



17 October 2022

COMMENT**India's Electricity Sector Transformation Continues to Gather Pace*****Zero emissions energy represents 100% of net new capacity adds in the first half of FY2022/23***Tim Buckley, Director, [Climate Energy Finance](#)

Newly released figures from India's Central Electricity Authority (CEA) show the country's electricity sector continues to embrace the energy security and economic merits of shifting towards zero emissions generation, with 100% of net new capacity adds in the first half of 2022/23 (1HFY2022/23) being variable renewable energy (VRE) comprising 98% and hydro-electricity making up 2%. Significantly, no net new thermal capacity has been added in the first six months.

Figure 1 details the CEA figures: 8.2 gigawatts (GW) of renewable energy have been added, plus 0.1GW of large scale hydro.¹

Figure 1: India's Installed Electricity Capacity (GW) end FY2021/22 vs YTD FY2022/23

Generation Source	Mar-22	Sep-22	Change (GW)	% of new capacity
Renewables	109.9	118.1	8.2	98%
Large Hydro	46.7	46.9	0.1	2%
Nuclear	6.8	6.8	0.0	0%
Thermal	236.1	236.1	0.0	0%
Total Ongrid Capacity	399.5	407.8	8.3	100%

Source: CEA, MNRE, Climate Energy Finance calculations

Figure 2 provides the breakdown of VRE, with utility solar (6.8GW) the key driver, and installs of onshore wind (1.3GW) starting to increase after a five year lull. The month of September 2022 saw 2.0GW installed.

¹ Central Electricity Authority, [October 2022 report](#)

Figure 2: Renewable Energy Capacity Additions 1HFY2022/23

Renewable Energy	Mar-21	Sep-22	Change (GW)
Wind	40.4	41.7	1.3
Solar	54.0	60.8	6.8
Small Hydro	4.8	4.9	0.1
Biomass/Co-gen	10.2	10.2	0.0
Waste to Energy	0.5	0.5	0.0
Total	109.88	118.08	8.2

Source: CEA, MNRE, Climate Energy Finance calculations

With India's strong economic growth being undermined by rampant imported fossil fuel hyper-inflation across oil, coking and thermal coal, liquid natural gas (LNG) and fertilisers, India faces the challenge of doubling its domestic VRE install rate, whilst removing the roadblocks to deliver on its large scale hydro and nuclear targets to build electricity generation diversity and prioritise zero emissions domestic capacity investments. Alongside this is a continued focus on reducing unsustainable grid transmission and distribution losses, accelerating energy efficiency and balancing VRE investment with grid firming (batteries, pumped hydro storage, demand response management and gas peakers).

We believe the long-term trajectory for renewable energy in India is still intact, even though recent global events have pushed policymakers to expand the use of domestic thermal energy.

IEEFA and CEF forecast that India will add 35-40GW renewable energy capacity annually through to FY2029/30, reaching 405GW. We forecast that thermal power will progressively lose market share and its generation share will fall to just 53% in FY2029/30 from 72% in FY2021/22.

The ambitious capacity addition targets of the Indian government and commitments by both private and state-owned companies across industries support our projections. Our study of similar clean energy commitments by global majors – NextEra Energy (U.S.), RWE (Germany), Ørsted (Denmark) and Enel (Italy) – offers important learnings for Indian counterparts. We find that the ambitious decarbonisation targets of the four global companies, which do not rely on carbon offsets or carbon capture and storage, have helped their share prices outperform broader equity markets and helped the companies tap a rapidly growing global green bond market.²

Another pleasing development in 2022 is the acceleration in behind the meter rooftop solar. India added 2,520MW of rooftop solar in the twelve months ending 30 June 2022, a growth rate of 44% year-on-year (yoy). This takes the cumulative rooftop installations to 10,221MW, according to Bridge to India.³

More than 80% of the rooftop solar installs are in the commercial and industrial sectors. Whilst this 10.2GW is well below the Government of India's 40GW target for 2022, the

² IEEFA and CEF, [India's Renewable Energy Journey: Short-Term Hiccups but Long-Term Trajectory Intact](#), October 2022

³ PV Magazine, [India installed 2,520 MW of rooftop solar in the twelve months ending June](#), 10 October 2022

recent acceleration is very promising given the huge potential of this sector, and the benefits of distributed energy systems to grid system strength and avoided AT&C losses.

