



# Overview of Pan-Asian Renewables

**Sarah Fairhurst, Partner, The Lantau Group**

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# Agenda

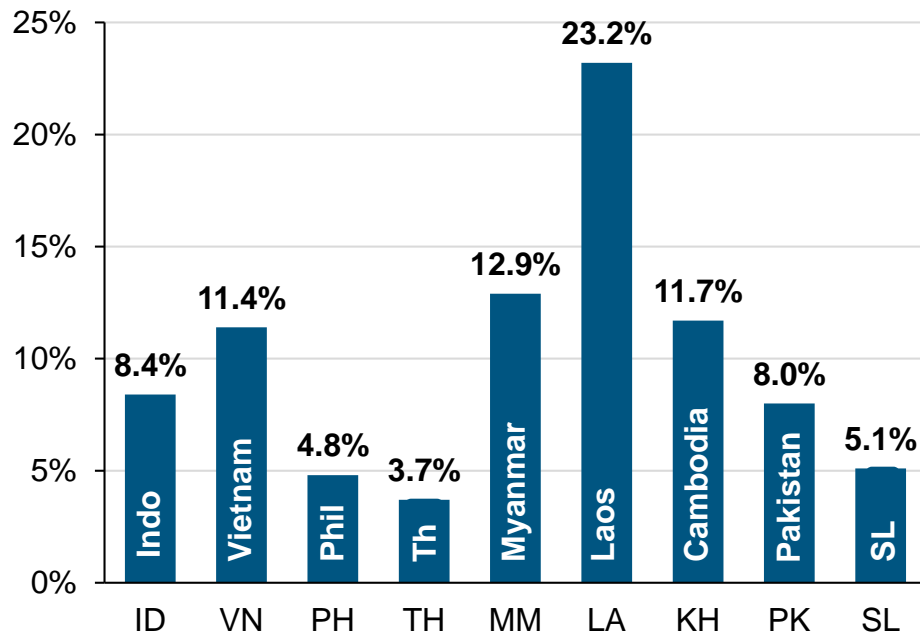
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- Renewables across Asia
  - Demand and generation dynamics
  - Future supply outlook
  - Renewables outlook and incentives
  - A turning point in RE economics
  - Off-grid application

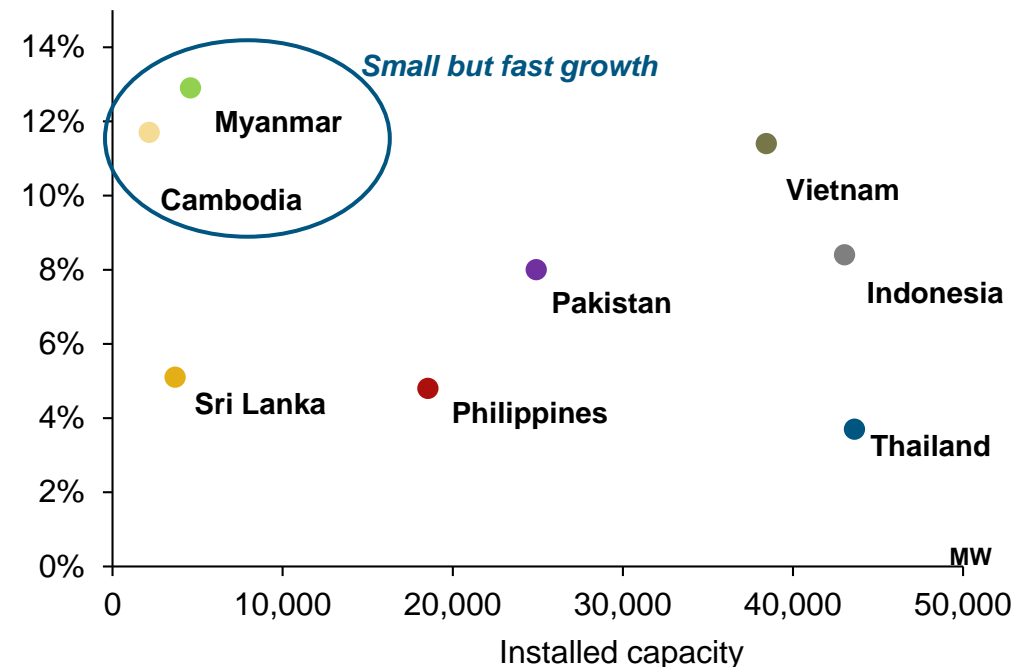
Much of the demand growth in Asia is being spurred by developing nations, particularly in the Mekong sub-region

- Demand growth is being spurred by industrialisation of developing economies.
- Countries with the highest rates of demand growth are typically those where increasing electrification is also unlocking hitherto unserved demand.

Forecast demand growth over the next 3 years (CAGR)



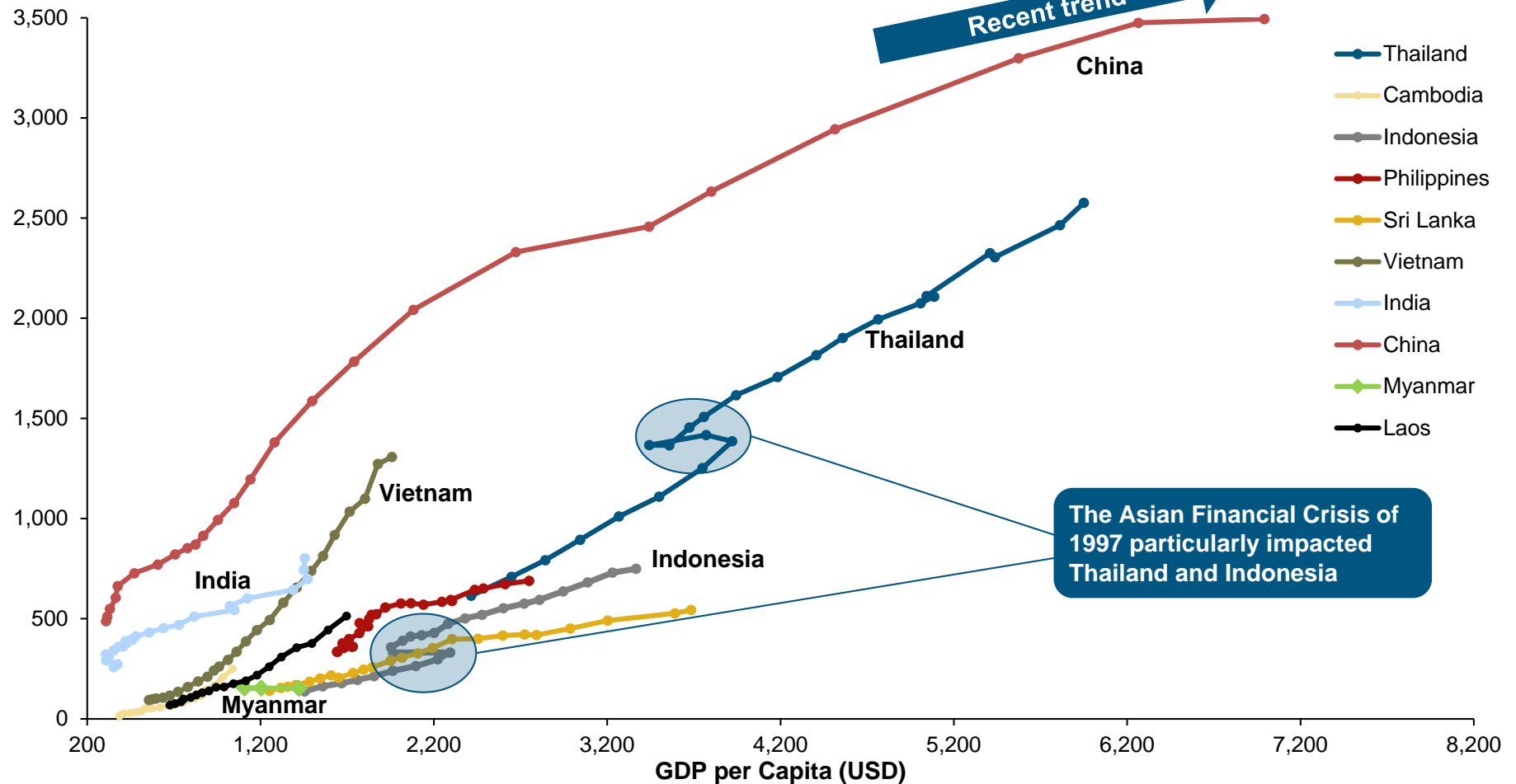
Demand growth forecast relative to 2015 installed capacity



