



Utility Scale RE Project Pipeline with Energy Storage Capacity

Project name or scheme (Auction / Tender)	Year of announcement	Project capacity contracted (MW AC)	Project capacity (Installed) ESS (MWh AC)	Project Location
1,200 MW Peak power supply	2020	900	3,500	Pan India
1,200 MW Peak power supply	2020	300	1,200	Pan India
400 MW Hybrid RTC-I	2020	400	2,000	Pan India
5,000 MW Hybrid RTC-II	2020	5,000	25,000	Pan India
100 MW Solar, 150 MWh BESS	2020	100	150	Chhattisgarh
14 MW Solar, 42 MWh BESS	2020	14	21	Leh and Kargil
20 MW Solar, 50 MWh BESS	2020	20	50	Leh
4 MW Floating Solar, 2 MW BESS	2020	4	2	Andaman
Lakshadweep Solar PV Park	2020	1.95	2.15	Lakshadweep
Rajnandgaon Solar PV Park	2020	40	120	Chhattisgarh

Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

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Project name or scheme (Auction / Tender)	Project promoter type (Private/Public/TBD*)	Project status	PPA tariff (INR/kWh)
1,200 MW Peak power supply	Private	Permitting	6.12
1,200 MW Peak power supply	Private	Permitting	6.85
400 MW Hybrid RTC-I	Private	Permitting	3.6
5,000 MW Hybrid RTC-II	TBD	Announced	TBD
100 MW Solar, 150 MWh BESS	TBD	Announced	TBD
14 MW Solar, 42 MWh BESS	TBD	Announced	TBD
20 MW Solar, 50 MWh BESS	TBD	Announced	TBD
4 MW Floating Solar, 2 MW BESS	Private	Permitting	Not reported
Lakshadweep Solar PV Park	Private	Permitting	Not reported
Rajnandgaon Solar PV Park	Public	Under Construction	Not reported

Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

*To Be Determined meaning these projects are yet to complete competitive discovery of tariffs and select project developer



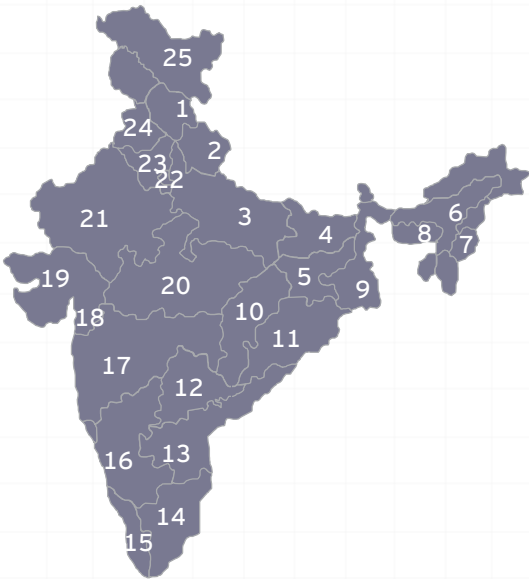


A significant majority of biopower capacity in pipeline is expected from waste to energy projects planned in 2019-20 for sustainable solid waste management in cities. About ~131 MW of contracted capacity is expected to commission beyond 2022 and a small capacity of ~55 MW is expected in 2022. A majority of waste to energy projects are promoted by public sector enterprises, mostly municipal corporations in major cities of New Delhi, Bengaluru, Ghaziabad, Surat, Ahmedabad, Mumbai, Jalandhar etc.

Biopower capacity (installed) in pipeline MW (AC)						
RE Technology	Project commissioning (estimated)					Total (MW)
	H1 2021	H2 2021	H1 2022	H2 2022	Beyond 2022	
Biopower	-	-	15	40	125	180
Hybrid (Solar-Biomass)	-	-	-	-	6	6
Total	-	-	15	40	131	186

Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

Rajasthan, Andhra Pradesh, Leh, Gujarat, Karnataka, Maharashtra, and Madhya Pradesh are the top locations emerging for maximum RE power generation projects in pipeline (see graphic). About ~34% of the contracted capacity in pipeline and poised for connecting to the inter state transmission network (ISTS) will finalize its location anywhere in India in due course of project development.



