

Corporate PPA in Japan

- Digest Edition -

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Renewable Energy Institute

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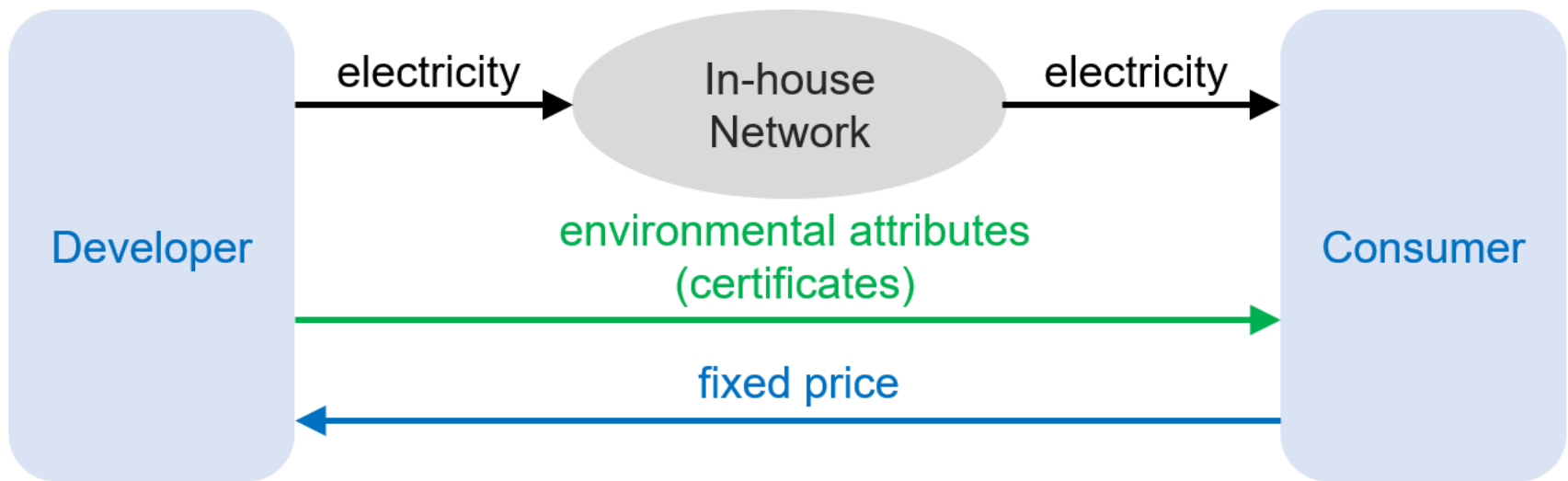
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Executive Summary

- Corporate PPA is becoming an effective procurement option of renewable electricity in Japan. Scores of corporations made onsite and offsite PPAs in 2021 for expanding renewable electricity with additionality.
- Cost of solar generation has been declining to JPY10/kWh (approx. USD100/MWh) or below and making corporate PPAs, particularly onsite, competitive with regular tariffs.
- In Japan, offsite PPAs, physical and virtual, should be made with registered retailers between developers and consumers. It reduces tasks and risks of consumers by paying fees.
- The Japanese government is implementing new policies to accelerate corporate PPAs, such as Feed-in Premium.
- Virtual PPAs have not been made so far mainly because of the current rule involving retailers in between. The government is considering changing the rule so that consumers will be able to make virtual PPAs directly with developers.

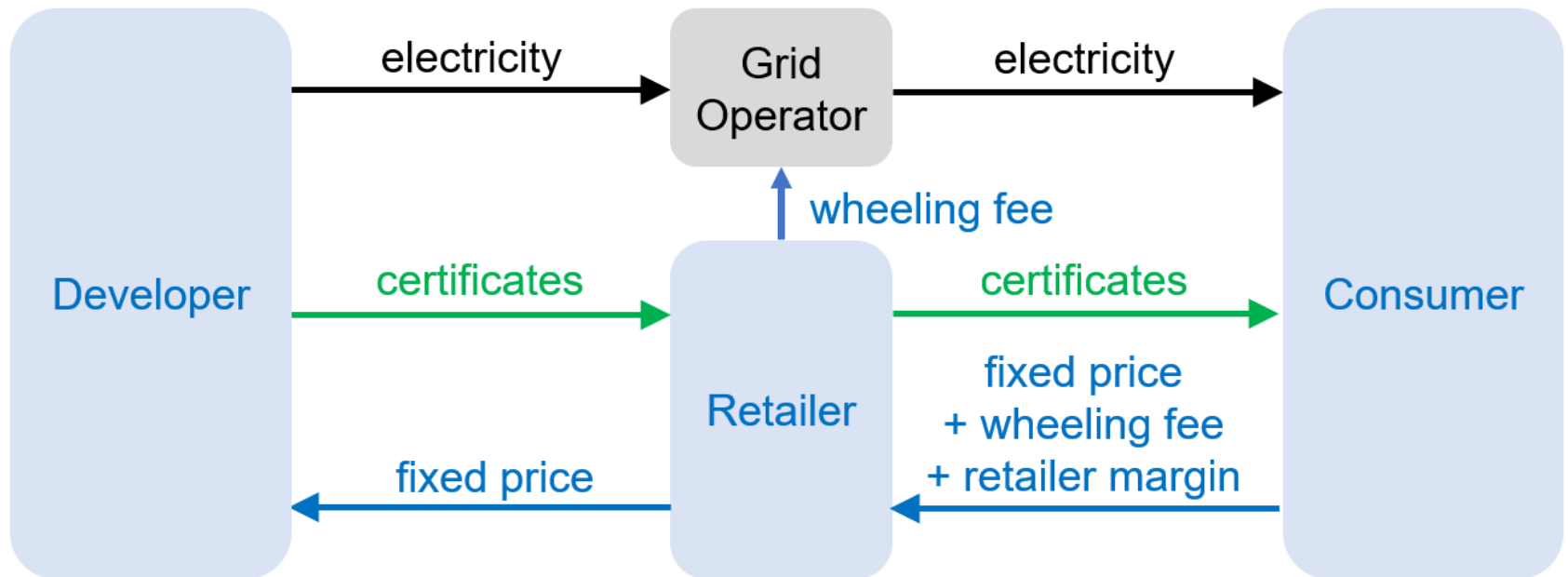
1-1. Contract Type: Onsite PPA

Onsite PPAs can be made directly between developers and consumers in Japan same as in other countries.



