan

1. **Contract Structures**
 - On-site PPA
 - Physical PPA
 - Virtual PPA
2. **Cost Comparisons**
3. **Major Projects**
4. **Issues & Solutions**

September 2022



■ Key Factors Expanding Corporate PPAs

1. Additional Renewables

Building (adding) new renewable facilities is effective for mitigating climate change to replace electricity generated by fossil fuels. Corporate energy users make PPAs, power purchase agreements, with new facilities to procure additional renewable electricity to use at offices, stores and factories for the long term.

2. Solar Cost Reduction

Many of new renewable facilities in Japan are powered by solar. The generation cost has been steadily declining in the last decade and was below JPY10/kWh in 2021. It is already lower than the generation cost by fossil fuels and nuclear power. The solar generation cost will continue to be reduced in the next decade.

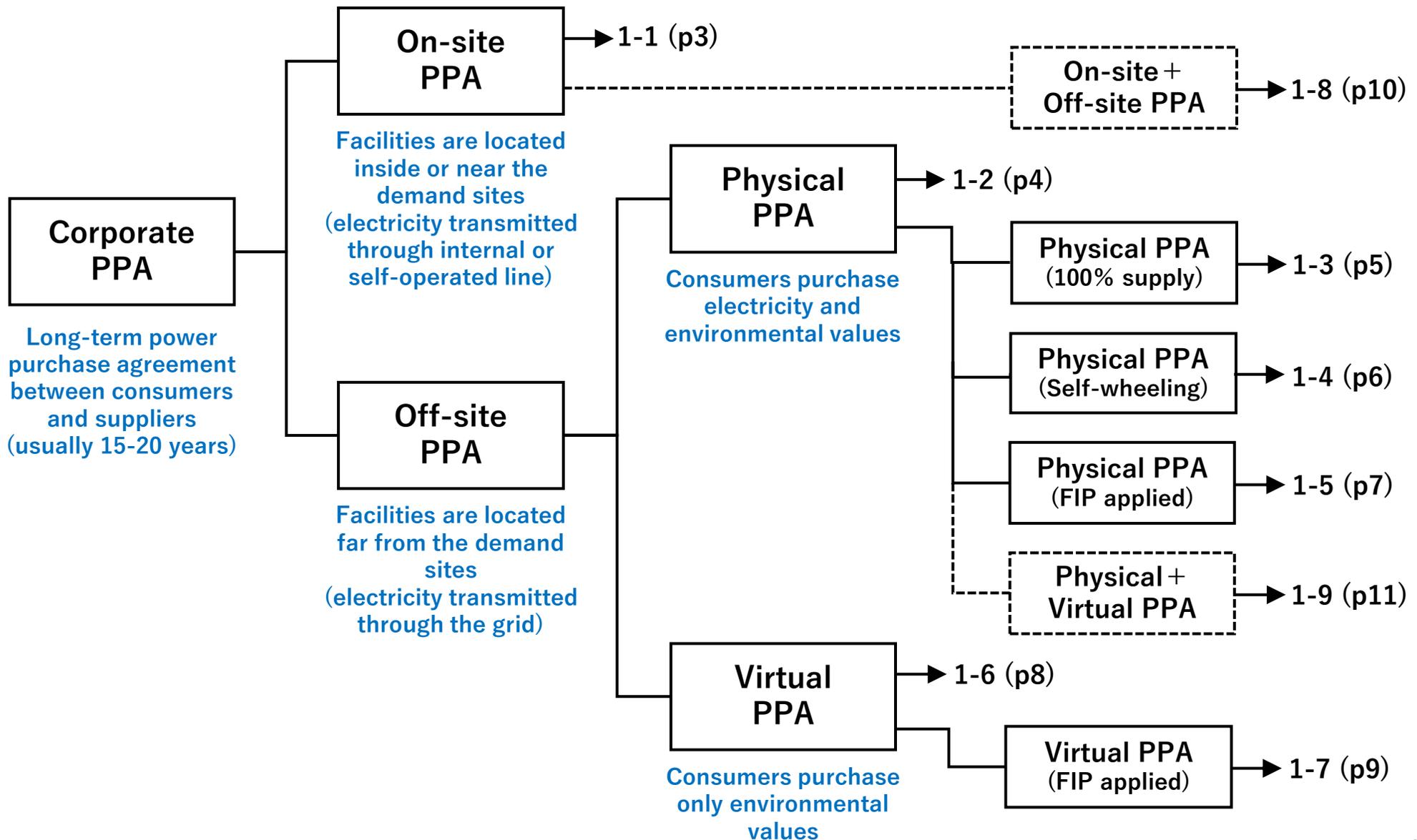
3. Electricity Price Increase

Fossil fuels prices soared since late 2021 globally. Electricity prices significantly increased in Japan due to the reliance on fossil fuels. Fuel surcharges increased more than JPY6/kWh in 12 months. Corporate energy users can reduce both CO₂ emissions and electricity costs by making corporate PPAs with renewables.

