



India: Eye of the Energy Transition Storm

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Power Generation Scenario



Power Transmission & Distribution



Engaging India's States



Energy Tipping Points



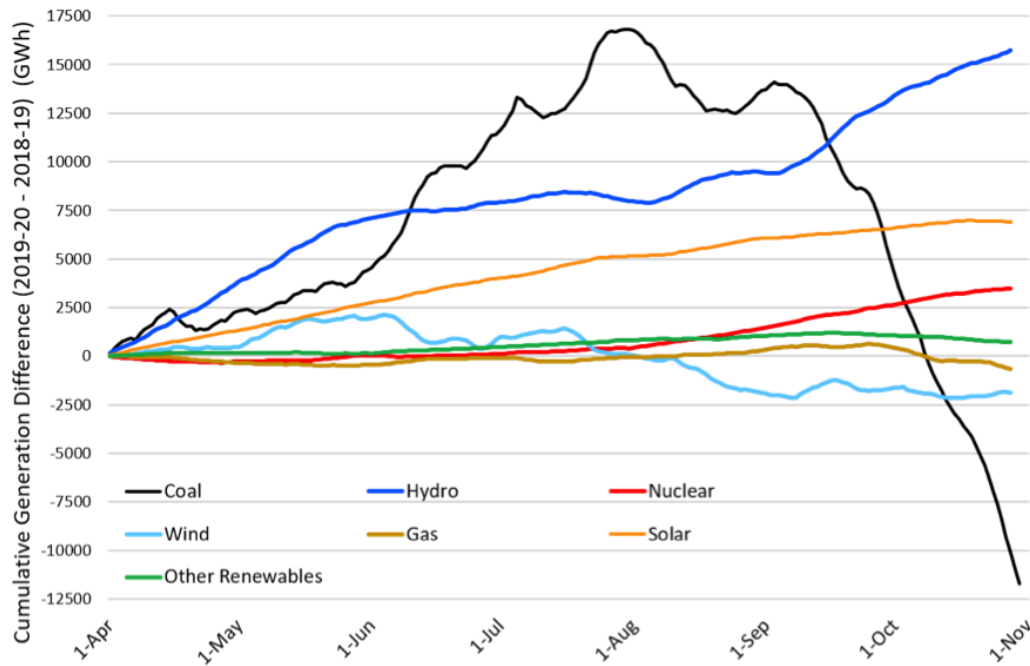
Power Sector Focus 2020-2023

India Power Generation Mix

	---- Capacity ----		-- Generation --		Capacity	Increase
	GW	%	TWh	%	Utilisation	GW yoy
Coal-fired	205.3	54.5%	1,016.1	71.8%	57.1%	4.6
Gas-fired	24.9	6.6%	48.8	3.4%	22.3%	0.0
Diesel-fired	0.5	0.1%	0.1	0.0%	2.0%	-0.1
Large Hydro	45.9	12.2%	154.9	10.9%	38.7%	0.5
Nuclear	6.8	1.8%	42.8	3.0%	72.1%	0.0
Renewables	93.5	24.8%	145.8	10.3%	19.2%	13.5
Bhutan (Import)	n.a	n.a	7.0	0.5%	n.a.	
Total	377.0	100%	1,415.4	100.0%		18.5
Captive power	51.4					
Total	428.4	113.6%				