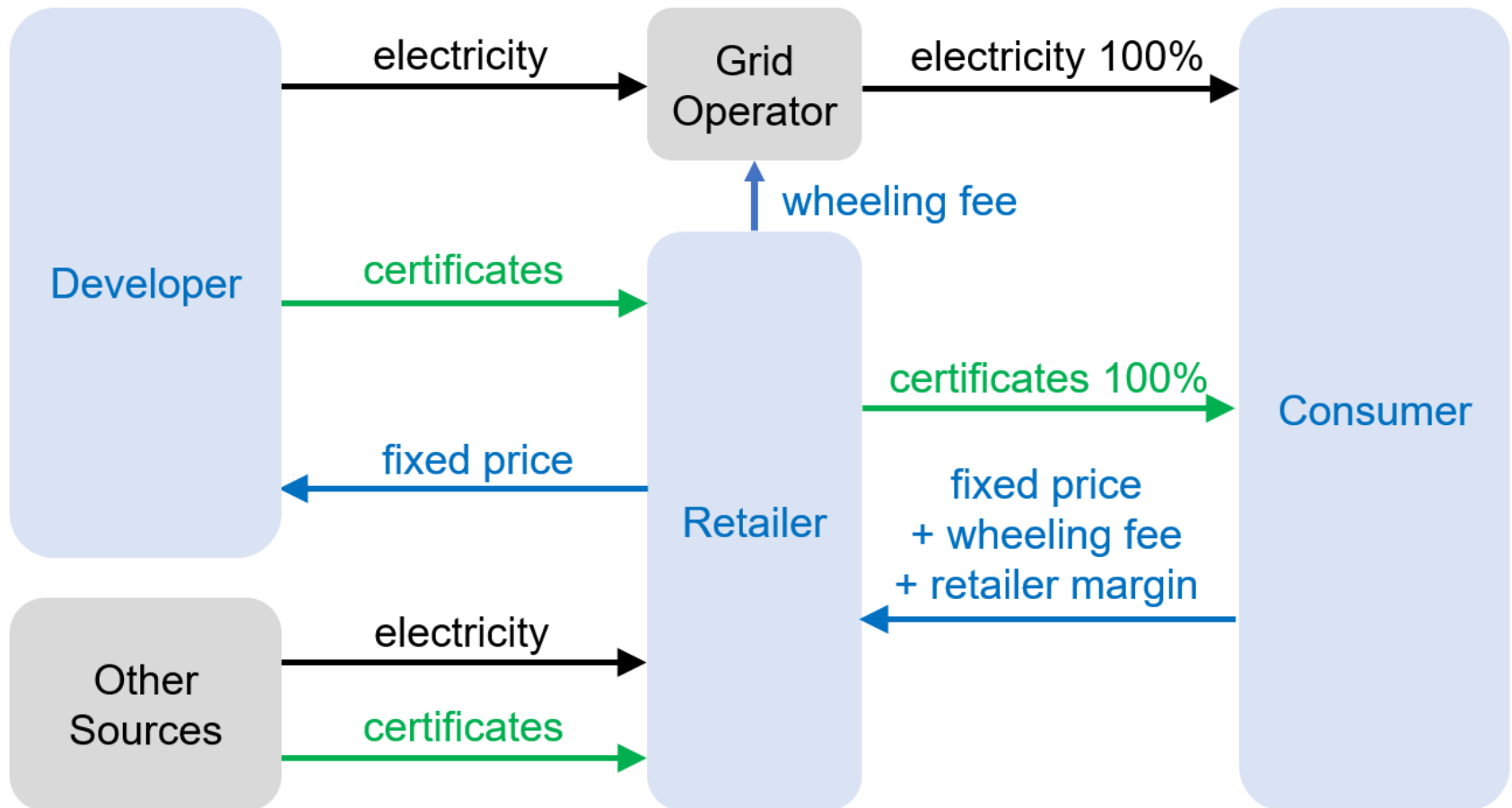
1-2. Contract Type: Physical PPA

Physical PPAs should be made with registered retailers between developers and consumers by Electricity Business Act.



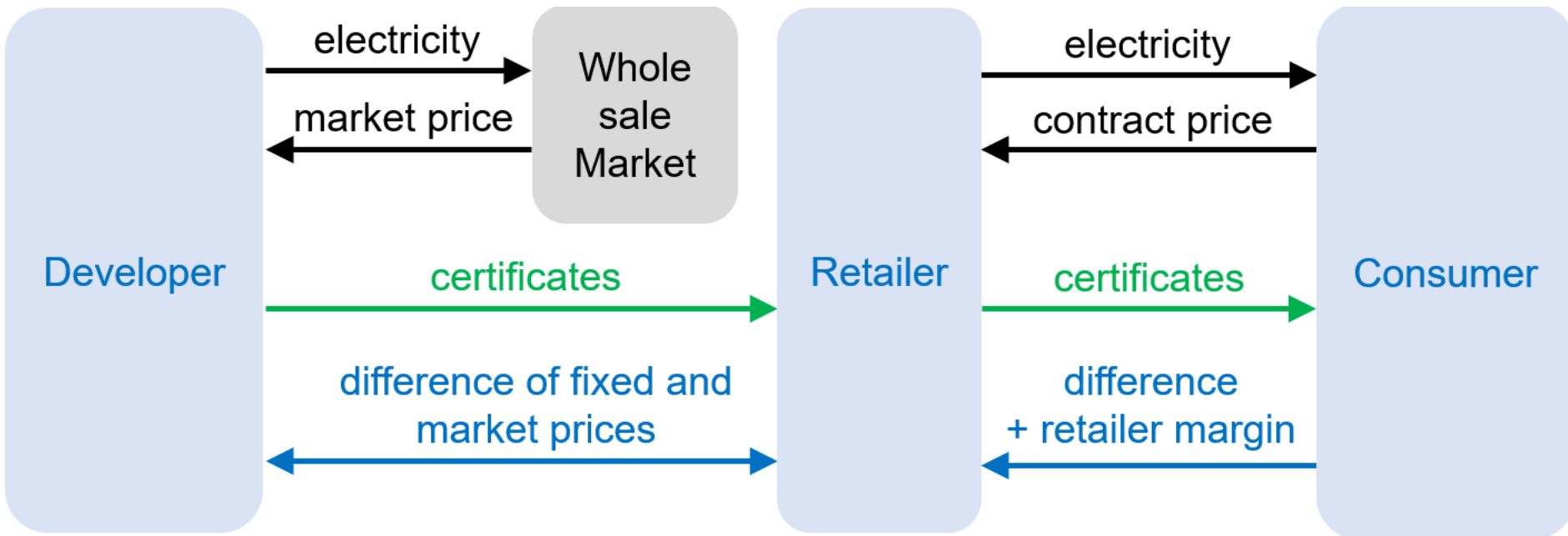
1-3. Contract Type: Physical PPA (RE100%)