4. Feed-in Premium

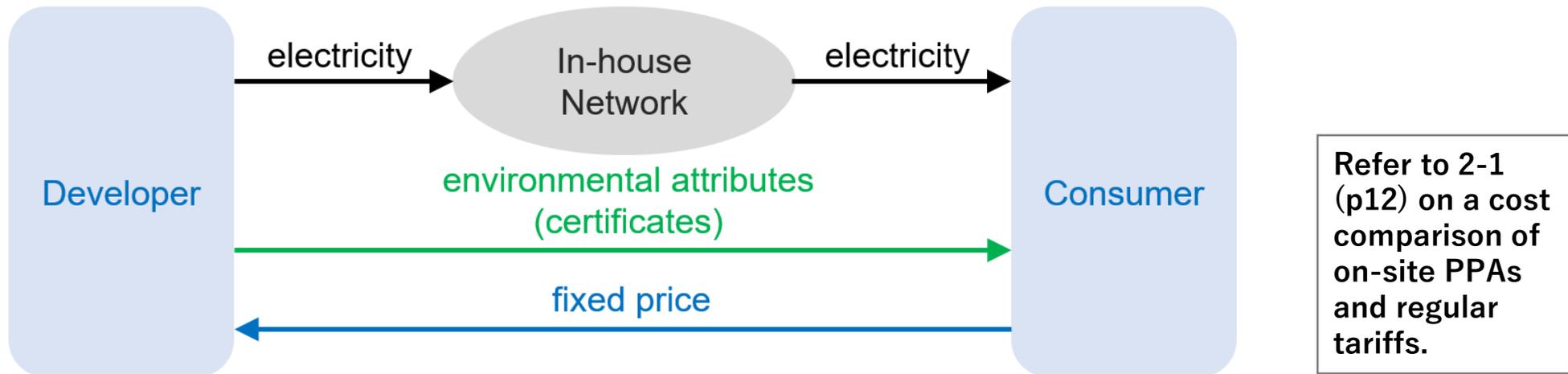
Feed-in Premium (FIP) program started in April 2022 to support new development of renewables and replace the existing Feed-in Tariff (FIT) program. In FIP, developers need to sell electricity and environmental values at their own risk. Corporate PPAs provide opportunities and benefits for both developers and energy users.

1 Options for Corporate PPAs



1-1 Contract Structure of On-site PPA

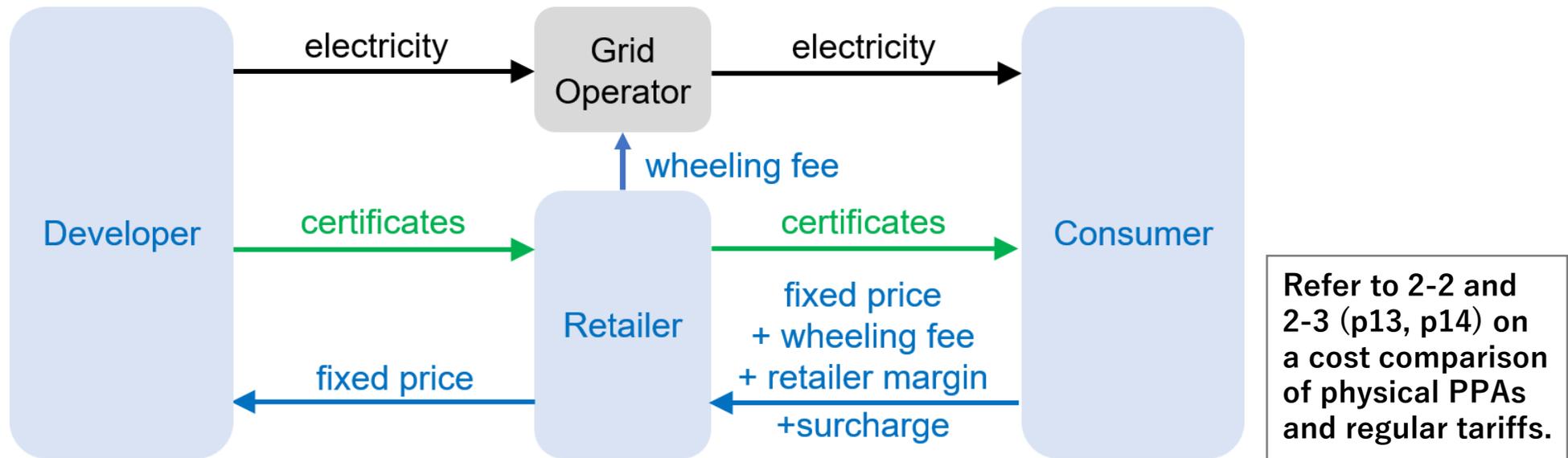
On-site PPAs are made between consumers and developers. Consumers provide spaces to install facilities and purchase generated electricity and environmental values at fixed prices.



Features	Benefits	Issues
<ul style="list-style-type: none"> ● Consumers provide developers with spaces on the roof-top of buildings or lands in the demand sites (or adjacent sites connected with self-operated transmission lines) ● The installation, operation and maintenance of generation facilities are outsourced to developers. 	<ul style="list-style-type: none"> ● Consumers are not responsible for the installation and operation of the facilities (not like self-generation). ● Wheeling fees and renewable surcharges are not imposed. ● Consumers can take over the facilities without extra costs when the contract is completed. 	<ul style="list-style-type: none"> ● The scale of generation facilities is usually small due to limited spaces. ● It is usually difficult to utilize surplus electricity (necessary to install batteries or connect with the grid).

