SOLAR ROOFTOP

CASE FOR INDONESIA

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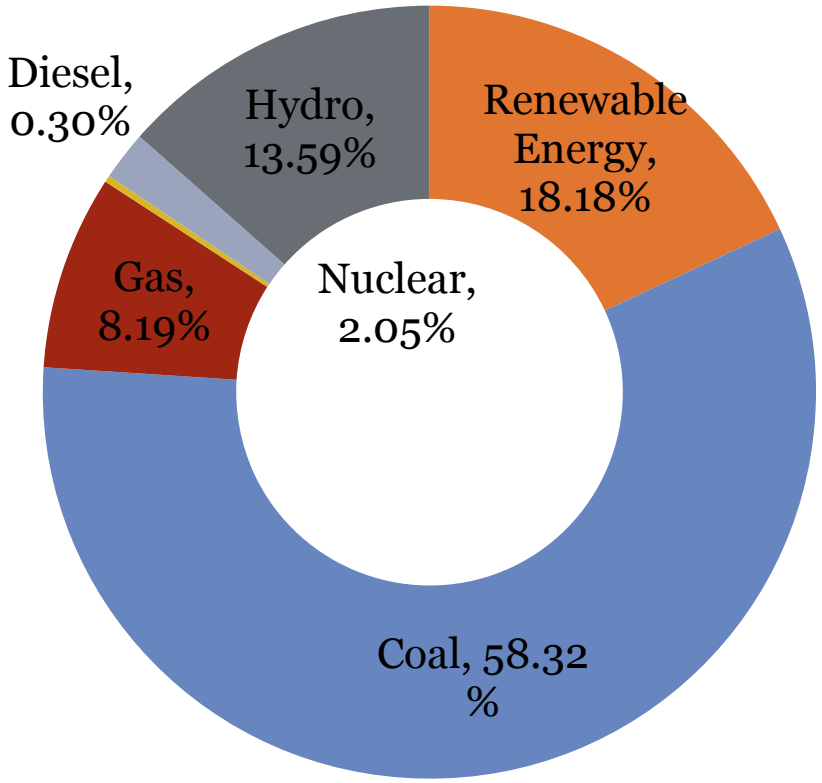
SOLAR ROOFTOP/DECENTRALISED SYSTEMS FOR INDONESIA

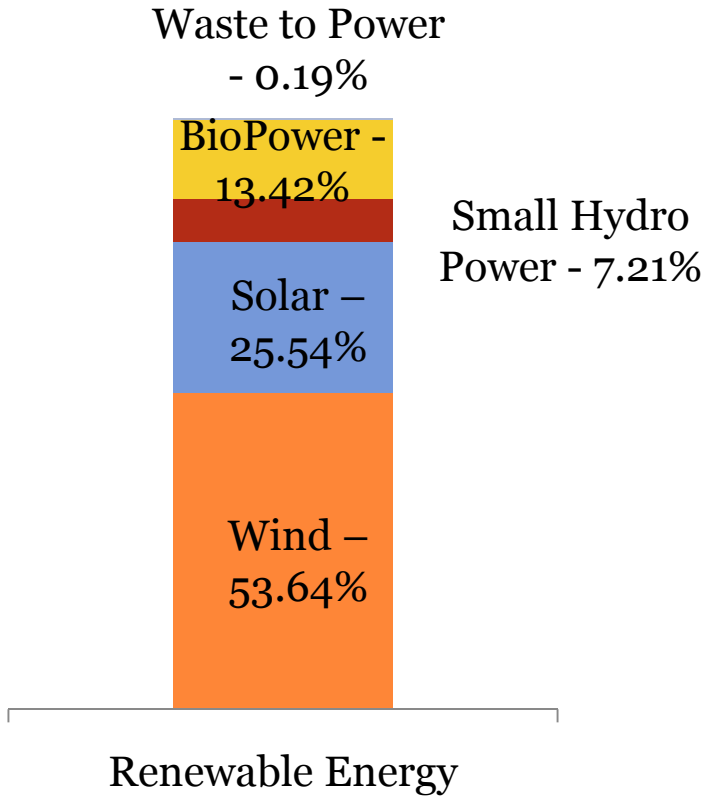
Solar systems or decentralized solar systems makes sense for Indonesia for a variety of reason

- Solar is becoming one of the cheapest source of power
- Respite for customers from increasing electricity tariffs
- Reduce dependency on diesel at times of power cuts and for remote villages
- Increase access in remote villages
- Reduce burden on the grid
- Climate change reasons

