Salzburg Reform Meeting
2019, October

Current and future costs of solar PV in Japan

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Background

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- Costs of Renewables affect cost for decarbonizing energy system.
- Trends of existing studies
  - Compare and Tracking：IEA、IRENA、BloombergNEF
  - Analysis of Breakdown Costs：Morris, et al (2013), Friedman, et al. (2014), Seel, et al (2014), Kimura & Zissler(2016)
  - Outlook of Future Costs：International organizations, private institutes, etc.

Purpose of this study

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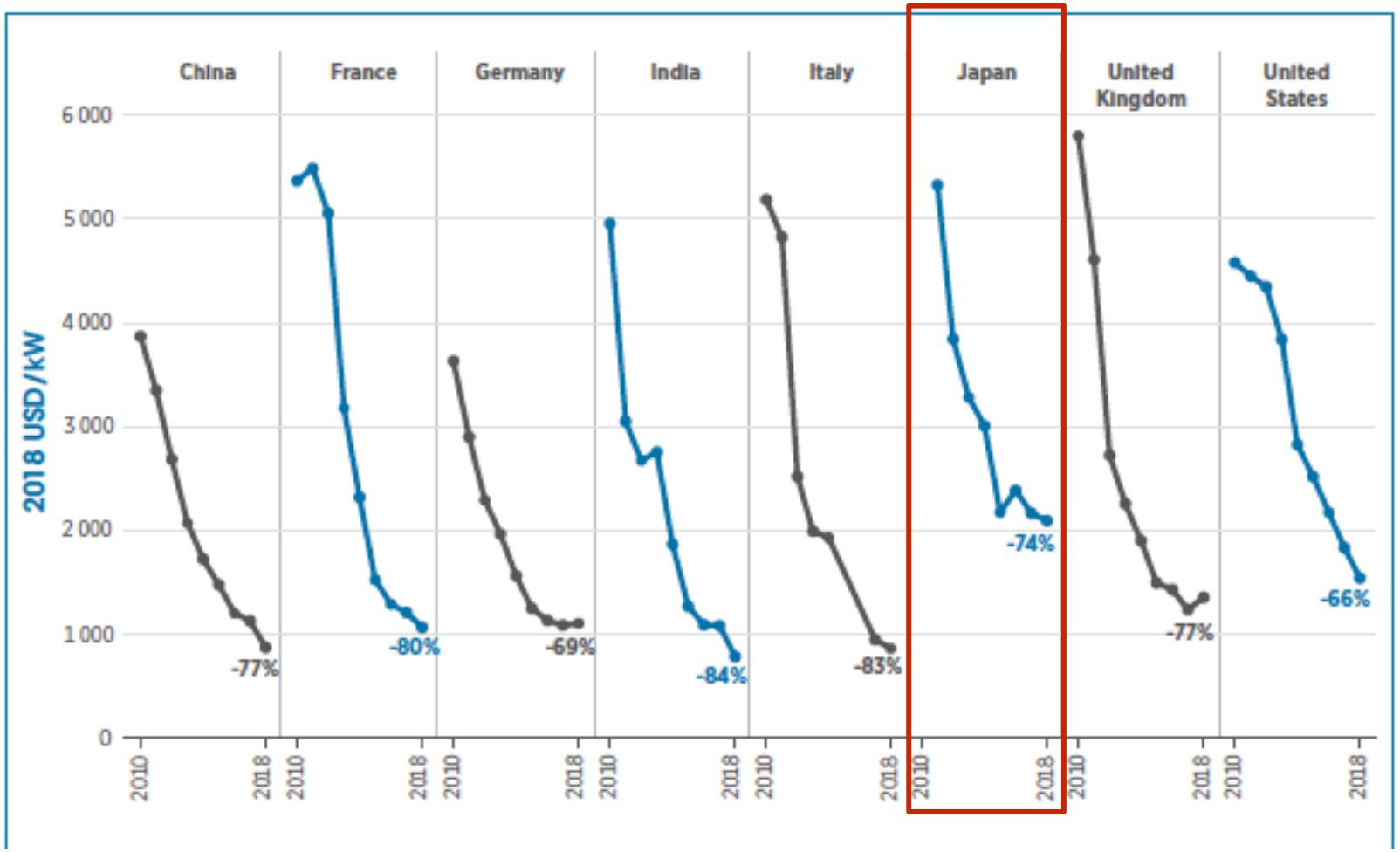
- Factors to push up current costs of solar PV in JP.
- Future costs of solar PV in Japan is estimated.



Utility-scale solar PV total installed cost, 2010-2018
IRENA (2019) Renewable Power Generation Costs in 2018

Current Costs Analysis

Methodology

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November and December, 2018

Target	Companies owning solar PV
送付数	1676
Respondent	212
Rate of response	13%

Data outlook

	Total	Small	Medium	Large
Effective N.	63	12	46	5
Capacity of plants(kW)	89,296	479	32,855	55,962
Average capacity(kW)	1,417	40	714	11,192
Capacity of modules(kW)	108,575	704	41,832	66,039
Over capacity rate	122%	147%	127%	118%

Cost structure of solar PV

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Investment Cost	
	Development costs (land acquisition, FiT certification, etc.)
	License acquisition costs
	Design costs
	Ground preparation costs (including tree felling)
	Solar PV module
	Inverter
	Mounting system
	Materials such as cables, junction box, etc.
	Installation costs
	Transforming equipment and installation costs
	Grid connection costs
	Other costs
Operation and Maintenance Costs	
	Day-to-day operation management/monitoring costs
	Weed removal
	Regular inspection costs (including legal inspections)
	Accident response/repair costs (including reserves for this purpose)
	Insurance costs
	Land leasing fees