1-2 Contract Structure of Physical PPA

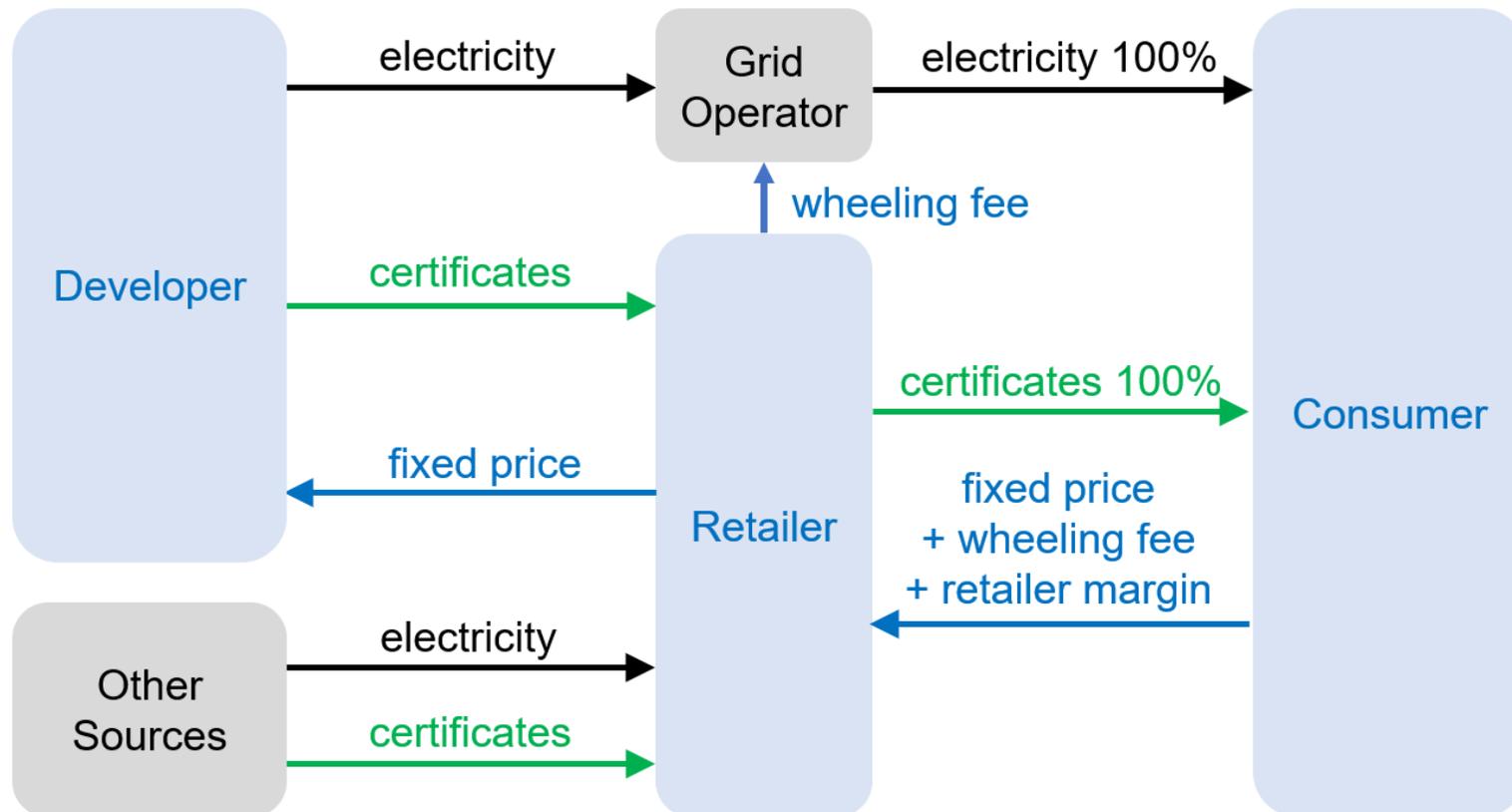
In physical PPAs, generation facilities are constructed at distant places from the demand sites. Consumers purchase generated electricity and certificates (environmental values) at fixed prices through retailers.



Features	Benefits	Issues
<ul style="list-style-type: none"> ● Developers construct generation facilities for consumers to provide electricity and certificates through retailers. ● With the self-wheeling program in case consumers are responsible for balancing supply and demand, direct contracts with developers are applicable. 	<ul style="list-style-type: none"> ● Consumers make contracts with specific facilities and can confirm environmental impacts of electricity generation. ● Consumers can fix costs of purchasing electricity and certificates for the long term. 	<ul style="list-style-type: none"> ● Consumers need to fix the demand sites. ● Consumers need to make other contracts for filling the gap between the entire demand of the sites and the supply by PPAs.

■ 1-3 Contract Structure of Physical PPA (100% supply)