- 1. Himachal Pradesh (265) (0) (0) ●
- 2. Uttarakhand (40) (0) (0) ●
- 3. Uttar Pradesh (889) (0) (0) ●
- 4. Bihar (8) (0) (0) ●
- 5. Jharkhand (173) (0) (0) ●
- 6. Assam (197) (0) (0) ●
- 7. Manipur (100) (0) (0) ●
- 8. Meghalaya (20) (0) (0) ●

- 9. West Bengal (421) (0) (0) ●
- 10. Chhattisgarh (202) (0) (150) ● ■
- 11. Odisha (501) (0) (0) ●
- 12. Telangana (240) (0) (0) ●
- 13. Andhra Pradesh (9353) (250) (0) ● ▲
- 14. Tamil Nadu (173) (526) (0) ● ▲
- 15. Kerala (290) (72) (0) ● ▲
- 16. Karnataka, 14. Tamil Nadu (225) (225) (0) ● ▲
- 16. Karnataka (2712) (1982) (0) ● ▲
- 17. Maharashtra (3772) (424) (0) ● ▲
- 18. Dadra & Nagar Haveli (3) (0) (0) ●
- 19. Gujarat (2963) (4273) (0) ● ▲
- 20. Madhya Pradesh (2753) (452) (0) ● ▲
- 21. Rajasthan (13440) (473) (0) ● ▲
- 22. Delhi (3) (0) (0) ●
- 23. Haryana (133) (0) (0) ●
- 24. Punjab (98) (0) (0) ●
- 25. Ladakh (7534) (0) (71) ● ■
- 26. Lakshadweep (2) (0) (2) ● ■
- 27. Andaman & Nicobar Islands (8) (0) (2) ● ■

Pan India project capacity in pipeline whose locations are yet to be determined



* Decimal values are rounded up

Source: EY analysis

How to read the chart?
(Positional number) (Name of State)
(Solar Cap) (Wind Cap) (ESS Cap)

Legends

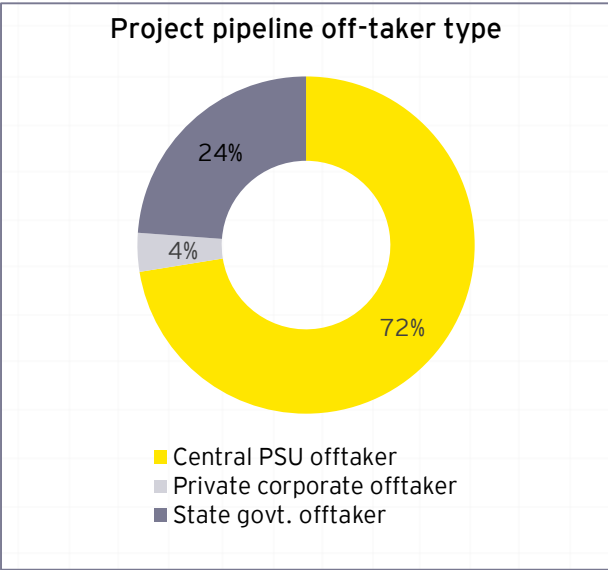
- Installed Solar Capacity (MW Ac)
- ▲ Installed Wind Capacity (MW Ac)
- Installed Energy Storage System (ESS) (MWh Ac)



Project location for ISTS connected projects are typically optimized for grid connectivity and availability of land in a solar / wind resource abundant region. In this regard, several RE auctions led by SECI for plain vanilla solar and wind power projects identified Rajasthan, Gujarat and most recently Ladakh as preferred locations. Furthermore, a few states such as Gujarat, Andhra Pradesh, Maharashtra and Madhya Pradesh have proactively auctioned projects led by state owned enterprises for meeting the growing power demand.

Projects with central public sector undertakings (PSU) off-takers (viz. SECI, NTPC, NHPC, Indian Railways etc.) account for 72% of the overall contracted capacity in pipeline, followed by projects with state off-takers (24%) and projects focusing on corporate renewable procurement (4%).