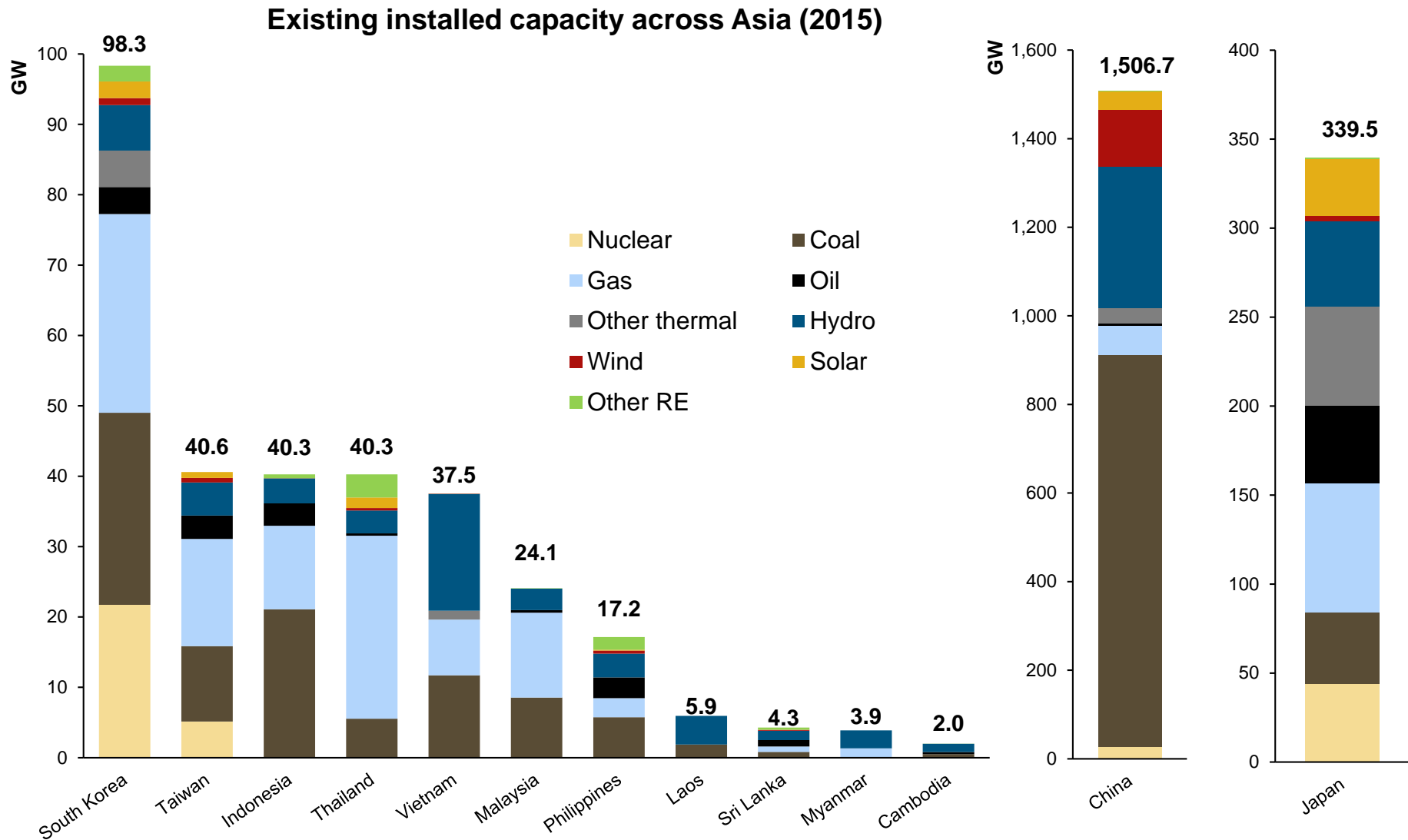
And whilst electricity consumption per capita will eventually reach saturation, the majority of SE Asia will remain on an upward trajectory for some time

Total Consumption per capita vs GDP per Capita (1989-2013)

