An Analysis on the PV and Battery Installation Connecting the Commercial and Residential Sectors

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Purpose of This Study

- Japanese Government has determined the new target of GHGs reduction to achieve 26% reduction from the emission level in 2013 up to 2030.
- The GHGs emissions in 2017 recorded to the 1.5% up from the 1990 level (the base level in Kyoto Protocol).
- In the long-run, the continuous increases in GHGs emission in the commercial and residential (household) sectors were largely influenced to the whole GHGs increases.
- In this study, we would like to analyze the PV and battery installation connecting the commercial and residential (household) sectors under various capacity conditions.
- We also would like to discuss the present problems and future subjects of this activity.

Cases Assumption for Economics Simulation

Case (i): PV zero and battery zero

Case (ii): PV zero and battery 20,000 kWh

Case (iii): PV 8,000 kWh and battery zero

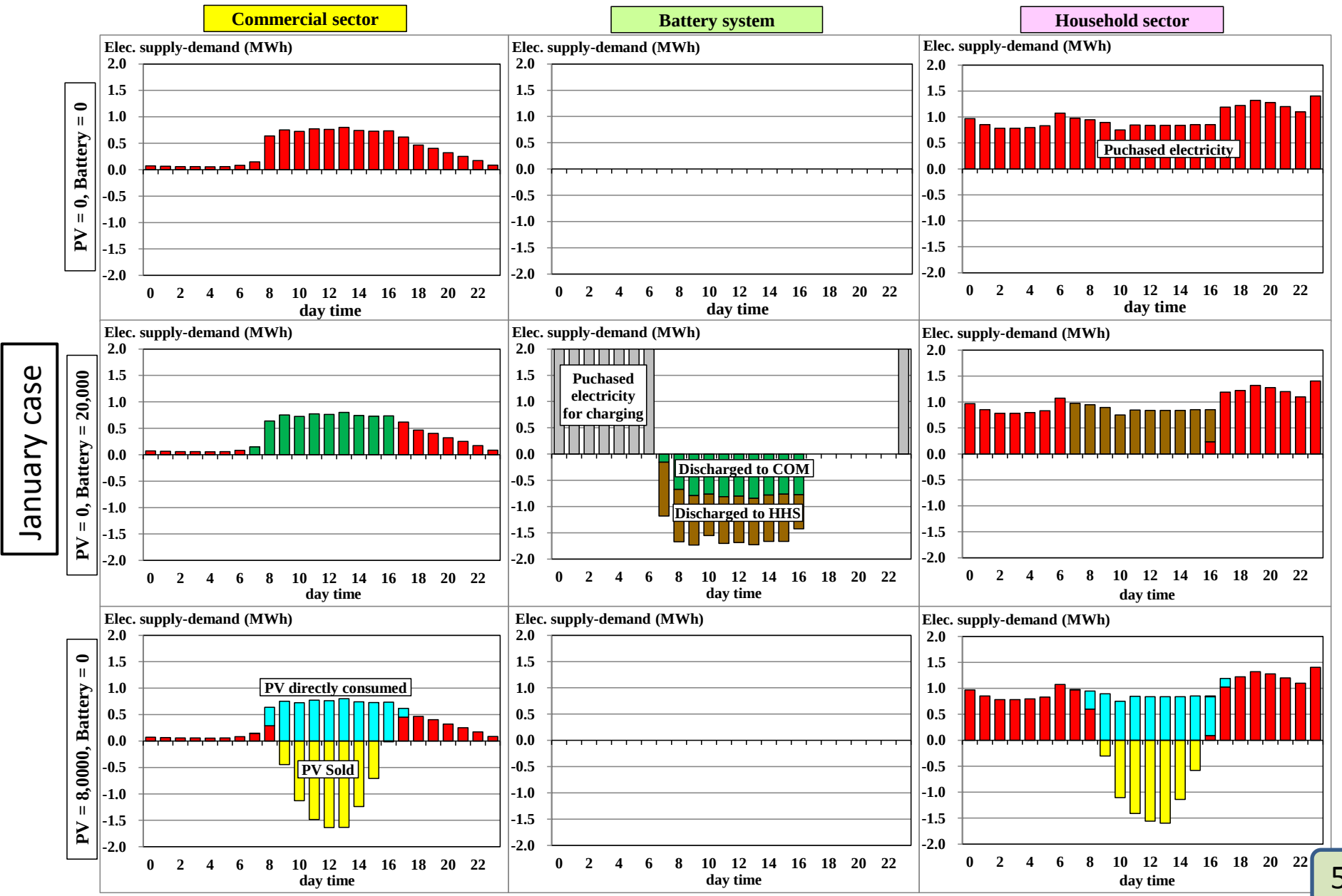
Case (iv): PV 8,000 kWh and battery 20,000 kWh
(Net zero case: small purchased and small PV sold are almost balanced)