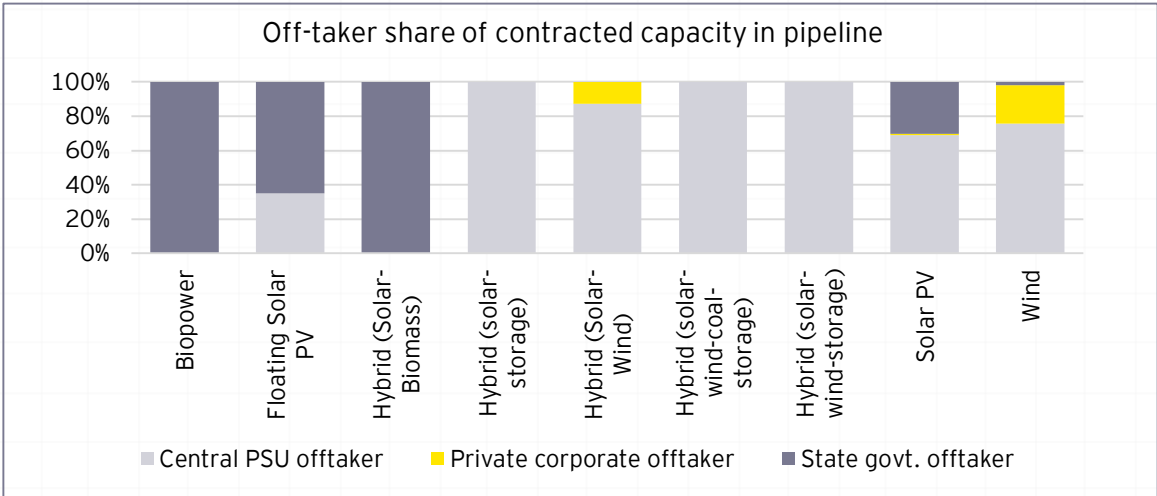
Wind power project pipeline has the highest share of private / corporate off-takers followed by solar-wind hybrid project pipeline. Whereas biopower, floating solar and hybrid (solar-biomass) project pipeline is largely driven by state govt. off-takers. Plain vanilla Solar PV, Wind and Hybrid RE project pipeline is largely driven by central PSU off-takers.



Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI auctions

Contracted capacity of utility scale RE projects in pipeline (MW)				
RE Technology	Project pipeline off-taker type			Total (MW)
	Central PSUs	Private / Corporate	State owned enterprises	
Biopower	-	-	180	180
Floating Solar PV	397	-	734	1,131
Hybrid (Solar-Biomass)	-	-	54	54
Hybrid (solar-storage)	180	-	-	180
Hybrid (Solar-Wind)	4,050	585	-	4,635
Hybrid (solar-wind-coal-storage)	5,000	-	-	5,000
Hybrid (solar-wind-storage)	1,600	-	-	1,600
Solar PV	43,411	621	18,976	63,008
Wind	6,522	1,925	175	8,621
Grand Total	61,159	3,132	20,117	84,408