kWh Consumption per capita

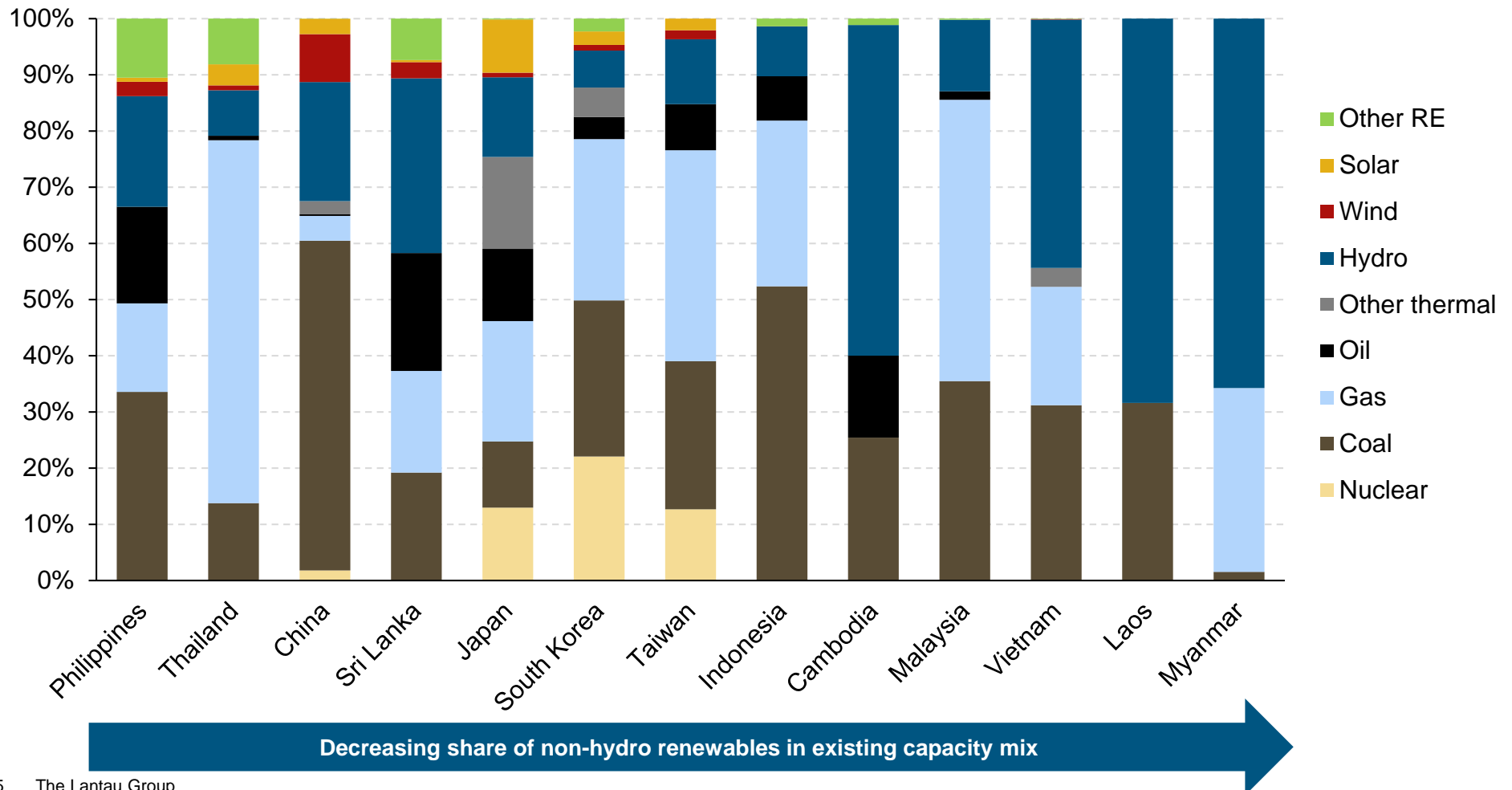


Coal and gas dominates the generation picture across Asia, particularly in developing nations where domestic fuel resources have played a key role

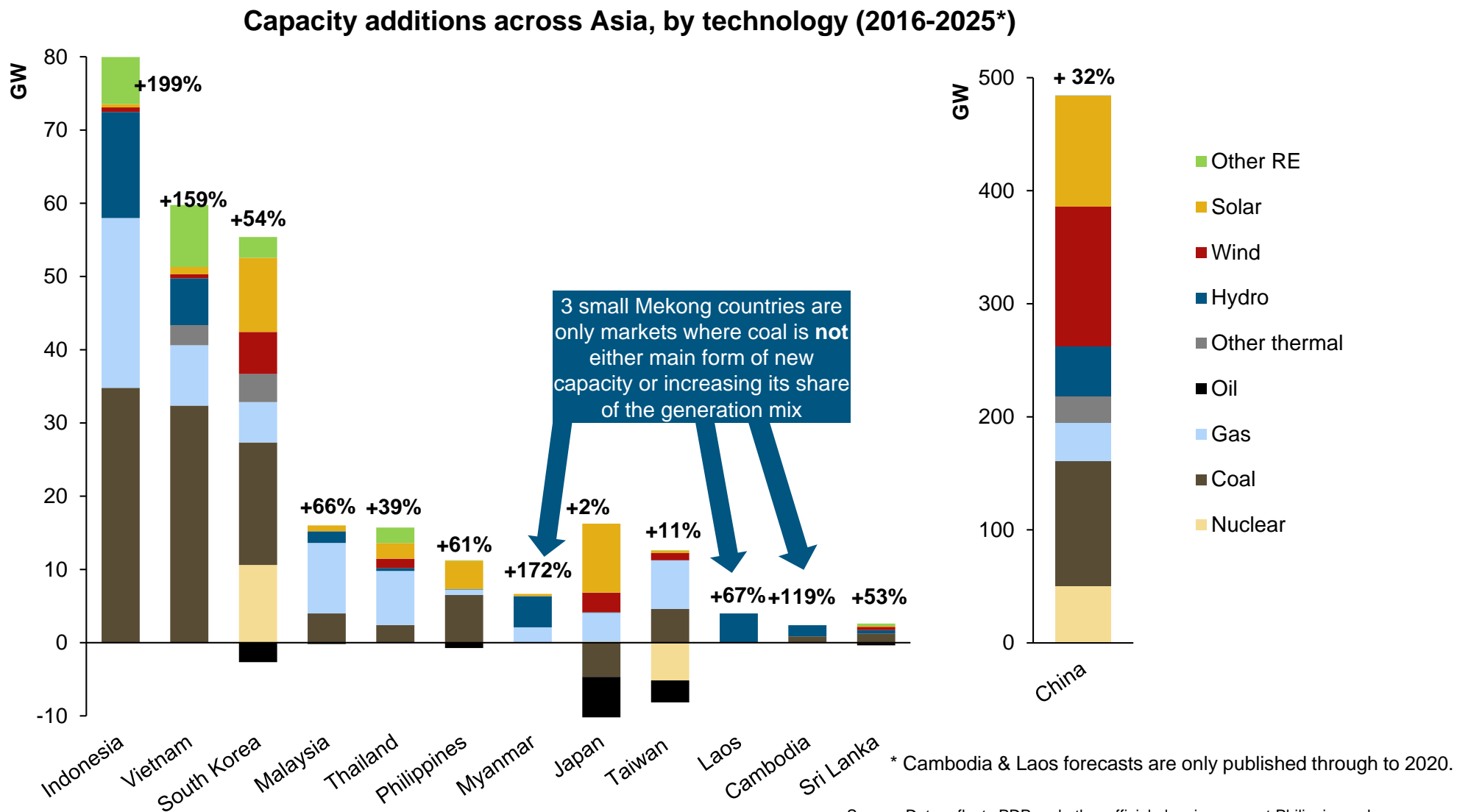


While hydro has historically been strong in Asia, other renewable energy still represents a relatively small share of the overall generation mix

Percentage share of existing installed capacity across Asia (2015)

