

RENEWABLE ENERGY MARKETS ASIA 2023 PANEL DISCUSSION

STATE OF THE MARKETS



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**Renewable Energy
Markets™ Asia 2023**

RE100

CLIMATE GROUP



The state of the voluntary renewable electricity market: Perspectives from RE100

REM Asia 2023

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Route to Clean Energy: CPPA in Asia Pacific



Executive summary



Corporations in Asia Pacific are set to contract a record 7 GW of renewable capacity in 2022, 80% higher than in 2021 following pandemic-related disruptions.

- Asia Pacific's cumulative corporate renewable procurement capacity stands at 17.5 GW as of H1 2022 and is expected to reach nearly 22 GW by the end of 2022.
- India, Australia, and the Taiwan Region lead Asia Pacific with a cumulative capacity share of 44%, 28%, and 17%, respectively.



Soaring fuel and power prices have improved the competitiveness of renewable corporate power purchase agreements (PPA) in Asia Pacific.

- Prices of spot LNG, coal, and crude oil have increased 2.4x, 4.1x, and 2.1x since January 2019, pushing up APAC end-users tariffs by an average of 36% between 2019 and 2022.¹
- Despite sharp increases in raw material prices, the levelised cost of electricity (LCOE) for utility-scale solar, commercial solar, and onshore wind remains more stable than gas or grid prices, making renewable energy procurement increasingly attractive.

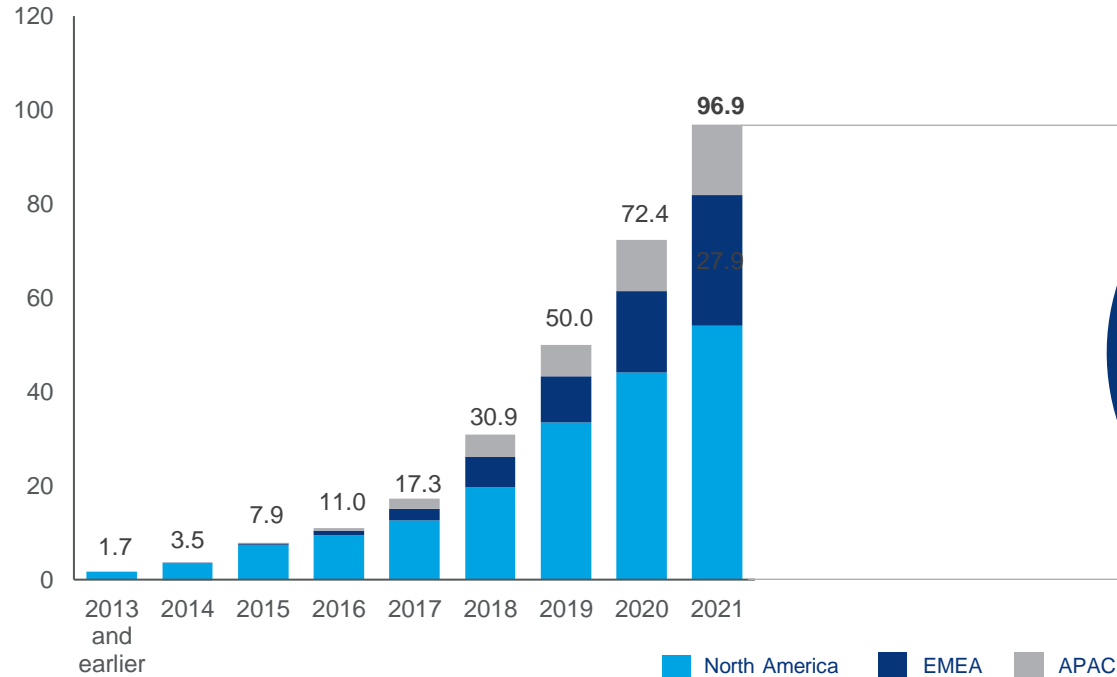


Countries with favourable policies for offsite corporate PPAs have achieved significant scale and growth