Case (v): PV 44,000 kWh and battery zero

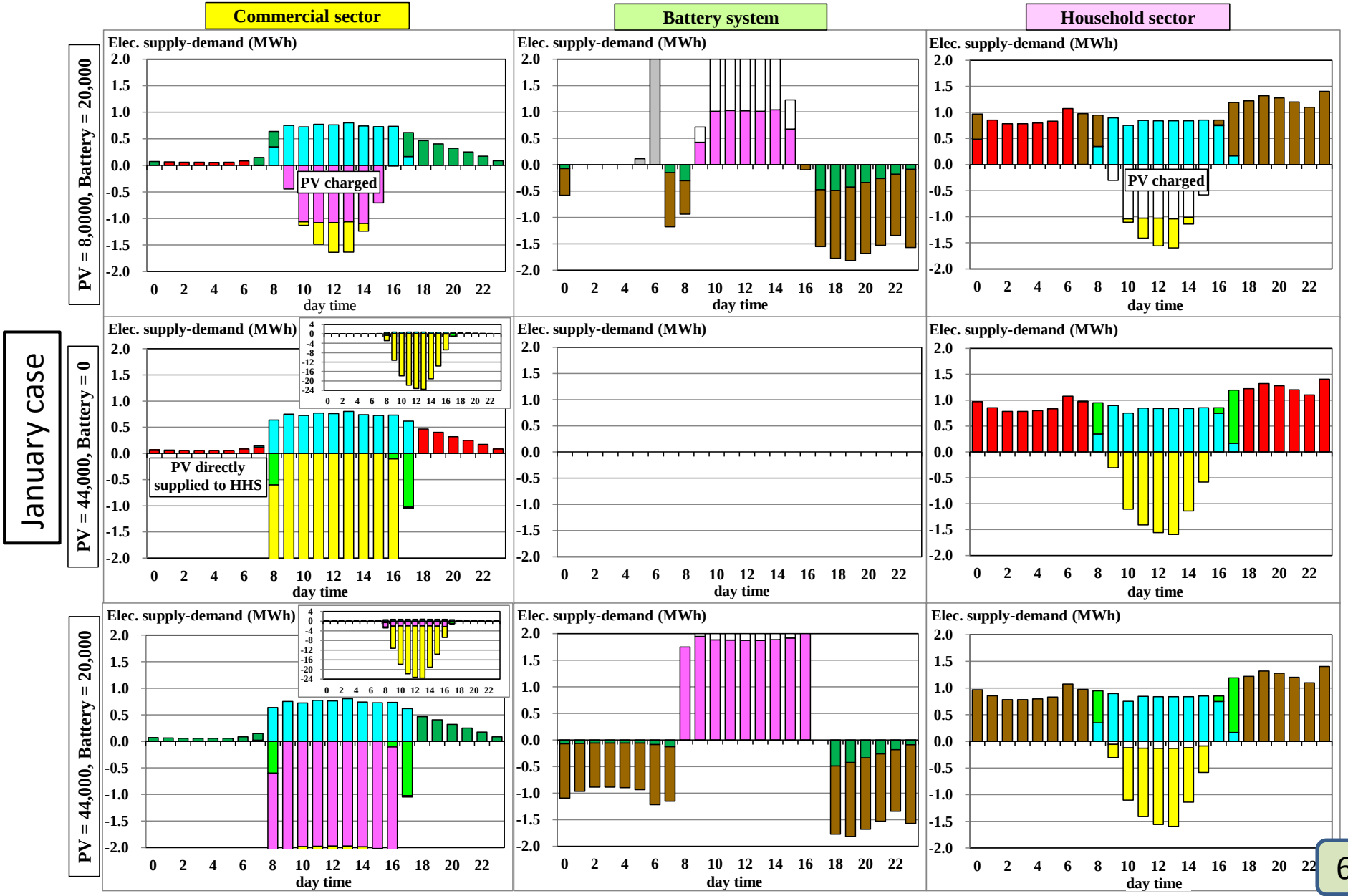
Case (vi): PV 44,000 kWh and battery 20,000 kWh
(Absolutely zero case)

Winter (Jan.), Summer (July), Intermediate (Oct.)

Changes in electricity supply pattern (1)