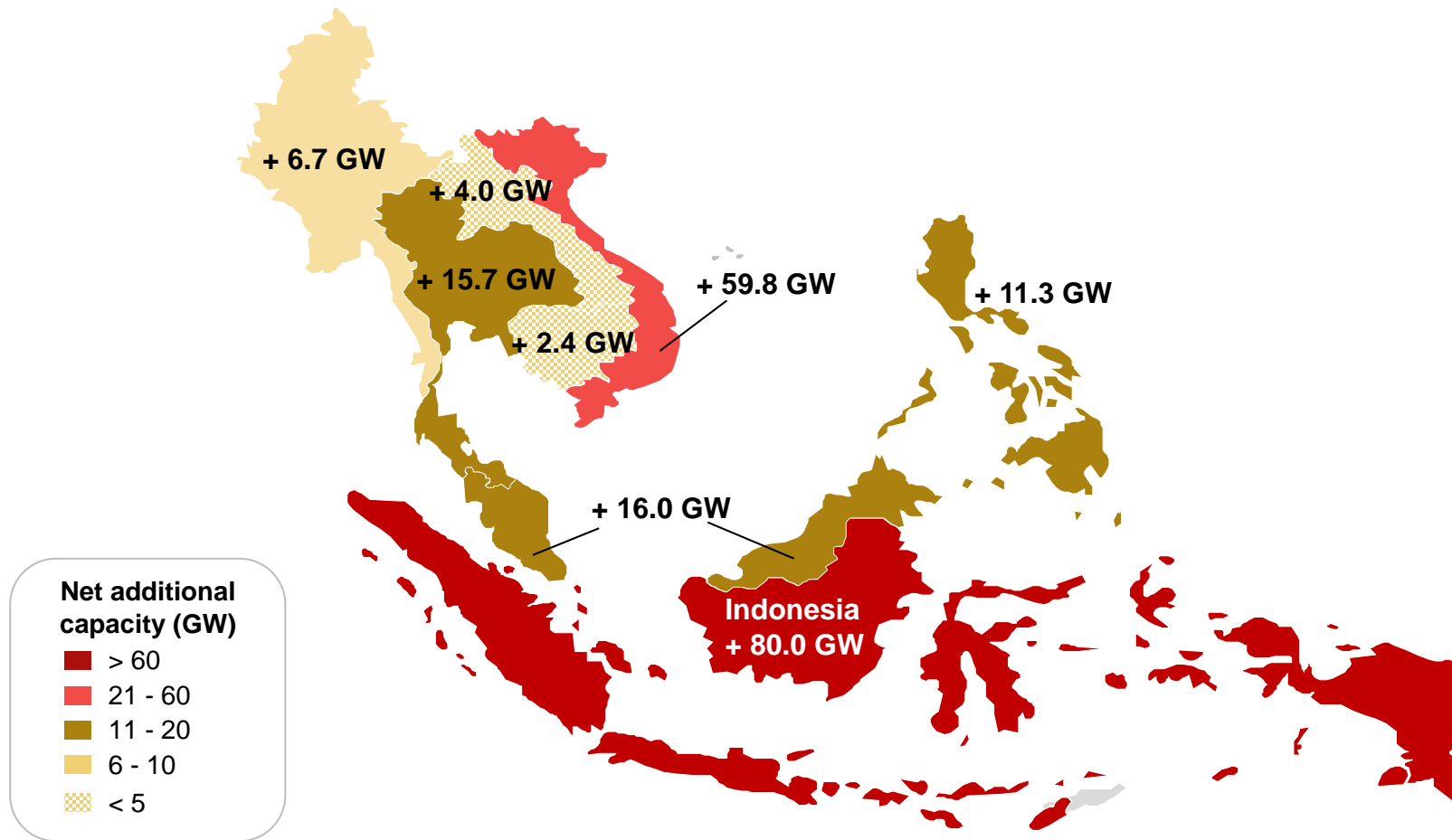


# So where is the electricity growth? China still dominates despite overcapacity concerns, whilst capacity in Indonesia and Vietnam is set to more than double



Within South East Asia, the next ten years will see Indonesia and Vietnam dominate the growth outlook in absolute terms