INDIAN SOLAR SECTOR

PRESENT POWER SCENARIO



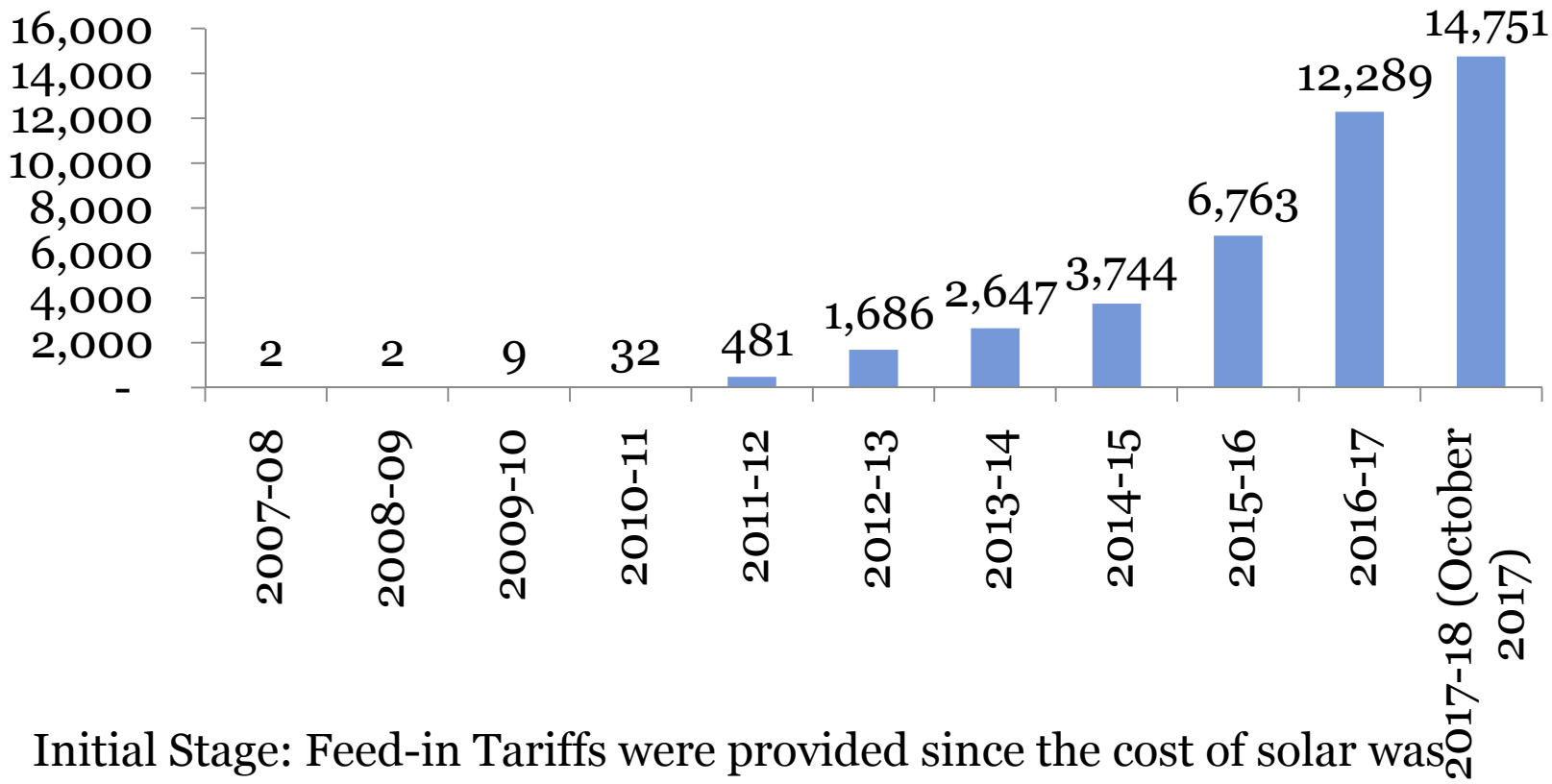


India has an installed capacity of 330,860 MW of power generation, out of which 60,157 MW is of renewable energy.
Per capita consumption of India 1,075 kWh in 2015-16

NATIONAL SOLAR MISSION

- Launched in 2010
- Set the target of installing 20,000 MW of grid connected and 2,000 MW of off-grid solar power by 2022
- Now the target has been increased to 100,000 MW of solar power by 2022

SOLAR POWER IN INDIA



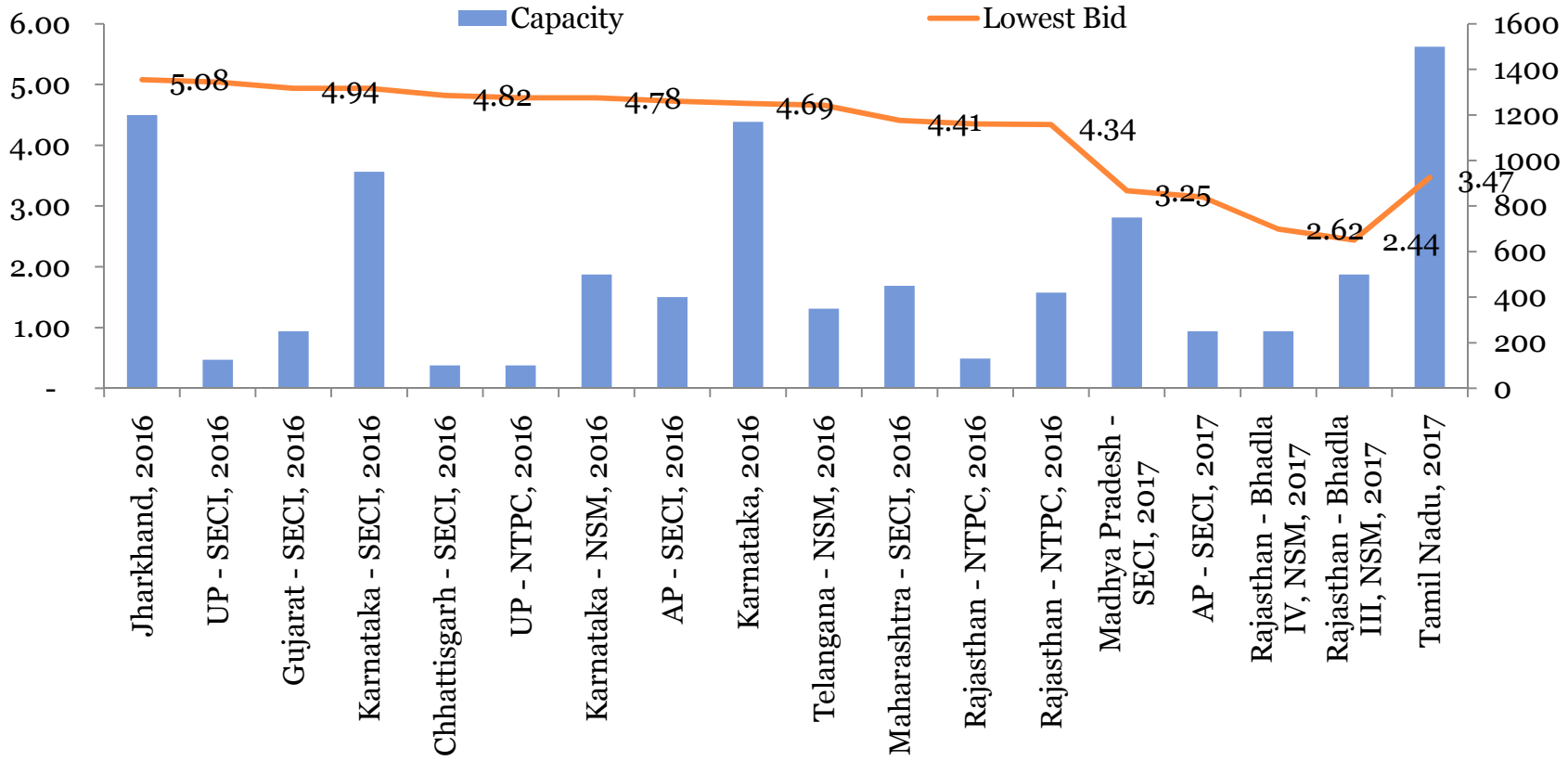
- Initial Stage: Feed-in Tariffs were provided since the cost of solar was high, developers needed financial support
- Reverse bidding has resulted in reducing cost of solar so much that now benchmark tariffs are not needed. There is no financial support – not even available subsidies – viability gap funding are being used.

SOLAR: REDUCTION IN TARIFF

JNNSM Phase I (2010)		CERC Benchmark Tariff	Lowest Tariff Quoted	Average Tariff Quoted
		INR/kWh	INR/kWh	INR/kWh
Batch I	CSP	15.31	10.49	11.48
	SPV	17.81	10.85	12.16
Batch II	SPV	15.39	7.49	8.77