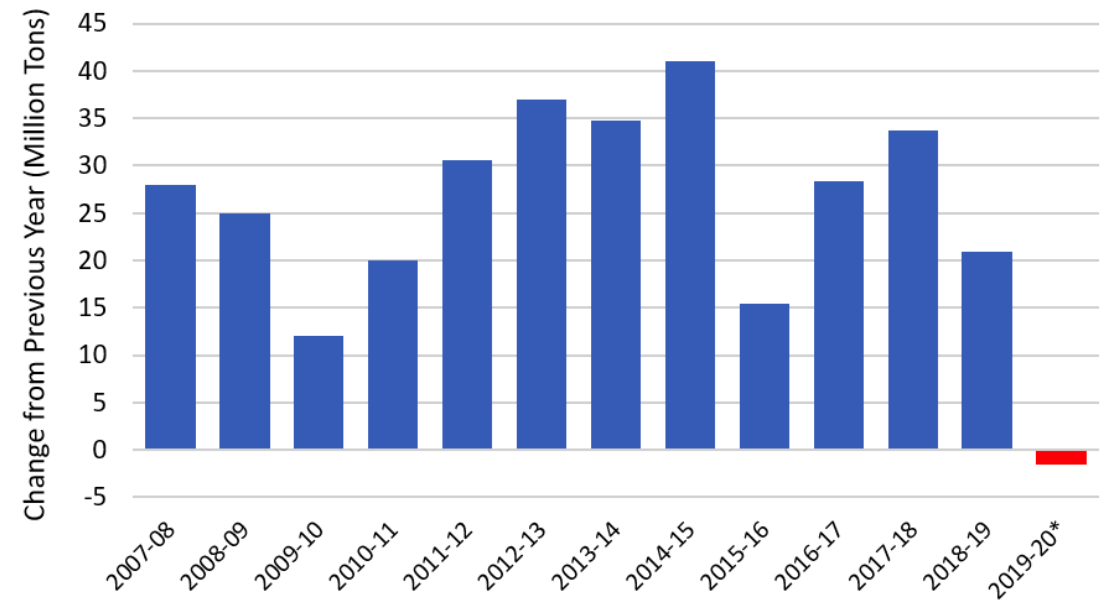
Coal Capacity vs. Renewable Surge

Figure 2. Cumulative Generation - Difference between FY 2019-20 and FY 2018-19



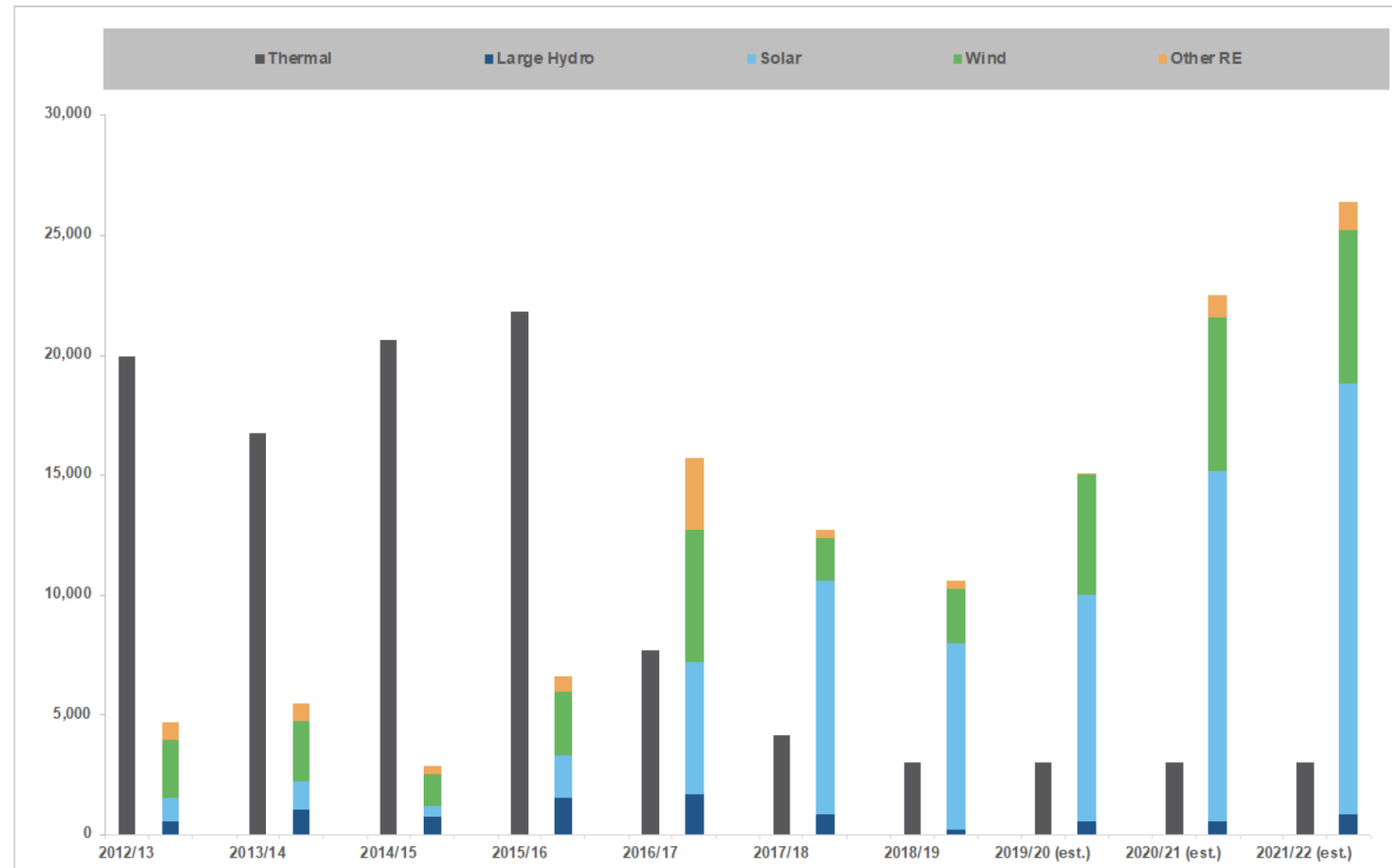
(Data: POSOCO Daily Generation Reports)