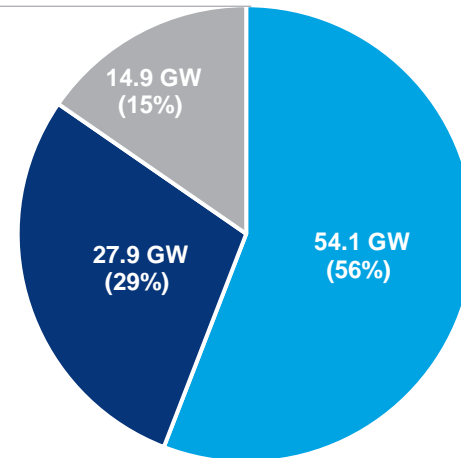
- Offsite Corporate PPAs account for 81% of the total Asia Pacific renewable Corporate PPA market. Countries with favourable offsite corporate PPA policies, such as India, Australia, and the Taiwan Region, lead the CPPA market.
- Other countries in Asia Pacific may lack comprehensive policies for offsite corporate PPA or have just introduced such mechanisms like in South Korea, Japan and Malaysia, where corporate PPA markets are nascent.

Although Asia Pacific's contracted renewable corporate PPA capacity has increased 7x from 2017 to 2021, it only accounts for just 15% of global capacity

Cumulative corporate renewable PPA capacity globally
GW



Contracted corporate PPA capacity globally in 2021
GW and percentage against global RE CPPA procurement

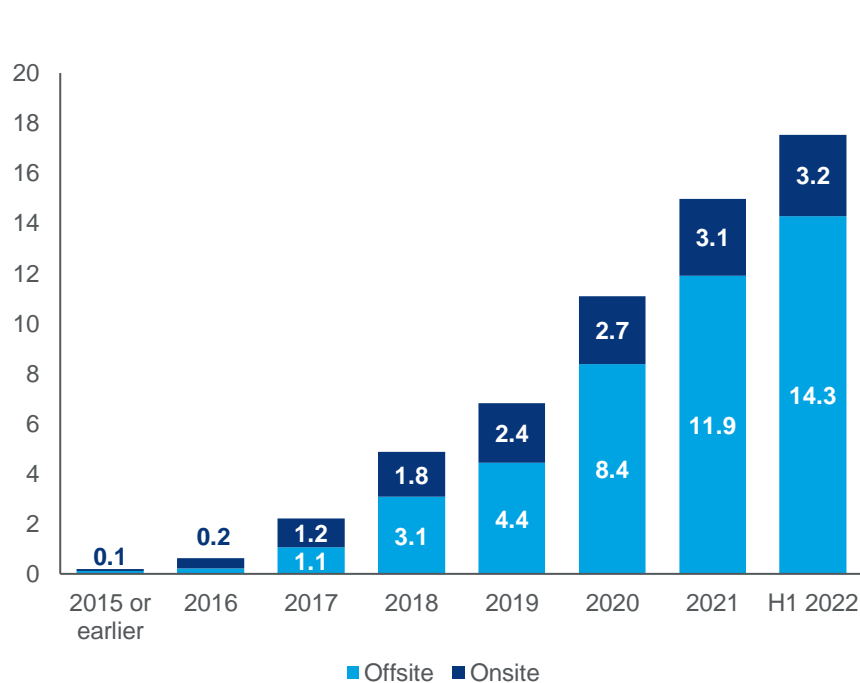


The diversity of CPPA deals help the market growing in Asia Pacific...