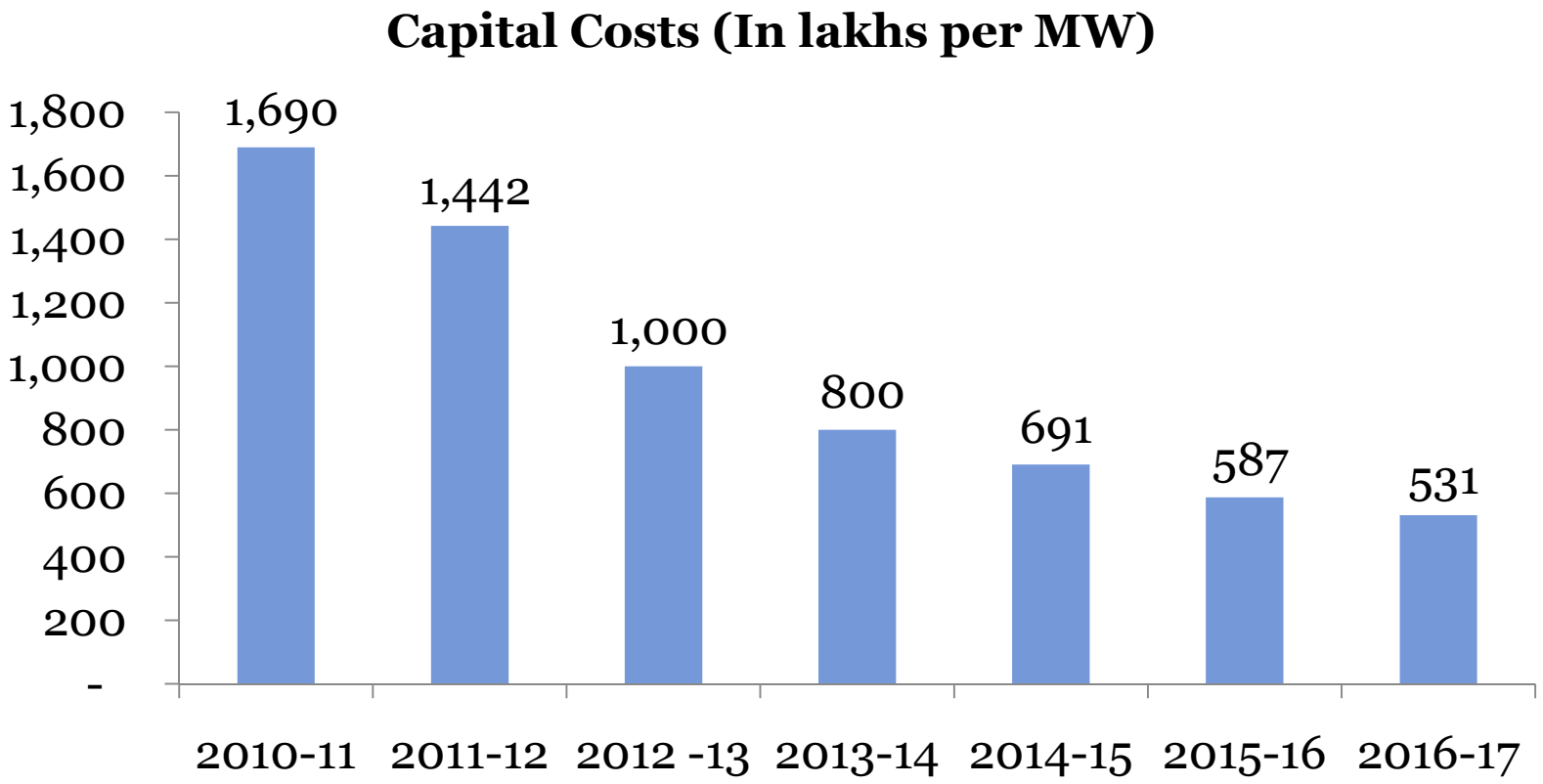
From Rs 10.49 being quoted in 2010, the lowest bid was of Rs 2.44 per unit was quoted in auctions for Bhadla Solar Park won by ACME Solar in May 2017.

SOLAR: REDUCTION IN TARIFF



- In the last two years, the price of solar has halved and now has achieved grid parity in Indian market. This is because of the
  1. Reducing costs due to sharp fall in Chinese module prices
  2. Massive economies of scale brought in by 10 GW of auctions
  3. Risk mitigation by protecting developers from discoms' failure to pay

SOLAR: REDUCTION IN COSTS

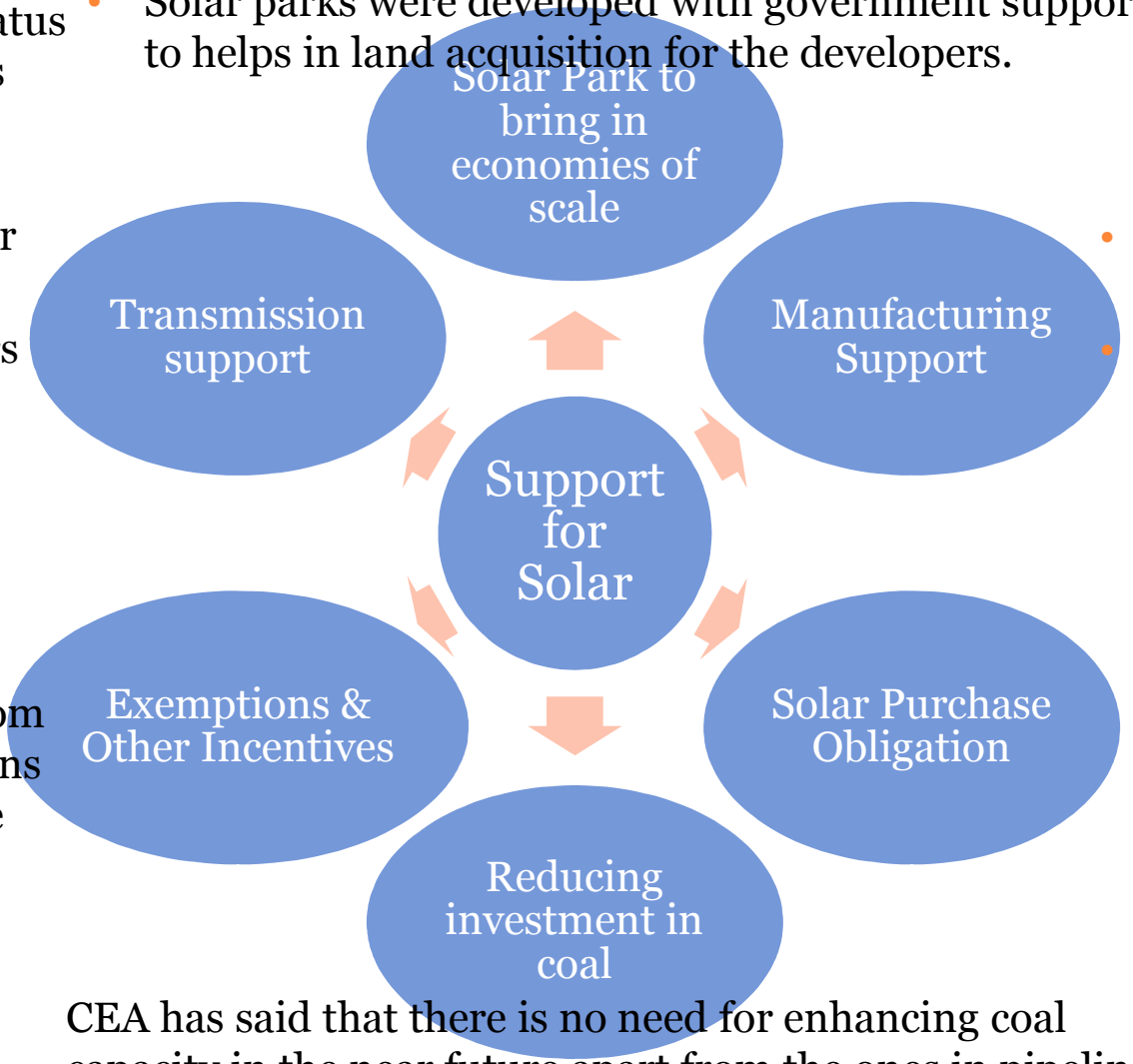


The capital costs have fallen by over 70% in the last 7 years and the oversupply in the global markets on account of Chinese manufacturers are the major reason for it.