Figure 1. Annual Change in Coal Consumption by Power Sector



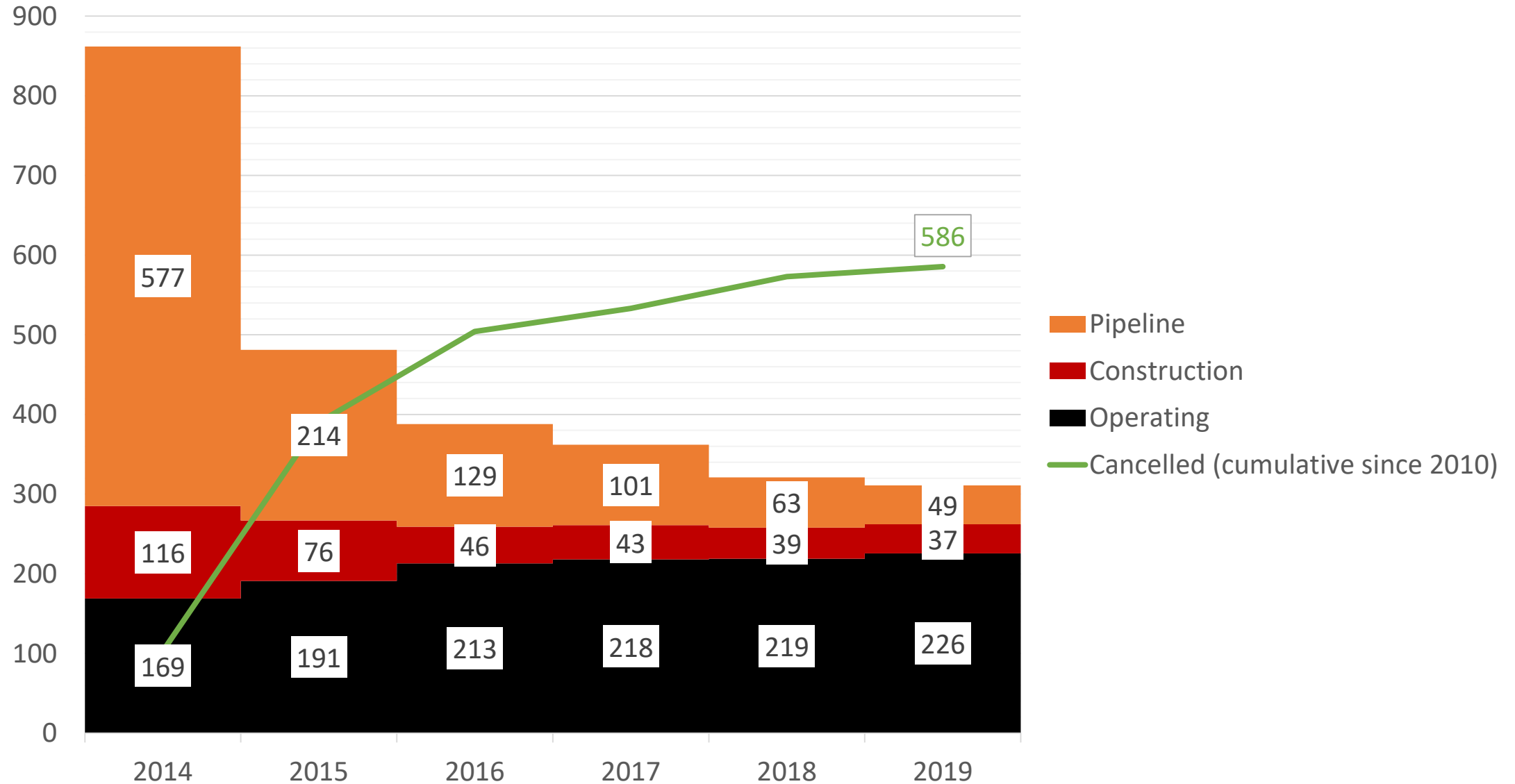
(Data: CEA) *First 7 months of FY 2019-20, based on CEA coal statements to September and estimated coal consumption for October from POSOCO generation reports.