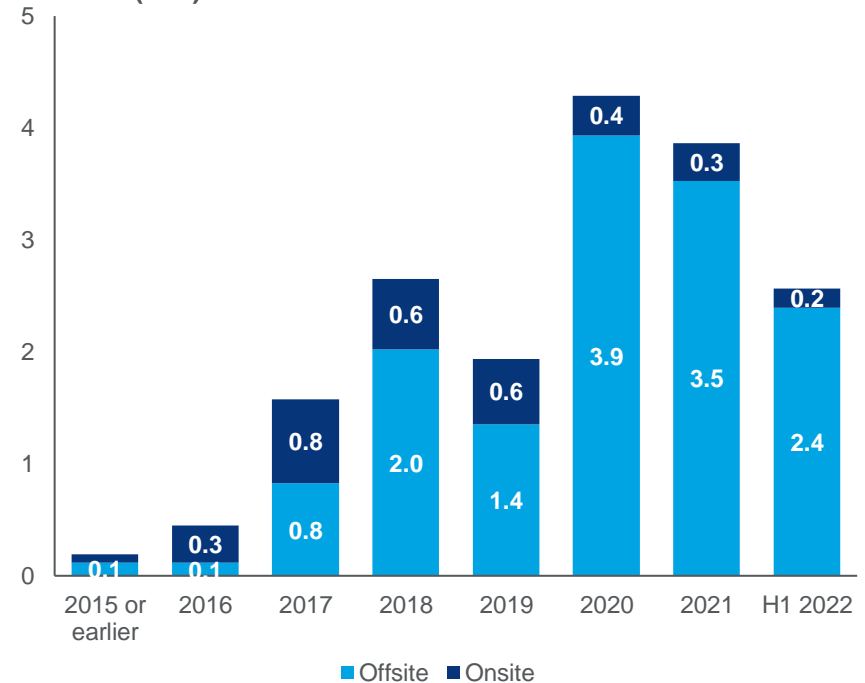
Category of CPPA	Direct wire <i>Onsite/Offsite</i>	Retail / sleeved <i>Offsite</i>	Virtual / synthetic <i>Offsite</i>
<p>i Main characteristics</p>	<ul style="list-style-type: none"> Direct contract between developer and corporate buyer 	<ul style="list-style-type: none"> Tri-partite contract among developer, buyer and retailer 	<ul style="list-style-type: none"> Financial contract, with certificates
<p>✓ Pros</p>	<ul style="list-style-type: none"> No intermediary utility or retailer Simplest contracts 	<ul style="list-style-type: none"> Higher flexibility for the buyer/seller Possible to develop larger RE plant 	<ul style="list-style-type: none"> No physical delivery of power Allow largest contracts
<p>⊗ Cons</p>	<ul style="list-style-type: none"> Land required vs land available Grid connection with utility unavoidable 	<ul style="list-style-type: none"> New intermediary and pricing risks Buyer and seller operations must be in the same area 	<ul style="list-style-type: none"> Complex financial agreements
<p>📅 Schematic contracts</p>			
<p>APAC Transition Well-established systems among markets</p>	<ul style="list-style-type: none"> Present in almost all markets. 	<ul style="list-style-type: none"> India, South Korea, Japan, the Philippines, Taiwan Region, Australia and Singapore. 	<ul style="list-style-type: none"> Common in Australia and Singapore. Developing in Taiwan region, South Korea, Japan.

Offsite corporate PPA deals drive the growth in corporate renewable procurement in Asia Pacific, accounting for 81% of the total contracted capacity

Cumulative corporate PPA capacity by project location (GW)



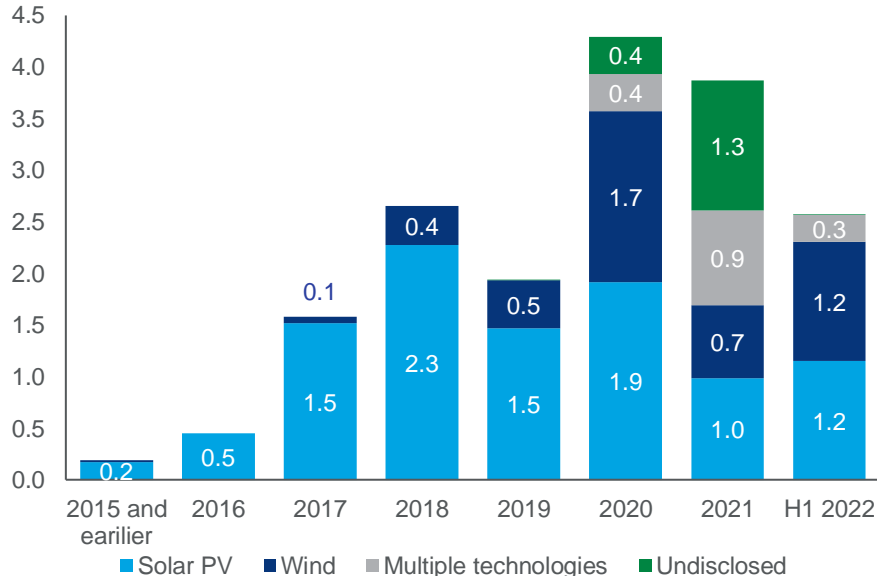
Incremental contracted corporate PPA capacity by project location (GW)