Physical PPAs may not be able to provide 100% electricity for the consumers' demand. Consumers can make comprehensive contracts with retailers including physical PPAs and other sources.



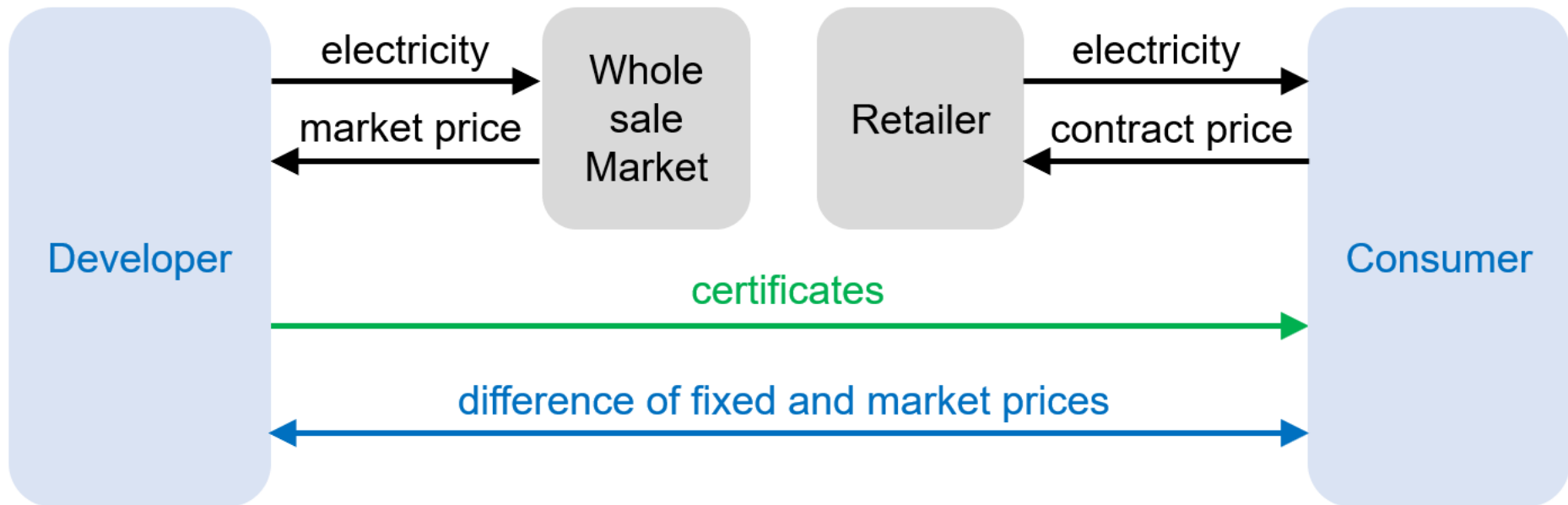
1-4. Contract Type: Virtual PPA

Virtual PPAs should be made with registered retailers between developers and consumers by the rules of Non-Fossil Certificates. Consumers need to procure certificates of virtual PPAs through the same retailer they purchase electricity. RE100% contracts are applicable same as physical PPAs (refer to 1-3).



1-5. Contract Type: Virtual PPA (direct)

Virtual PPAs can be made directly between developers and consumers in case the rules of Non-Fossil Certificates are deregulated (expected in 2022). Consumers will be able to procure certificates of virtual PPAs from the developers.



1-6: Regular Tariffs vs. PPA Prices

- Average regular tariffs are around JPY14/kWh for offices and stores (high-voltage, 50kW-2MW) and around JPY10/kWh for large factories (extra-high-voltage, 2MW-).
- Consumers need to pay surcharges additionally, JPY3.36/kWh from May 2021 to April 2022, for electricity supplied through grid network. Surcharges will be higher in the upcoming years.
- Onsite PPA prices for consumers are around JPY10/kWh in 2021. Consumers do not have to pay surcharges for onsite PPAs. It is cost competitive compared with regular tariffs.
- Physical PPA prices are around JPY16/kWh for high-voltage consumers in 2021 and higher than regular tariffs by averagely JPY2/kWh. Several customers receive subsidies for physical PPAs from the government and cover the additional costs.
- Cost issues for physical PPAs will be solved by new policies implemented in 2022.

1-7: New Policy: Feed-in Premium

- The government is going to support renewable energy development projects by Feed-in Premium from April 2022. Developers will receive premiums based on wholesale market prices and retain environmental attributes of renewables.
- The new program covers 50kW or larger projects by solar, wind, medium-small hydro (up to 30MW), geothermal and biomass.
- Developers need to sell electricity to the wholesale market or to retailers by bilateral contract. Environmental attributes will be provided to retailers or consumers from developers in the form of Non-Fossil Certificates.
- By selling electricity to the wholesale market, developers can make virtual PPAs and receive differences of fixed PPA prices and wholesale market prices by premiums. By bilateral contract with retailers, developers can make physical PPAs at lower prices than usual by receiving premiums from the government.