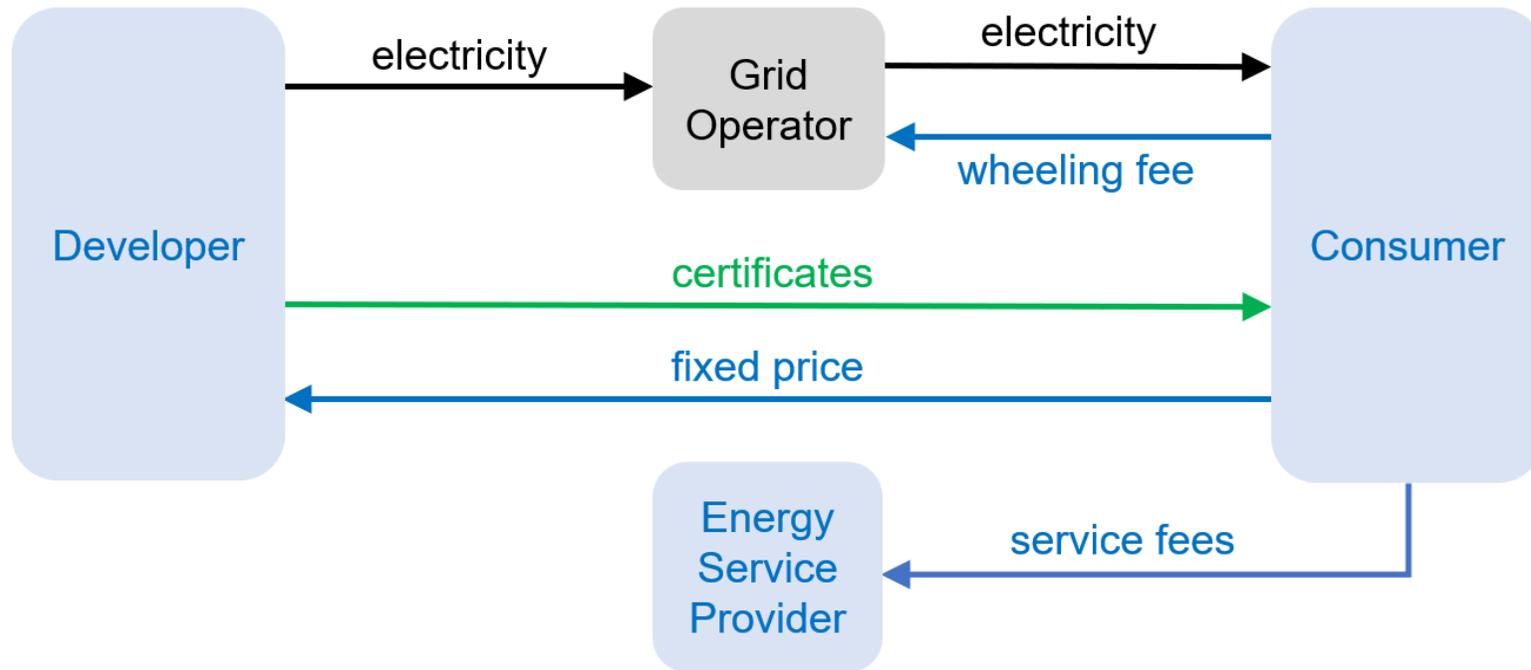
In case the entire demand at the sites is not covered by physical PPAs, retailers procure electricity and certificates from other sources to provide 100% renewable electricity to consumers.



Consumers may make contracts with retailers at fixed costs for the entire demand. The fixed costs may be higher than the case of simple physical PPAs.

■ 1-4 Contract Structure of Physical PPA (Self-wheeling)

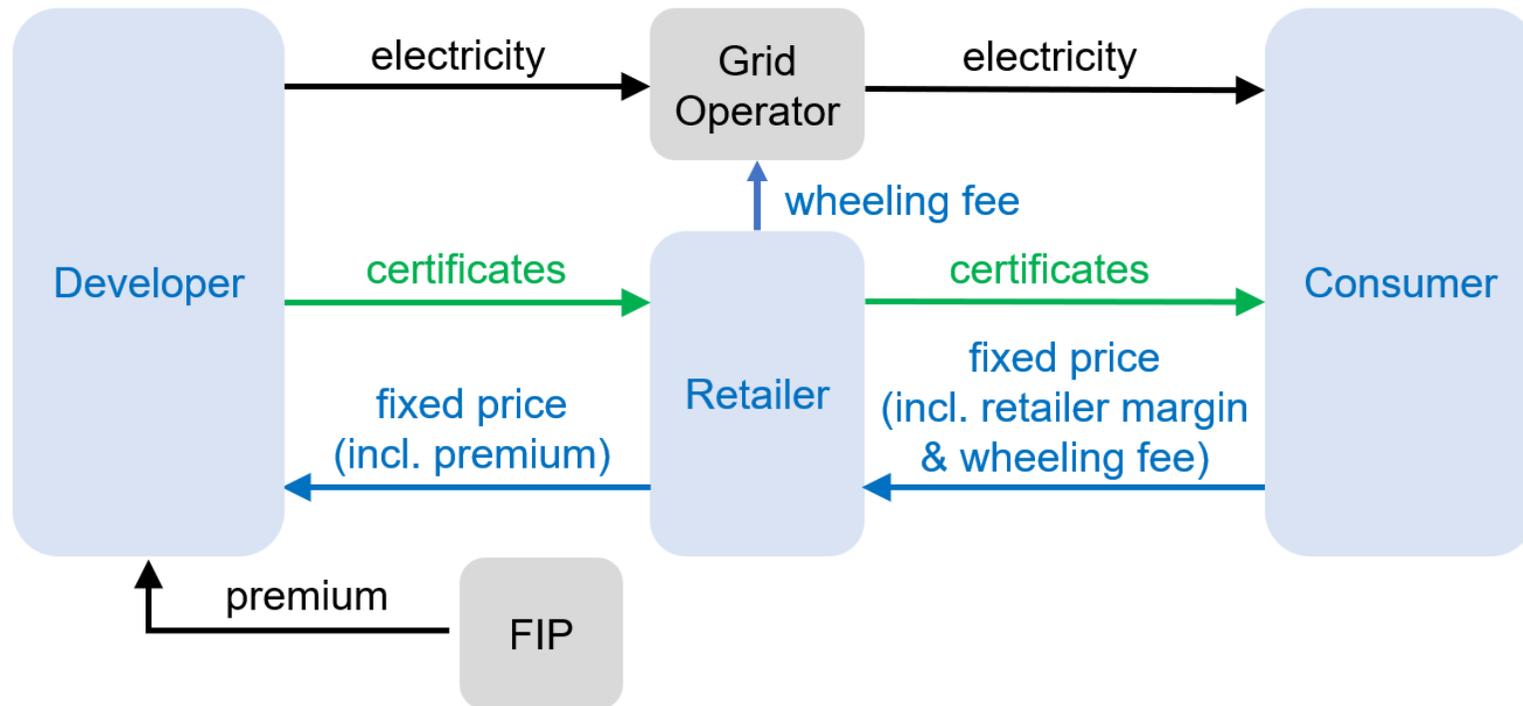
With adopting the self-wheeling program, consumers and developers can make physical PPAs directly. Consumers do not have to pay renewable surcharges when the self-wheeling is applied but need to outsource balancing tasks of supply and demand to energy service providers.