Trends of investment costs: 2017-2019

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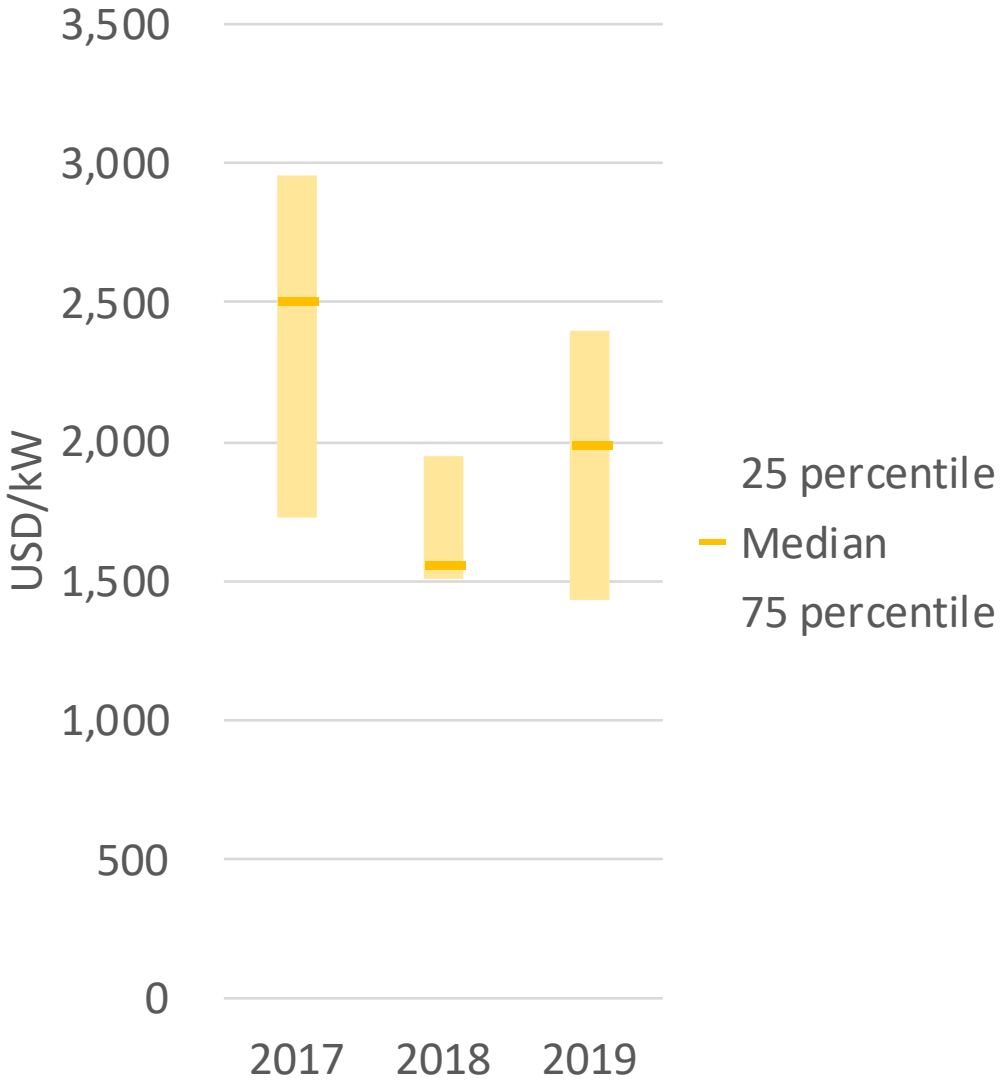
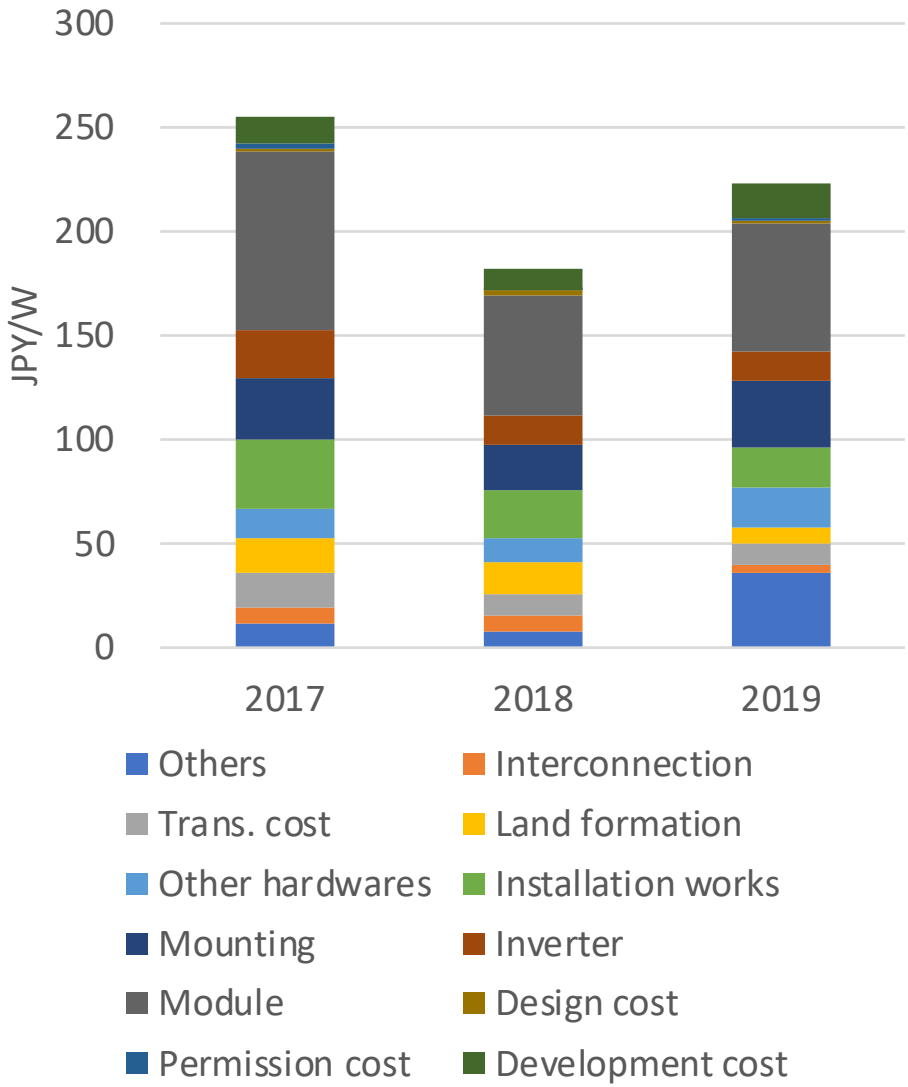
Quartile values of investment costs by operational year