1-8: New Policy: Self-wheeling

- Self-wheeling is a program for corporate consumers to transfer self-generated electricity to other locations through grid network. In case of self-wheeling, consumers need to pay wheeling fees but no surcharges.
- The program was applicable only in case both the generation site and the recipient sites owned by the same company or group companies.
- The government changed the rule in November 2021 so that consumers can apply the self-wheeling program in case the generation site is newly built, owned by other companies and consumers procure the electricity by long-term contract (physical PPA). Consumers do not need to pay surcharges and can reduce the total costs of physical PPAs.
- Projects certified by Feed-in Premium or Feed-in Tariff are not applicable for the self-wheeling program.

2-1: Cost Estimation for Onsite PPA

Onsite PPA prices for solar are around JPY10/kWh in 2021. Installation costs of onsite solar are usually lower than offsite because it does not require land forming and complex mounts.

Capacity	1MW (AC)
Generation	1.50 GWh (capacity factor: 17%)
Lifetime	20 years
Total Investment	JPY 252 million
Generation Cost	JPY 8.4 /kWh
PPA Price	JPY 10.0 /kWh (incl. environmental attributes)
Generation Revenue	JPY 300 million
ROI	0.95% /year

2-2: Case Study on Onsite PPA Aeon (retail)

Aeon is Japan's largest retail company and consumes 7.1TWh of electricity globally in 2020. Aeon made 8 onsite PPAs by rooftop solar as of October 2021 including a shopping center in Shiga (below). Contract terms are usually 15-20 years and PPA prices are lower than regular tariffs. Aeon is planning to make more than 300 onsite PPAs for stores nationwide and offsite PPAs later.

Consumer	Aeon
Site	Aeon Town Konan (Shiga Pref., high-voltage)
Generator	MUL Utility Innovation
Capacity	1,162kW
Start of Operation	September 2020
Contract Years	undisclosed

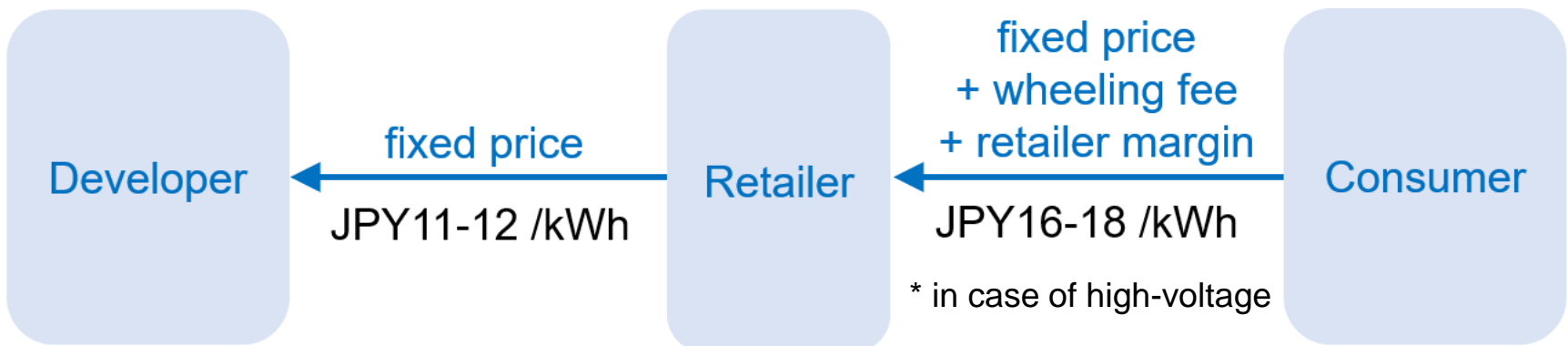
2-3: Case Study on Onsite PPA Kaihara (textile)

Kaihara is globally recognized as a quality denim manufacturer and operates 4 factories in Japan. Kaihara made the first onsite PPA by rooftop solar at one of the factories (below). It is the largest onsite PPA in Japan to date and will provide 12% of electricity consumed in the factory. PPA prices are approximately 25% lower than the current regular tariffs.

Consumer	Kaihara
Site	Sanwa Factory (Hiroshima Pref., extra-high-voltage)
Generator	Orix
Capacity	2,247kW
Start of Operation	June 2021
Contract Years	18 years