SUPPORT MECHANISM FOR SOLAR

- "Must Run" status for solar plants
- Net metering policy for grid connected solar rooftop plants
- Green corridors reduces evacuations
- No charges on open access

- Solar parks were developed with government support to helps in land acquisition for the developers.



- Rs 970 crores as capital subsidy
- SECI enhancing the local manufacturing industry by creating demand for them

- Excise & Custom duty exemptions for most of the Equipment, Machinery etc
- 10 year tax holiday

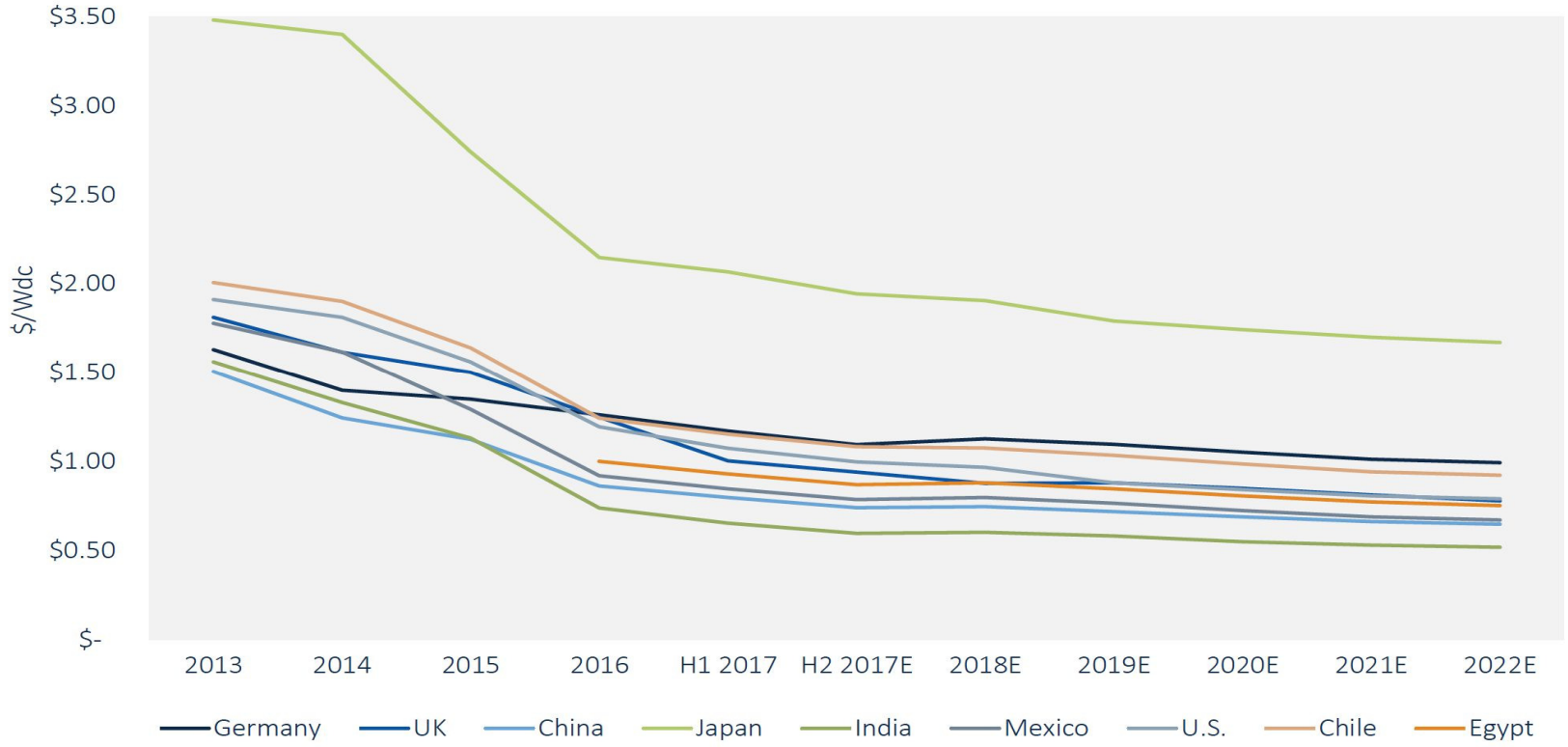
CEA has said that there is no need for enhancing coal capacity in the near future apart from the ones in pipeline.

LEARNINGS FROM INDIA

- Favourable global costs trends helped all countries including India
- Government ambitions has resulted in flood of investment, further reducing the costs because of economies of scale
- Policies that have been critical for the development of RE sector
- Grid integration is not a challenge up to a significant share of renewable energy
- Distributed generation could be a valuable tool to address energy access and deal with cuts in urban areas
- Other benefits:
  - Reduced need for polluting coal power plants for which finances are harder to acquire
  - Distributed generation may help in reforming discoms which supply subsidized electricity