Breakdown average investment costs



Trends of Hardware costs

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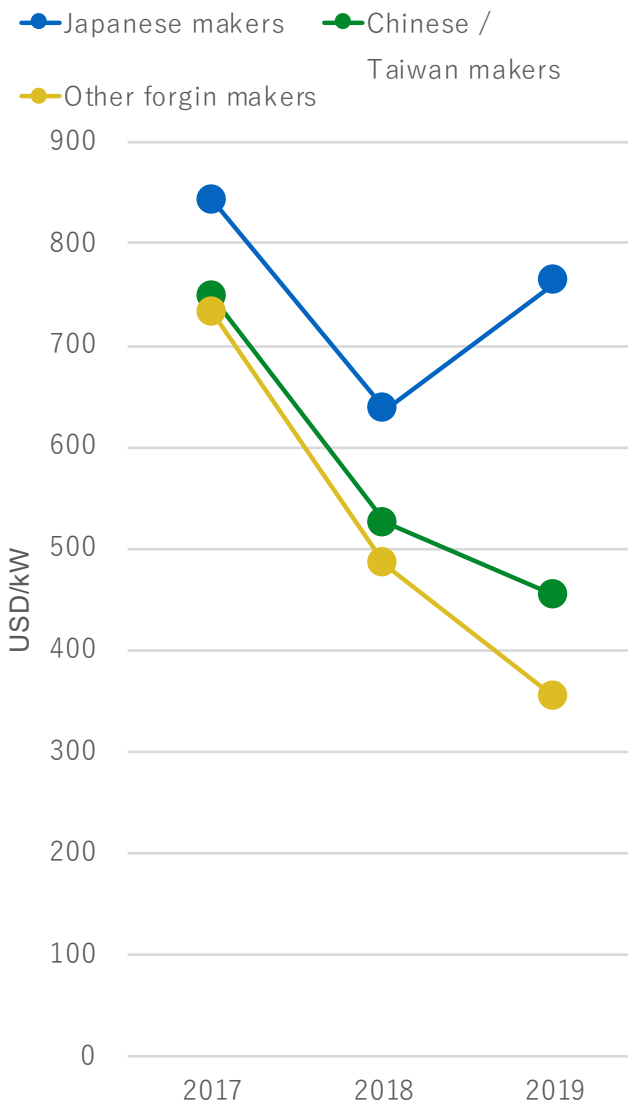
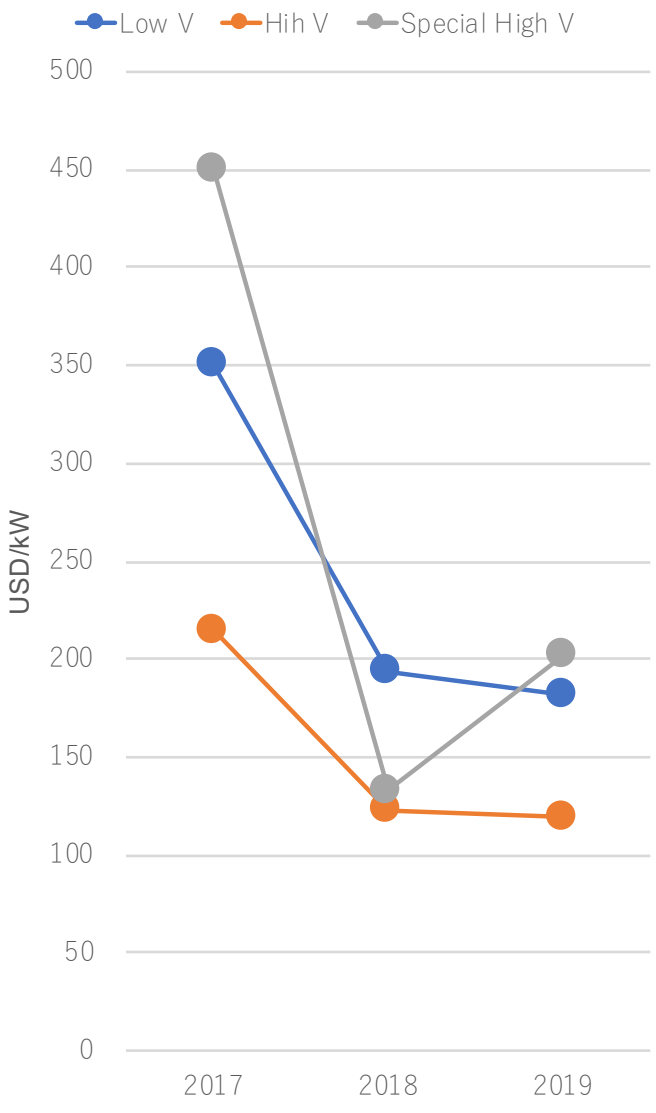
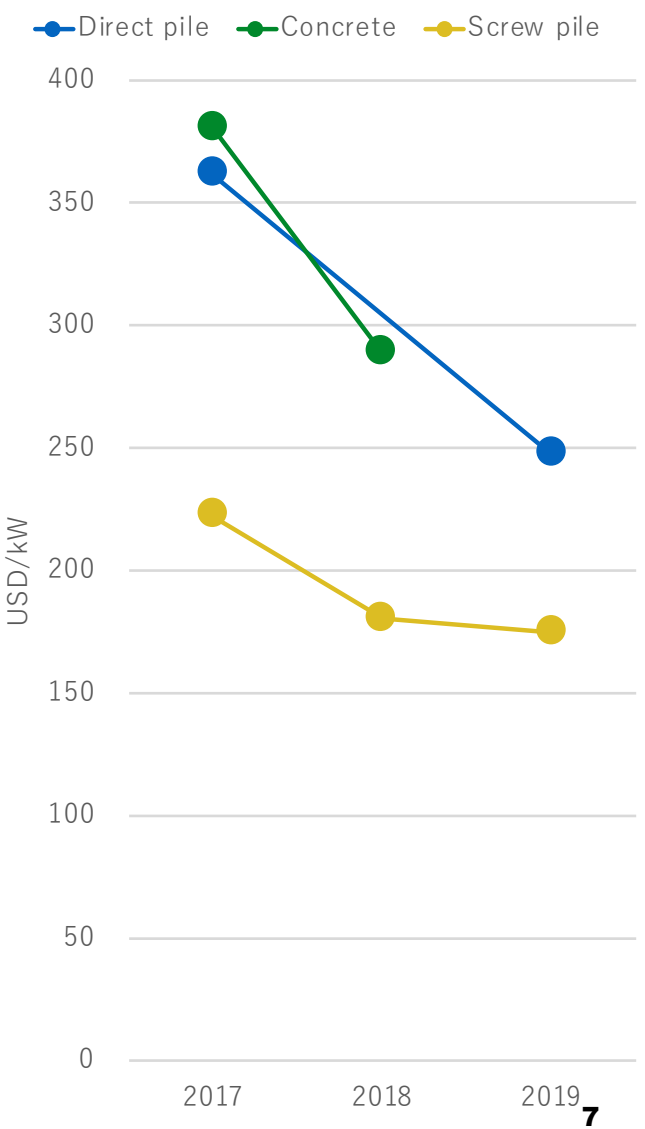
Average module costs