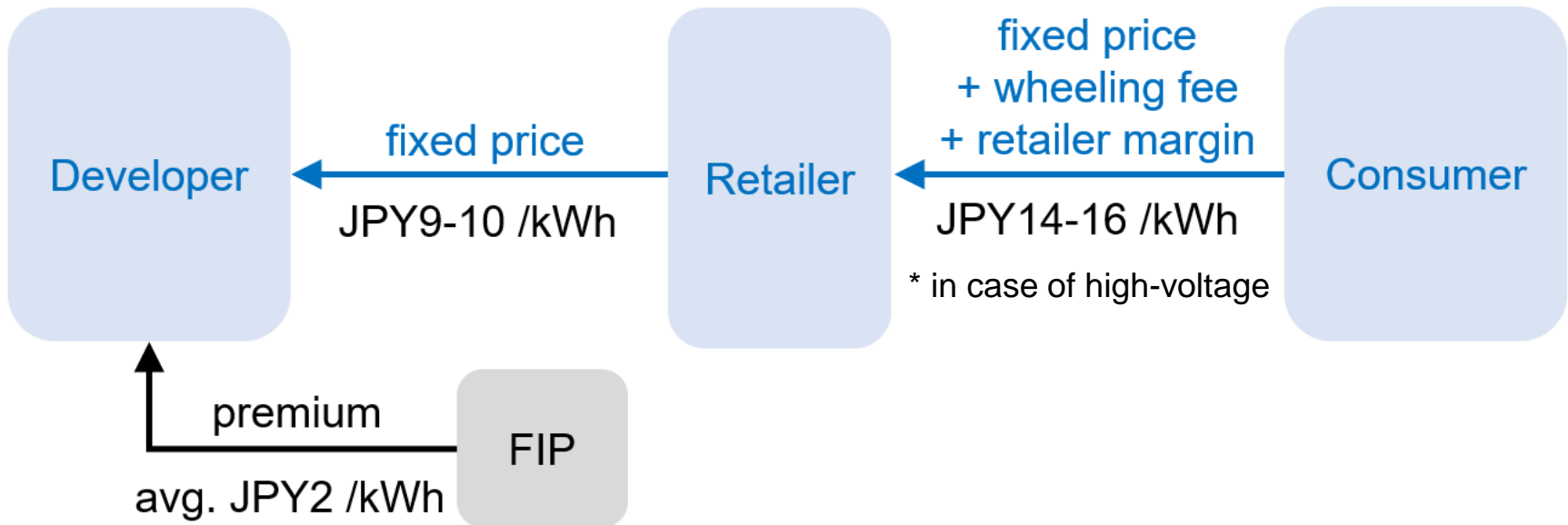
3-1: Cost Estimation for Physical PPA

- Estimated from the leading cases of physical PPAs in Japan, developers sell electricity and environmental attributes to retailers at JPY11-12/kWh for solar projects commencing in 2022.
- Retailers need to pay wheeling fees to grid operator at around JPY4/kWh for supplying high-voltage electricity. In addition, retailers are responsible for balancing demand and supply.
- In total, physical PPA prices will be JPY16-18/kWh for high-voltage, and JPY14-16/kWh for extra-high-voltage with a lower wheeling fees around JPY2/kWh.



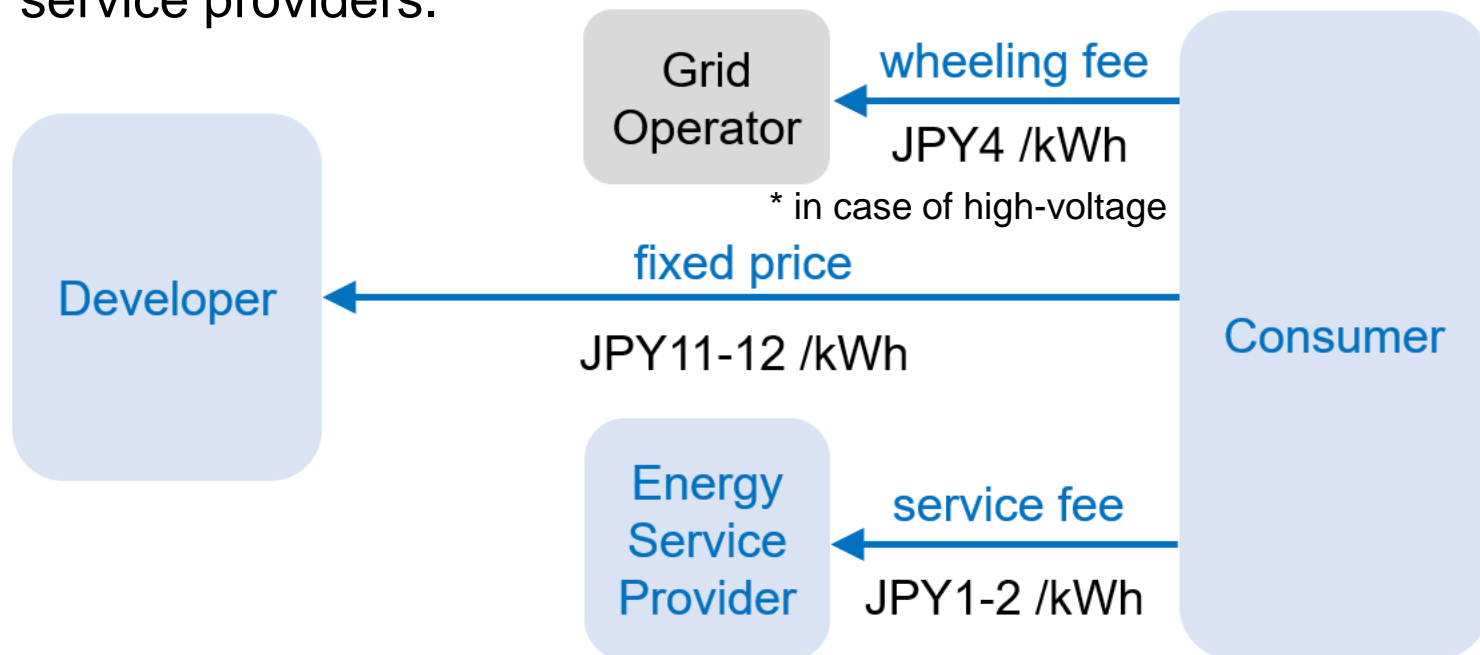
3-2: Cost Estimation for Physical PPA with Feed-in Premium (FIP)

- The government set the FIP base price for large-scale solar plants certified in FY2022 (Apr 2022 – Mar 2023) at JPY10/kWh. Wholesale market reference prices are estimated at around JPY8/kWh on annual average. The differences will be covered by premiums and paid to developers.
- Physical PPA prices can be lowered considering the premium.



3-3: Cost Estimation for Physical PPA with Self-wheeling

- In case the self-wheeling program is applied to physical PPAs, consumers can procure electricity and environmental attributes directly from developers without paying surcharges.
- Consumers should be responsible for balancing supply and demand instead. The task is usually outsourced to energy service providers.



3-4: Cost Comparison of Physical PPAs

- Physical PPAs by self-wheeling will provide the lowest prices as consumers do not need to pay surcharges, JPY3.36/kWh for a year from May 2021 and higher in the following years.

Contract Type		Physical PPA	Physical PPA + Feed-in Premium	Physical PPA + Self-wheeling
Consumer Costs (excl. sales tax)		JPY16-18 /kWh + surcharges	JPY14-16 /kWh + surcharges	JPY16-18 /kWh
Costs	Developer	JPY11-12 /kWh	JPY9-10 /kWh (excl. premium JPY2 /kWh)	JPY11-12 /kWh
	Retailer	JPY1-2 /kWh (margin)	JPY1-2 /kWh (margin)	—
	Grid operator	JPY4 /kWh	JPY4 /kWh	JPY4 /kWh
	Energy service provider	—	—	JPY1-2 /kWh

* Costs other than developer are for high-voltage supply.

3-5: Case Study on Physical PPA Hulic (real estate)

Hulic owns 250+ buildings and plans to operate with no carbon emissions by 2030. For internal use, all the electricity (60GWh annually) will be procured through physical PPAs by 2024. Hulic invests solar projects, owns the plants, supplies the generated electricity through a retailer in the group (1st project below).

