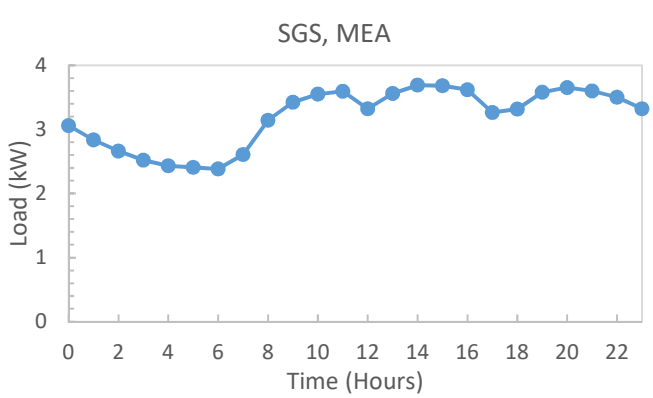
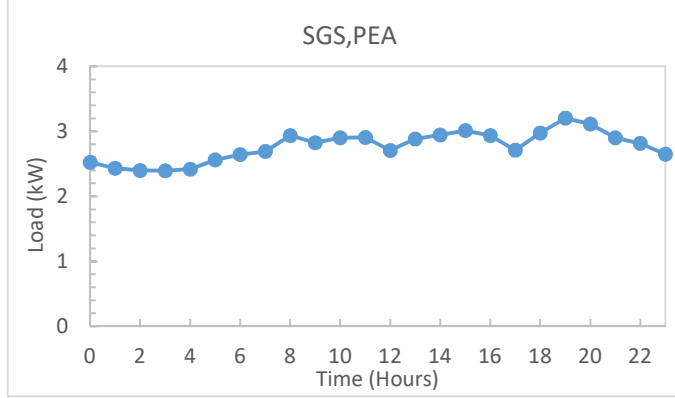
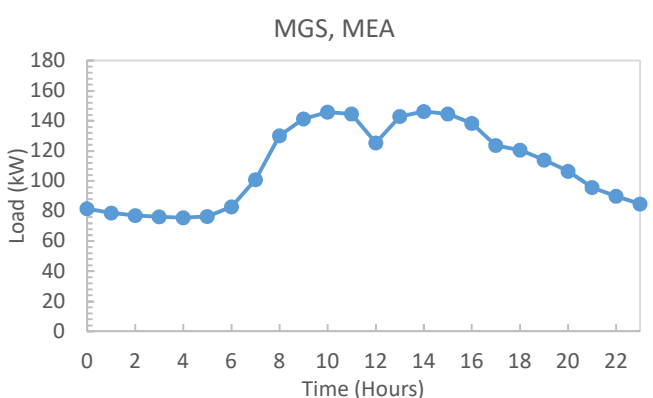
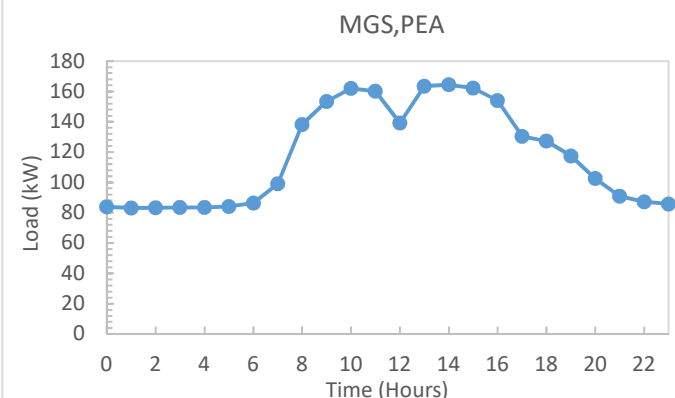


Supplementary Materials

1. Load Profiles

Table 1. Customer's load profiles in MEA and PEA area (Public data from their website).

Group	Modeled load profiles (MEA) (Average day in 2015)	Modeled load profiles (PEA) (Average day in 2015) (It shows an average day (an average of each hour of load profile in a day), not a peak day.)
RES		
SGS		
MGS		