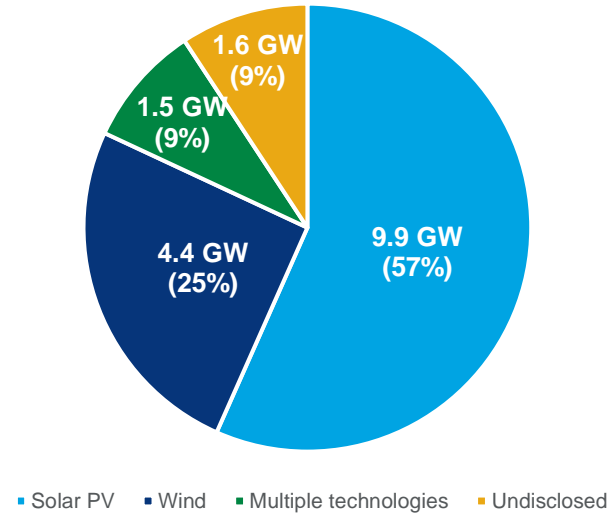
Solar dominates the corporate renewable procurement share accounting for 57% of Asia Pacific's contracted corporate PPA share to date

However, wind's share of annual corporate PPA capacity addition has been catching up rising from 18% in 2021 to 44% in H1 2022

Incremental contracted corporate PPA capacity by technology (GW)



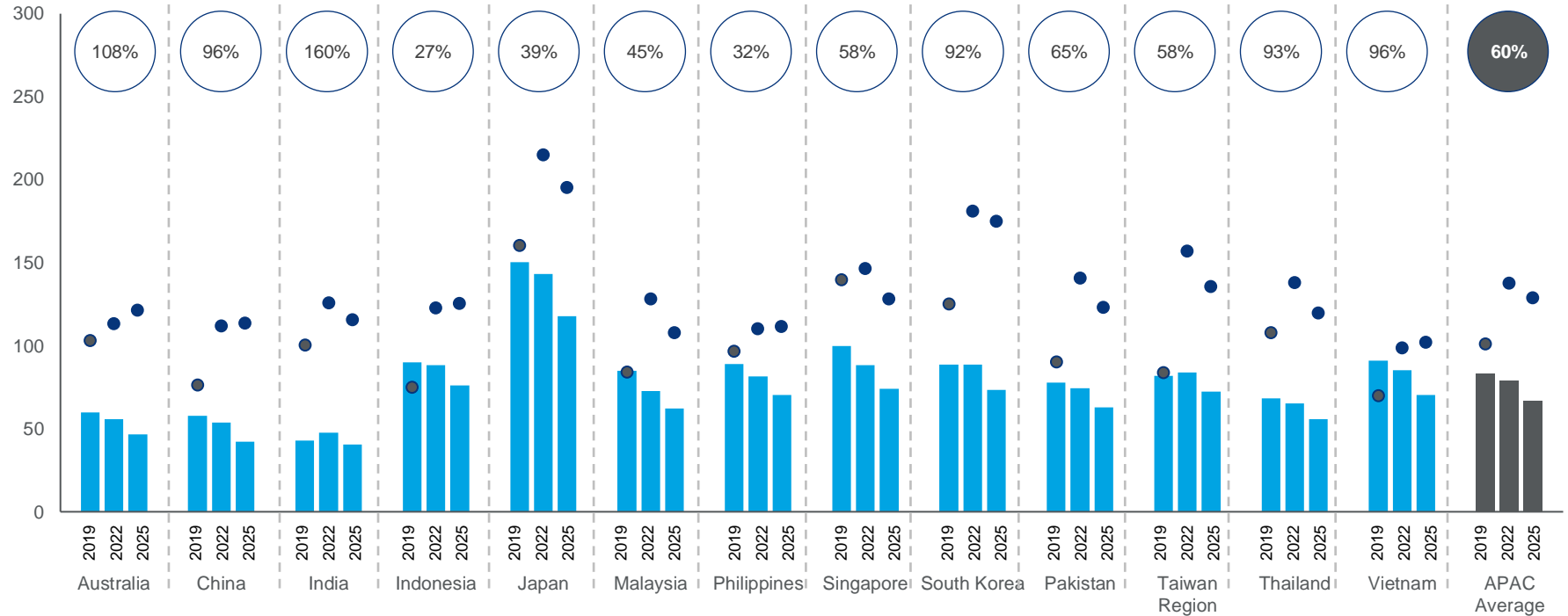
Cumulative corporate PPA capacity share by technology as of H1 2022 (GW)



Note: procurement amount is based on publicly announced data and estimated based on the capacity factor of a renewable project.