**Net capacity additions in South East Asia through to 2025**

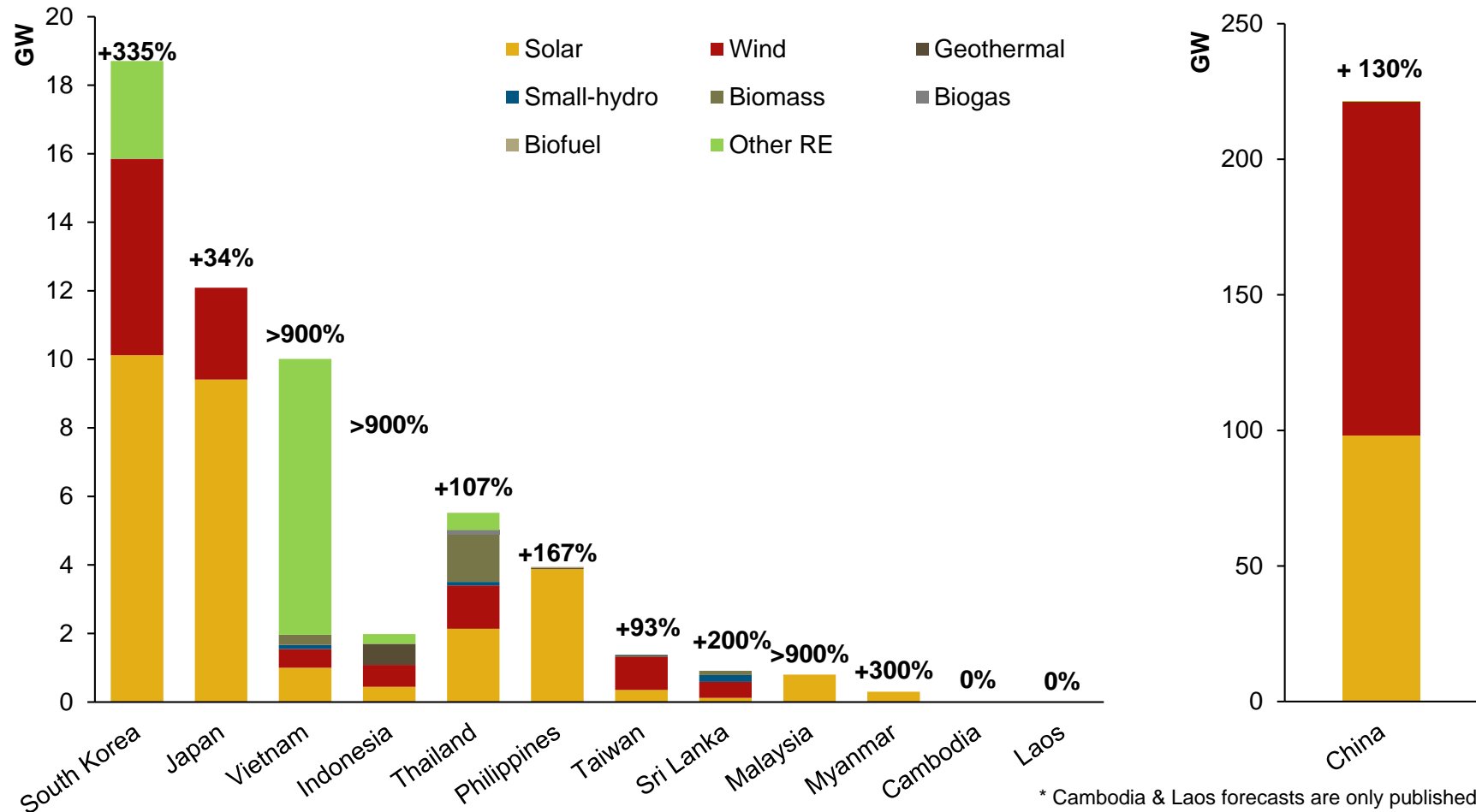


\* Cambodia and Laos forecasts are only published through to 2020

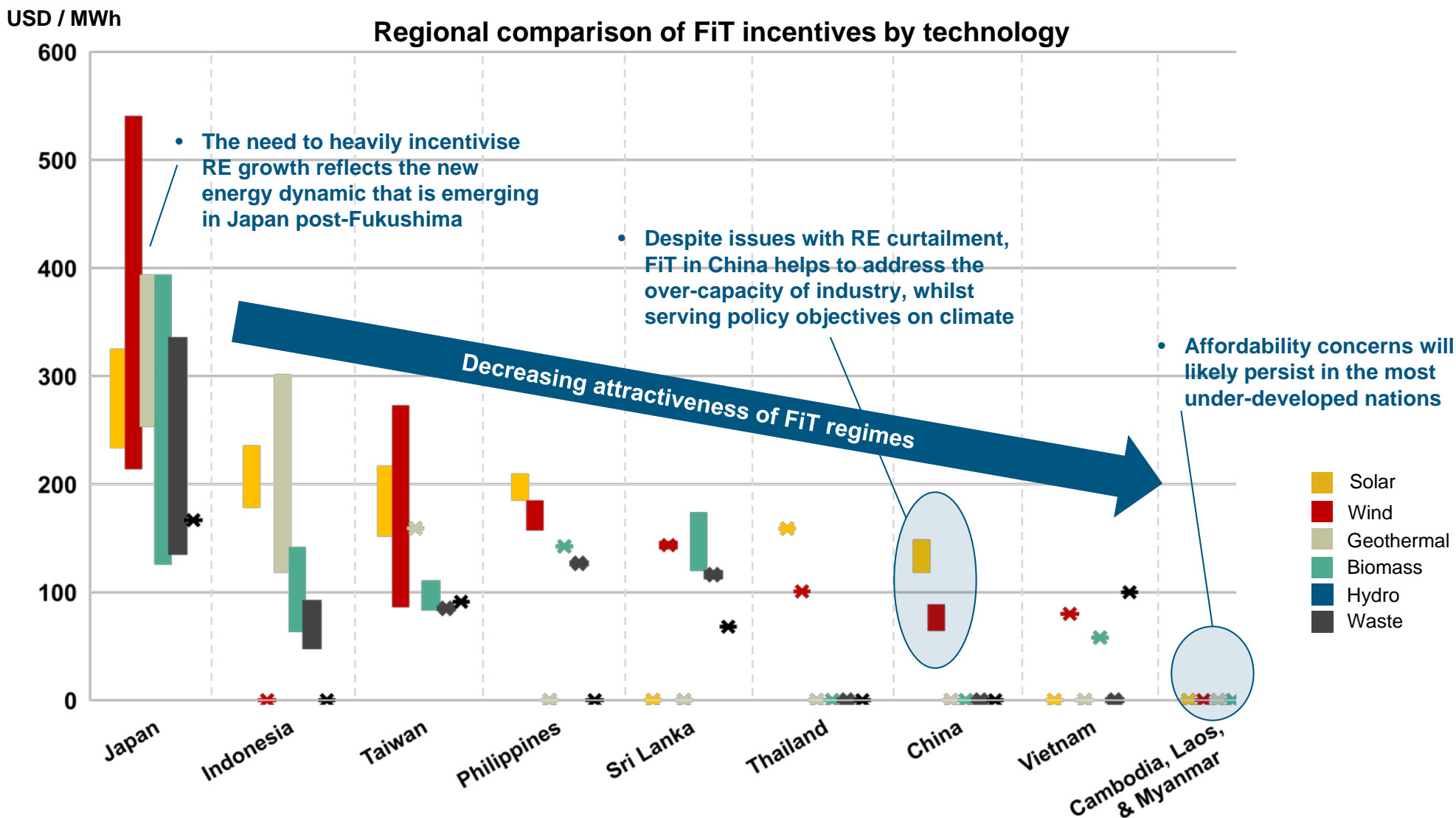
Source: Data reflects PDP and other official planning, except the Philippines where forecasted capacity additions have been modeled using TLG market models.

In terms of renewables, regional plans are slowly incorporating more RE, with solar and wind expected to dominate the future mix of technologies

Renewable energy capacity additions across Asia, by technology (2016-2025\*)

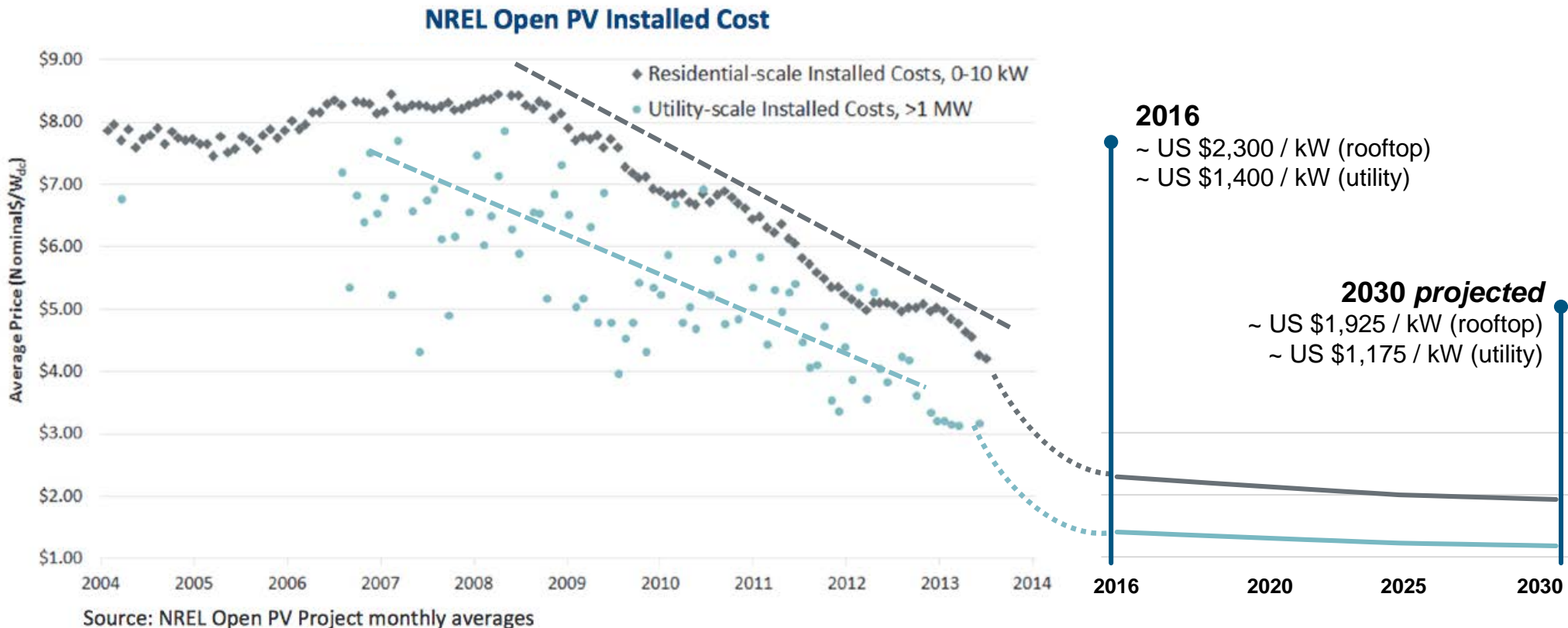


# The incentive regimes vary considerably with attractiveness and maturity reflecting the different political and economic contexts across Asia