Average inverter costs



Average mounting costs



Costs by developing methods (1)

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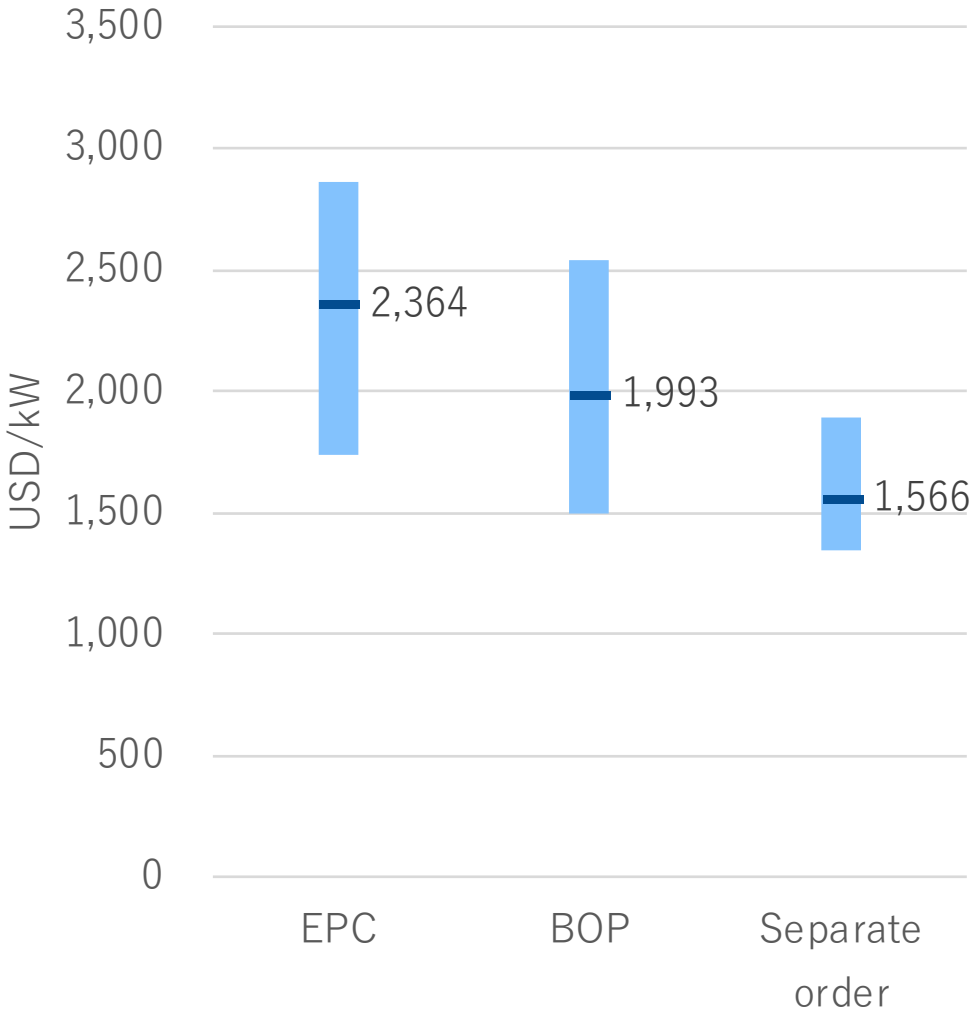
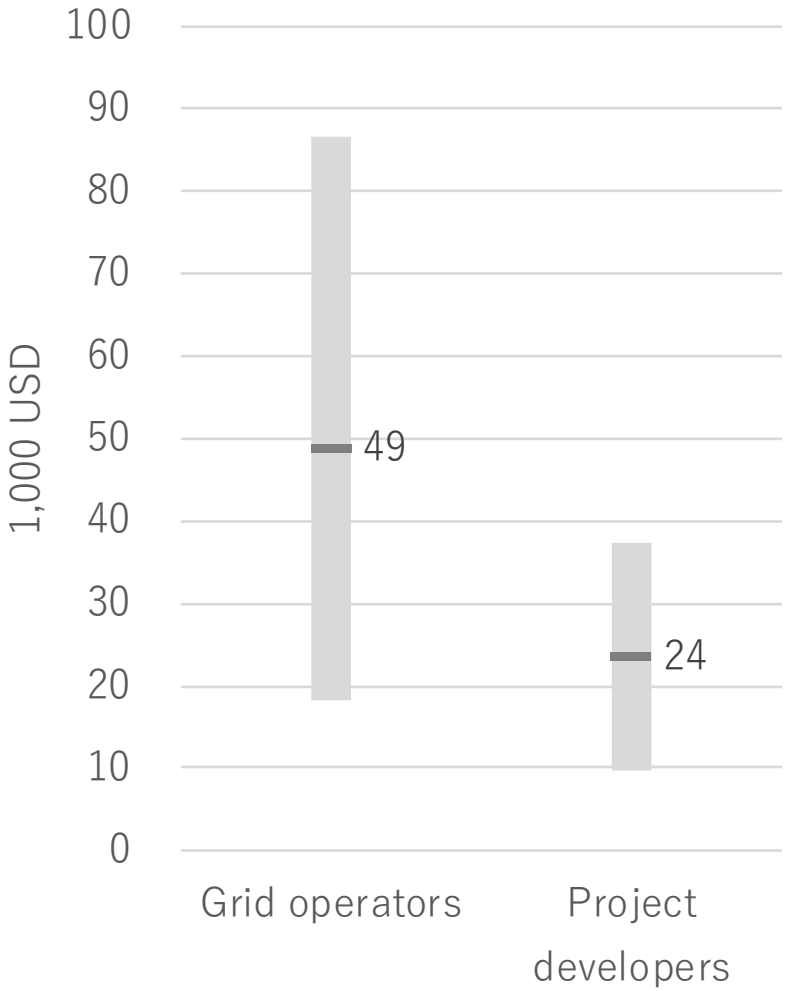
Quartile values of investment costs by way of order