For adopting the self-wheeling program for physical PPAs, consumers and developers need to comply with the guidelines by Ministry of Economy, Trade and Industry, effective as of November 18, 2021.

■ 1-5 Contract Structure of Physical PPA (FIP applied)

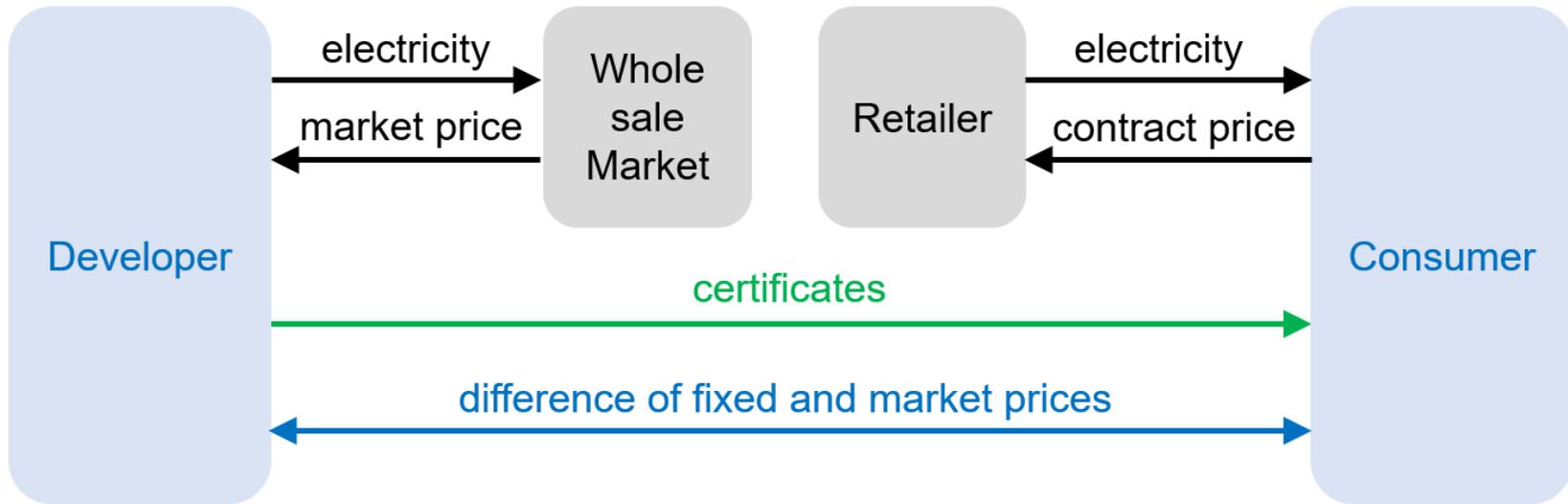
With applying the Feed-in Premium (FIP) program, developers can receive premiums based on the difference between FIP-certified fixed prices and the average wholesale market prices. Physical PPAs with generation facilities other than solar can be made at the same level of market prices.



In the FIP program, a fixed price is certified for each generation facility. Premiums are paid to developers based on the difference between the fixed price and the average wholesale market price. No negative payment occurs. Developers can get market-based premiums on the fixed revenue from Physical PPAs.

1-6 Contract Structure of Virtual PPA

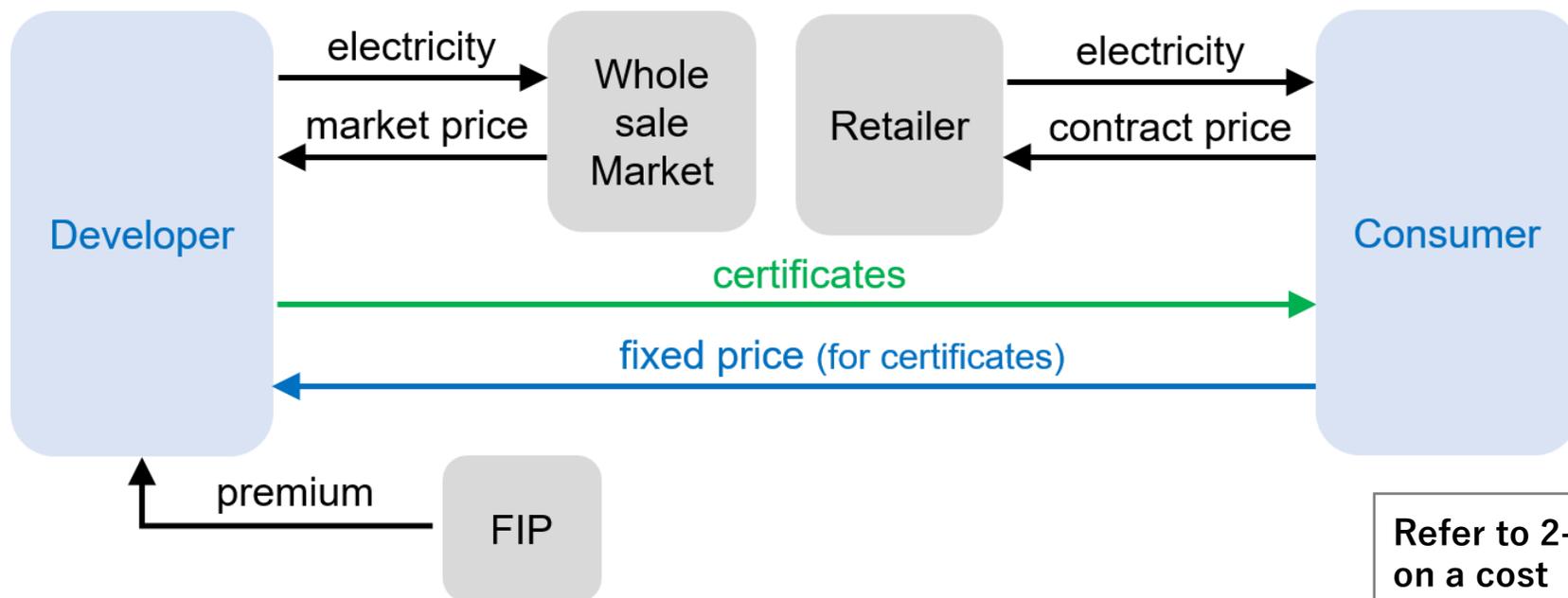
In virtual PPAs, consumers purchase certificates from developers, and electricity from retailers through the other contracts. Developers sell generated electricity to the wholesale market and receive or pay the difference of the fixed price and the market price.