LGS

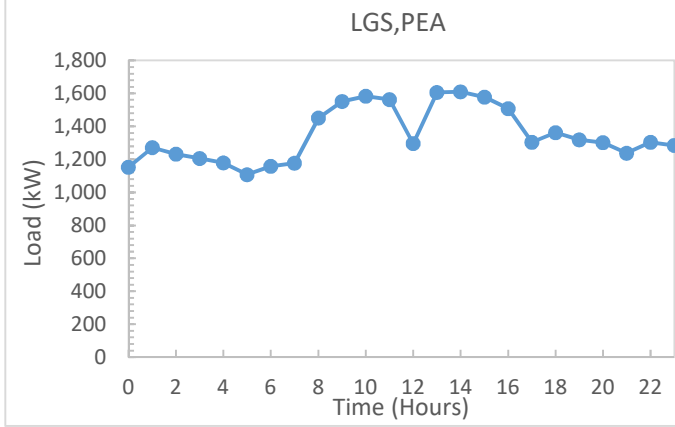
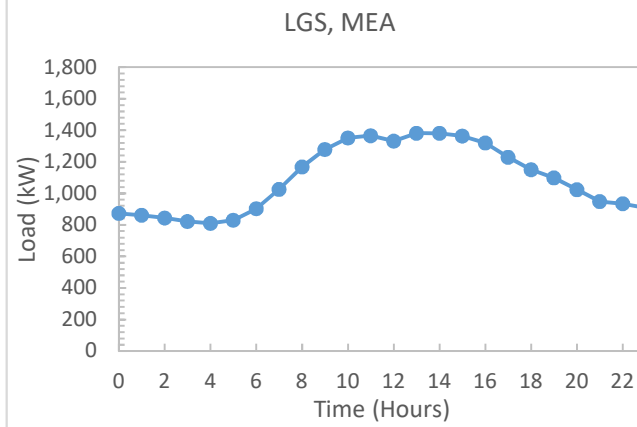
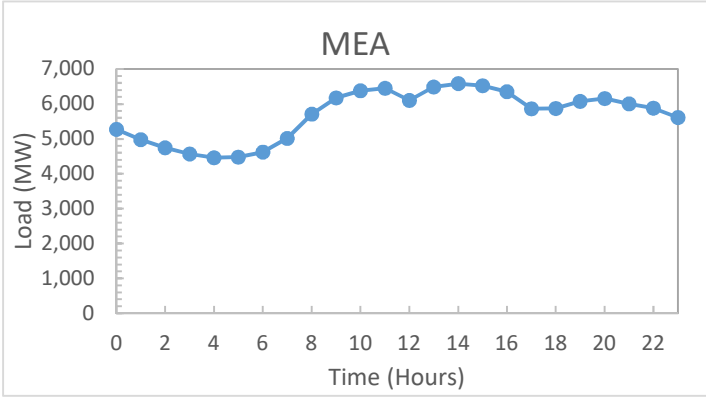
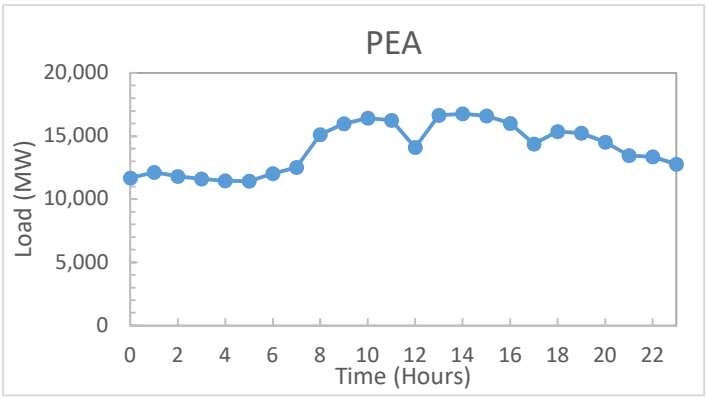
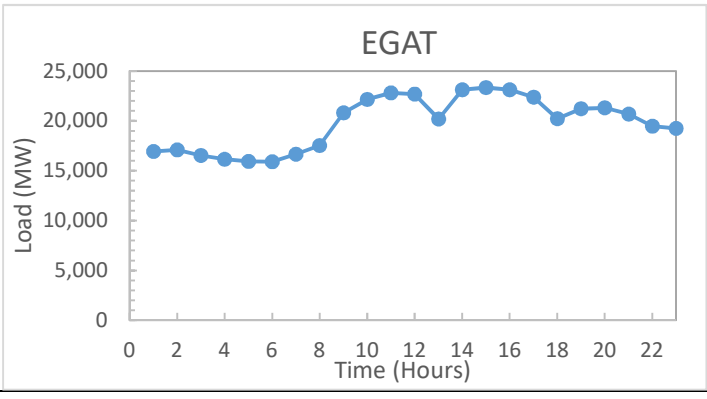


Table S1. Utility system's load profiles.

Utilities	Modeled load profiles (Average day in 2015)
MEA	
PEA	
EGAT	

Note: They were calculated based on the individual load profile of each customer group and then extrapolated to cover the overall system of each utility.

2. Assumptions

Table S2. System parameters for performance model in SAM.

System Parameters	Input
System size (kW)	5,5,100,1000 for Res, SGS, MGS, and LGS
Module Type	Crystalline Silicon
Module Efficiency (%)	15.9
DC to AC Ratio	1.1
CEC Weighted Inverter Efficiency (%)	96.65
Array Type	Fixed Open Rack
Tilt (Latitude) (degrees)	13.7
Azimuth (Facing South) (degrees)	180
System Losses (%)	14
Ground-to-coverage ratio (GCR)	0.3
System Lifetime (years)	25
Degradation rate (%)	0.5
Weather data	As available in SAM (Same weather data for MEA and PEA)

Table S3. PV installation costs (based on Thailand's PV market as of November 2017).

	RES	SGS	MGS	LGS
PV Installation Costs				
PV installation costs (USD/W)	1.43	1.43	1.29	1.00
Other Costs				

Operating and maintenance costs (USD/year)	142.86	142.86	285.71	1,428.57
Insurance costs (% of installation costs)	0.25			
Interconnection cost (USD)	–	–	2,857.14	2,857.14
Total	1.43	1.43	1.29	1.00

Note: Inverter (which constitute about 18% of PV installation costs) was assumed to be replaced every 11 years.