Quartile values of grid connection costs by entity



Costs by developing methods (2)

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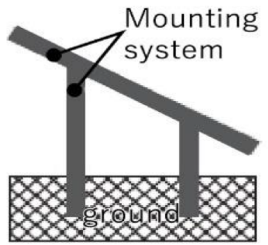
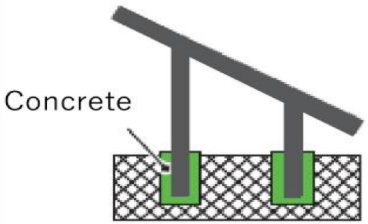
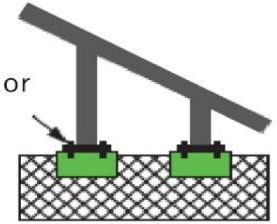
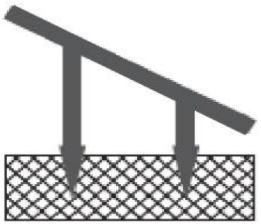
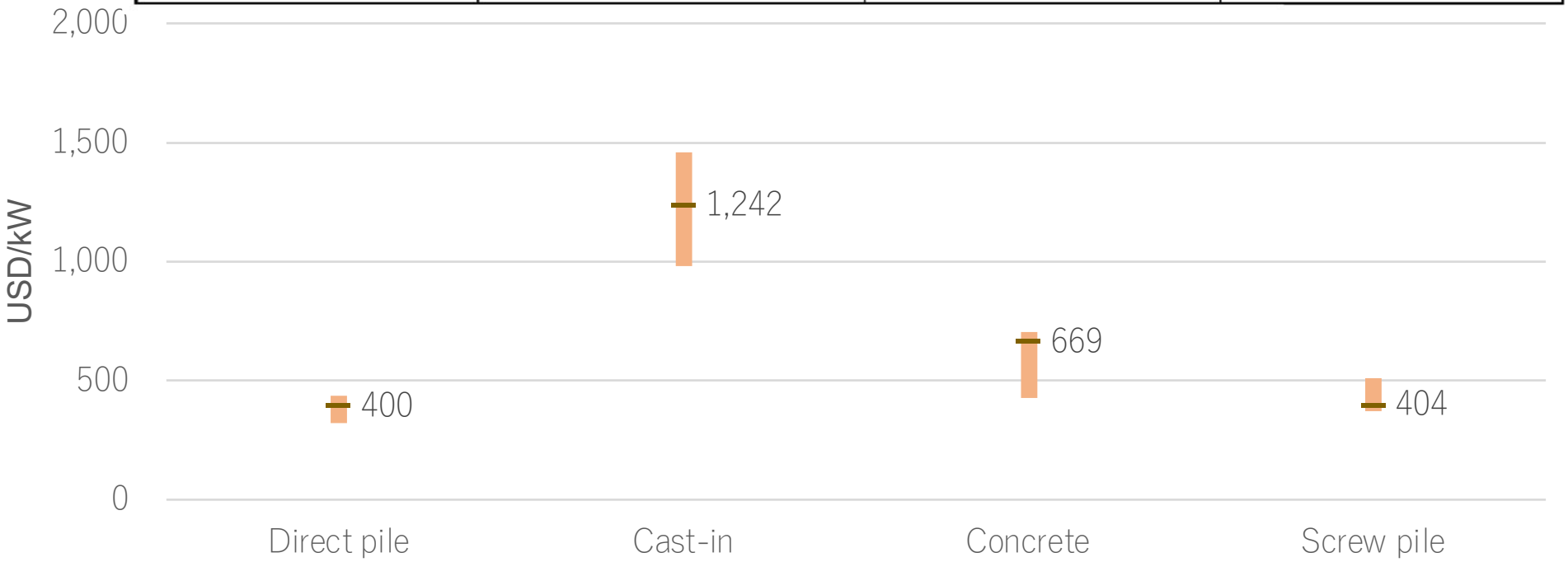
Ramming method	Cast-in method	Concrete method	Ground screw method
Piles driven directly into ground	Holes drilled in ground, concrete poured to fix piles	Piles fixed using concrete base with anchor bolt	Screw-tipped piles are rotated and fixed into the ground