Features	Benefits	Issues
<ul style="list-style-type: none"> ● Developers construct new generation facilities and provide only certificates to consumers while selling electricity to the wholesale market. ● The price including electricity and certificates is fixed and the difference from the wholesale market price is paid between developers and consumers. 	<ul style="list-style-type: none"> ● Consumers do not have to change the existing electricity contracts. ● Certificates can be applied to any demand sites. ● Regardless of the demand every hour, certificates can be used for electricity consumed during the month or the year. 	<ul style="list-style-type: none"> ● Electricity costs of are not fixed. ● Consumers need to manage with variable costs (except in case the contracted electricity prices are based on the wholesale market prices)

■ 1-7 Contract Structure of Virtual PPA (FIP applied)

Developers can receive premiums based on the difference between FIP-certified fixed prices and the average wholesale market prices. With the premiums covering the difference, developers may make virtual PPAs with consumers at fixed prices.

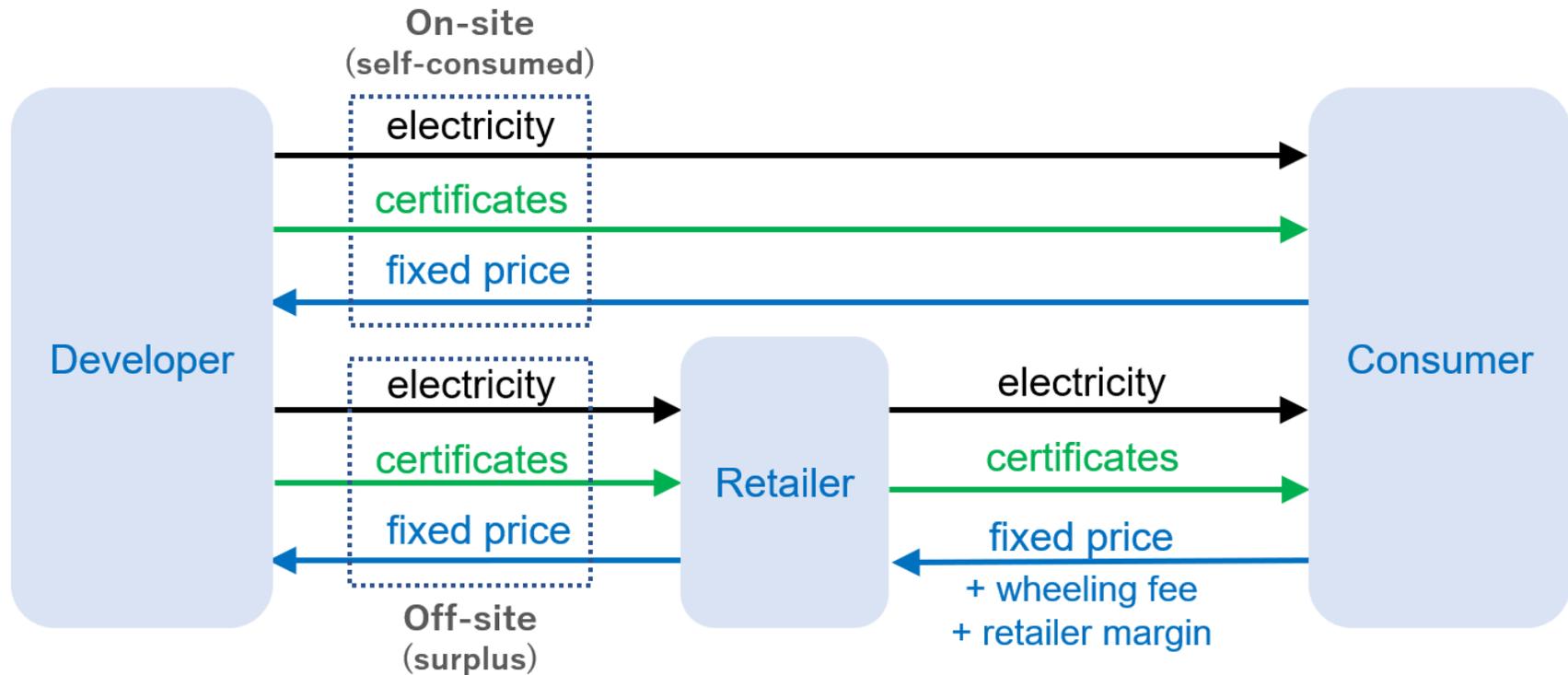


Refer to 2-4 (p15)
on a cost
comparison of
FIP-applied
virtual PPAs and
regular tariffs.