FALLING PRICES OF SOLAR ENERGY

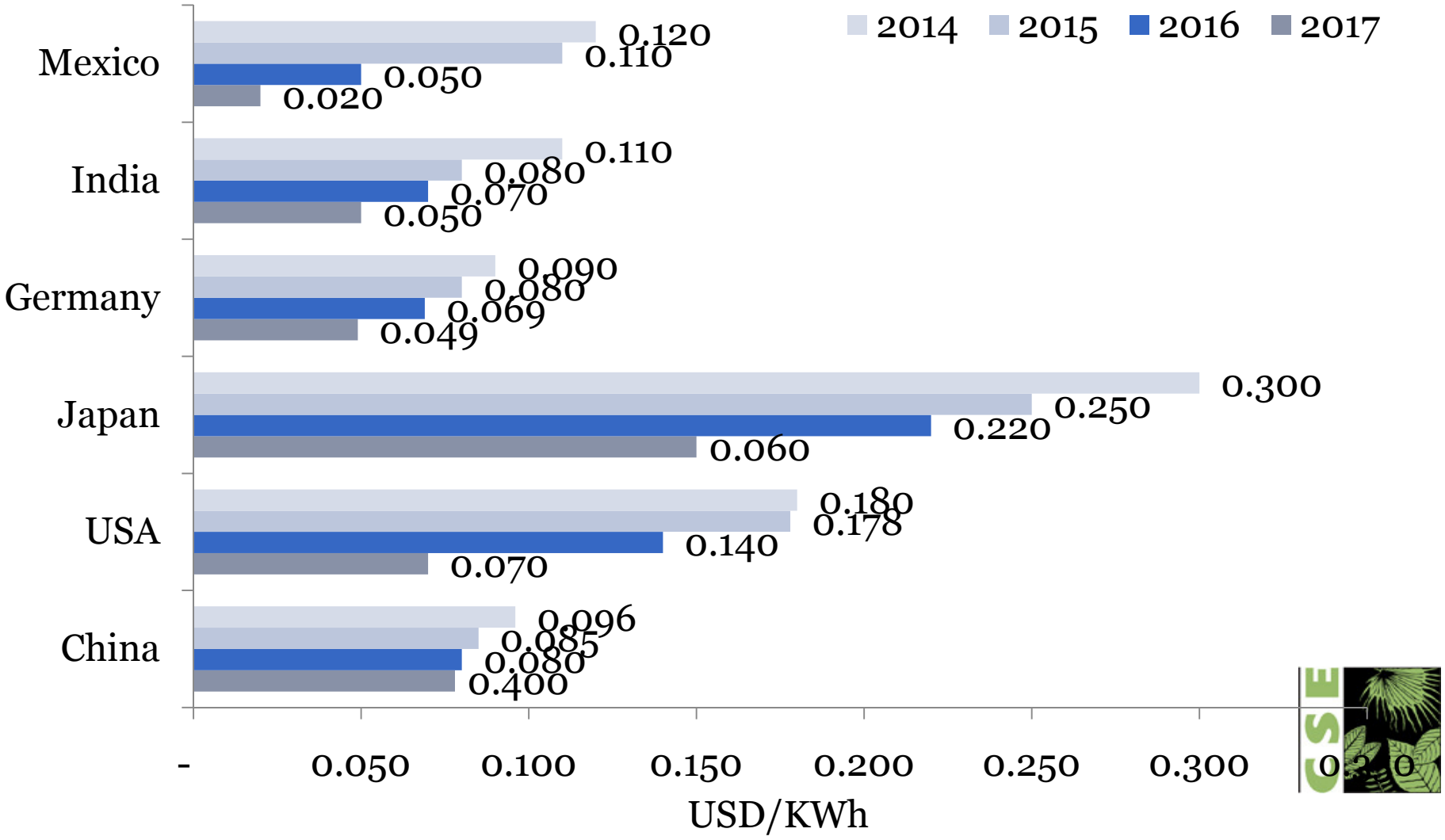
SOLAR'S TIME IN THE SUN



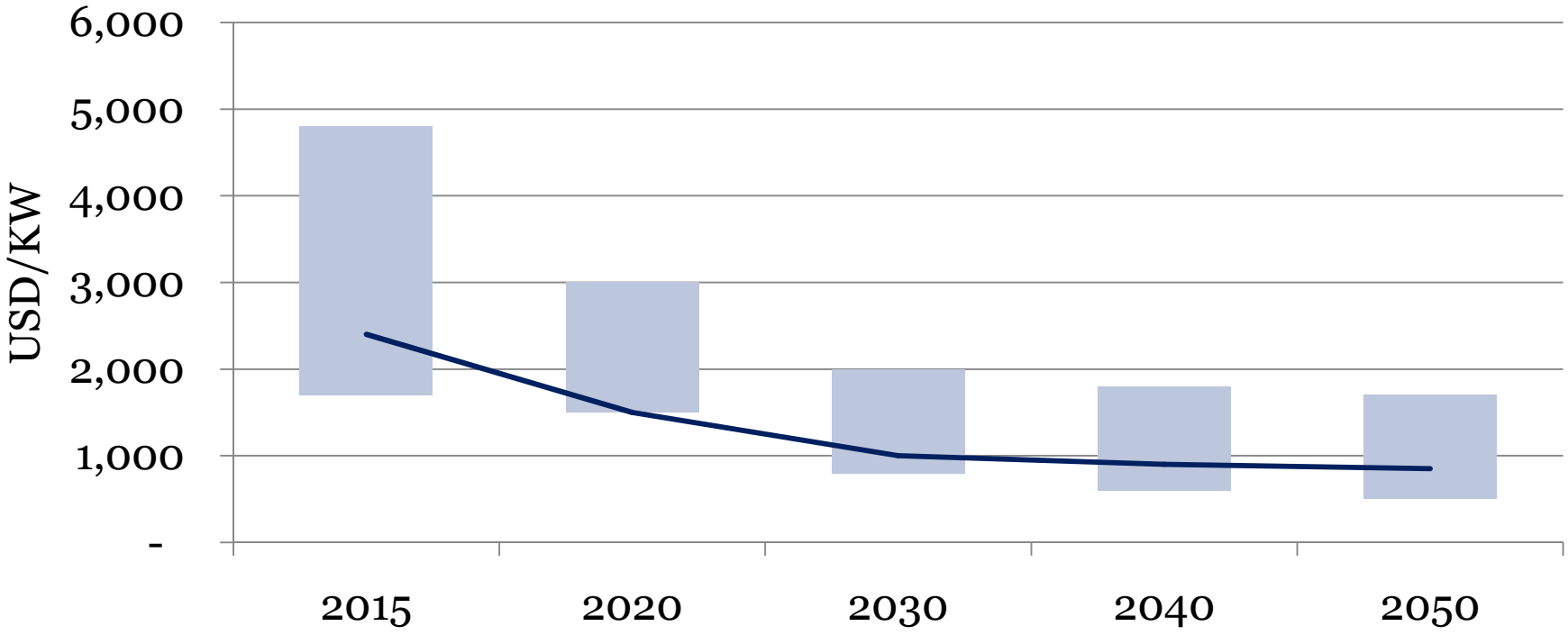
Source: GTM Research

Costs in India and China are at USD 0.65 per Watt-peak and USD 0.80 per Watt-peak, lowest as it has ever been. It is expected to stabilize below USD 0.50 per Watt-peak.

FALLING PRICES ACROSS THE GLOBE

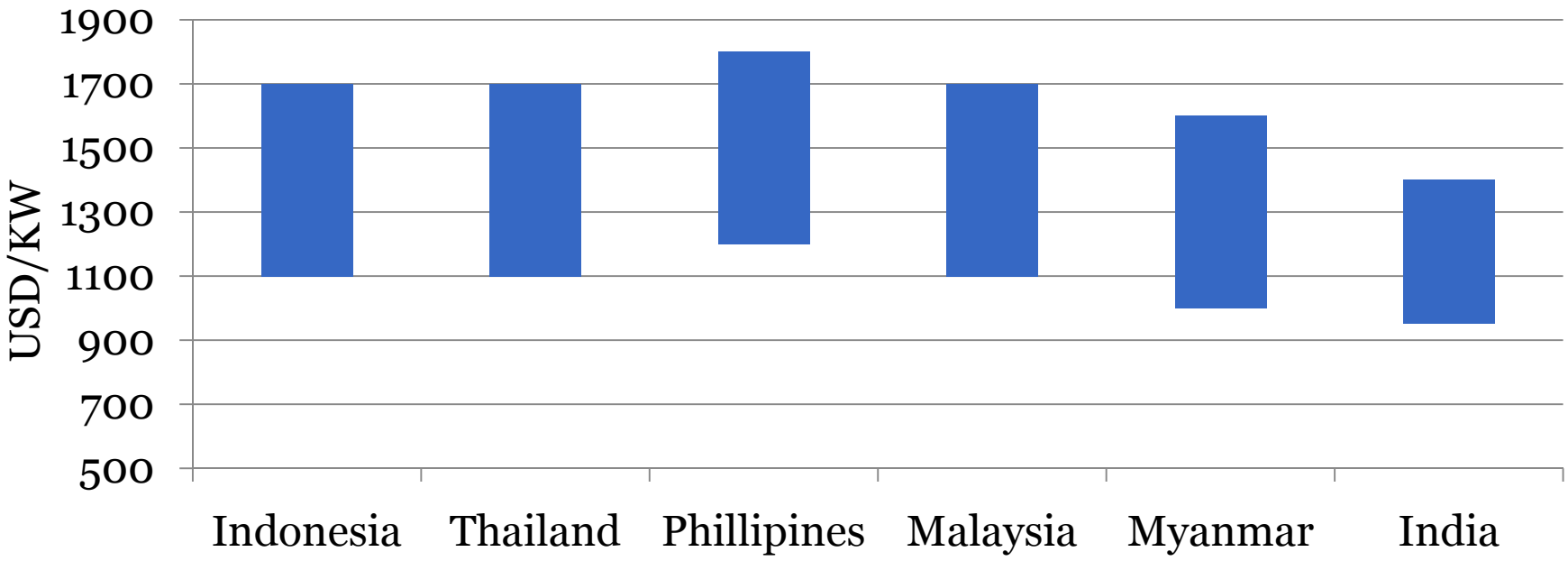


SOLAR ROOFTOP COSTS IN INDONESIA (as estimated in 2014)