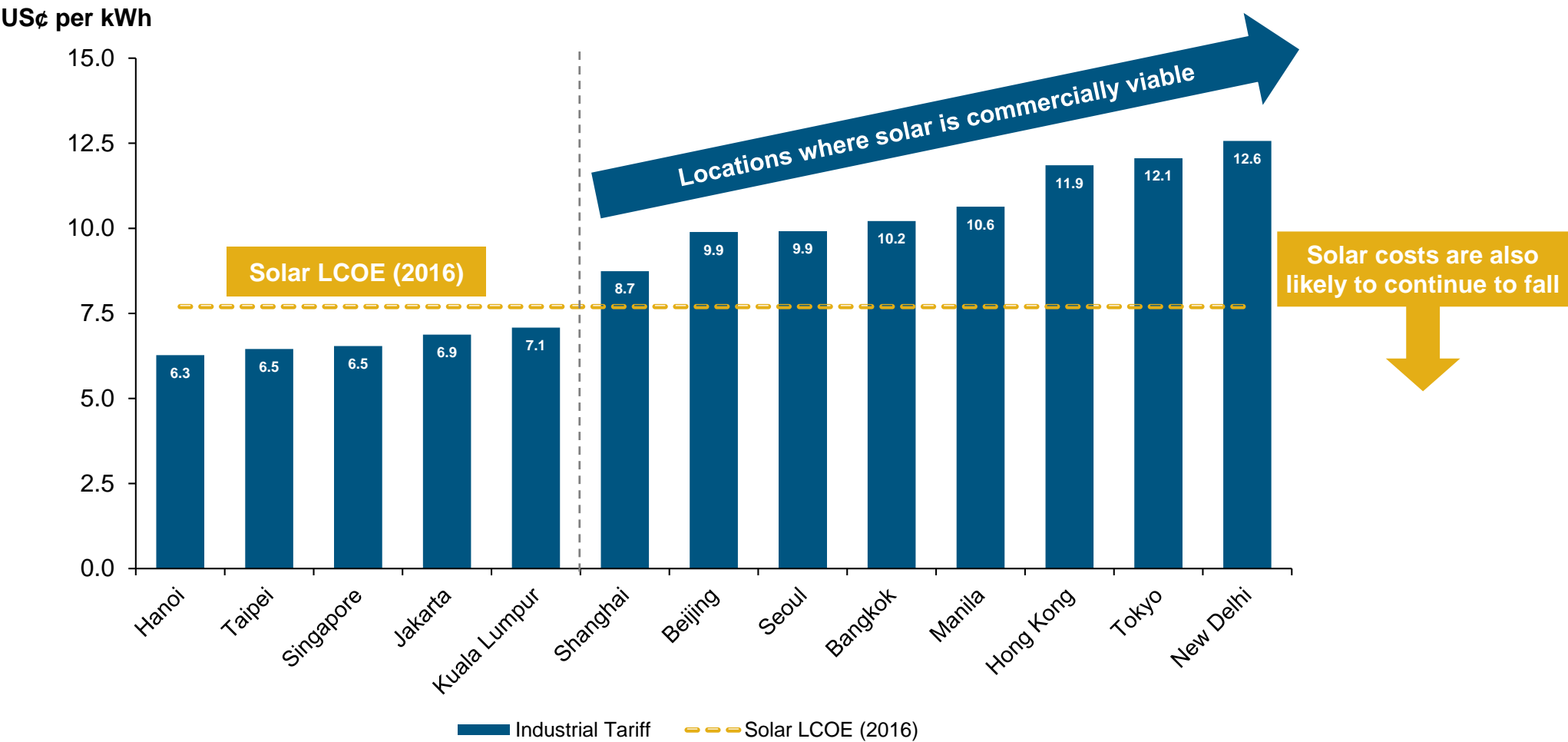


Nevertheless, falling costs for solar are making the economic case for solar increasingly compelling in southern (sunny) countries...

- Solar costs have been on a clear downward trajectory for the past 8 to 10 years, a trend which is modestly expected to continue to fall

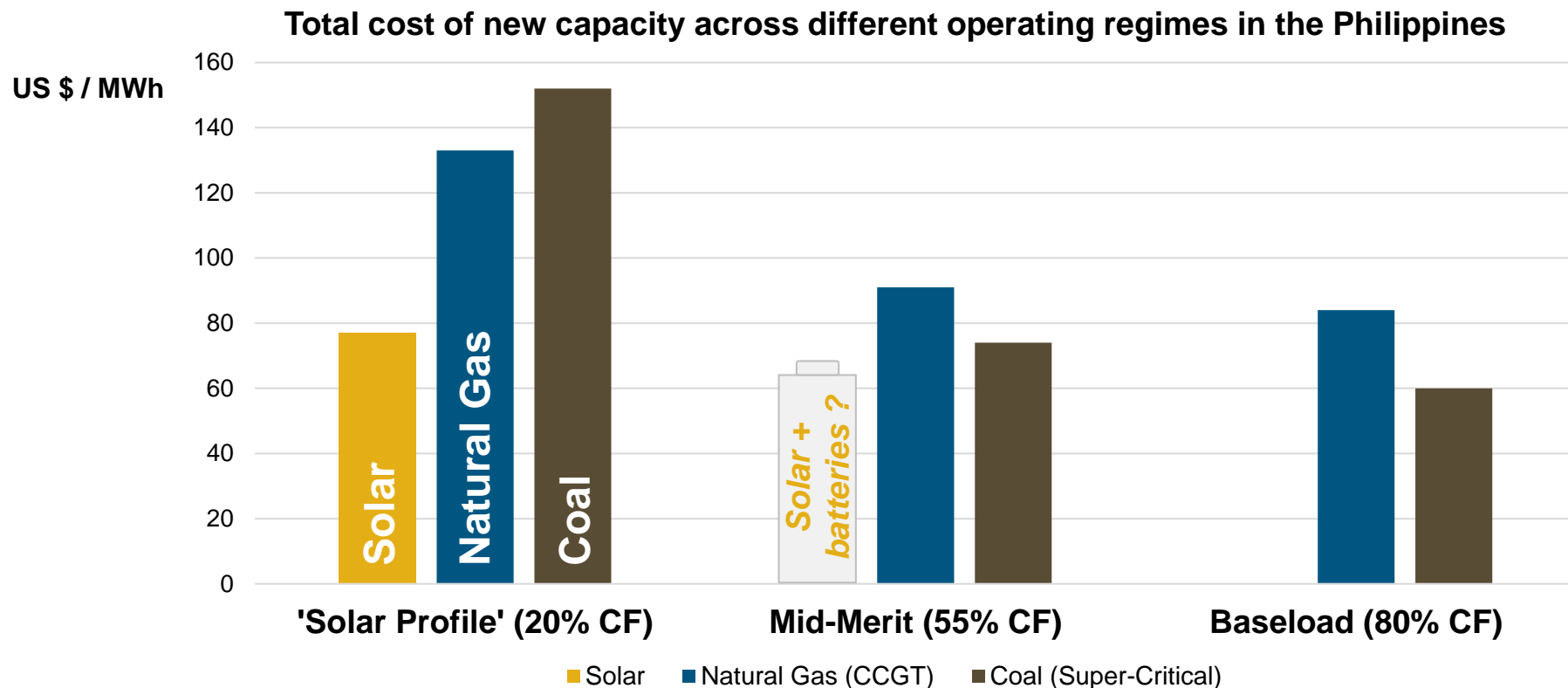


And when compared against prevailing tariffs, solar is becoming increasingly commercially viable in a number of Asia cities, even without the need for a FiT...