Utility-scale solar is the most competitive corporate PPA resource; Asia Pacific's industrial tariffs soared to a premium of 74% above solar costs in 2022 on average

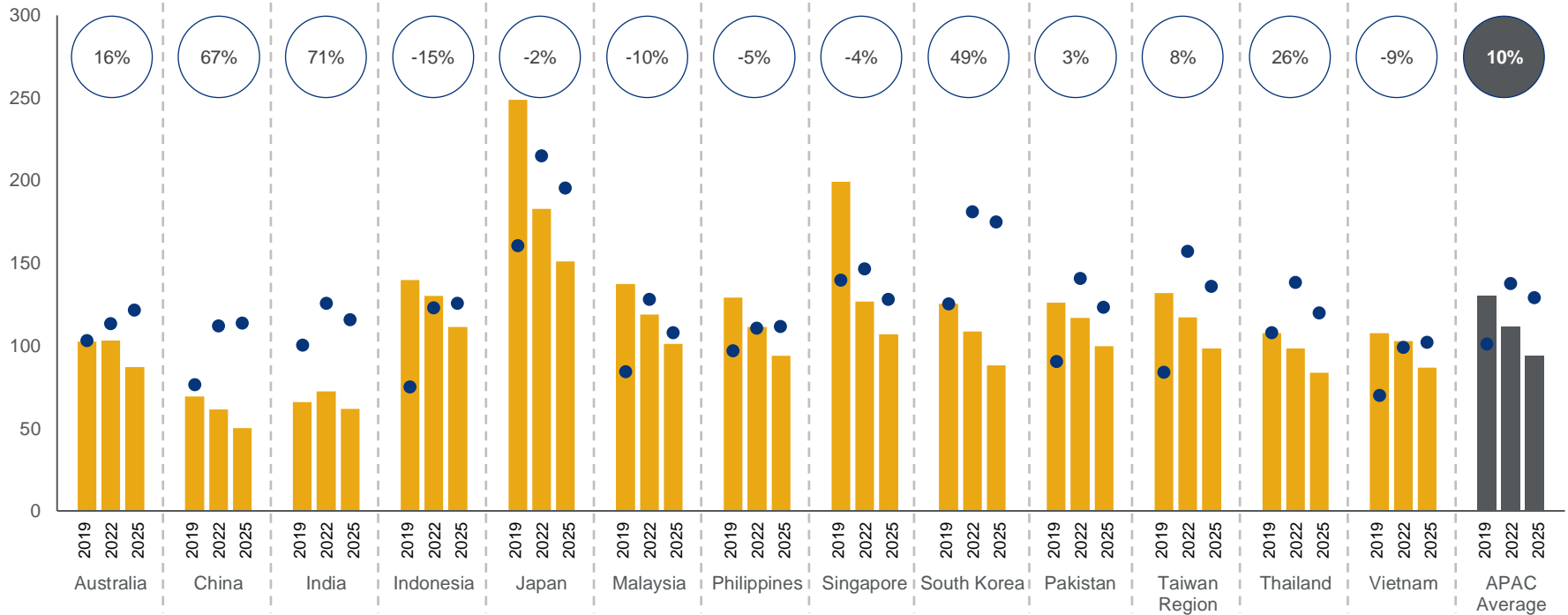
Utility-scale solar LCOE (US\$/MWh) and industrial end-user tariff (US\$/MWh)



19% Average premium of end-user tariffs over LCOE from 2019, 2022, and 2025
 ■ Utility-scale solar LCOE
● Industrial end-user power tariff

Commercial solar is cheaper than industrial end-user rates in Asia Pacific in 2022 compared to being 22% more expensive in 2019

Commercial and industrial-scale solar LCOE (US\$/MWh) and industrial end-user tariff (US\$/MWh)