Source: IEA, 2014

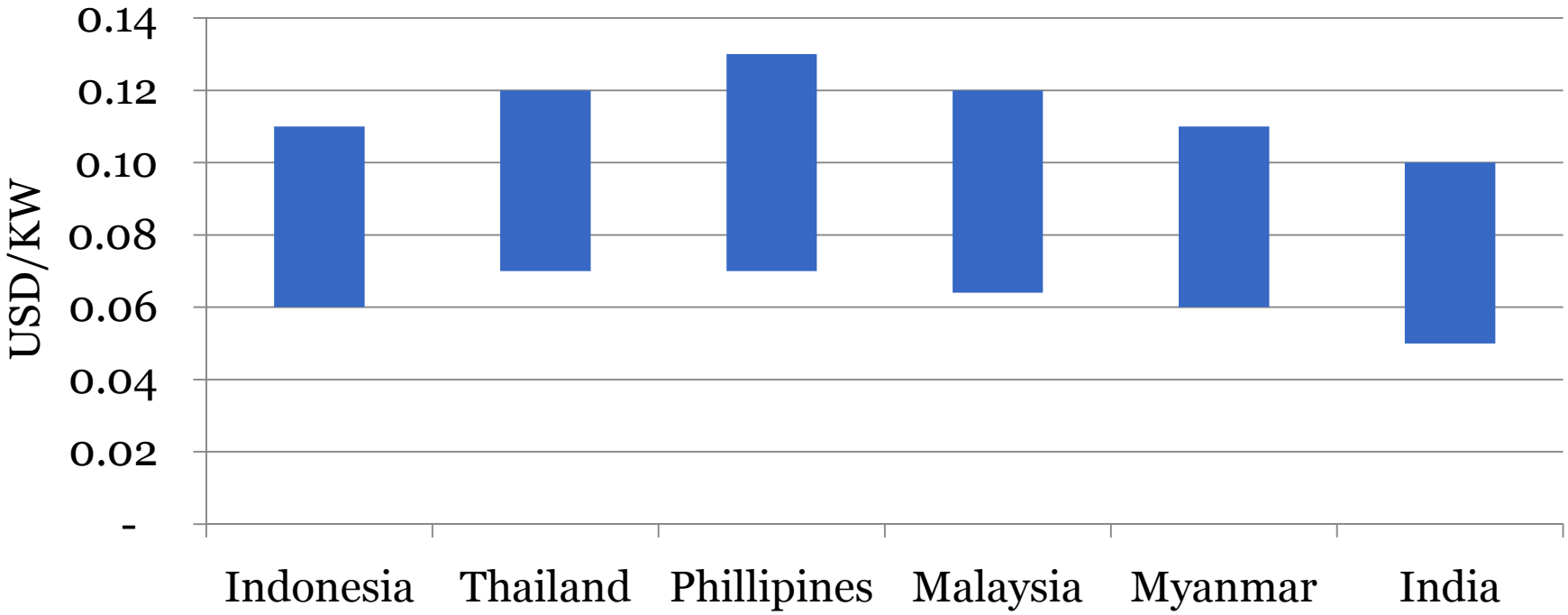
CAPITAL COSTS IN INDONESIA (as estimated in 2017)



In 3 years, the estimates have fallen from USD 1800-4800 per watt-peak have fallen to USD 1100-1700 per watt-peak.

Source: Mott McDonald, 2017

LCOE IN INDONESIA (as estimated in 2017)



Source: Mott McDonald, 2017

INCREASING ELECTRICITY TARIFFS

ELECTRICITY PRICES IN INDONESIA

Categories of Customers	Electricity Tariffs Range (USD/kWh)
Special Category – Subsidized	0.01 – 0.08
Residential	0.01 – 0.10
Business	0.02 – 0.10
Industrial	0.01 – 0.09
Government	0.04 – 0.10

Consumers paying higher tariffs than the generation cost of electricity of rooftop systems more than 0.06 per unit

- Although subsidised, S-2 and S-3 category consumers
- Customers with a connection of more than 900 V-RTM under R-1, R2 and R3
- B-1 with capacity of 1300 VA and higher, B-2, B-3 category of consumers
- Categories higher than I-1 1300 VA capacity
- P-1 with capacity of 1300 VA and higher, P-2, P-3 category of consumers