New
Renewable
Energy
Capacity
Overtakes New
Coal Capacity



Source: CEA, MNRE, IEEFA estimates.

India's Coal Plant Status (GW, GCPT)



Transmission & Distribution Sector

Transmission:

- Unified Indian grid established in 2016
- Green Corridors

Distribution:

- 100% household electrification achieved in 2019
- AT&C losses hover around 21% on average
 - Power theft
 - Tariff rationalization
 - Inability to prioritize investment in key infrastructure due to operation in losses
 - Lack of sufficient human resource capacity



Engaging Indian States

<https://indianstates.csis.org>

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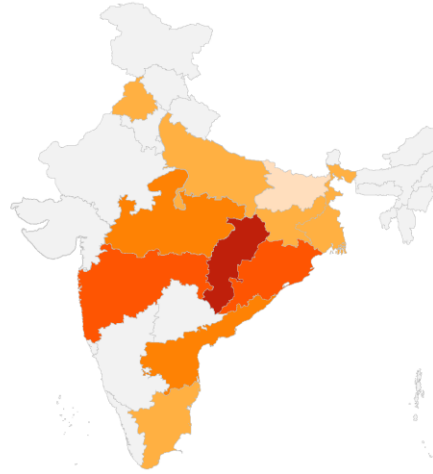
STRESSED THERMAL ASSETS BY THE NUMBERS

29: the number of stressed (unable to stress their debt) coal-based power projects as of December 2019

40,750 MW: combined planned generation capacity of the stressed assets
the geographic spread of the stressed capacity assets (by concentration low-to-high) reflected in the map

21,805 MW: generation capacity commissioned

9,920 MW: total capacity under construction



Sources: Lok Sabha Secretariat, Ministry of Power, *Stressed/Non-performing Assets in Electricity Sector Thirty-Seventh Report* (New Delhi: Lok Sabha Secretary 2018), https://164-100-47-47-193/isscommittee/Energy/16_Energy_37.pdf; "India: Stressed coal-based power projects," Numerical, December 2019, <https://numerical.co.in/numericals/collection/5e1b5094545c9d1c18f2328c>.

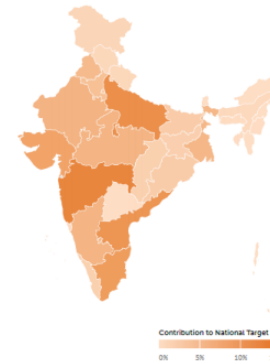
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CLIMATE CHALLENGES

Engaging Indian States Solar Performance Tracker

NATIONAL TARGET CONTRIBUTION

Each Indian state has been assigned a solar power capacity target that it needs to achieve in order for India as a whole to reach 100 GW of solar power by 2022. State targets are based on their potential to produce solar power, including land area and days of sun per year, and thus vary widely. This map represents each state's solar capacity target as a percentage of the national target.