Table S4. Retail rate (public data by MEA and PEA¹).

(1) Residential scale with block rate (RES)

Block Rate	Rate
1–150 unit (USD/kWh)	0.092
151–400 unit (USD/kWh)	0.121
Over 400 unit (USD/kWh)	0.126
Fixed charge (USD/month)	1.0920

(2) Small general service with block rate (SGS)

Block Rate (Voltage Level < 12 kV)	Rate
1–150 unit (USD/kWh)	0.092
151–400 unit (USD/kWh)	0.121
Over 400 unit (USD/kWh)	0.126
Fixed charge (USD/month)	1.0920

(3) Medium general service with TOU rate (MGS)

TOU rate (Voltage level = 12–24 kV)	Rate
On peak (USD/kWh)	0.120

¹ Fuel adjustment charge (Ft) is not included. It was –0.0045 USD/unit as of September–December 2017. Value Added Tax (VAT) is also not included at 7%

Off peak (USD/kWh)	0.075
Demand charge (USD/kW)	3.798
Fixed charge (USD/month)	8.921

(4) Large general service with TOU rate (LGS)

TOU Rate (Voltage level = 12–24 kV)	Rate
On peak (USD/kWh)	0.120
Off peak (USD/kWh)	0.075
Demand charge (USD/kW)	3.798
Fixed charge (USD/month)	8.921

Table S5. Other parameters for CBA².

Parameters	MEA	PEA	EGAT	References
Number of customers	3,062,576 for Res 517,300 for SGS 22,524 for MGS 2,324 for LGS	16,739,341 for Res 1,539,077 for SGS 72,446 for MGS 6,396 for LGS	–	MEA and PEA as of 2016 and assumed constant throughout the analysis
Total electricity consumption (GWh)	51,183	132,399	183,582	MEA and PEA and EGAT as of 2017
Retail growth rate (% per year)	1.89 (or 3.42 including inflation rate) ³			PDP 2015
Wholesale growth rate (% per year)	1.64 (or 3.16 including inflation rate)			PDP 2015

² Most of data are available online through stakeholder's website unless specified.

³ Inflation rate was assumed to be 1.5% based on Thailand's market.

Electricity growth rate (% per year)	3.54			Average from 2007–2017 based on MEA and PEA's sales
Utility's system loss (%)	3.5	5.2	2.3	Average from 2010–2014
Investment cost per year (Million USD)	484.57	721.83	848.14	MEA, PEA, EGAT and ERC
Utility's interest rate (%)	2.3	2.1	6.29	MEA, PEA, EGAT and ERC
Projected utility's revenue (MTHB/year)	Depends on electricity growth rate and electricity price growth rate			
Integration cost (USD/kW)	3.77	3.77	23.37	(Agora,2015) ⁴
Fuel mix and % reserve	Depends			PDP 2015
Fuel price	<ul style="list-style-type: none"> - Average purchased electricity (USD/kWh) = 0.07 - Coal (USD/ton) = 19.80 - Natural gas (USD/MMBtu) = 6.71 - Average oil (USD/L) = 0.47 			ERC with fuel price growth rate as inflation rate
Heat rate	<ul style="list-style-type: none"> - Coal = 0.00038 Ton/kWh - Natural gas = 0.007878 MMBtu/kWh - Oil = 0.29441 L/kWh 			EIA ⁵ and advised by EGAT and

⁴ Agora Energiewende, "The Integration Costs of Wind and Solar Power," Agora Energiewende, Berlin, 2015.