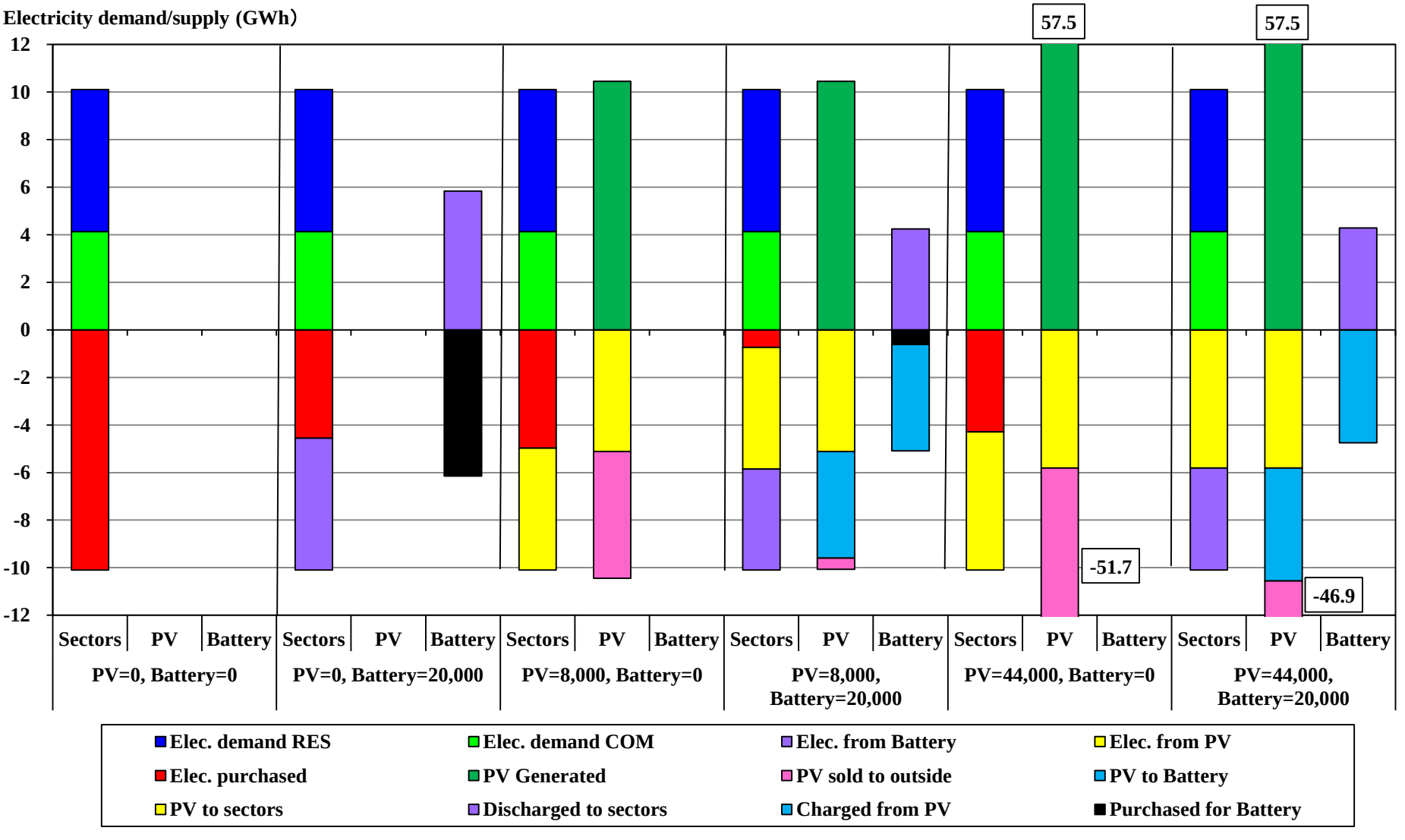
Changes in electricity supply pattern (2)



Specific Characteristics on Electricity Supply Pattern

- In winter, the demand increases in both sectors. Especially, the household demand increases in the whole day. The commercial demand increases mainly in the daylight. In Case (vi) only, the E purchased becomes zero.
- In summer, the demand also increase in both sectors. Especially, the commercial demand increases largely in the daylight. The household demand increases mainly from evening to mid night. In Case (vi) and in Case (iv), the E purchased becomes zero or almost zero.
- In intermediate, the demand decreases in both sectors, compared with winter and summer. Not only in Case (vi) but also in Case (iv), the E purchased becomes zero.
- PV plays a good role on covering the commercial demand in the daylight. PV also plays a certain role on covering the household demand in the daylight. However, the combination of PV and battery plays a crucial role on covering the household demand in the night.