Quartile values of installation-related costs by mounting system type

Investment costs by FiT tariffs

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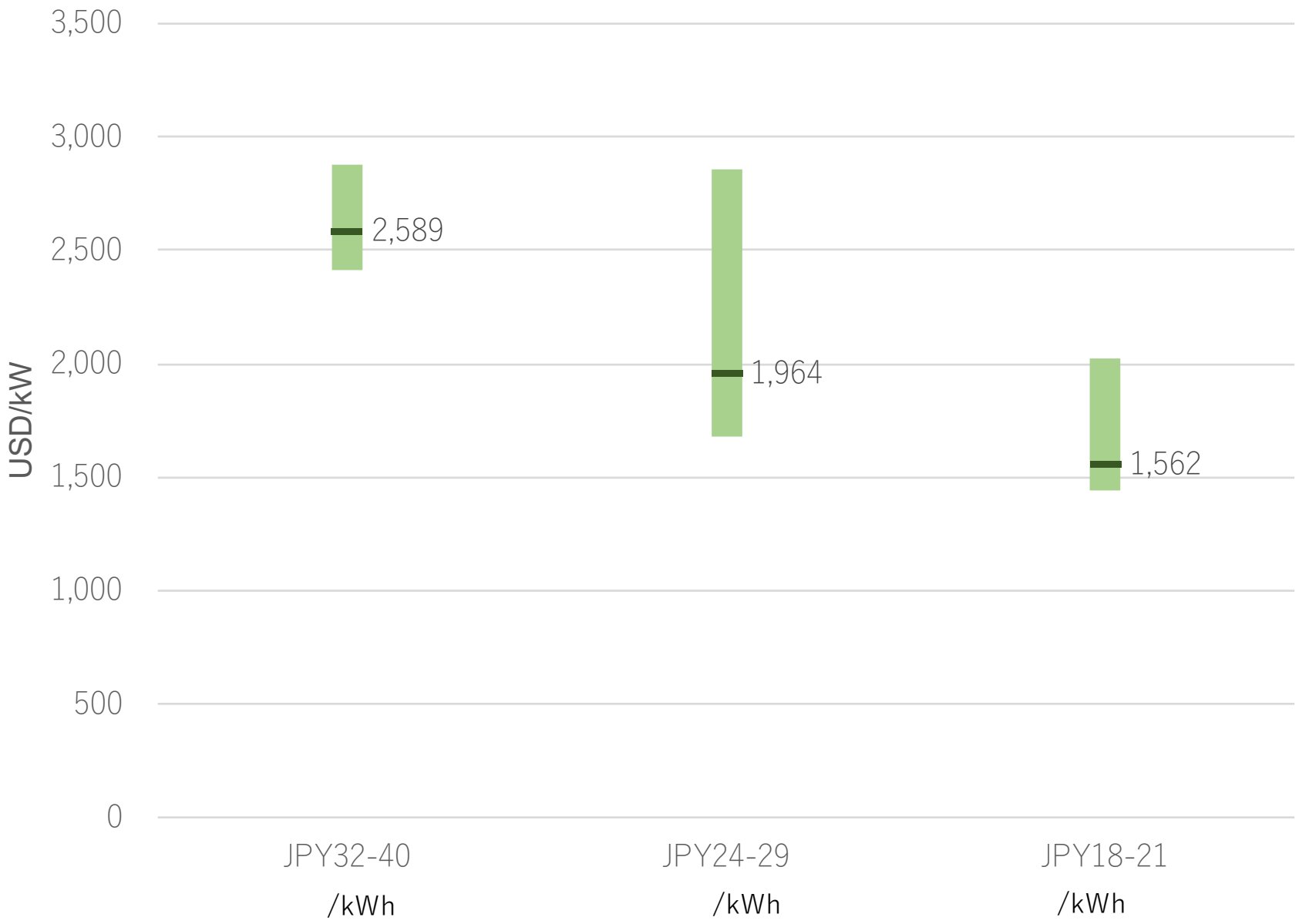

LCOE of Solar PV in JP

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- Solar PV projects with the scale of high voltage are classified with ability-based, Benchmark, and High-cost plants.
- Ability-based: qualified in FY2017 and 2018 and started operation in 2018 and 2019; developed by separate order.
- Benchmark: all plants average
- High-cost: qualified in FY2012 and 2014 and started operation in 2018 and 2019; developed by ordering EPC companies.

	Cost Effective	Benchmark	High-cost
Investment costs (USD/kW)	1,564	1,818	2,582
O & M costs (USD/kW/Yr)	26	32	41
LCOE (USD/kWh)	0.12	0.14	0.19

BloombergNEF: Germany 0.06~0.08 $/kWh; UK 0.08~0.10 $/kWh in 2Q 2018.