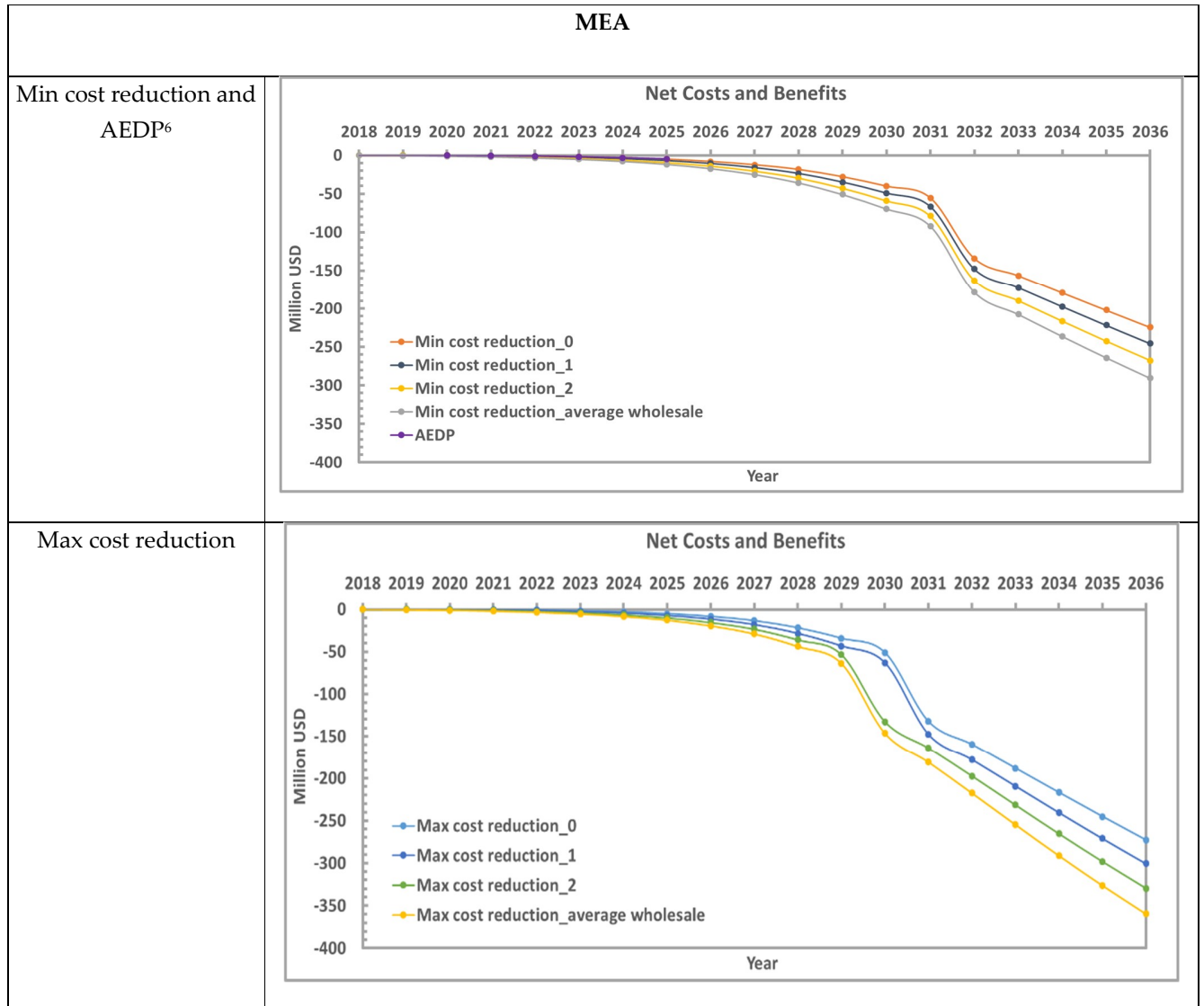
⁵ Available online at https://www.eia.gov/electricity/annual/html/epa_08_01.html.

		constant over time
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3. Detailed Results

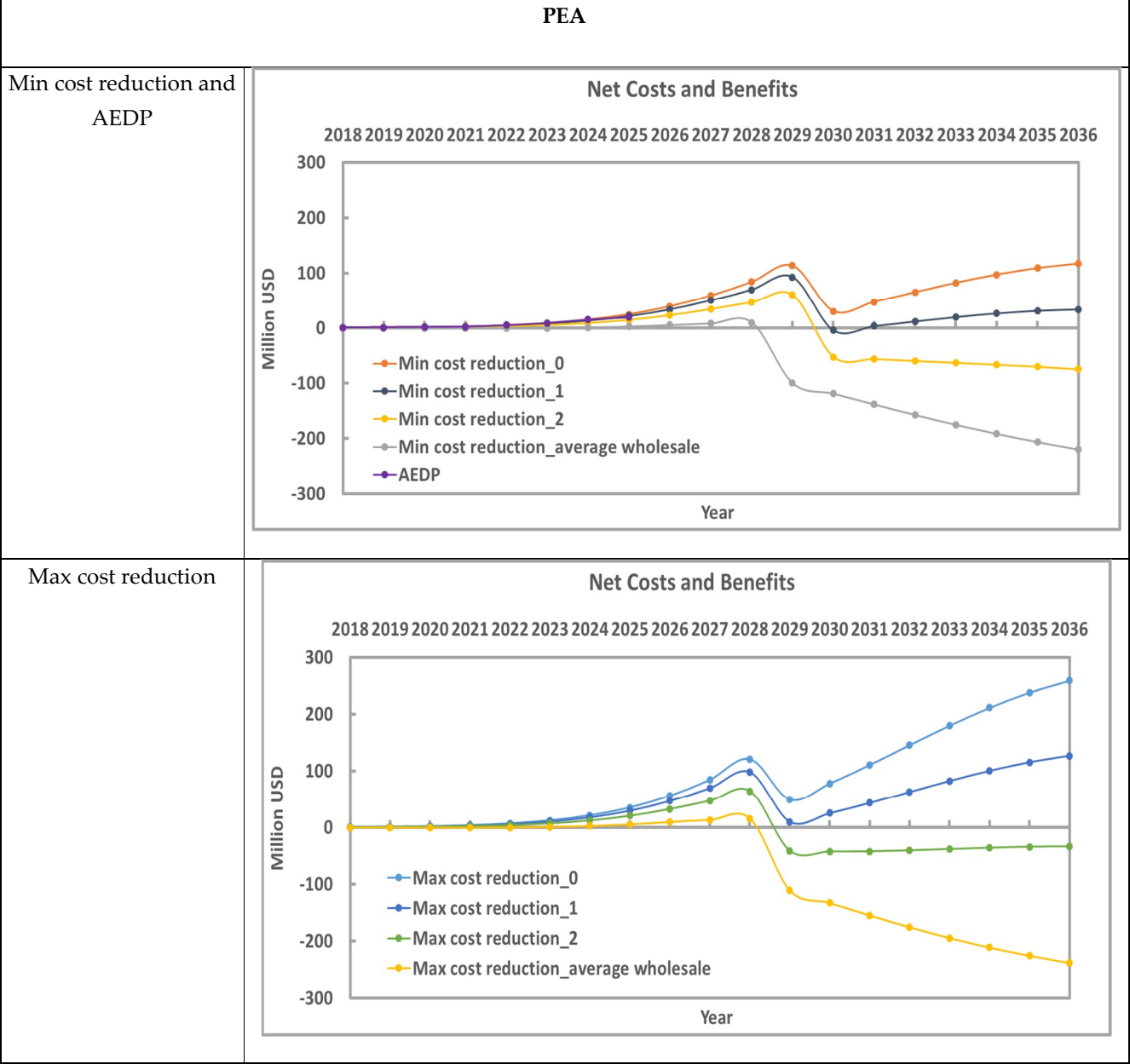
Table S7. Net economic impacts (net costs and benefits).