INCREASING TARIFFS

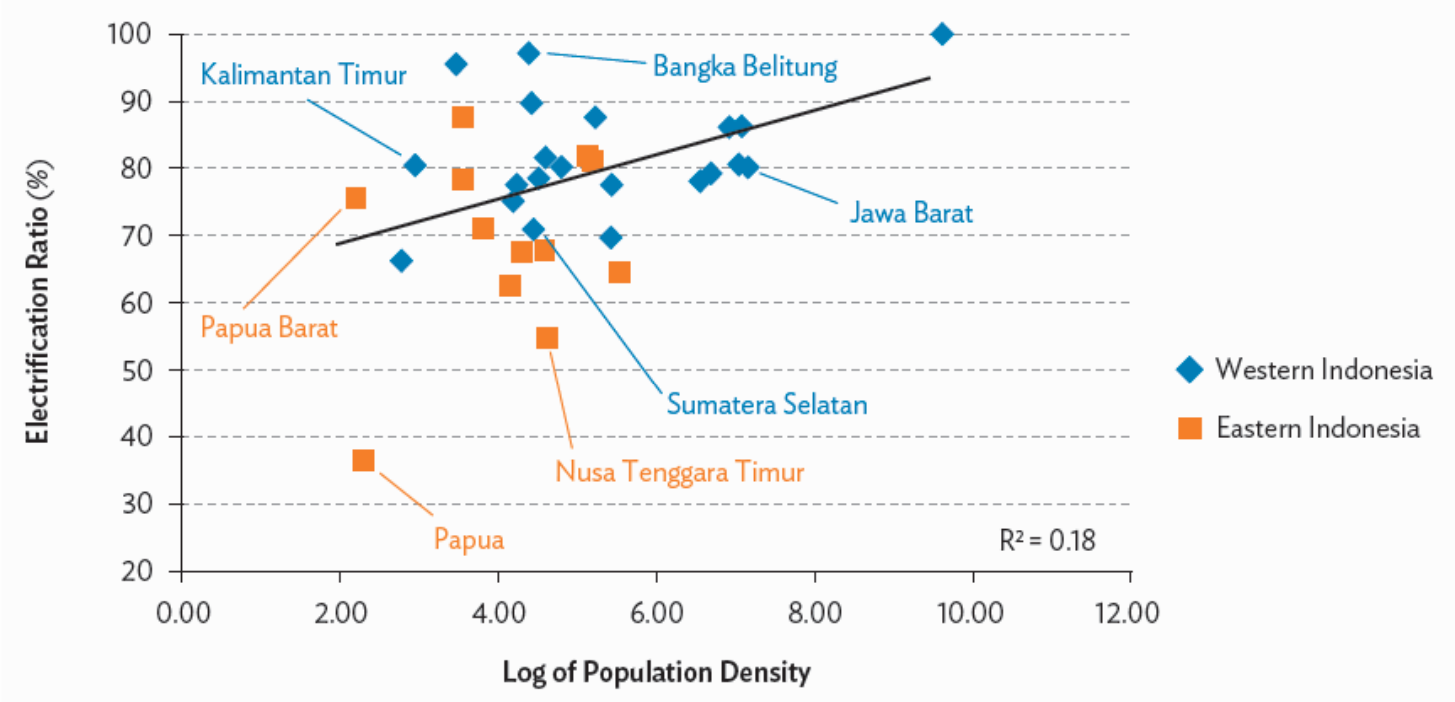
- Stages of subsidy withdrawal under President Joko Widodo
  - Stage I – 2014
    - Cut 280 trillion rupiah (USD 24 billion) subsidy bill by increasing tariffs for its top electricity consumers by 10-11% for all consumers and 5.5% for government and households
  - Stage II – 2016
    - Fall of subsidies to IDR 59.23 trillion in 2016
  - Stage III – 2017
    - Subsidy for 900-VA customers would be gradually revoked starting from January to May 2017
- Only 4.3 million 900-VA and 450-VA customers would be eligible for cheap electricity and receive government subsidies

DEPENDENCY ON DG SETS

POWER QUALITY & OUTAGES IN CITIES

- According to news reports, major cities in Indonesia like Bandung, Surabaya, Medan, Semarang etc. are facing problems with both quality power and outages
- Asian Development Bank (ADB) report quotes power outages as one of the most important factors in hindering business operations in Indonesia
- Among foreign investors, the Japanese companies complained about power shortages.
- Power voltage levels were fairly low throughout the 25 locations monitored through the WRI-Prayas initiative

SOLAR FOR THE ACCESS IN REMOTE ISLANDS



- Based on this analysis, changes in population density account for only 18% of the differences in electrification ratios.
- Electrification is a factor of the costs and difficulty of connecting rural areas instead of population density
- Solar can provide electricity to remote islands

ACCESS IN REMOTE ISLANDS-I

- Electrification in the
  - Western part of the country as high as 99.98% (DKI Jakarta)
  - Eastern part of the country as low as 47.8% (Papua)
- More than nine hundred permanently inhabited Islands
  - The non-availability of quality power can have severe spillover effects.
  - Facing problems in business investment
  - Logistical challenge for maintaining a reliable electricity grid supply

ACCESS IN REMOTE ISLANDS-II

- Electricity access is a matter of both policy and settlement patterns.
- In Indonesia, around 20% variation in electrification ratios is seen among the provinces.
- Both Funding from various schemes and geographical/settlement patterns determine the level of electrification and quality of power supplied.
- Still around 12-14 % of population has limited or no access to grid based electricity.
- Research shows that the last 10% of electrification is very costly.
- In this context solar power and other renewables can play an important role.

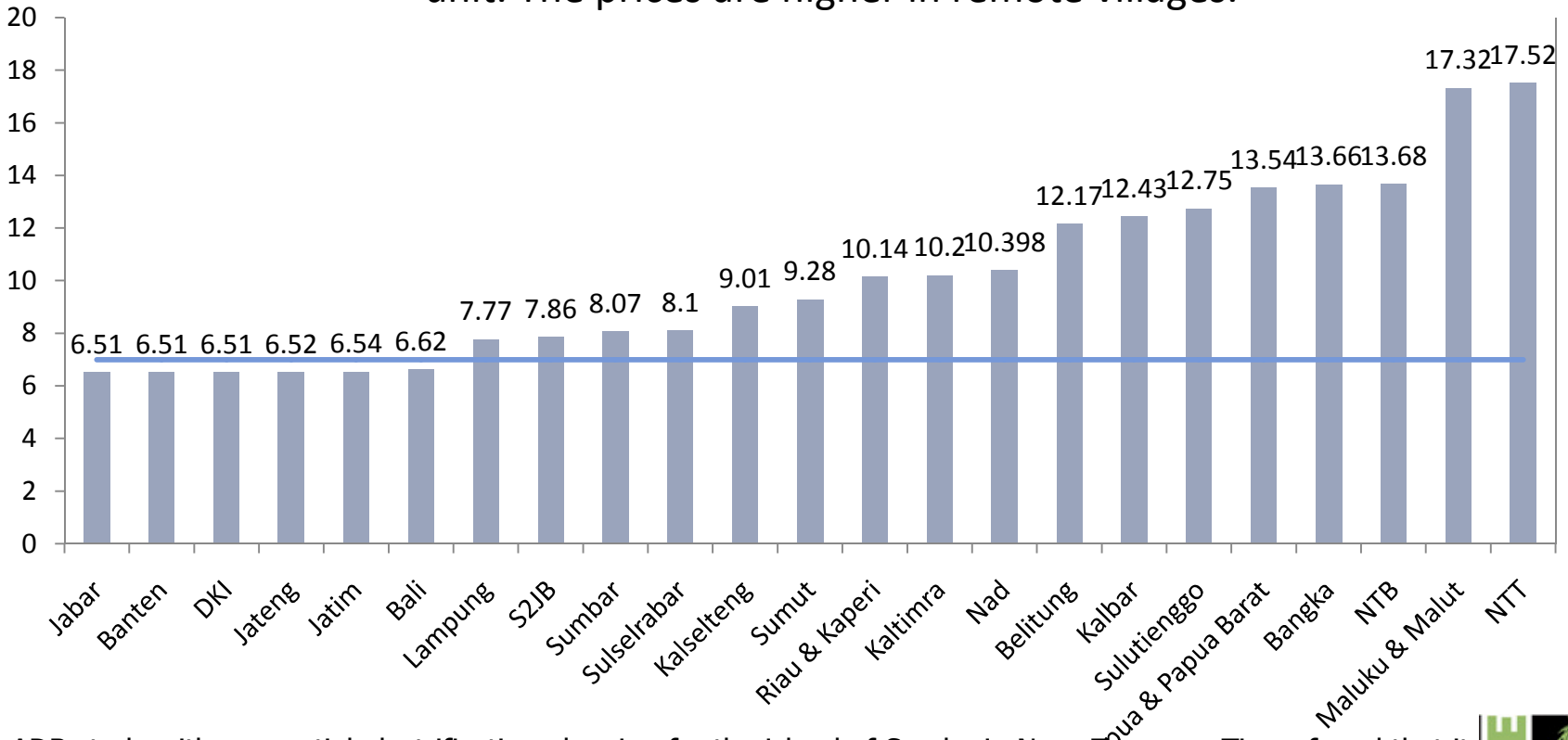
DEPENDENCY ON DG-SETS

- Power interruptions prompted to rely on private generators
- Seeking services of a **'Floating Power Plant (based on diesel)**' from Turkey
- As per the CSE analysis, a diesel gen-set with efficiency in the range of 0.3-0.6 liters/kWh and with average diesel price of USD 0.68 per liter (current price in Indonesia), would generate electricity at the **cost of USD 0.2 to USD 0.4 per kWh.**
- Electricity procurement prices in remote villages is as high as **USD 0.18 per kWh.**