... Which has resulted in solar competing head-to-head with gas-fired generation to serve peak demand in some countries

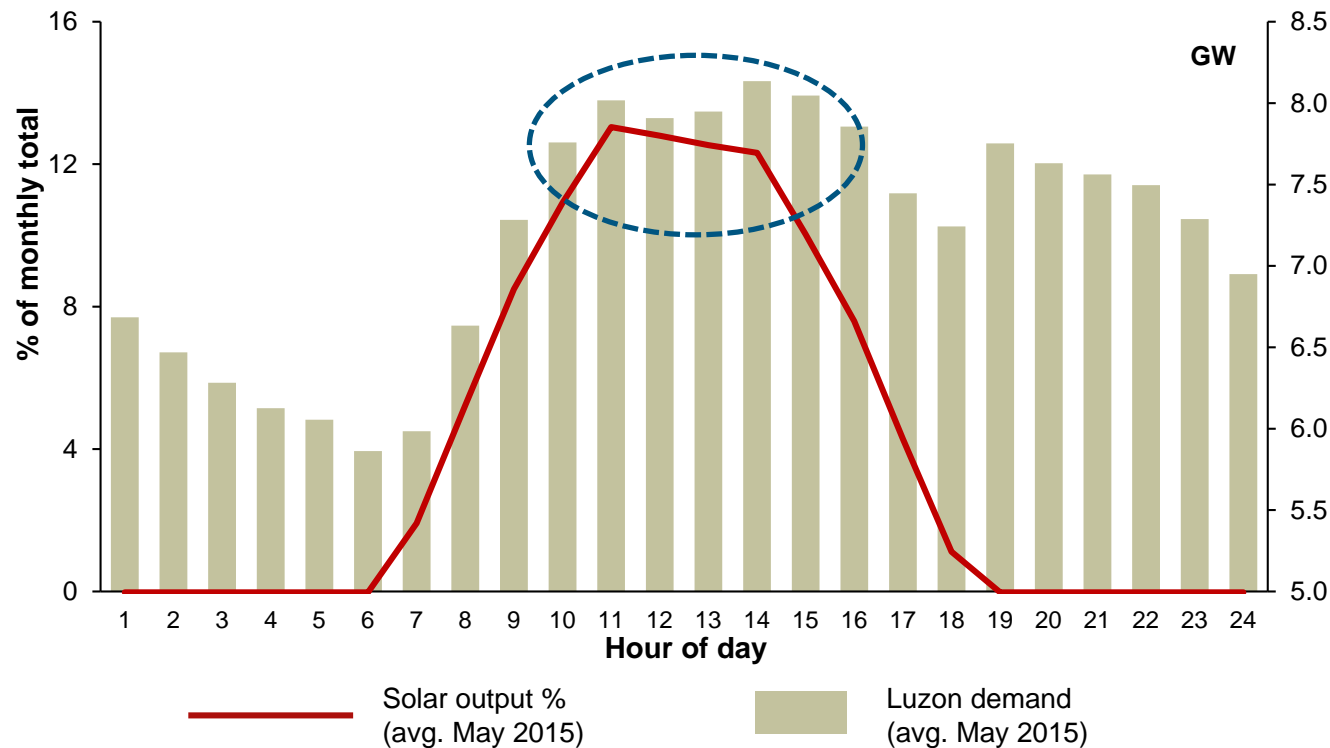
- The economic entry of solar is increasingly viable and, compared against natural gas, is highly competitive in a peaking application.
- Looking forward, the advent of 'solar-plus-battery' systems on a commercial basis is likely to further disrupt the status quo.



Solar is further bolstered by the natural tendency for solar output align with demand during peak hours in countries where air conditioning drives demand

*Philippines case study*

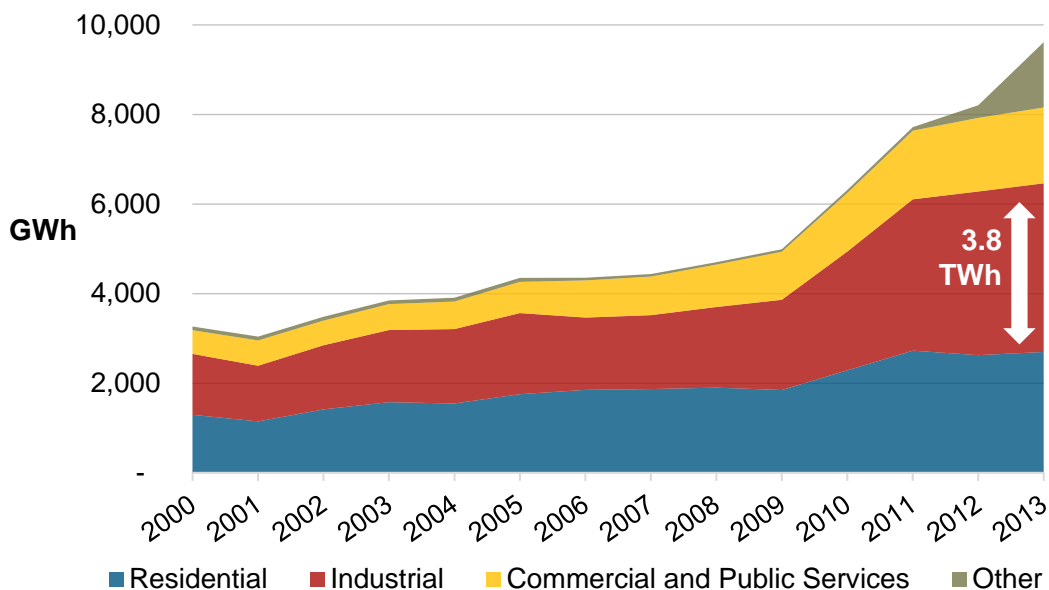
**Hourly solar generation and demand in the Philippines (Luzon)**



- On average, there is a strong alignment between average peak demand and the solar generation profile.
- As a result, solar is typically able to capture the most profitable hours.