Consumer	Hulic Group
Site	Headquarters (Tokyo, high-voltage)
Generator	Hulic
Capacity & Location	Solar, 1311kW (Saitama Pref.)
Retailer	Hulic Property Solution
Start of Operation	October 2020
Contract Years	20 years

3-6: Case Study on Physical PPA

Seven & i (retail)

Seven & i operates 70,000+ stores globally and made the first physical PPA for 40 convenience stores and a shopping mall (below). The second physical PPA was made for 300 convenience stores.

Consumer	Seven & i Group
Site	1. Seven-Eleven 40 stores (high-voltage) 2. Ario Kameari (Tokyo, high-voltage)
Generator	NTT Anode Energy
Capacity & Location	1. Solar, 0.8MW (Chiba Pref.) 2. Solar, 2.3MW (Chiba Pref.)
Retailer	Ennet
Start of Operation	1. June 2021 2. January 2022
Contract Years	20 years

3-7: Case Study on Physical PPA Kao (healthcare)

Kao provides healthcare products globally and aims at procuring 100% renewable electricity by 2030. The first physical PPA (below) was made by receiving a government subsidy for covering cost increase. The headquarters will procure 100% renewable electricity including other sources through the same retailer.

Consumer	Kao
Site	Headquarters (Tokyo, high-voltage)
Generator	Jenex
Location	Solar (Shizuoka Pref.) * capacity undisclosed
Retailer	Minna Denryoku
Start of Operation	February 2022
Contract Years	20 years

3-8: Case Study on Physical PPA

Dai-ichi Life (insurance)

Dai-ichi Life aims at procuring 100% renewable electricity by 2023 and made the first physical PPA (below) by receiving a government subsidy. Each solar site is small-scale so that developers can find available lands easily and construct facilities in a short period.

Consumer	Dai-ichi Life
Site	Offices (Tokyo, high-voltage)
Generator	Clean Energy Connect
Capacity & Location	Solar x 22 locations, 2MW in total (Kanto & Tohoku Districts)
Retailer	Orix
Start of Operation	February 2022
Contract Years	20 years

3-9: Case Study on Physical PPA Amazon (technology)

Amazon made the first corporate PPA in Japan (below) but did not disclose the details. It is estimated to be physical and will provide 23 GWh of electricity annually. Amazon needs to make more PPAs for data centers and distribution centers to procure 100% renewable electricity by 2030 and looks for opportunities of physical and virtual.

Consumer	Amazon
Site	undisclosed
Generator	Mitsubishi Corporation Energy Solutions
Capacity	Solar x 450 locations, 22MW in total * locations undisclosed
Retailer	MC Retail Energy
Start of Operation	2022-2023
Contract Years	undisclosed

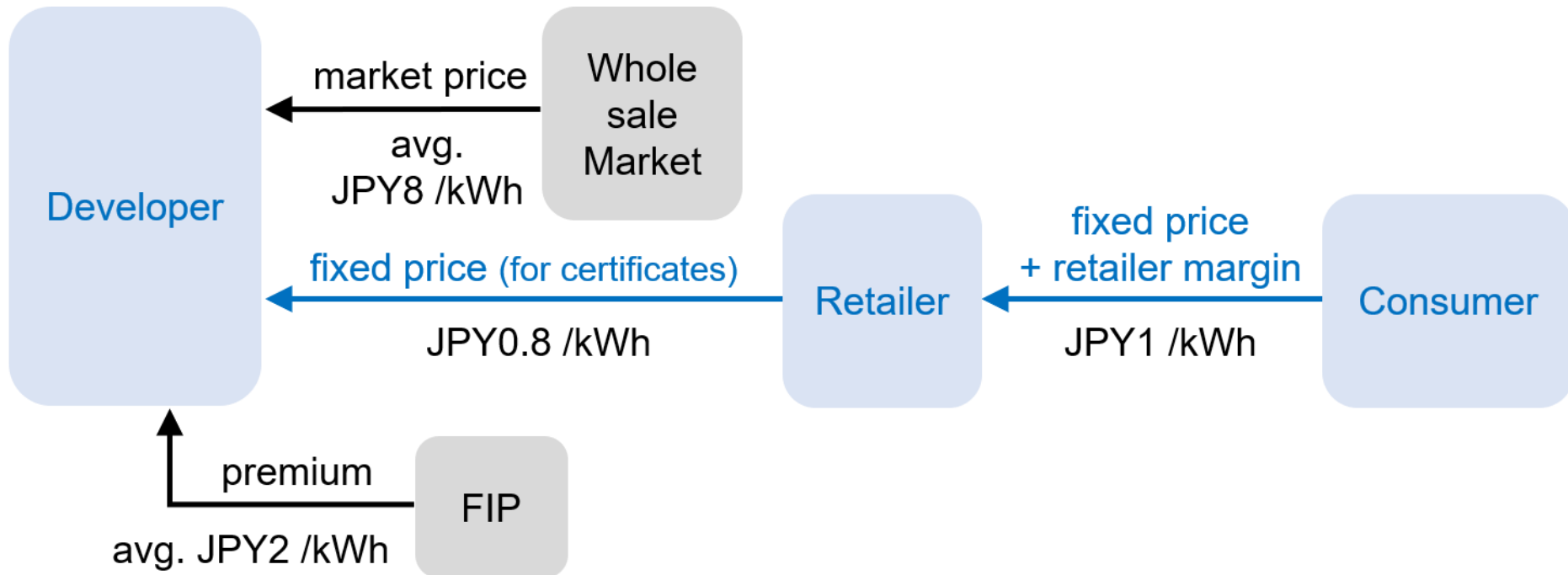
3-10: Case Study on Self-wheeling Sony (electronics)

Sony adopted the self-wheeling program for supplying electricity from a solar plant to a factory. The plant is owned by a developer and Sony should take responsibility of the generator to make it for internal use. As the rules changed (refer to 1-8), physical PPAs by self-wheeling can be made directly with developers.