Case Changes in Annual Supply Demand Balances

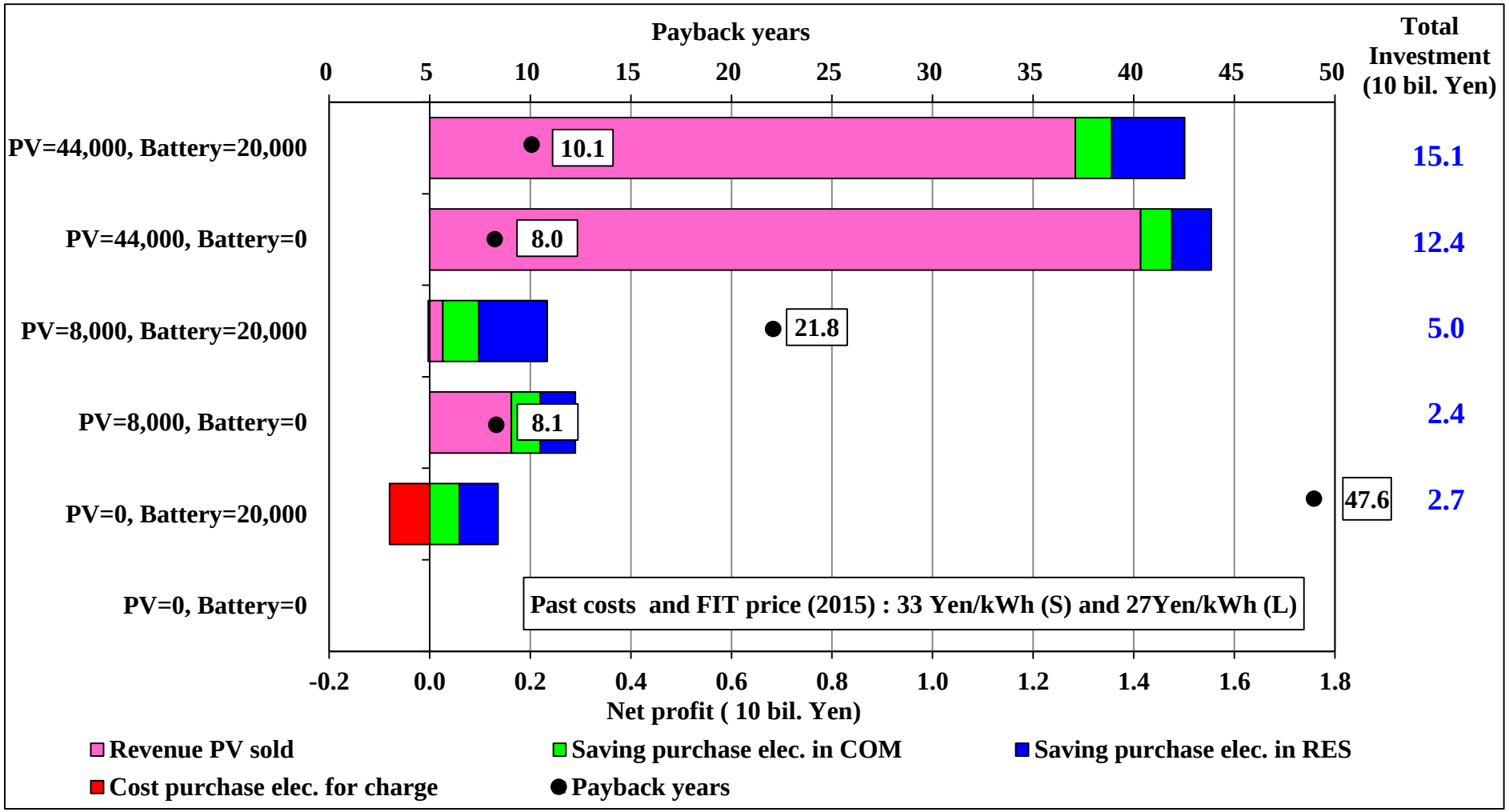


Purchased E remains in (ii),(iii), (v). Large surplus PV is sold in (V), (vi)