(a) MEA



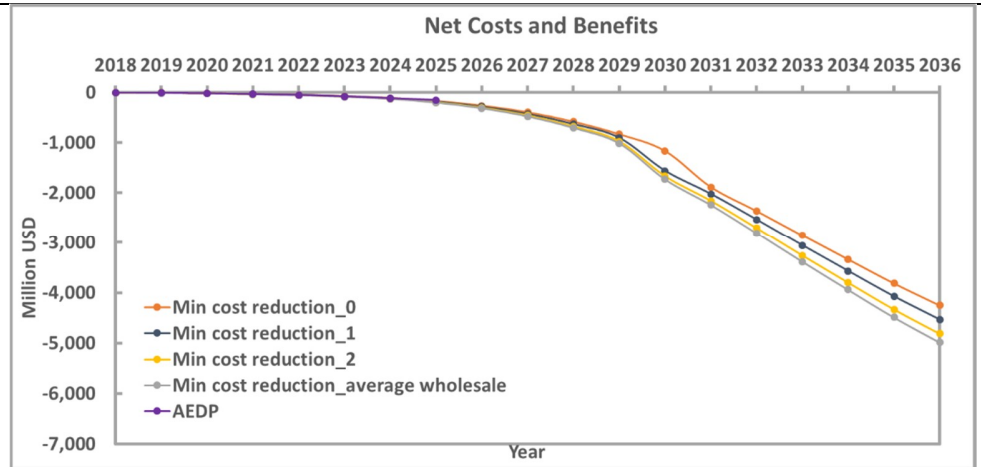
⁶ Only from 2018–2025 as discussed earlier in the paper.