Consumer	Sony Group
Site	Sony Global Manufacturing & Operations Koda Site (Aichi Pref., extra-high-voltage)
Generator	Sony Group
Capacity & Location	Solar, approx. 400kW (Aichi Pref.)
Energy Service Provider	FD
Start of Operation	April 2021
Contract Years	15 years

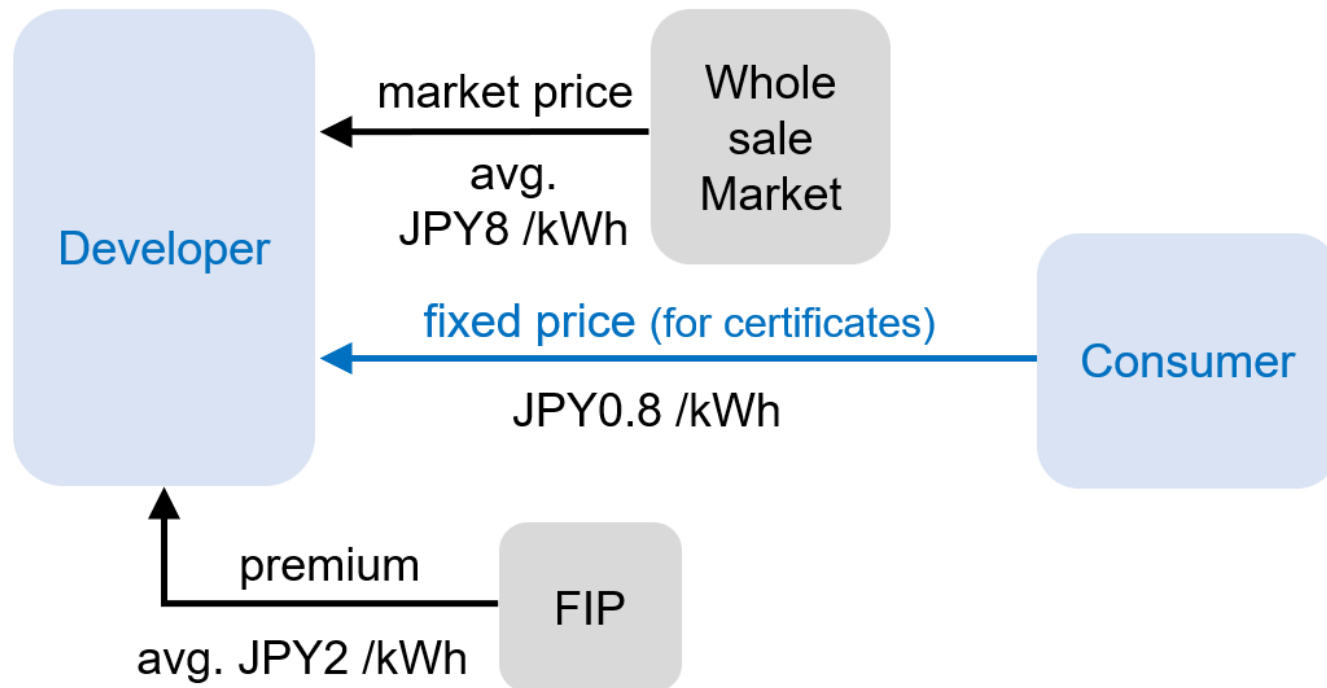
4-1: Cost Estimation for Virtual PPA with Feed-in Premium (FIP)

- Virtual PPAs in Japan will be more efficient and cost competitive with adopting the Feed-in Premium program (refer to 1-7).
- Developers can get premiums and cover volatility of wholesale market prices. PPA prices can be fixed for transferring certificates to consumers through retailers.



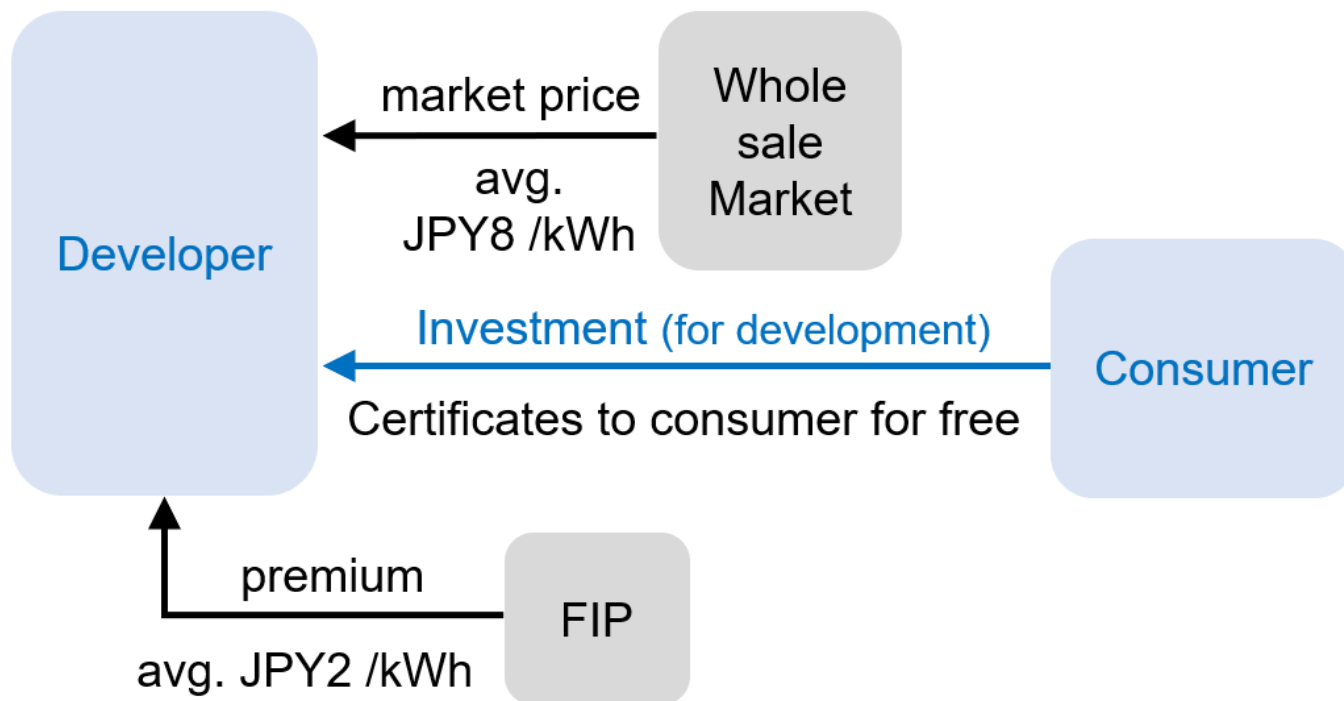
4-2: Cost Estimation for Virtual PPA by Direct Contract

- Virtual PPAs can be made directly between developers and consumers after the rules of Non-Fossil Certificates changed (refer to 1-5). FIP is effective in this scheme.