REDUCE BURDEN ON THE GRID

REGIONAL POWER GENERATION COSTS

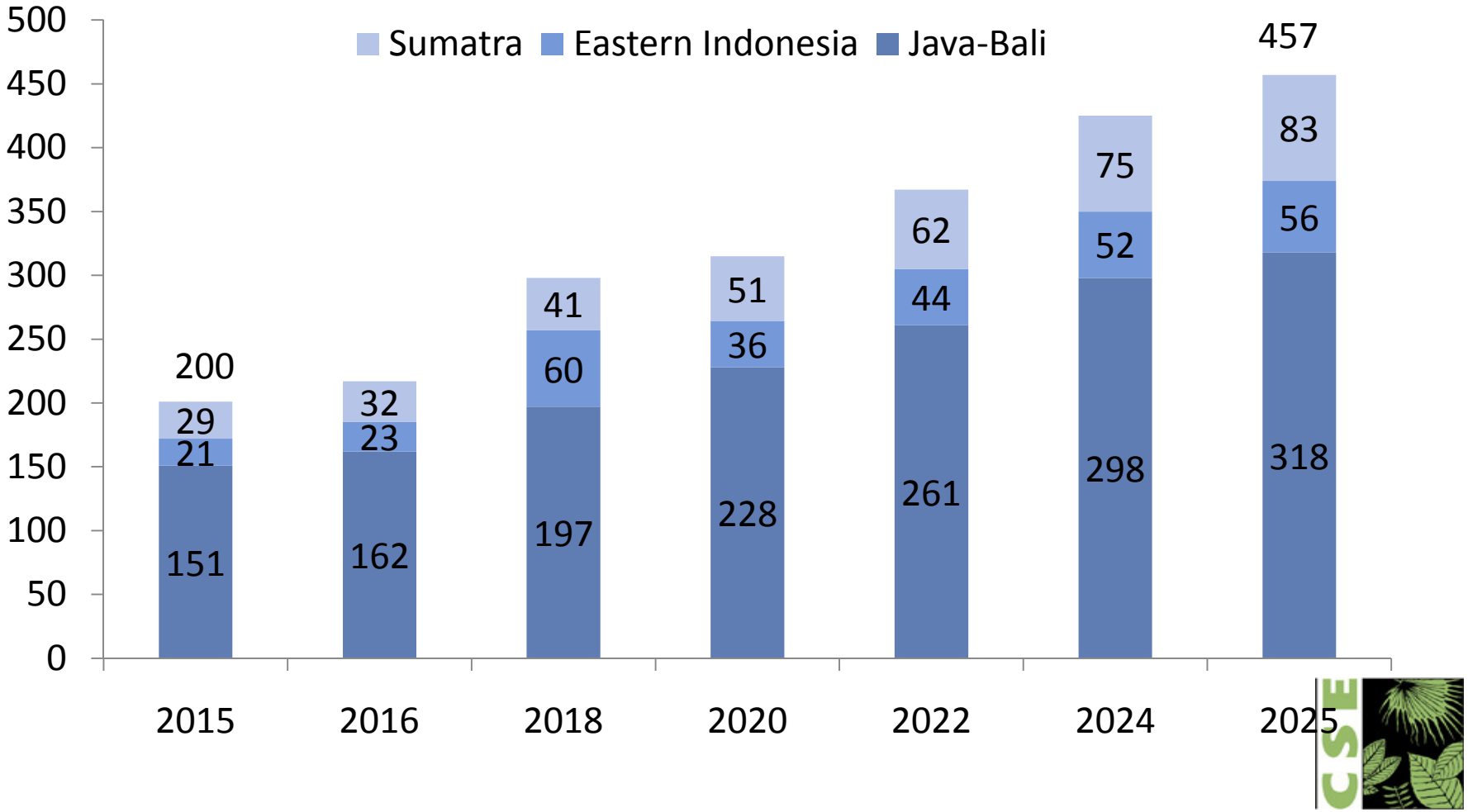
Electricity generation costs in Indonesia varies from USD 0.065 to USD 0.175 per unit. The prices are higher in remote villages.



An ADB study with geospatial electrification planning for the island of Sumba in Nusa Tenggara Timur found that it would be less costly to use renewable off-grid technologies rather than grid extension to serve some 30% of the households remaining to be electrified.

INCREASE IN ELECTRICITY REQUIREMENT

Electricity demand is projected to increase two and half times in the next 10 years



SOLAR SYSTEMS CAN HELP PLN

- National average cost of generation in Indonesia is as high as USD 0.18 per kWh in East Nusa Tenggara (NTT) and Maluku.
- Cost of solar power procurement should encourage PLN to promote solar especially in remote islands and their villages
- Help manage demand and reduce dependency on grid
- Beneficial for consumers who are paying tariffs more than USD 0.06 per unit
- Help source the increasing demand through solar instead of depending on fossil fuels

OTHER RENEWABLE ENERGY OPTIONS

WHERE ALL OTHER RENEWABLE OPTIONS CAN BE ADOPTED IN INDONESIA?

Type of Energy Option	Potential Area of Application
Wind	Areas with high wind intensity
Biomass	Rural and agriculture
Tidal	54,720 Kms of coastline
Hybrid systems (like solar-wind, tidal-wind, floating solar etc.)	For Floating Solar Plants Indonesia has around 93,000 square kilometers of inland seas (straits, bays, and other bodies of water). When 1 sqkms can have 100 MW, then even 0.1 % of this 93,000 sqkms can give around 9.3 GW

CHALLENGES WITH THESE OPTIONS

- Testing of solar and other renewable options as a viable business models on pilot project basis
- Development of regulatory models for governance of these renewable energy options.
- Forecasting and grid integration of intermittent renewable power although not a challenge for 25 per cent RE share
- Addressing issues like tariff, subsidy, grid integration etc. to sustain a conducive ecosystem for these technologies.

POLICY GAPS

- Indonesia, today lacks ambition for renewable energy especially solar that can pool demand and attract investment.
- Focus still lies in fossil fuels – when the country can take advantage of lowered costs of solar for both access and power cuts
- Another important aspect for enhancing investment in the sector is the supporting mechanism
  - The regulatory framework including FiT should be supporting the development of RE instead of acting as disincentive which it currently is.
  - High taxes on auxiliary equipment - (aluminum frame, ethylene vinyl acetate film, back sheet, junction box, silver solder ribbon and sealant etc) are taxed in range of 13 to 20 per cent.
  - Mandatory high domestic content requirement (25.63 per cent on goods sourced, 100 per cent on services and 43.85 per cent on both combined)

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