Recent Changes on Economic Conditions

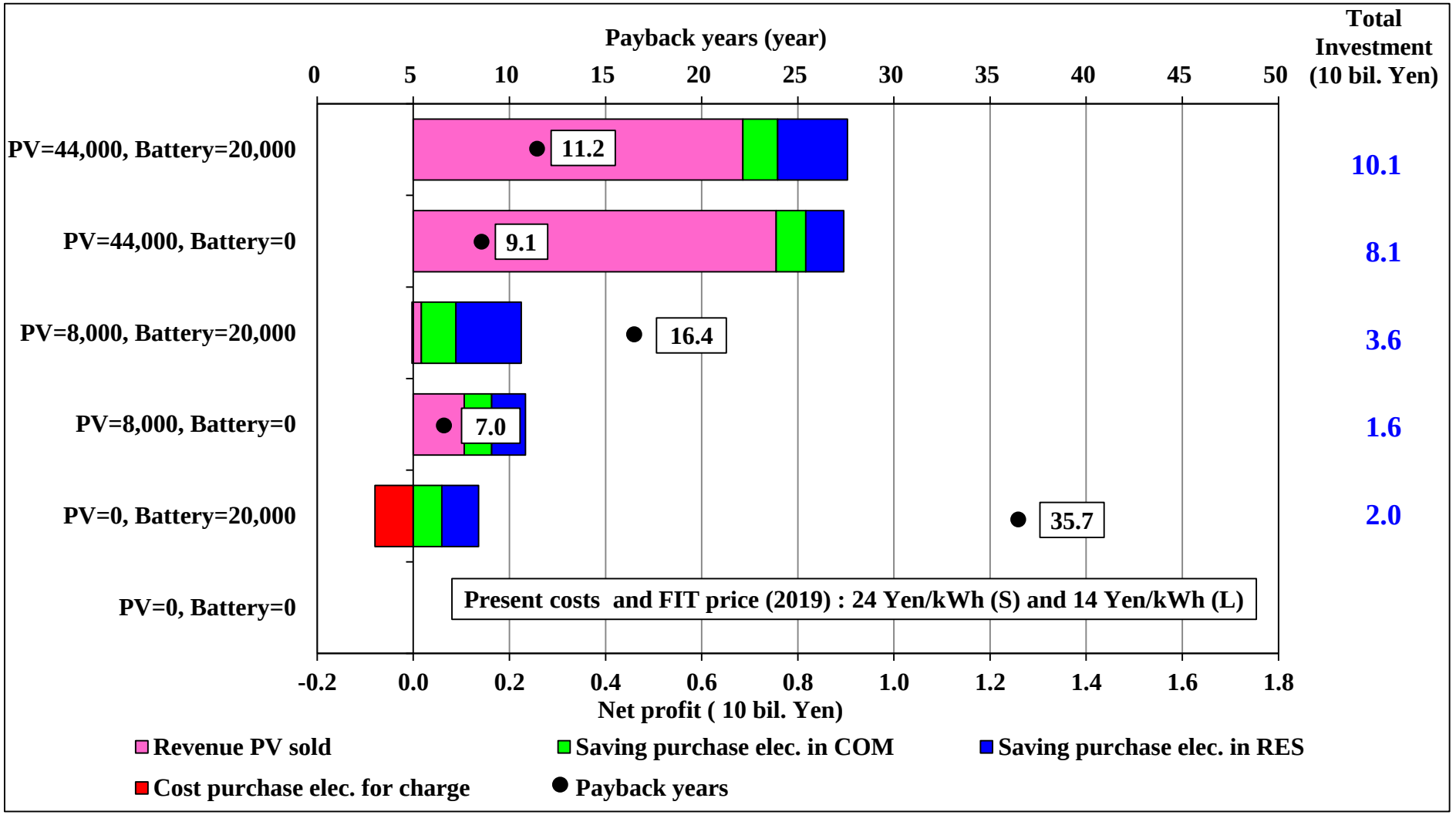
	2014~2015	2018~2019 Present
Battery cost (Yen/kWh)	200,000	150,000
PV cost (Yen/kW) (Mega & large)	300,000	200,000
PV cost (Yen/kW) (Small)	350,000	250,000
FIT price (Yen/kWh) (PV Commercial)	27	14
FIT price (Yen/kWh) (PV Household)	33	24

Economics of Cases under Previous Cost Conditions (2014~2015)



Battery cost is largely influenced to economics of Case (ii) and (iv).
But in Case (vi), economics is improved by FIT revenues of PV

Economics of Cases under Present Cost Conditions (2018~2019)