In case generation facilities applying the FIP program start the operation in April 2022 and beyond, virtual PPAs between developers and consumers are allowed. Facilities without the FIT program are also allowed for direct virtual PPAs. In other cases, retailers should be involved between developers and consumers.

■ 1-8 On-site and Off-site Hybrid PPA

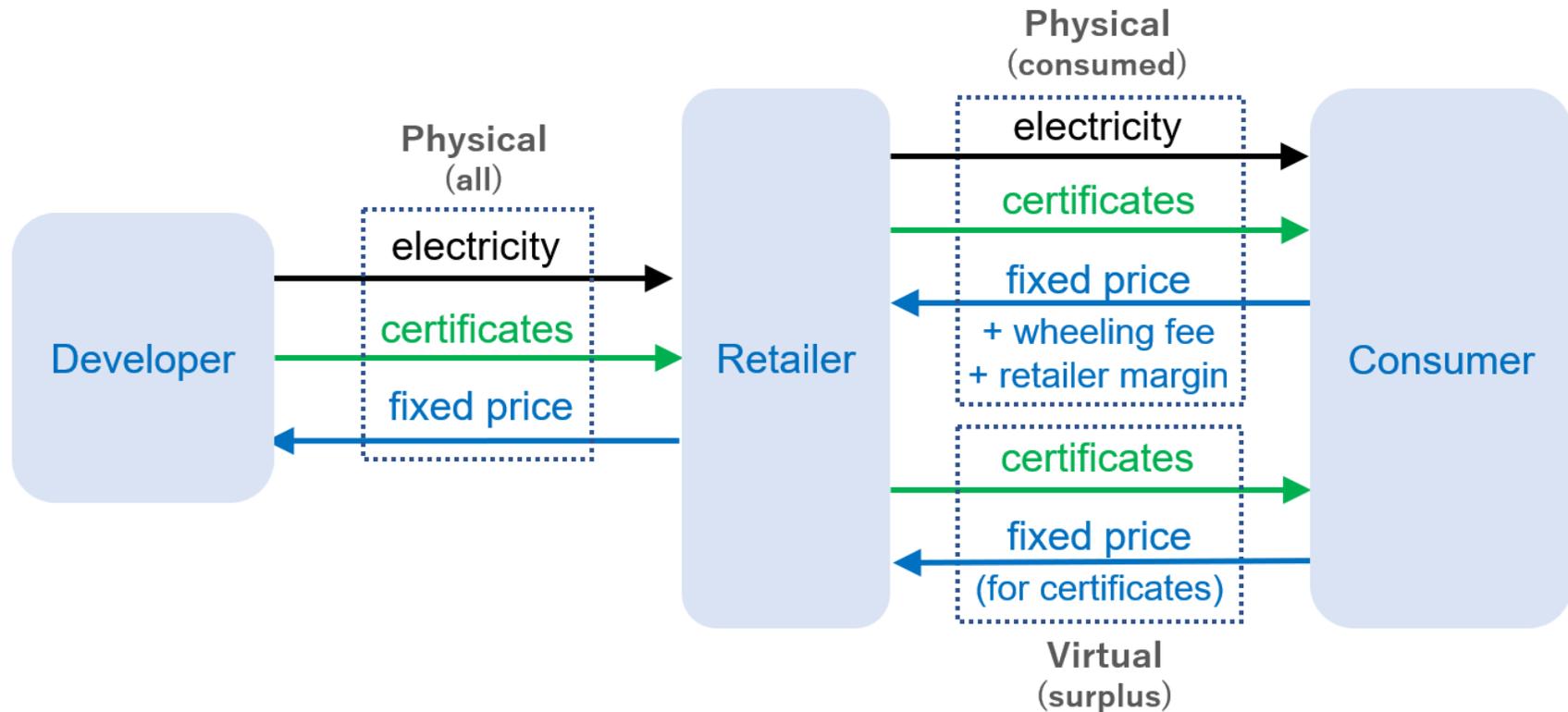
Surplus electricity and certificates from on-site PPAs are provided to other demand sites of consumers through off-site PPAs.



Both physical and virtual PPAs can be applied for surplus electricity and/or certificates.

■ 1-9 Physical and Virtual Hybrid PPA

Surplus certificates from physical PPAs are provided to consumers through virtual PPAs.



Surplus electricity is sold to other consumers by retailers without certificates.

■ 2-1 Costs of On-site PPA

Consumers do not have to pay wheeling fees and renewable surcharges for on-site PPAs to reduce costs compared with regular tariffs.

JPY/kWh	On-site PPA (solar)	Regular Tariffs (high-voltage, 50kW-2MW)	Regular Tariffs (special high-voltage, 2MW-)
Generation	9~11	14.5 (incl. fuel surcharges)	13 (incl. fuel surcharges)
Retail	—		
Wheeling	—	4	2
Renewable Surcharges	—	3.36	3.36
Total Consumer Costs	9~11	22	18.5

* The above costs are approximately estimated except renewable surcharges.
Regular tariffs are national average as of April 2022.

■ 2-2 Costs of Physical PPA (high-voltage)

Consumer costs for physical PPAs were slightly higher than regular tariffs in 2021 but become competitive in 2022.