2030 Cost Projection

Investment costs projection in 2030

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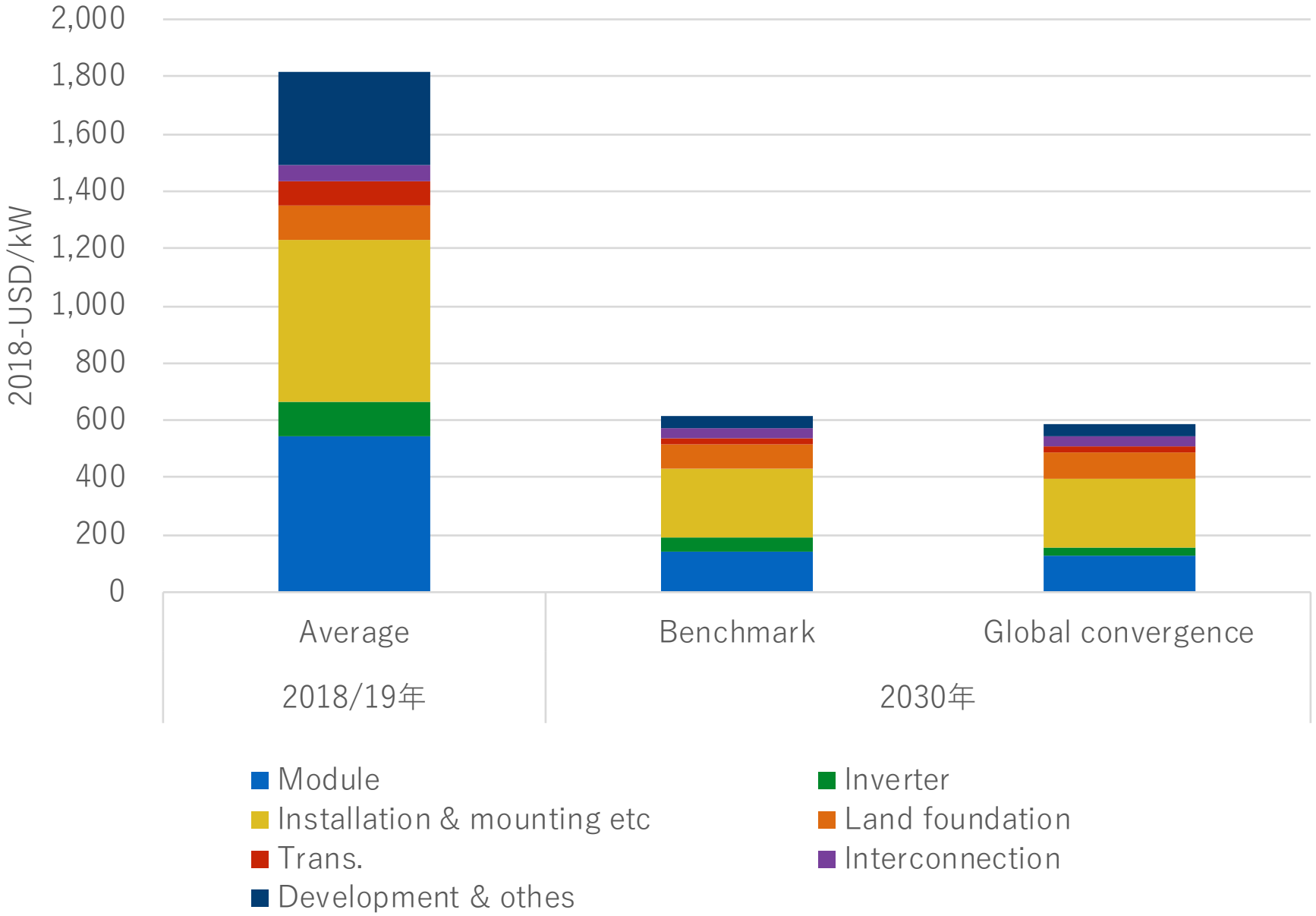

O&M costs in 2030

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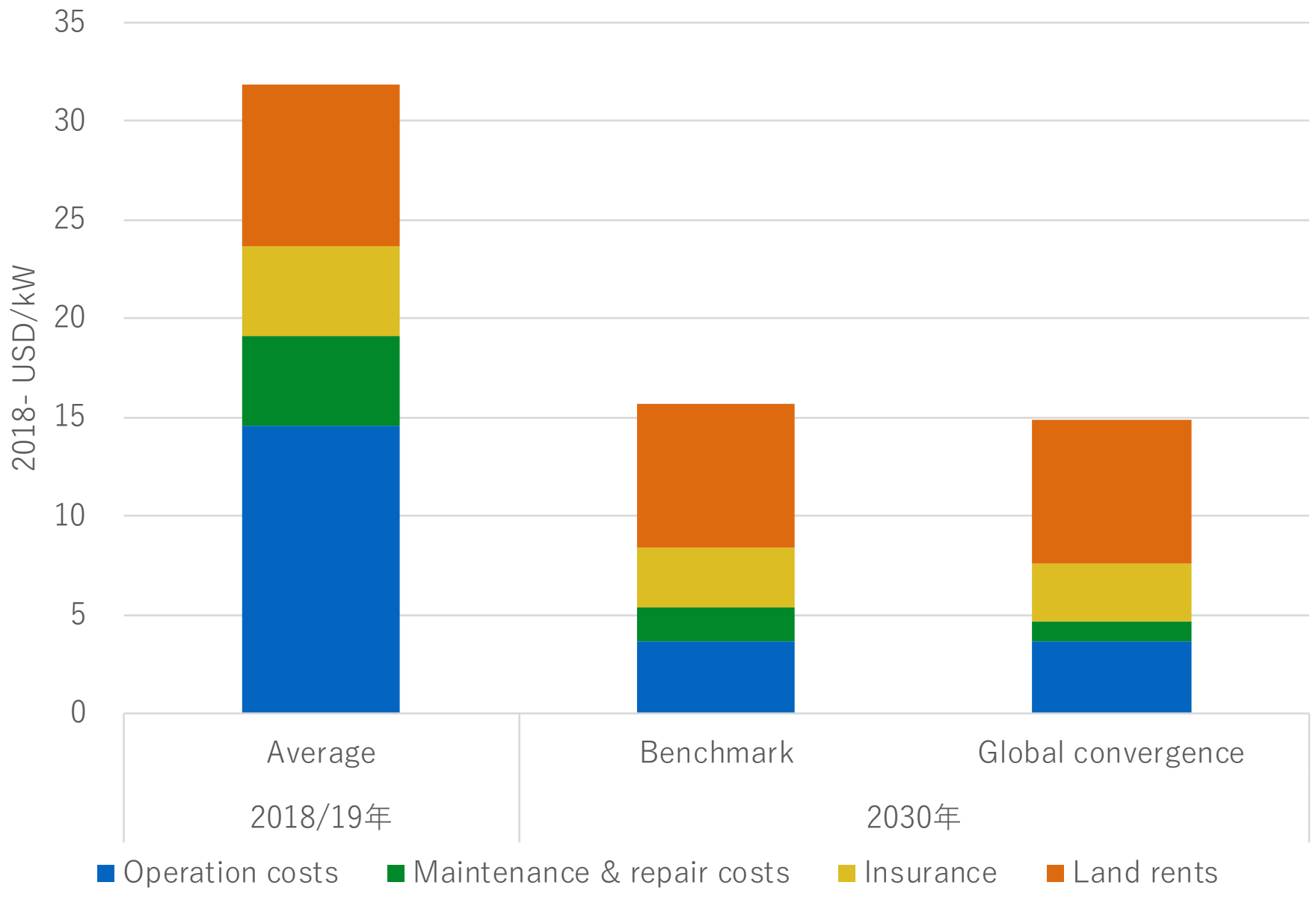