(b) PEA



(c) EGAT

Min cost reduction
and AEDP



Max cost reduction

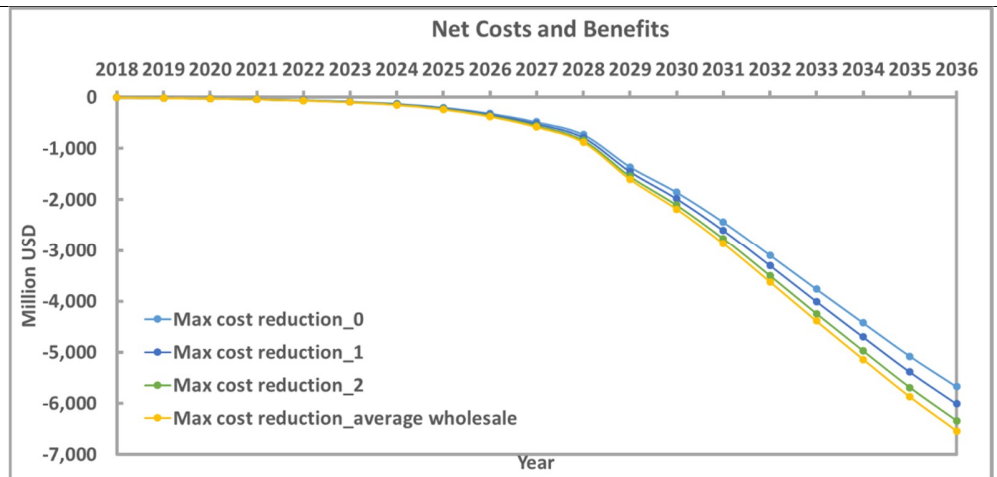
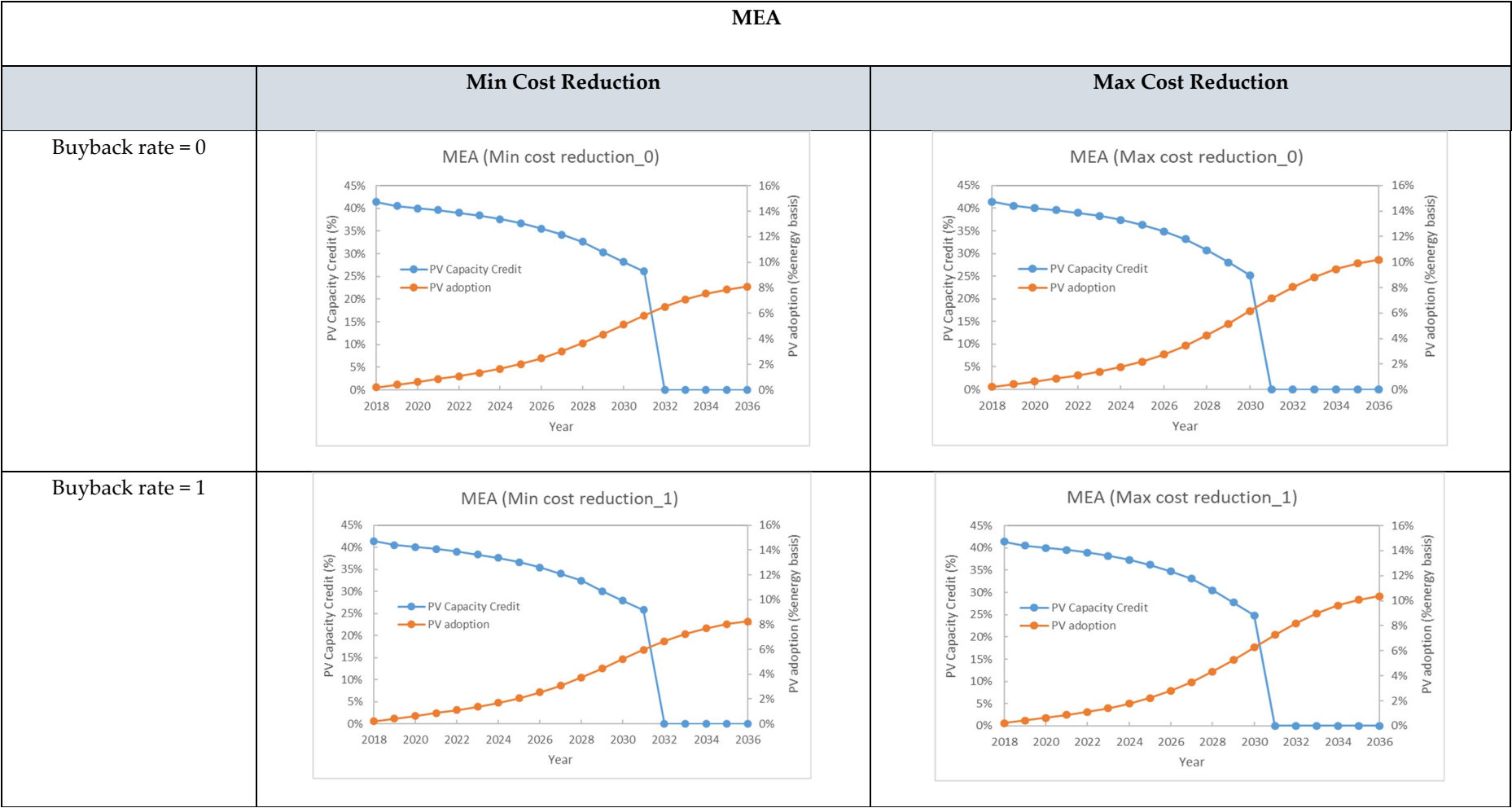
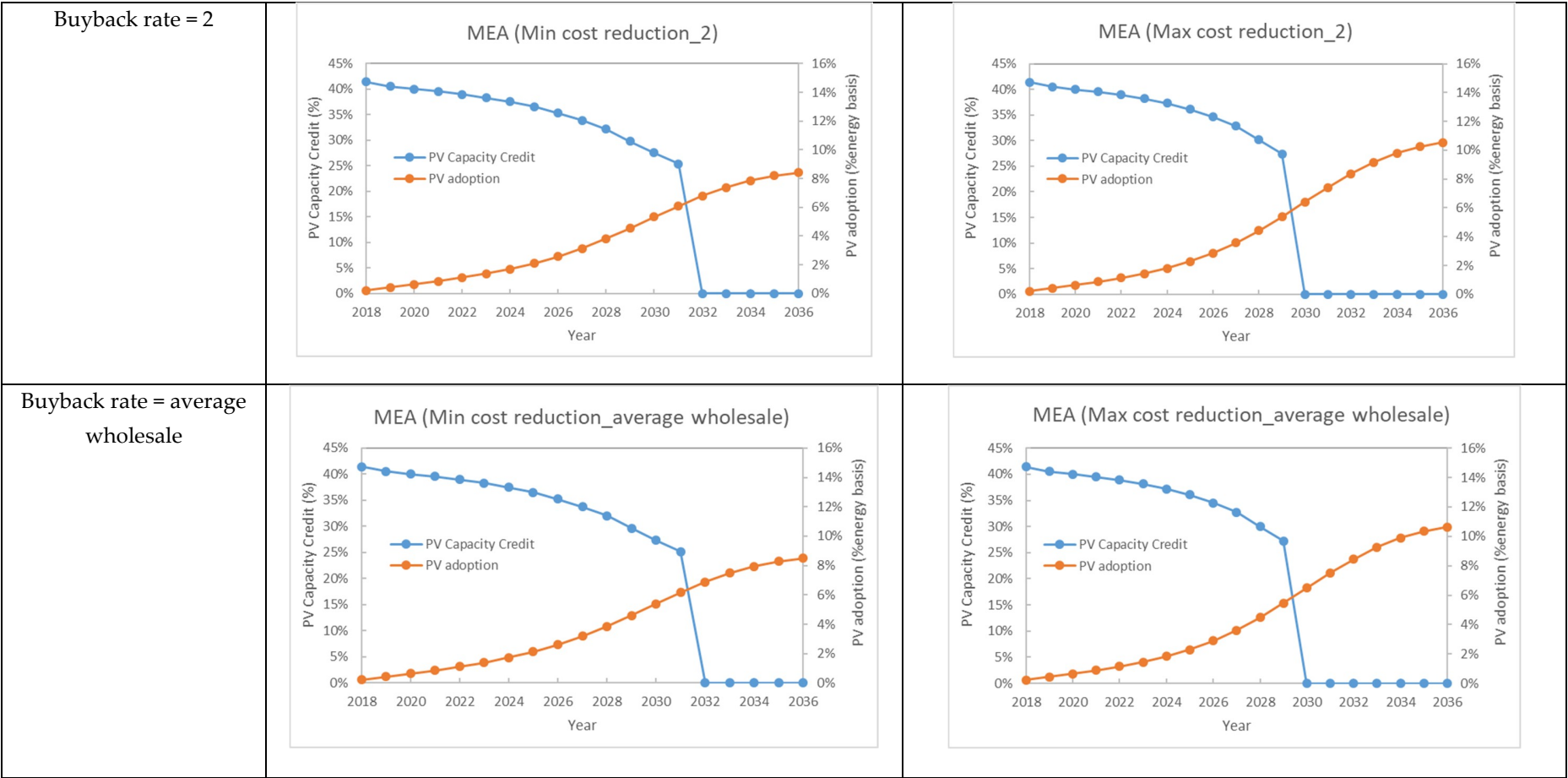