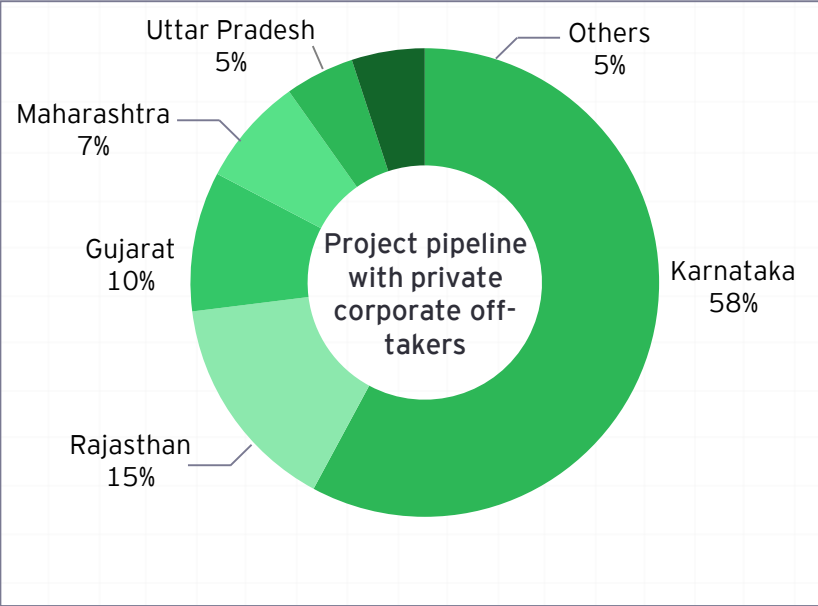
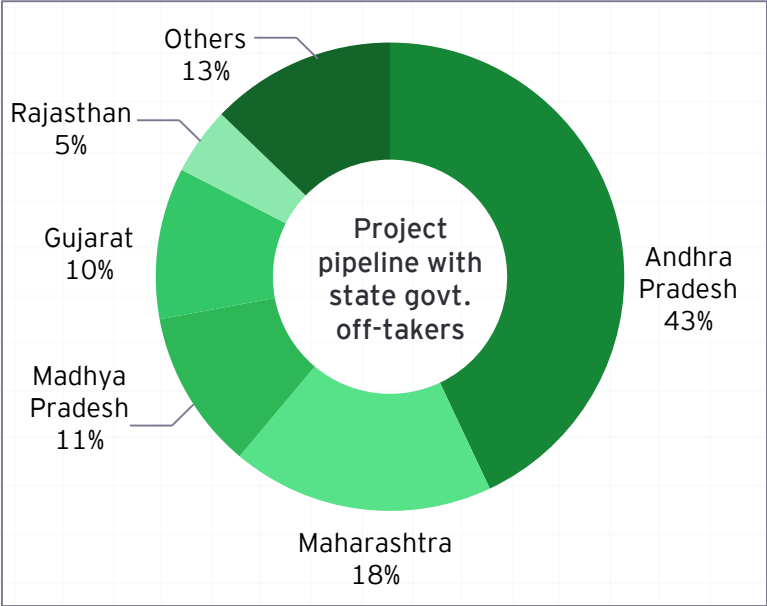
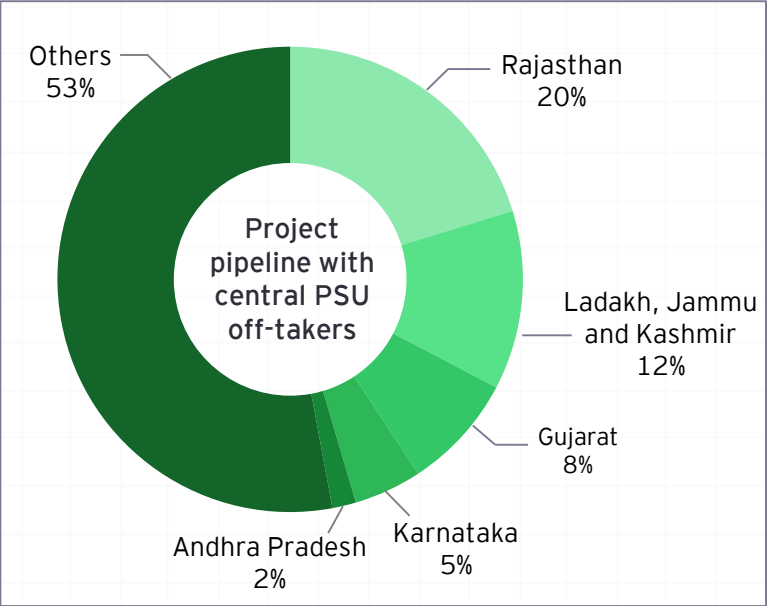
Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI



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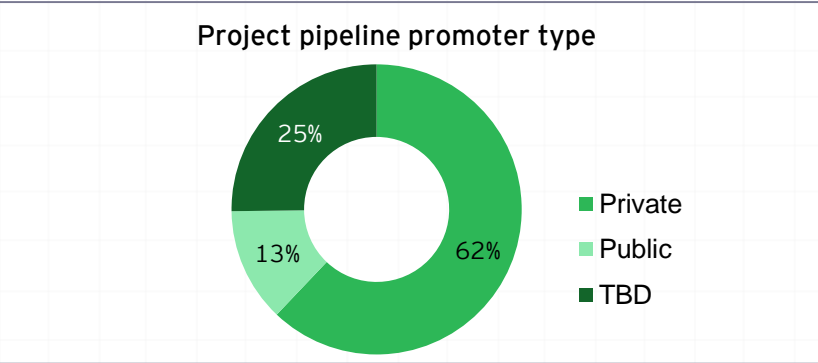


Among those projects in pipeline with central PSU off-takers, Rajasthan, Ladakh, Gujarat and Karnataka are emerging as top locations for the project developers. Whereas among those projects in pipeline with state govt. off-takers, Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujarat and Rajasthan are emerging as top locations for the developers. Further among those projects in pipeline with private / corporate off-takers, Karnataka is emerging as the top location.



*Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

Among those utility scale RE projects in pipeline, ~62% of the contracted capacity is led by private sector investments. These projects can be characterized as captive units for self-consumption or as Independent Power Producers (IPPs) governed by PPAs with the off-takers. Project pipeline representing ~25% of the contracted capacity is yet to select project promoters by way of reverse auctions for competitive tariff discovery. Whereas, project pipeline representing ~13% of the contracted capacity is being developed by PSUs for captive generation or having to enter into PPAs with the off-takers.



Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI





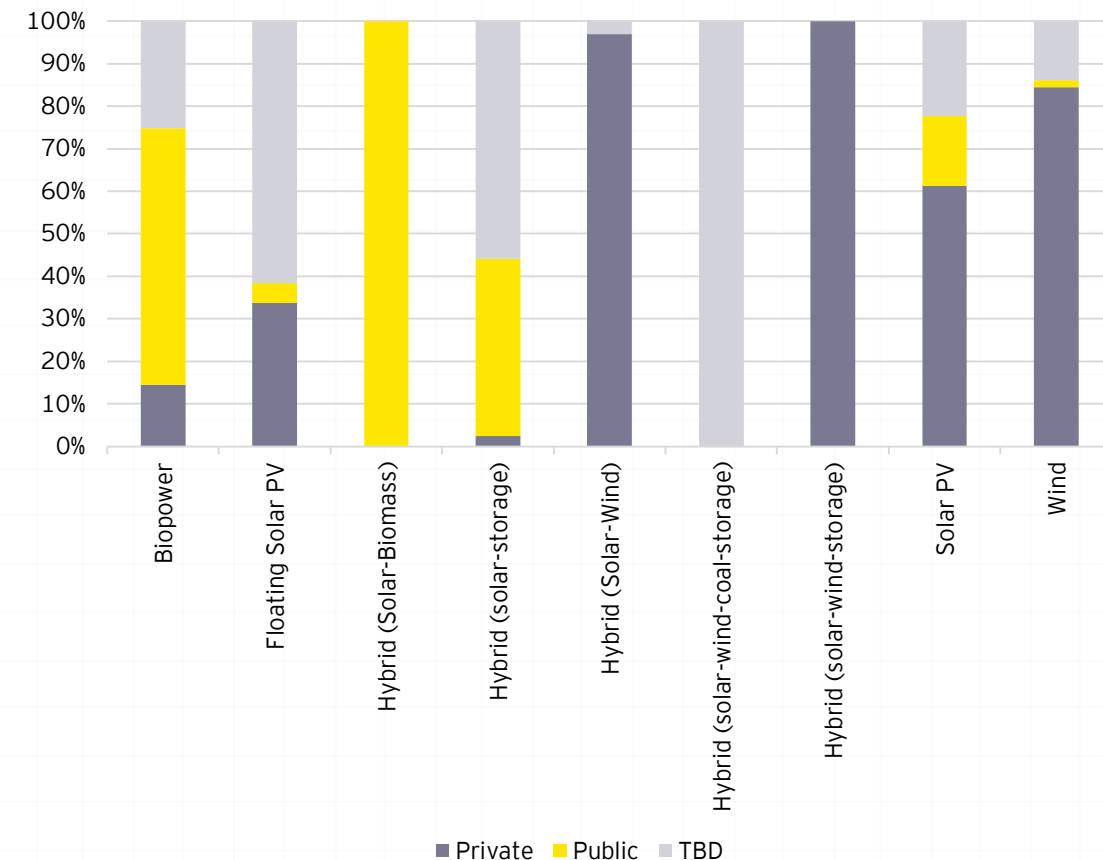
Contracted capacity of utility scale RE projects in pipeline (MW)

RE Technology	Promoter type leading the project pipeline			Total (MW)
	Private	Public	TBD*	
Biopower	26	109	45	180
Floating Solar PV	382	52	697	1,131
Hybrid (Solar-Biomass)	-	54	-	54
Hybrid (solar-storage)	6	40	134	180
Hybrid (Solar-Wind)	4,495	-	140	4,635
Hybrid (solar-wind-coal-storage)	-	-	5,000	5,000
Hybrid (solar-wind-storage)	1,600	-	-	1,600
Solar PV	38,614	10,343	14,051	63,008
Wind	7,283	139	1,200	8,621
Grand Total	52,406	10,736	21,267	84,408

Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

*To Be Determined meaning these projects are yet to complete competitive discovery of tariffs and select project developer