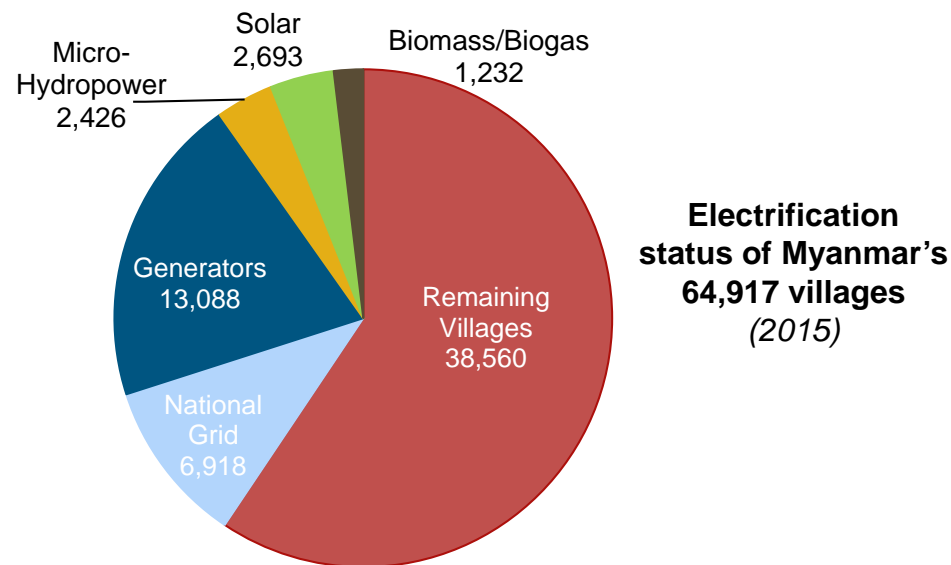
# The role of distributed, off-grid RE can also not be ignored: In Myanmar, there is substantial latent demand

## Robust electricity demand growth led by industry



- Electricity consumption has more than doubled between 2006 and 2016, and grown at a average annual rate of 13.6% over the last five years.
- Growth underpinned by a strengthening economic outlook and growth in Myanmar's transmission infrastructure.
- Industrial demand has grown at 15.1% pa. since 2010.

## In rural areas there is substantial unserved demand



- Two-thirds of Myanmar's population of 53 million live rurally.
- Electrification stands at around 32% of households, with ~ 38,000 of 65,000 villages lacking access to electricity.
- Myanmar's HV transmission network is largely confined to the Yangon–Mandalay corridor.

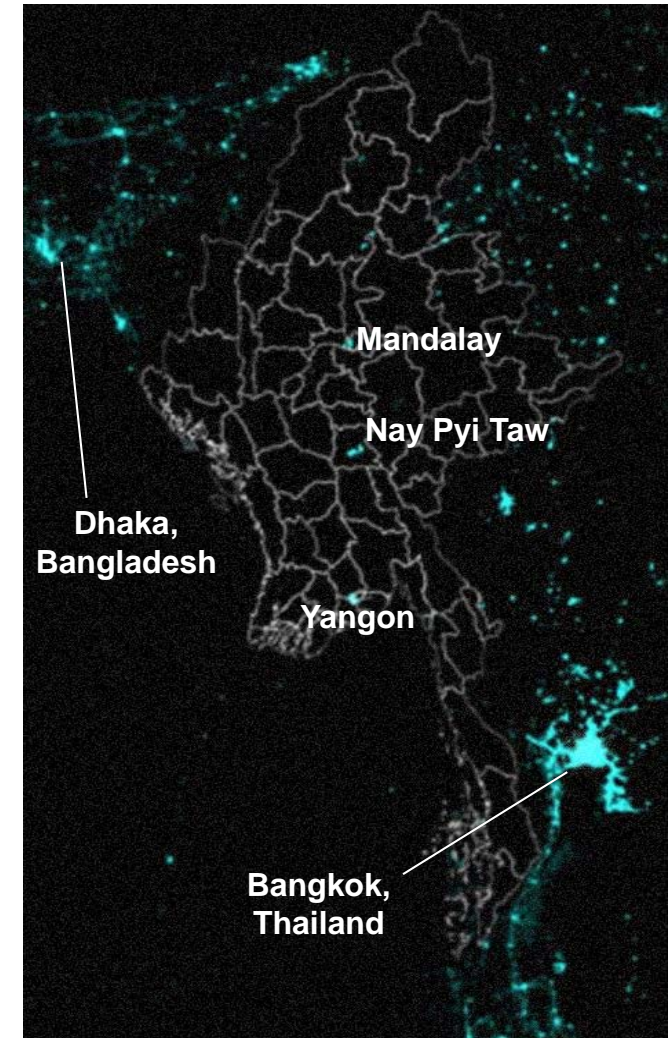
# Distributed power will likely have a key role to play

## Context

- Off-grid forms of distributed generation, particularly renewables, have significant potential in markets with low levels of electrification and/or small-scale generation in remote areas.
- Conventional grid access is challenging or not economically viable given that nearly 66% of Myanmar's 53 million population lives rurally.
- Stated government targets to provide universal access to electricity by 2030, supported by a \$700 million World Bank loan. Similar financing initiatives have also been used in Cambodia.

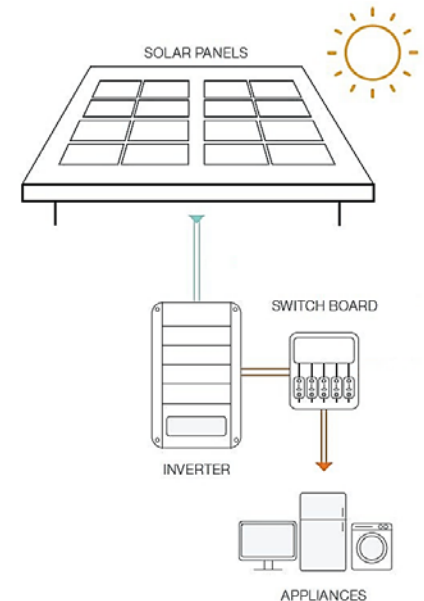
## Recent developments

- World Bank loan of \$700m in 2015 to support electrification programs.
- Ministry of Livestock, Fisheries and Rural Development (MLFRD) has plans to provide electrification to over 140,000 households by 2017.



## Solar home systems are the least-cost option for electrification in many cases

- Solar Home Systems (SHS) are becoming increasingly cost-effective for off-grid electrification, and meeting unserved demand.
- SHS is also highly versatile, particularly in rural settings with dispersed households, and where conventional electrification through grid extensions is not viable.
- Brighterlite Norway AS signed an MOU in March 2016 to provide up to 3 million solar home systems in Myanmar by 2020.
- SHS programs are also receiving significant financial assistance from international aid organisations in helping countries such as the Philippines to reach its electrification targets:
  - TLG is engaging in the with Philippines Department of Energy and the World Bank in a large-scale 'PV Mainstreaming' program
  - 415,000 households targeted, with an initial phase of 40,500
  - Stimulating growth and competitive activity in the supply chain is key



Thank You

**Sarah Fairhurst**  
[sfairhurst@lantaugroup.com](mailto:sfairhurst@lantaugroup.com)



4602-4606 Tower 1, Metroplaza  
223 Hing Fong Road  
Kwai Fong, Hong Kong

Tel: +852 2521 5501

**[www.lantaugroup.com](http://www.lantaugroup.com)**