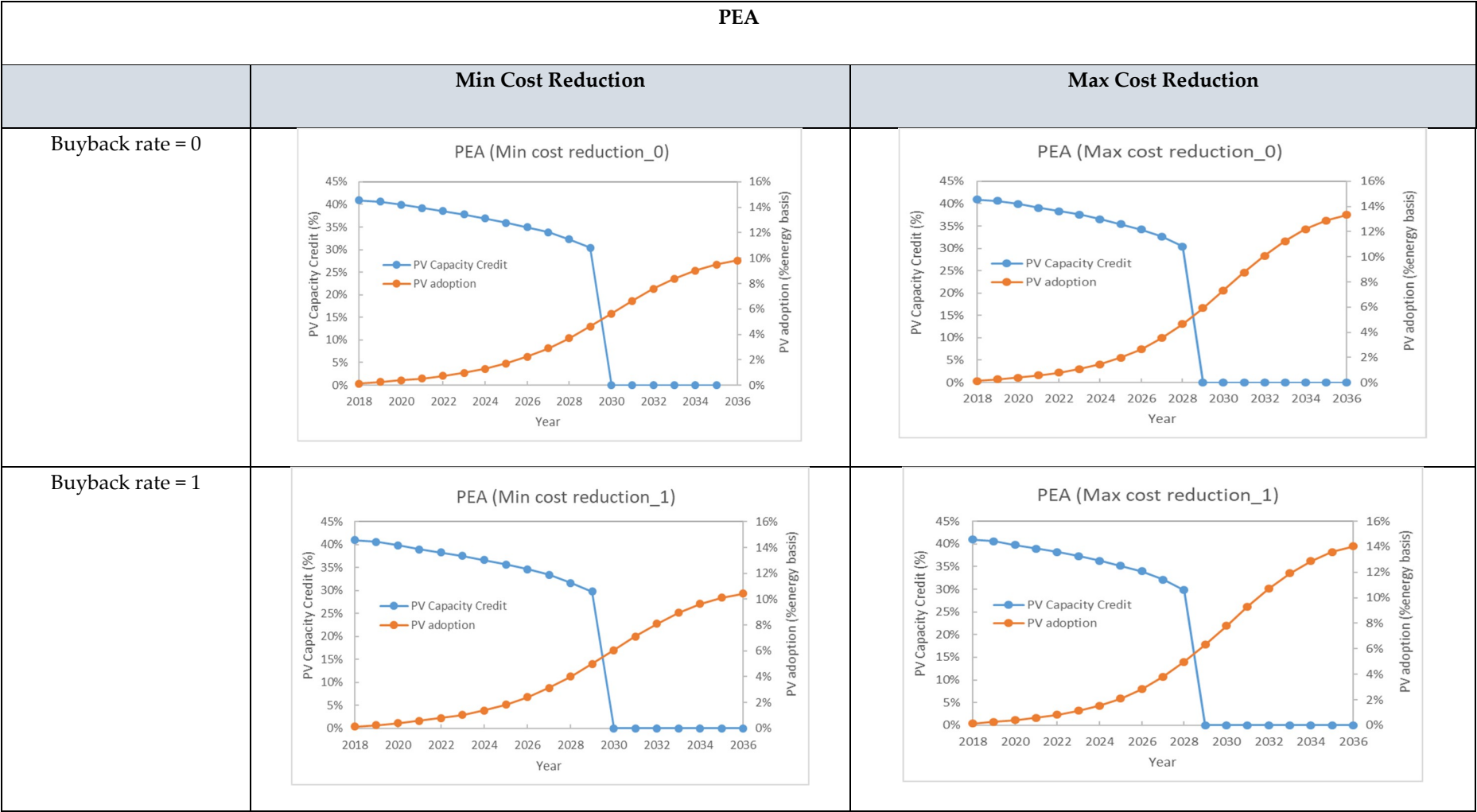
Table S8. PV capacity credits.