JPY/kWh	Physical PPA (solar, high-voltage)	Regular Tariffs (high-voltage)
Generation	10~12	14.5 (incl. fuel surcharges)
Retail	1~2	
Wheeling	4	4
Renewable Surcharges	3.36	3.36
Total Consumer Costs	18.5~21.5	22

* The above costs are approximately estimated except renewable surcharges. Regular tariffs are national average as of April 2022.

■ 2-3 Costs of Physical PPA (special high-voltage)

Regular tariffs for special high-voltage (2MW or higher electricity supply) are lower than high-voltage. Consumer costs for physical PPAs become competitive in 2022.

JPY/kWh	Physical PPA (solar, super high-voltage)	Regular Tariffs (super high-voltage)
Generation	10~12	13 (incl. fuel surcharges)
Retail	1~2	
Wheeling	2	2
Renewable Surcharges	3.36	3.36
Total Consumer Costs	16.5~19.5	18.5

* The above costs are approximately estimated except renewable surcharges. Regular tariffs are national average as of April 2022.

■ 2-4 Costs of Virtual PPA (FIP applied)

Consumers may purchase certificates at fixed costs through Virtual PPAs for FIP-certified generation facilities. Electricity costs depend on the contracts with retailers.

JPY/kWh	Virtual PPA + FIP (solar, high-voltage)	Regular Tariffs (high-voltage)
Generation	0.5~1 (for certificates)	14.5 (incl. fuel surcharges)
Retail	14.5 (by regular tariffs)	
Wheeling	4	4
Renewable Surcharges	3.36	3.36
Total Consumer Costs	22.5~23	22

* The above costs are approximately estimated except renewable surcharges. Regular tariffs are national average as of April 2022.

■ 3 Major Projects (Off-site PPAs, 1MW+)

Consumer	Retailer	Developer	Scale	Start	Term
Hulic	Hulic Property Solution	Advance	1.3MW	Oct 2020	20 years
Seven & i Holdings	Ennet	NTT Anode Energy	3.1MW	Jun 2021	20 years
Dai-ichi Life	Orix	Clean Energy Connect	2MW	Feb 2022	20 years
Amazon	MC Retail Energy	Mitsubishi Corporation Energy Solutions	22MW	2022~2023	undisclosed
Shimizu Corporation	Smart Eco Energy	Clean Energy Connect	1MW	April 2022	20 years
Seven-Eleven	Hokuriku Electric Power	Hokuriku Electric Power Biz Energy Solution	6.2MW	Jun 2022	20 years
Tokai Rika	Chubu Electric Power Miraiz	Chuden Loop Solar	1.2MW	Dec 2022	undisclosed
Lawson	Mitsubishi Corporation	West Holdings	45MW	Apr 2022	undisclosed
Aeon Mall	(self-wheeling)	LLC by Aeon Mall	65MW	Fall 2022	undisclosed
Panasonic Operational Excellence	Kansai Electric Power	Kanden Eco Style Solar Power	18MW	Jun 2022 or later	20 years
Hydro Edge	Kansai Electric Power	KPRE	2MW	Feb 2023	20 years
Sumitomo Mitsui Banking	TEPCO Energy Partner	Advance	4.9MW	Feb 2023	undisclosed
Mitsubishi Heavy Industries	Chugoku Electric Power	Chugoku Electric Power	10MW	undisclosed	undisclosed
Murata Manufacturing	(virtual PPA)	Mitsubishi Corporation	70MW	by Mar 2026	undisclosed

* Information from the official announcement (as of July 2022).

■ 4 Issues and Solutions

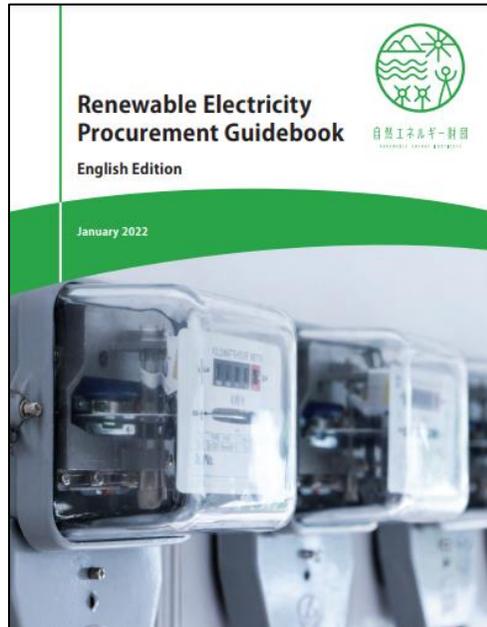
There are major issues for accelerating corporate PPAs in Japan. Political support for promoting renewable energy is required.

Issue		Key Solutions
Construction Sites	- Limited construction sites for new generation facilities nationwide	[Policy] Deregulations of land usage [Developer] Aggregation of small spaces [Consumer] Usage of owned spaces
Grid Connection	- Difficulty of connecting new generation facilities to the grid. Construction costs may be very high - Same issue for surplus electricity from onsite PPAs	[Policy] Enhancement of the grid [Operator] Improvement of grid operation [Developer] Construction of low-voltage facilities
Curtailment	- Temporary shutdown in case of grid congestion or oversupply.	[Policy] Revision of the dispatching rule [Operator] Improvement of forecast [Consumer] Option of hydro and geothermal
Long-term Contract	- Risks of facility troubles and other unpredictable events during the contract term	[Developer] Purchase of damage insurance [Consumer] Addition of midterm cancellation [Financial Inst.] Insurance for corporate PPA

[Reference]

Renewable Electricity Procurement Guidebook

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