4-3: Cost Estimation for Virtual PPA by Project Investment

- Consumers may invest in developing power plants for virtual PPAs and receive certificates instead of interests.
- Developers are free from financing and can construct plants in a shorter period.



4-4: Cost Comparison of Virtual PPAs

- From consumer perspectives, virtual PPAs are less risky for projects certified by Feed-in Premium to avoid contract for difference (cfd).

Contract Type		Virtual PPA	Virtual PPA + Feed-in Premium	Virtual PPA (direct) + Feed-in Premium
Consumer Costs (excl. sales tax)		avg. JPY15 /kWh + contract for difference + surcharges	avg. JPY15 /kWh + surcharges	avg. JPY14.8 /kWh + surcharges
Costs	Developer	—	—	JPY0.8 /kWh
	Retailer (electricity)	Avg. JPY14 /kWh	Avg. JPY14 /kWh	Avg. JPY14 /kWh
	Retailer (certificate)	JPY1 /kWh + cfd (incl. payment for developer)	JPY1 /kWh (incl. payment for developer)	—

* Retailer electricity costs are for high-voltage supply.

Direct contracts will be applicable by deregulation of Non-Fossil Certificates (refer to 1-5).

4-5: Cost Comparison of Virtual and Physical

- Consumer costs of virtual PPAs mainly depend on electricity costs by retailers independent of the PPAs while physical PPAs depend on generation costs by developers.
- Virtual is economically more flexible and volatile than Physical.

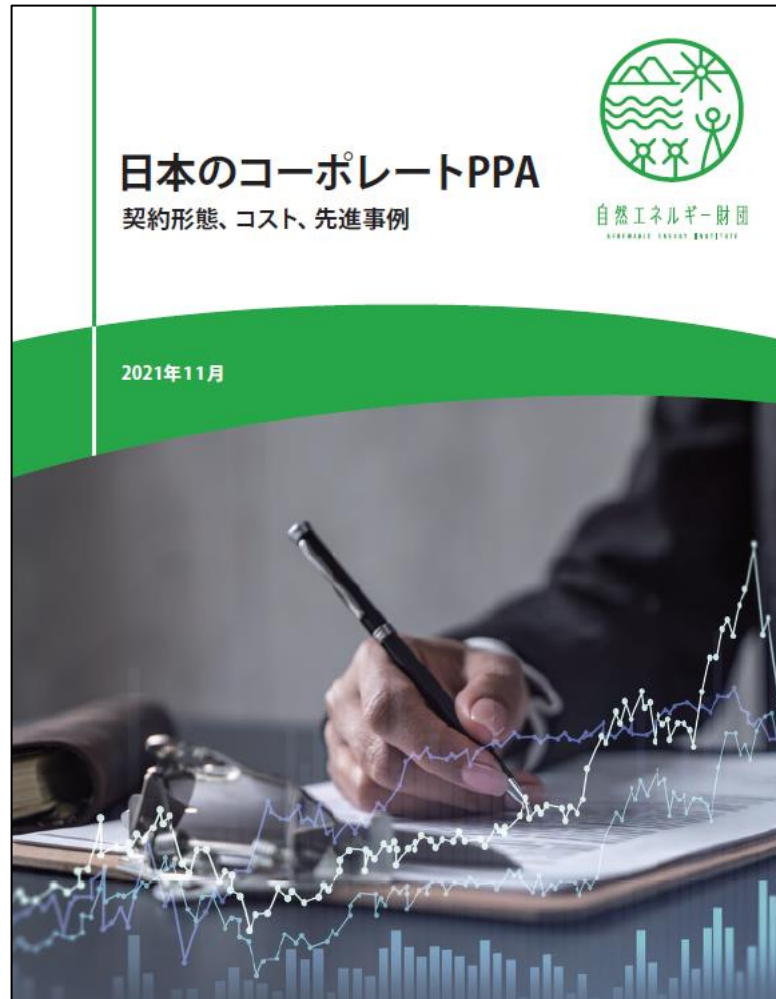
Contract Type		Virtual PPA + Feed-in Premium	Physical PPA + Feed-in Premium
Consumer Costs (excl. sales tax)		avg. JPY15 /kWh + surcharges	JPY14-16 /kWh + surcharges
Costs	Developer	—	JPY9-10 /kWh (excl. premium JPY2 /kWh)
	Retailer (electricity)	avg. JPY14 /kWh	JPY5-6 /kWh
	Retailer (certificate)	JPY1 /kWh (incl. payment for developer)	

* Retailer electricity costs are for high-voltage supply.

Policy Recommendations

1. **Deregulation:** Renewable energy sources are abundant in Japan. Corporate PPAs will expand by deregulating restrictions of land use and others.
2. **Liberalization:** For increasing new renewables, the electricity system must be reformed further, such as by changing the dispatching rule to prioritize solar and wind over nuclear.
3. **Certificates:** Non-Fossil Certificates are complicated and inflexible. The system should be restructured covering only renewables and make it easier for consumers to apply.
4. **Project Matching:** A nationwide online platform should be established for developers and consumers to find opportunities of corporate PPAs.
5. **Decarbonization:** For accelerating energy transition in the industries, new measures reducing fossil fuels such as Carbon Pricing should be implemented to promote using renewables.

Full Edition (Japanese)



https://www.renewable-ei.org/pdfdownload/activities/REI_JPcorpPPA2021.pdf

Contact:

Renewable Energy Institute

11F, KDX Toranomom 1-Chome Bldg.,
1-10-5 Toranomom, Minato-ku, Tokyo 105-0001

TEL: +81-3-6866-1020

E-mail: info@renewable-ei.org

Web: <https://www.renewable-ei.org/en/>



Renewable Energy Institute