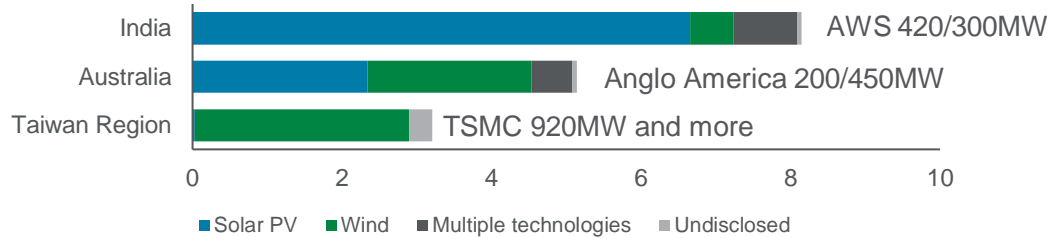
18% Average premium of end-user tariffs over LCOE from 2019, 2022, and 2025

Commercial solar LCOE

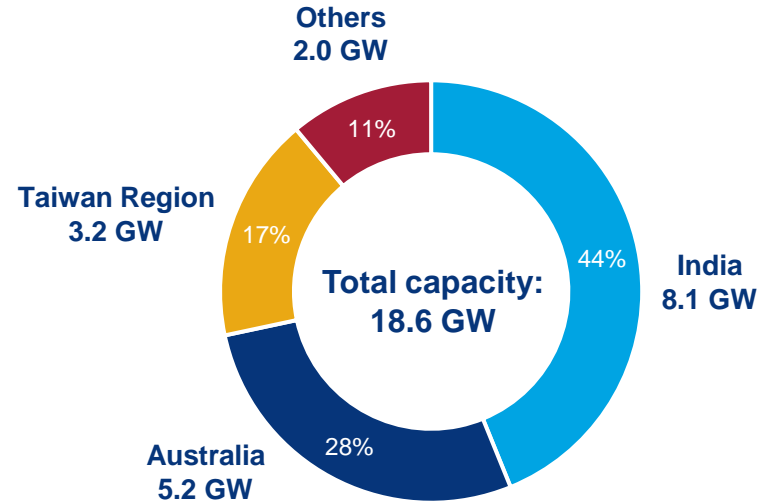
Industrial end-user power tariff

India, Australia, and the Taiwan Region top Asia Pacific in cumulative corporate PPA procurement capacity, making up 89% of overall capacity share

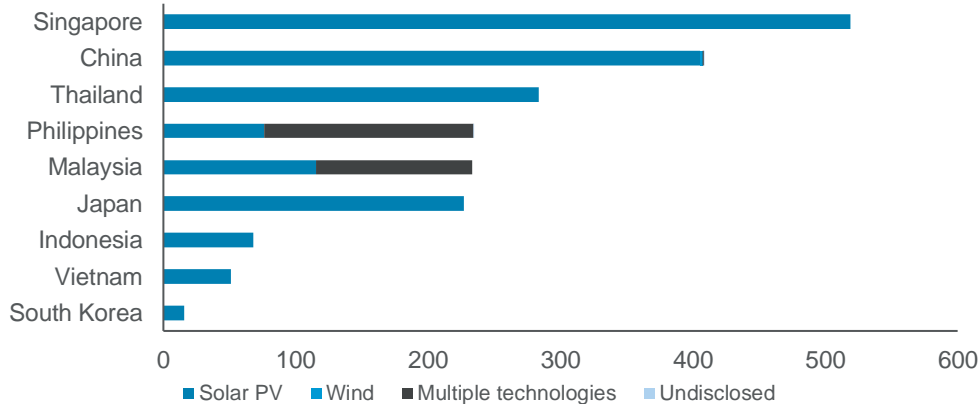
Cumulative contracted capacity (GW) by country/region in 2022 H1



Cumulative contracted capacity as of H1 2022
GW and percentage against APAC RE CPPA procurement