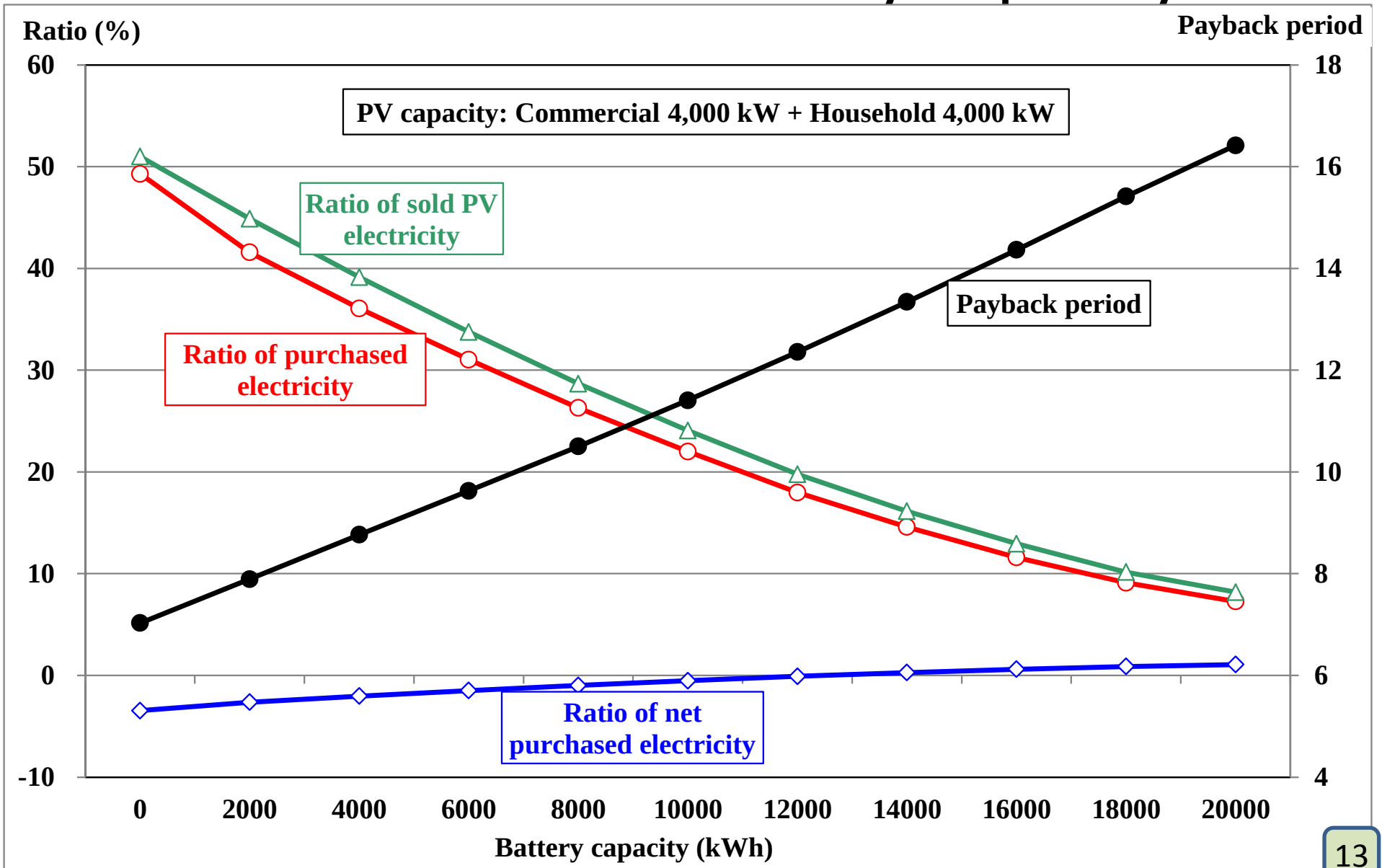


Economics of cases is improved under present cost conditions in spite of the lowering of FIT purchased prices of PV