Promoter share of contracted capacity in pipeline



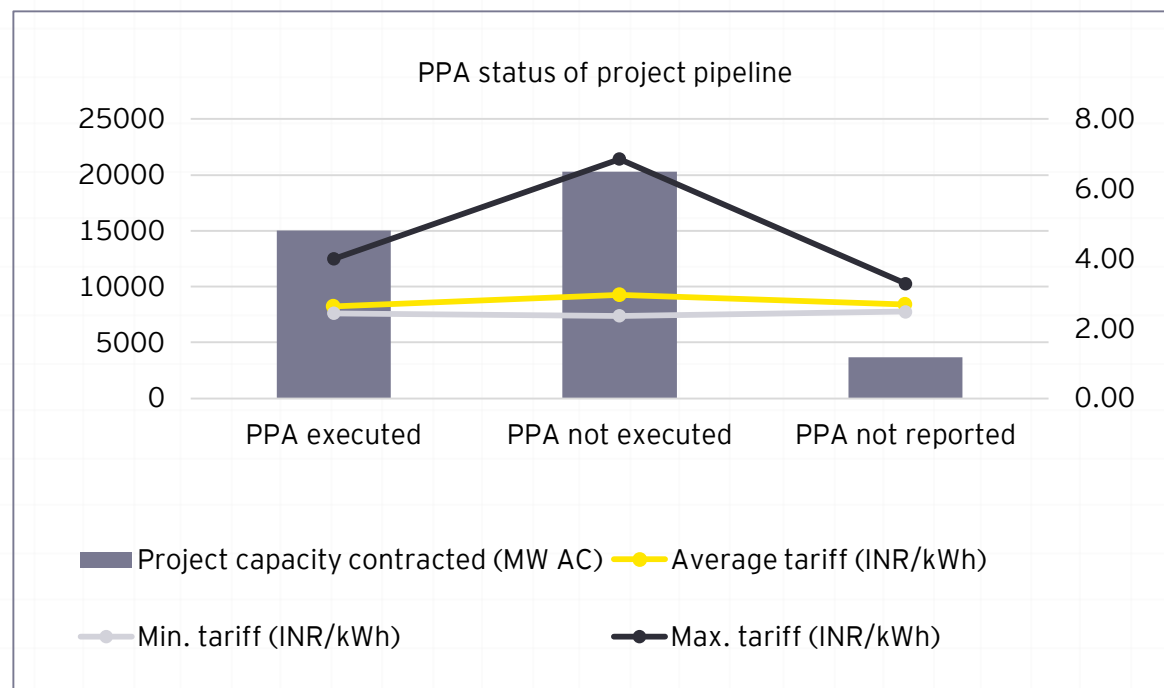
Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

To be Determined meaning these projects are yet to complete competitive discovery of tariffs and select project developer





Authorities / off-takers after issuing Letter of Award (LOA) have executed PPAs for projects with ~15 GW of contracted capacity in pipeline. These projects have successfully managed to find buyers for the tariff discovered through auctions. Only plain vanilla solar PV, wind and a few hybrid (solar-wind) projects have managed to advance beyond the LOA stage. Approx. ~20 GW of contracted capacity from auctions held in the years 2018, 2019 and first half of 2020 still remain stranded without PPAs. This does not include projects which are yet to complete auctions/ tariff discovery. Notably, ~18 GW of this stranded capacity pertains to plain vanilla solar PV projects auctioned largely in first half of 2020, out of which ~12 GW capacity pertains to manufacturing linked Solar PV projects announced in January 2020.



Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

PPA status / Year of auction	Contracted capacity of Utility scale RE projects in pipeline (MW)					Grand Total (MW)
	Floating Solar PV	Hybrid (Solar-Wind)	Hybrid (Solar-wind-storage)	Solar PV	Wind	
Executed	-	1,065	-	8,800	5,129	14,994
2018	-	-	-	3,400	3,010	6,410
2019	-	840	-	2,980	2,119	5,939
2020	-	225	-	2,420	-	2,645
Not executed	-	970	1,600	17,704	-	20,274
2018	-	-	-	500	-	500
2019	-	-	-	600	-	600
2020	-	970	1,600	16,604	-	19,174
Not reported*	150	-	-	3,536	-	3,686
2018	150	-	-	-	-	150
2019	-	-	-	3,536	-	3,536

PPA status	Average PPA tariff of RE projects in pipeline (INR / kWh)					Average (INR / kWh)
	Floating Solar PV	Hybrid (Solar-Wind)	Hybrid (Solar-wind-storage)	Solar PV	Wind	
Executed	-	2.65	-	2.61	2.69	2.64
Not executed	-	3.00	5.52	2.66	-	2.96
Not reported	3.29	-	-	2.49	-	2.69

*Not reported refers to project information not available in public domain
Project pipeline which have not received LOA are not included in this assessment
Source: EY analysis from CEA 2020, GlobalData, CEEW-CEF 2020, SECI