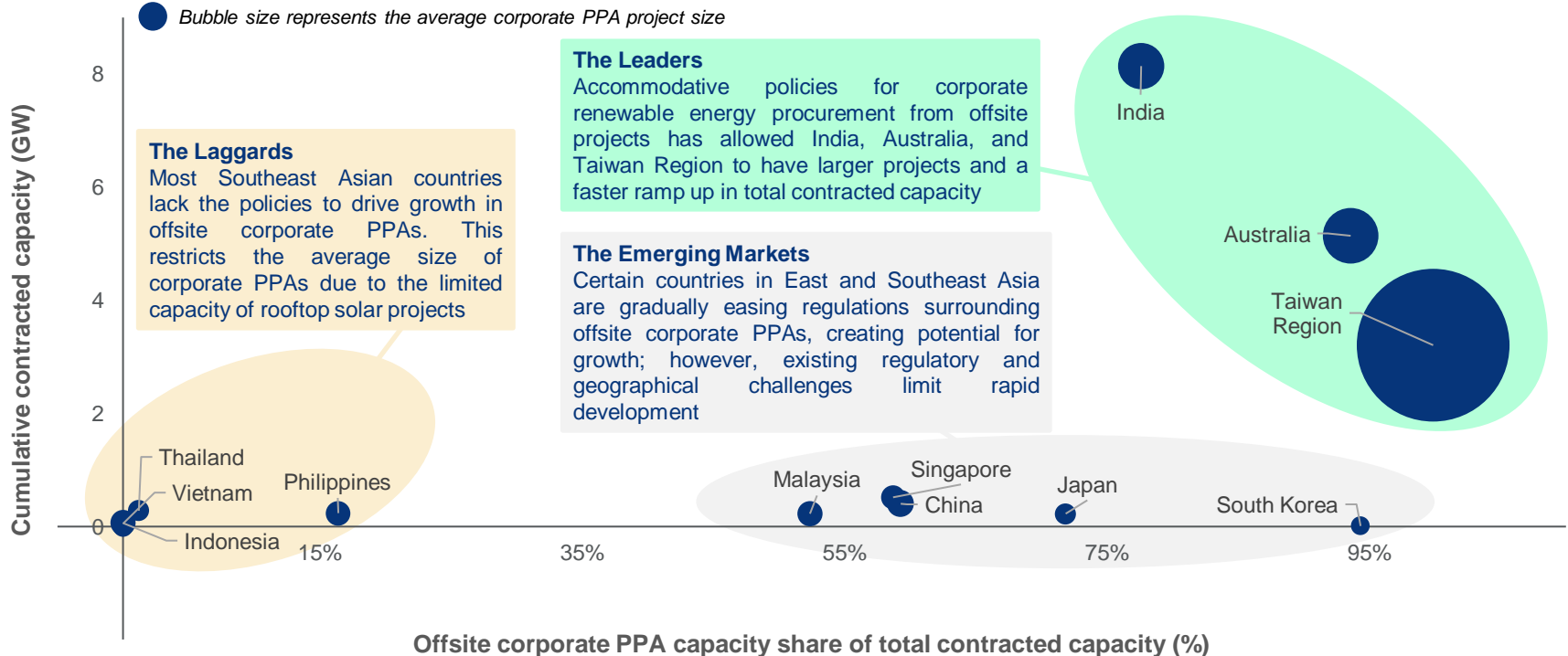


Cumulative contracted capacity (MW) by country in 2022 H1



Countries that have favourable policies for offsite corporate energy procurement have seen the greatest levels of development within the corporate PPA market

Cumulative contracted corporate PPA capacity (GW), average project size (MW), and cumulative corporate PPA capacity share by project location (%)