Andaman and Nicobar Islands	Lakshadweep
Andhra Pradesh	Madhya Pradesh
Arunachal Pradesh	Maharashtra
Assam	Manipur
Bihar	Meghalaya
Chandigarh	Mizoram
Chhattisgarh	Nagaland
Dadra and Nagar Haveli	Odisha
Daman and Diu	Puducherry
Delhi	Punjab
Goa	Rajasthan
Gujarat	Sikkim
Haryana	Tamil Nadu
Himachal Pradesh	Telangana
Jammu and Kashmir	Tripura
Jharkhand	Uttar Pradesh
Karnataka	Uttarakhand
Kerala	West Bengal



INDIVIDUAL STATE TARGETS

This chart tracks the progress each state has made towards reaching its own target for solar power.

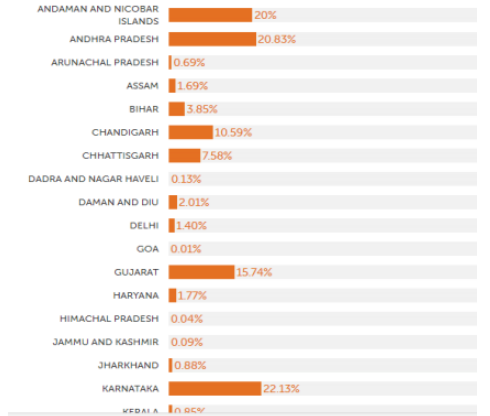
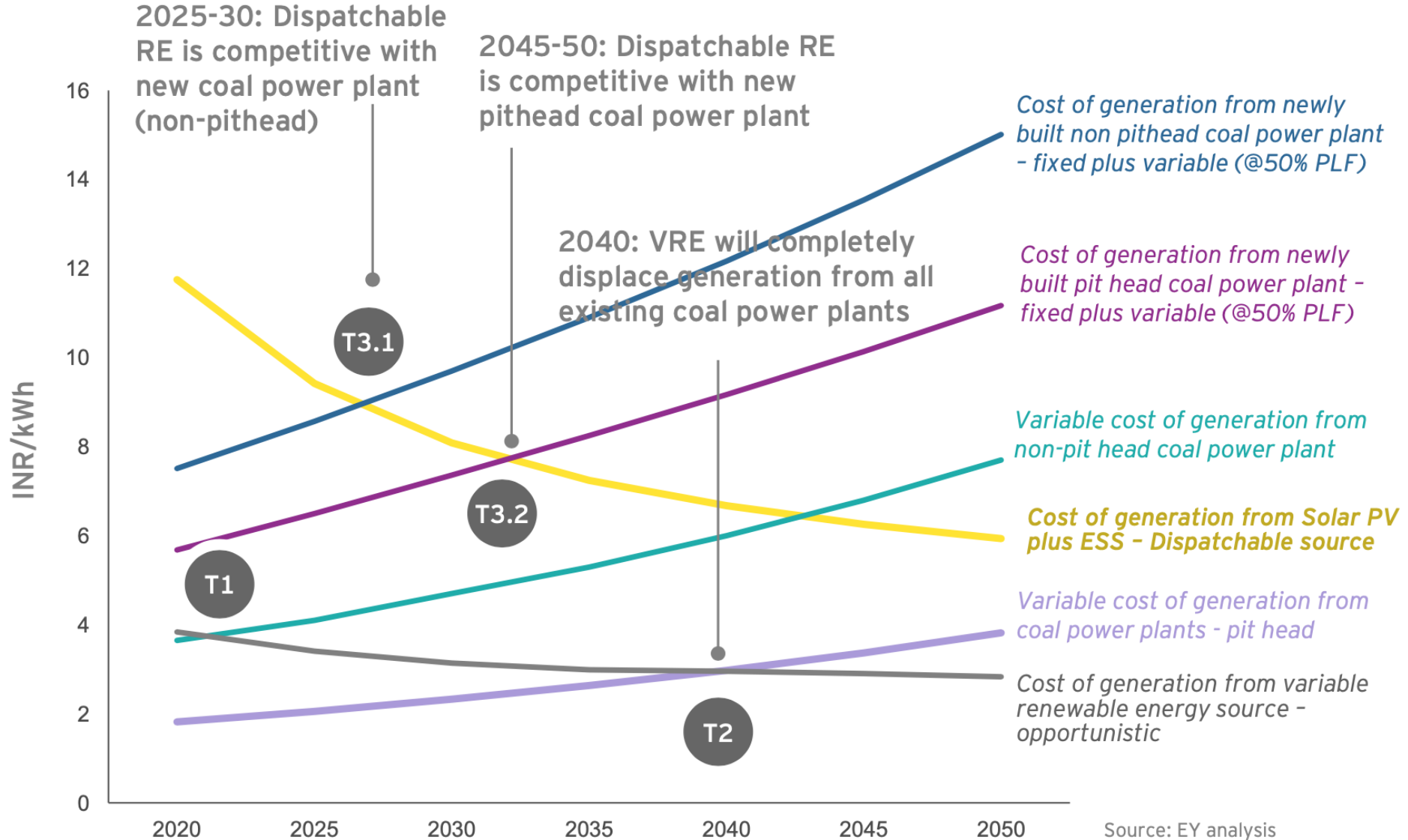