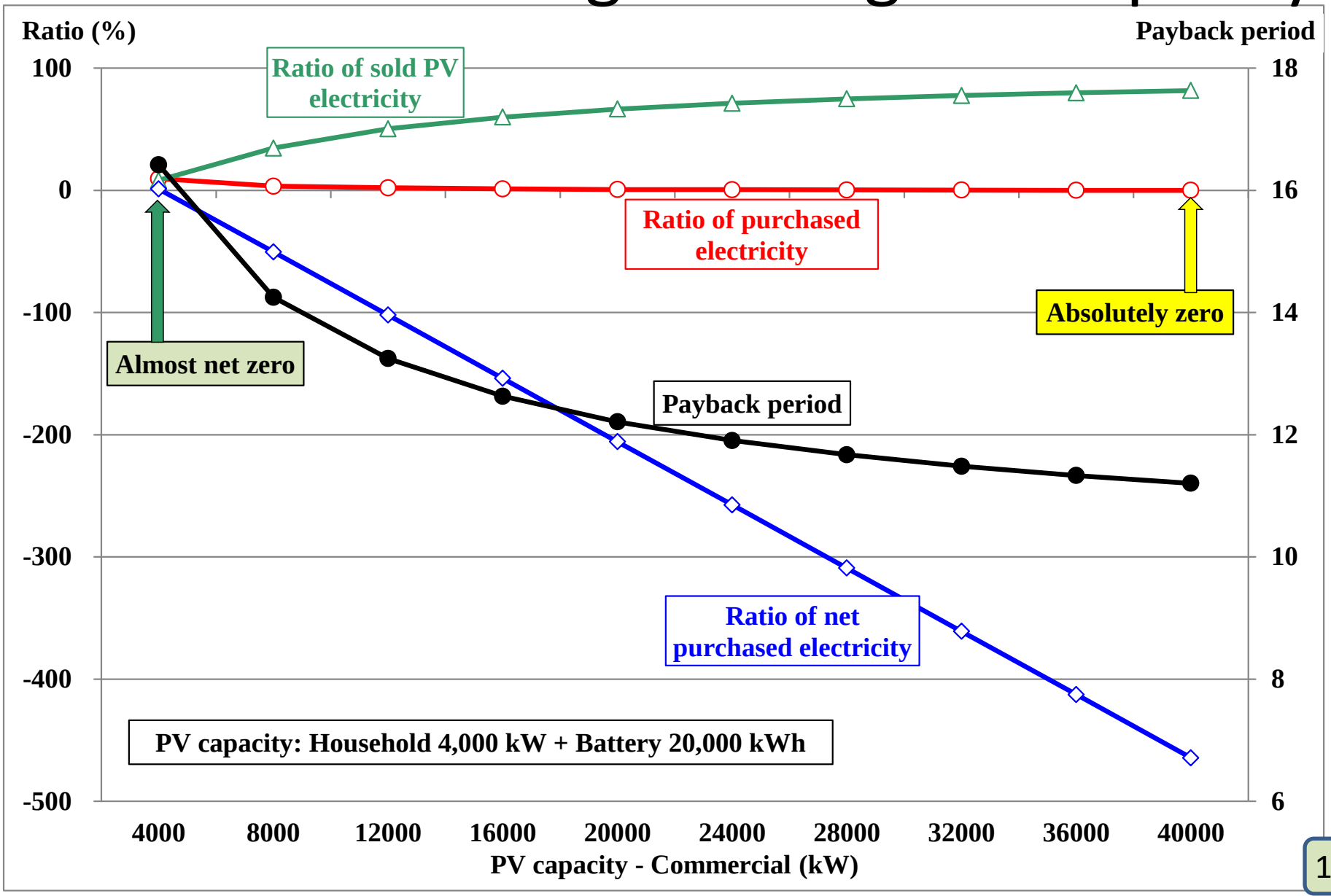
Summary of Economics Analysis

- **The reduction of battery cost is quite crucial for the effective use of PV and battery in the commercial and household sectors.**
- **The reduction of PV cost is also important for the purpose mentioned above.**
- **The lowering of FIT purchase price has a bad influence on the effective use of PV and battery in the commercial and household sectors.**
- **However, too preferable FIT purchase price bring a kind of distortion on the effective use of PV and battery in the commercial and household sectors (Huge PV installation over the necessity in both sectors).**

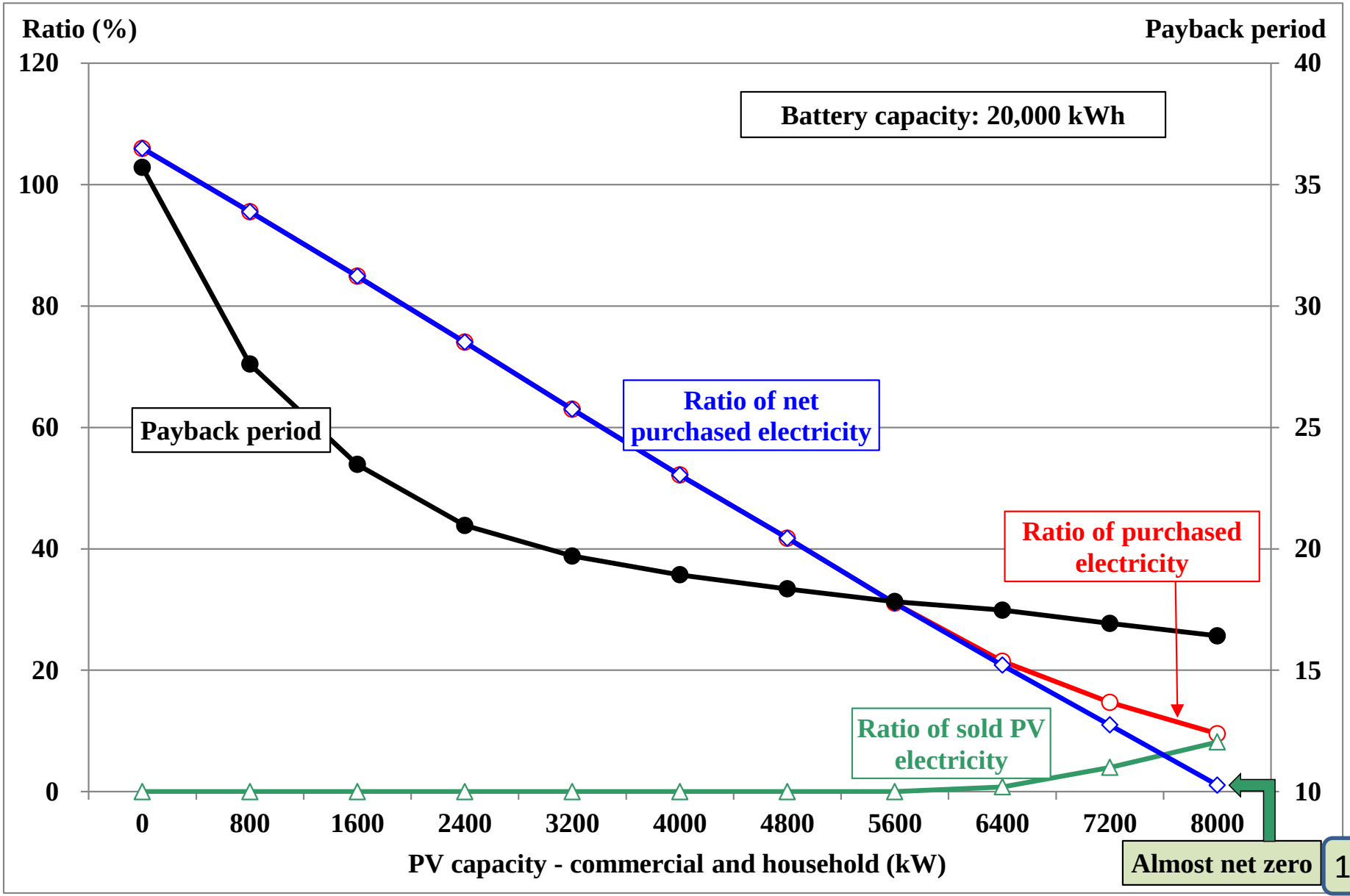
Economics and performance changes by the increase on battery capacity