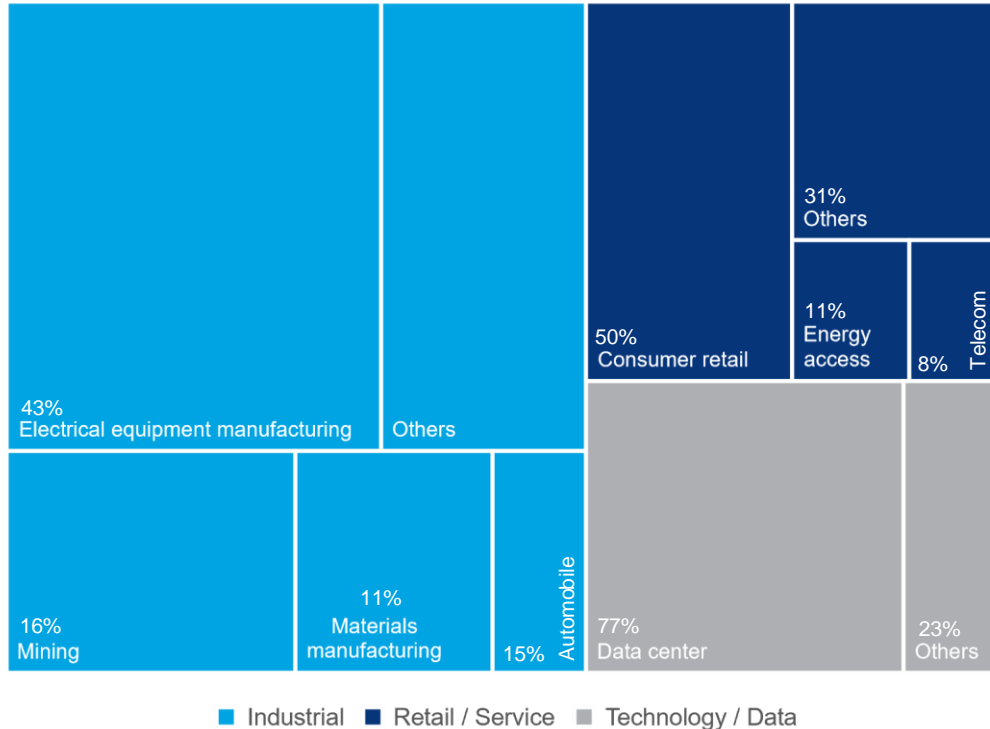


More CPPA choices are available for corporate buyers now, but efforts are still needed from the government and NGOs

Label guide		Countries	Market type	CPPA			
			Regulated, wholesale or hybrid	On site	Off- Site	VPPA	
Market type	Regulated market		Wholesale market				
	Hybrid Mix of regulated and wholesale elements	Australia					
		Singapore					
Renewables and capacity market policy	Wholesale market	Japan	Hybrid of regulated and market				
	Yes Policy scheme offered in the market	Philippines					
		South Korea					
	No Policy scheme absent in the market	India					
		Vietnam			▲		▲
		China					
		Indonesia			▲		
	Partial Partial implementation; select cases	Regulated		Malaysia			●
				Taiwan Region			
				Thailand	▲		

Large energy users in the industrial, retail, and technology sectors are the primary offtakers, accounting for 62% of the total corporate PPAs contracted in Asia Pacific

Treemap of offtaker industry sub-categories in Asia Pacific



Industrial offtakers: 6.3 GW cumulative procured capacity

- Manufacturers of electrical equipment such as semiconductors occupy the largest share in industrial offtake, with TSMC in the Taiwan Region leading the way with 2.4 GW capacity procured.
- Mining companies in Australia such as BHP and Newcrest Mining occupy the next largest share to power their mining operations.
- Large energy demand from the materials manufacturing industry consist primarily of companies in the cement and steel manufacturing sectors.

Retail / service offtakers: 2.5 GW cumulative procured capacity

- Large Australian supermarket chains such as Coles and Woolworths dominated the procurement share.
- Telecommunication service providers such as Telstra are procuring renewables to power their data centres.

Technology / data offtakers: 1.9 GW cumulative procured capacity

- Majority of contracted energy are directed towards powering regional data centres.
- Demand mainly driven by ambitious goals of multinational technology companies such as Amazon and Sify technologies, to decarbonise their global operations.

Sourcing renewable remains challenging for retail business. Even with a good credit rating, they are like the rest of other SMEs

Country	Annual Consumption (MWh)	How to Reach RE100
Singapore	3211	VPPA
South Korea	2,123	VPPA
China / Hong Kong SAR / Macau SAR	24,532	On-site solar/ Green tariff/ REC/Project Investment
Taiwan Region	2,561	Green tariff/ REC/ project investment
Australia	3,248	Self-invested on-site solar/ VPPA/ LGC
Malaysia	1,123	On-site solar REC/ pilot VPPA
Thailand	1,799	On-site solar/REC/ pilot green tariff
Vietnam	549	On-site CPPA/ REC
New Zealand	42	REC

Straightforward	Combined solutions, but achievable	Challenging
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For questions and comments, please contact our team

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