This follows a similar trend in the US, where behind the meter rooftop solar installs grew 40% yoy in 2QCY2022, putting the country on track to install upwards of 5.3GW in CY2022,⁴ in addition to 29GW of utility-scale VRE and 6.2GW of batteries.⁵ This doubling in annual rate of battery installations and the now 300GW strong investor proposed battery pipeline⁶ should alleviate Indian grid integration of VRE concerns.

Beyond the hyper-inflation in fossil fuels, one of the other key energy themes of 2022 is energy security, and with that, supply chain security. India has made very significant progress in expanding renewable energy and supply chain manufacturing initiatives in the zero emissions industry sector.

Mukesh Ambani's Reliance Industries (RIL) is leading the way. RIL aims to begin production of solar cells and modules by 2024 at its 10GW state-of-the-art Gujarat factory⁷, and to then double capacity to 20GW by 2026. Additionally, RIL is aiming for a fully integrated 5GWh annual cell-to-pack manufacturing facility by 2024, and a further scale-up to 50GWh annual capacity by 2027.⁸

Likewise, Gautam Adani is following Ambani's lead into zero emissions industry manufacturing in India, targeting a 10GW integrated silicon-to-solar panels manufacturing complex, a 10GW wind-turbine manufacturing facility, and a 5GW hydrogen electrolyser factory. Adani additionally plans to add 45 GW of hybrid renewable power generation capacity this decade as part of a US\$70bn investment program in clean energy this decade.⁹ Adani confirmed its target to build a 10GW solar park in Rajasthan.¹⁰

Renew Power is one of India's largest owner / operators of VRE, with a cumulative built and acquired capacity of 13.2GW in development (7.7GW operational). Renew has highlighted it has Rs30,000 crore (US\$3.6bn) in 5GW of new developments underway.¹¹

Waaree Energies aims to grow its solar module manufacturing capacity revenues tenfold from 2021-2025 to US\$2.4bn pa, having just completed a US\$120m private equity raise.¹²

And even Coal India Ltd, the world's largest coal mining firm, aims to diversify into renewables, having this month announced a US\$1bn, 1.19GW solar development at Vidyut

⁴ Financial Times, [Storms and steep utility bills drive US rooftop solar boom](#), 8 October 2022

⁵ Energy Information Administration, [The U.S. power grid added 15 GW of generating capacity in the first half of 2022](#), 3 August 2022

⁶ Bloomberg, [There's a Mind-Bending Amount of Solar in the US Pipeline](#), 30 September 2022

⁷ SolarQuarter, [REC Group Signs a Major Solar Equipment Supply Agreement with Maxwell Technologies](#), 14 October 2022

⁸ PV Magazine, [India's Reliance Industries presents scaled-up solar, battery ambitions](#), 30 August 2022

⁹ Economic Times / PTI, [Adani to invest USD 100bn across new energy, data centres](#), 27 September 2022

¹⁰ Hindustan Times, [Adani to invest ₹65k crore in Rajasthan; focus on solar plant, cement and Jaipur airport](#), 7 October 2022

¹¹ Economic Times, [ReNew Power to invest Rs 30,000 cr to scale up green capacities: Chairman Sumant](#), 17 October 2022

¹² The-ken, [What a US\\$630M solar-panel maker's IPO U-turn says about investors' clean-energy appetite](#), 17 October 2022

Utpadan Nigam's 2GW Ultra Mega Renewable Energy Power Park in Rajasthan. This is part of Coal India's 3GW by FY2024 solar ambition.¹³

India is building energy security and putting in place measures to permanently reduce reliance on hyper-inflationary imported fossil fuels by building out domestic renewable energy generation capacity as well as by boosting self-reliance through associated domestic manufacturing initiatives.

The trends are positive, but we need to see a doubling in the current VRE install run-rate to 35-40GW annually to both deliver on Prime Minister Narendra Modi's ambitious 450GW by 2030 target and drive decarbonisation. Whilst 35-40GW pa is exceptionally ambitious, it is both entirely economically viable and comparably modest relative to the more than 150GW of VRE installs likely in China in 2022.¹⁴ The global technology race to decarbonisation is on. The economic, investment, employment and import replacement benefits are huge for India, as well as China.

¹³ PV Magazine, [Coal India to set up 1.19 GW solar project](#), 14 October 2022

¹⁴ Bloomberg, [China's Clean Energy Growth Outlook for 2022 Keeps Getting Bigger](#), 24 June 2022