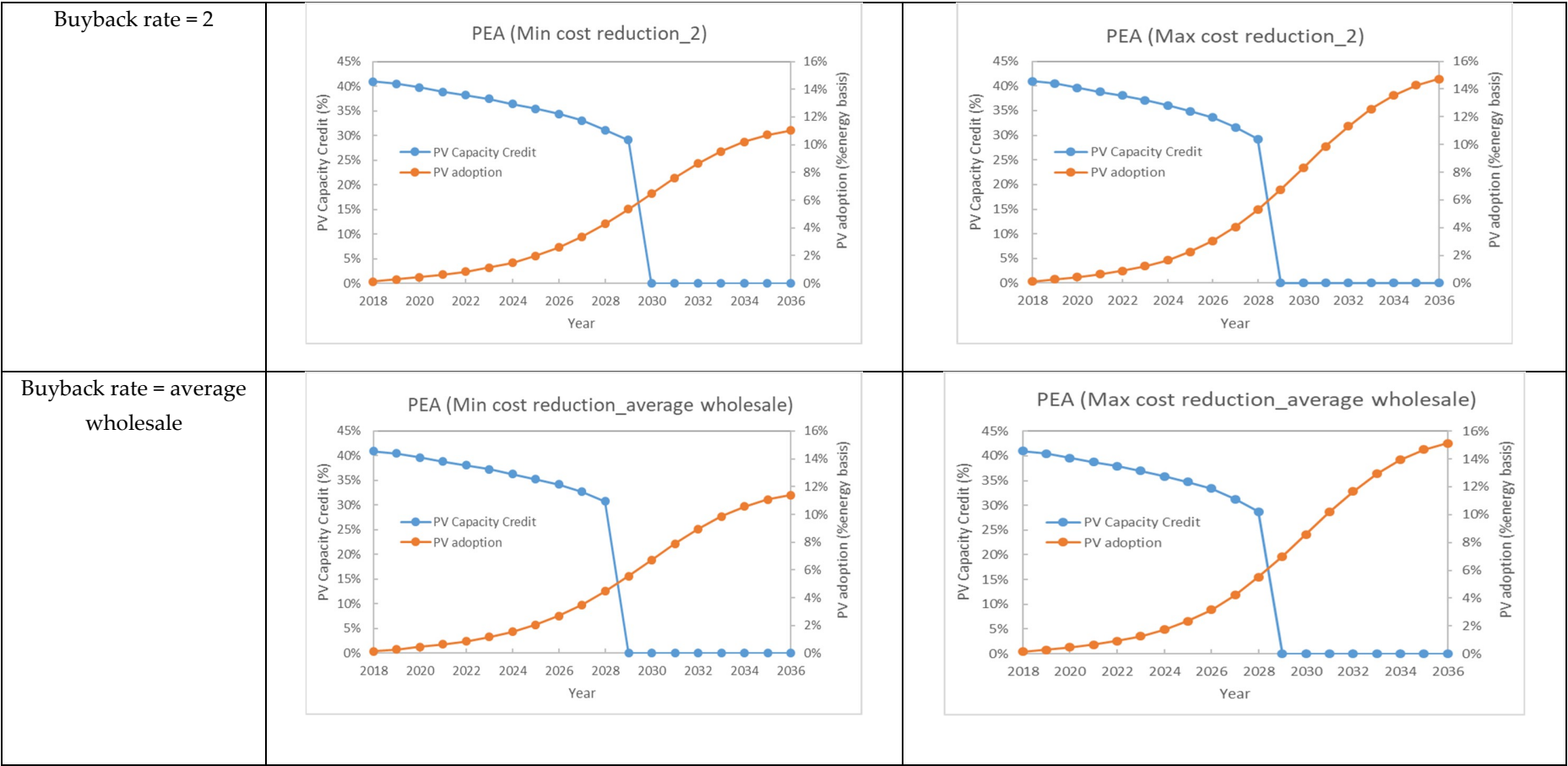
(a) MEA





(b) PEA





(c) EGAT