LCOE of solar PV in 2030

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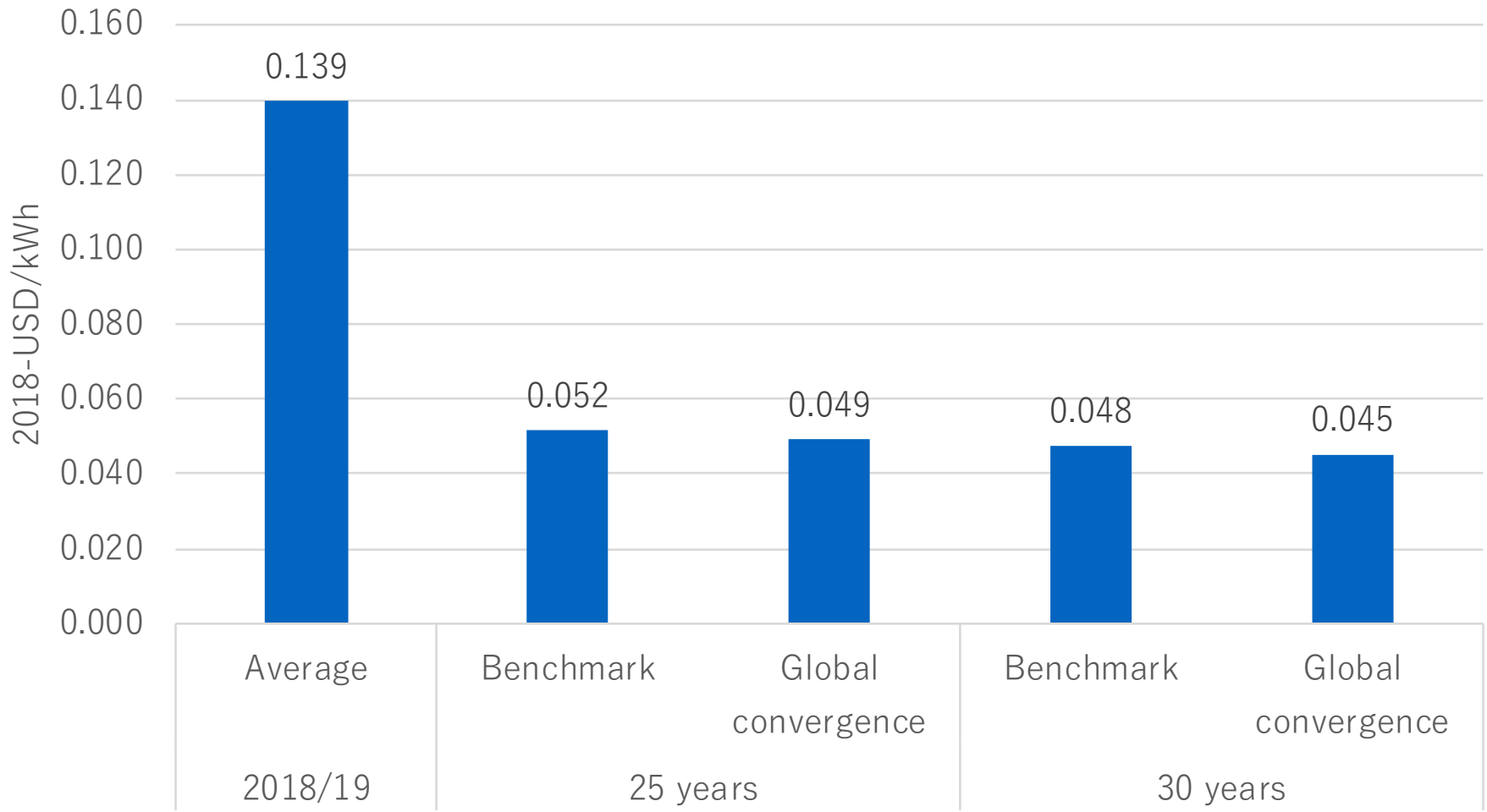

Not only competitive in the wholesale market, but the cheapest power source in JP.

Conclusion & Discussion

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Conclusion

- Cost of solar PV in JP have been expensive, but it might come from poor administrated FiT.
- Recent qualified projects with lower FiTs constructed in lower costs which was closing to the international level.
- Based on these facts, LCOE of solar PV in future could be reduced to 4~5 cts/kWh in Japan.

Discussion

- Roof-top vs. ground-mounted solar PV?
- Not only the costs, the value should be evaluated.
- Investment to solar PV would be promoted without policy supports in future. This might mean environmental protection against developments may be important.

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