Image Source: [CSIS Energy](https://www.csis.org/energy)

- States are the laboratories grappling with the energy transition.
- Every state wants to be energy secure.
- States are the ultimate authorities to deliver on or exceed the central government's power sector vision.

Issues Being Raised by States

1. Smart meter adoption not taking off
2. Dues from distribution utilities to power generators (\$8.4 billion) and from state governments to distribution utilities (\$6.7 billion) climbing
3. Recently, states were urged by India's Power Minister to go beyond RPO compliance (though RPO compliance has been a struggle for many states) to procure more renewable energy
4. Renegotiation of power purchase agreements a major concern as new prices for renewable energy are being discovered



LEVELIZED COST OF ELECTRICITY IN INDIA BY GENERATION TYPE

Current and projected values shown in dollar per megawatt hour

GENERATION TYPE	2017	2022	2025	2030
Solar PV Ground Mounted	39.9	35.8	33.6	32.0
Wind Onshore	39.6	38.2	37.4	35.8
Solar PV Rooftop	93.9	83.8	78.4	74.2
Small Hydro	53.9	53.9	53.9	53.9
Biomass Power	78.9	91.4	103	125
Nuclear	54.5	54.6	55.0	55.9
Large Hydro	66.8	66.8	66.8	66.8
Natural Gas / Combined Cycle	70.9	79.3	86.7	101
Pit Head Super Critical Coal	50.6	55.2	59.2	67.0
Non-Pit Head Super Critical Coal	69.1	76.8	83.5	96.6

Source: Adapted from The Energy and Resources Institute, *Coal Transition in India* (New Delhi: TERI, 2018). The average monthly conversion rate for November 2018 was used to convert rupees to dollars.

Government of India Focus 2020 - 2023

- India Budget 2020 Highlights (February 2020)
 - a. \$3.1 billion allocated towards solar pump project
 - b. Smart pre-paid meters to be rolled out across the country in three years
 - c. Consumer choice in selecting electricity provider soon
 - d. Old polluting thermal plants will be ordered to close and land repurposed
- New Tribunal to be established to help resolve disputes between generators and distribution utilities
- Improvement of grid reliability and quality of power distributed
- New Renewable Energy Business Promotion Cell to be set up to help increase ease of doing business for setting up renewable energy projects (issues of land, contract dispute resolution, etc. to be handled by this unit)
 - Will aid the facilitation of 450 GW by 2030 target
- Flue gas desulphurization to be installed at thermal power plants, focus on reducing coal imports and making power plants “flex-ready”
- Electric mobility initiative phase two to boost electric two-wheeler, three-wheeler, and bus adoption.