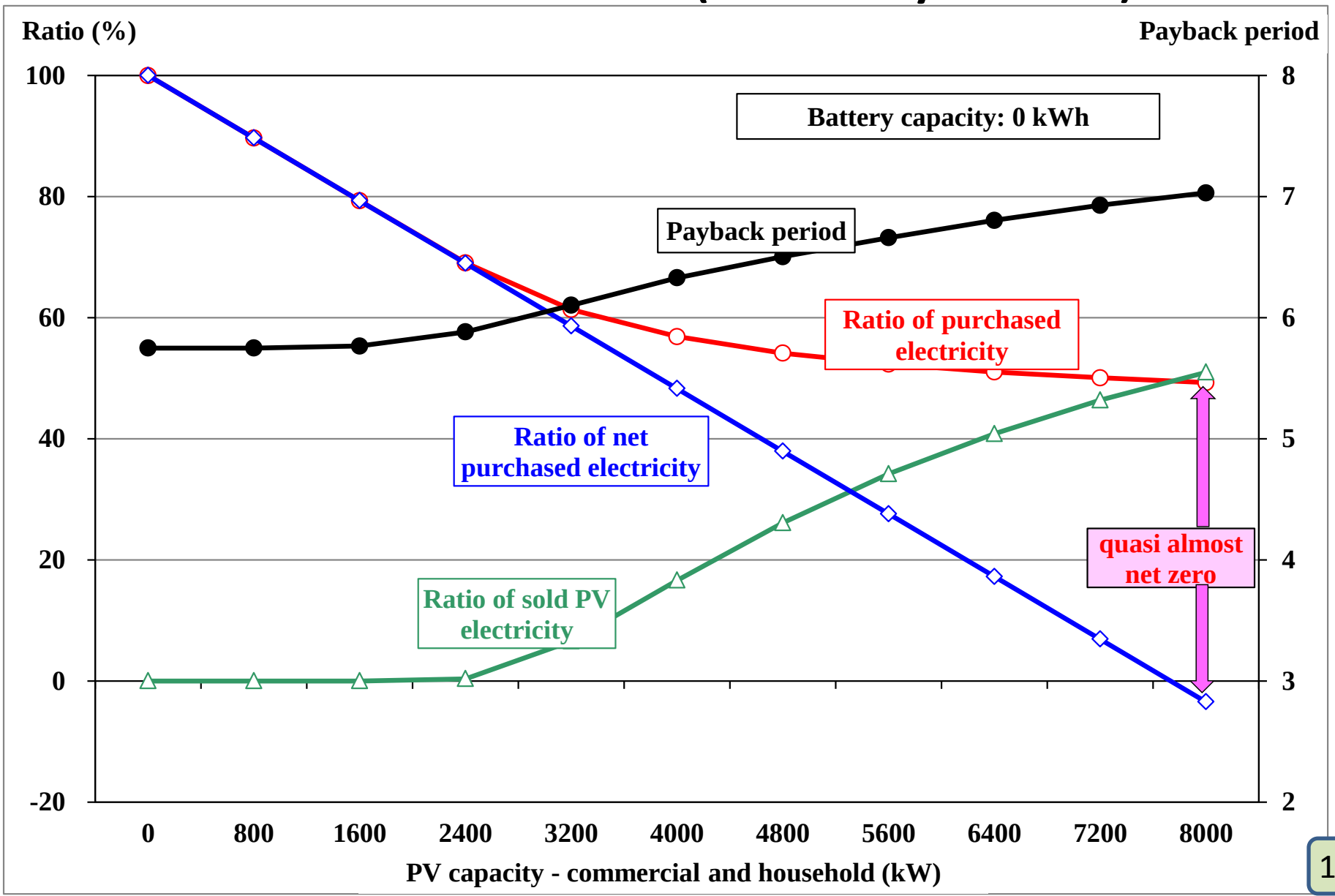
Economics and performance changes by the increase on large or mega PV capacity



Economics and performance changes by the PV increase (Battery: 20,000 kWh)



Economics and performance changes by the PV increase (Battery: zero)



Concluding Remarks （1）

- **The special environment brought by the much preferable purchased price of PV electricity by FIT makes quite large distortion to the decision making of investments for the installation of PV and battery.**
- **We need to reconsider desirable and sustainable FIT system, particularly to PV, more carefully.**
- **For the installation of PV and battery connecting the commercial and residential sectors, the cost reduction will be quite essential.**
- **Of these, especially, the cost reduction of various batteries would play a crucial role.**
- **Thus, technology innovation of battery will be desired earnestly from now on.**

Concluding Remarks （2）

- **The “absolutely zero” purchased electricity at any time is often pursued as an achievable target.**
- **But the realization of this target is not reasonable.**
- **Instead of this strict target, the balancing between the small purchased electricity and the small sold PV electricity (“net zero”) should be pursued.**

Thank you very much for your kind attentions !!