

BRIEFING NOTE: MAY 20, 2022

Achieving 2022 RE targets would have averted India's April power crisis, conserved 4.42 mn tonnes of coal

In April 2022, India witnessed acute power shortage due to unavailability of coal supplies, with more than 100 MU (million units) of energy shortage on 8 days over the course of the month. This forced discoms to enforce load-shedding / rolling blackouts to ration power. The power shortage was due to problems with the evacuation and stockpiling of coal at thermal power plants, combined with a spike in the price of imported coal for coastal plants. March 2022 was also the hottest in 122 years, causing increased power demand for cooling, with impacts on coal stocks at power plants. There was little relief from high temperatures in April.

The power shortage has led to some calls to further augment India's coal power capacity, while others have pointed out that the crisis was a result of lack of coal supply, and not lack of power generation capacity. This analysis looks at the role played by renewable energy during this crisis, and what lessons it reveals for the future.

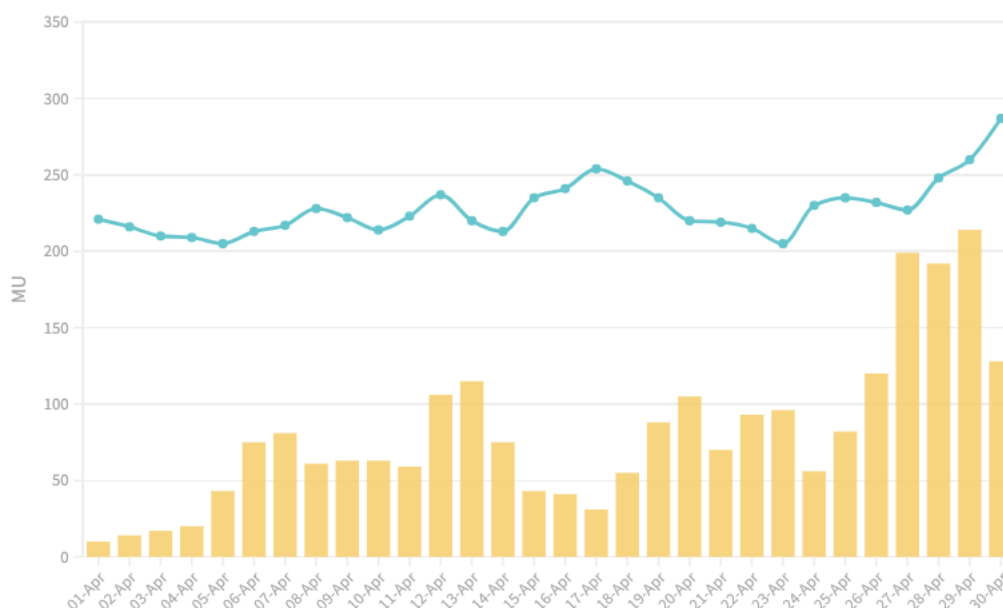
Key points:

- India's solar PV and wind capacity touched 94 GW in April 2022, a nearly three-fold jump from 2016. Absent this rapid growth in RE capacity, the April power crisis would have been significantly worse, with widespread load shedding for extended periods. In April, solar and wind generated 8.8% of India's total generation, equivalent to consumption of 7.83 million tonnes of coal. With less RE capacity online, the coal supply crisis would have been significantly worse.
- India is not on track to meet its goal of 175GW RE by 2022. If India was on track to achieve this target, it would have an additional 35.6 GW and 16 GW of solar and wind respectively already installed. **Generation from this additional capacity would have been sufficient to avert the April power crisis.**
- The additional solar PV + wind generation of 6,834 MU over the month of April would have enabled power plants to conserve their coal stocks for evening hours when solar is unavailable. This would have in effect **reduced coal requirements by 4.42 million tonnes.**
- **The generation from additional solar and wind capacity would have been more than the energy shortage by a considerable margin on each day in April.**

Achieving 2022 RE targets would have averted India's April power crisis



■ Additional generation if on track to meet targeted RE capacity ■ Recorded Power Shortage



Background

In FY 2016, Government of India announced an ambitious target of installing 175 GW of renewable energy by 2022, which includes 100 GW of solar and 60 GW of wind. At the end of FY 16, installed capacity of solar and wind were 6.8 GW and 26.8 GW respectively. Achieving the 175 GW target would have required 13.8 GW and 4.9GW of annual solar and wind installation from April 2016 to December 2022, assuming a constant rate of capacity addition.

Based on this, installed capacity of solar and wind should have been close to 90 GW and 56 GW respectively by April 2022. However, actual installed capacity as of April 2022 is 54 GW of solar and 40 GW of wind, implying a deficit or shortfall of 35.6 GW and 15.95 GW of solar and wind respectively.

	Capacity (GW)				
	FY 16	2022 Target	April 22 Prorated Target	FY 22-Actual	Shortfall
Solar	6.80	100.00	89.64	54.00	35.65
Wind	26.80	60.00	56.31	40.36	15.95

What would have been the impact of generation on the April 2022 energy shortage if the targeted capacity had in fact been achieved and was operational?

Methodology & Assumptions

1. Based on installed capacity and actual generation data from POSOCO, we have determined the daily Capacity Utilisation Factor (CUF) of wind and solar. **(Table 1)**
2. We then assume that the additional capacity of 35.6 GW of solar and 15.95 GW of wind would have operated at the same CUF as installed capacity, on each day in April 2022.
3. We are then able to compare the hypothetical daily generation from additional RE capacity with the daily recorded energy shortage. **(Table 2)**
4. This also allows us to calculate how much coal would have been conserved if the targeted RE capacity had been operational, based on specific coal consumption of 0.65 kg/kWh.¹

Finding:

- Generation from additional solar and wind capacity would have been more than the energy shortage by a considerable margin on each day in April.
- If India was on track towards meeting its 2022 target, RE capacity would have greatly contributed towards overcoming the acute power shortage by substituting generation from coal, in effect saving **4.42 million tonnes** of coal that could have been used to keep power plants online.

Implications:

1. Coal's logistical supply constraints are a long stand issue and are independent from coal mining and coal power capacity. Facilitating greater coal mining or additional power plant construction will do nothing to address these constraints. To the contrary, India already has surplus coal production capacity at existing mines, and also has surplus thermal generation capacity.
2. India's power system needs to pivot from the practice of power-rationing to coal-rationing. Delivering on its wind+solar targets is critical to diversify its power mix, insure against the risk due to heavy reliance on coal and ensure greater stability.
3. States that are dependent on longer, more volatile supply chains for their coal supply (rail routes or imports from the international market) will benefit more from a rapid increase of renewable energy contracts.

Caveats:

- It is difficult to precisely quantify the energy shortage that could have been avoided by the target RE capacity as energy shortfall data does not distinguish between shortfall due to capacity constraints (Inadequate capacity, outages etc.) or fuel constraint (coal shortage).

¹ Report on Optimal Generation Capacity Mix for 2029-30, CEA, January 2020.

However, reporting indicates that the April power crisis was not due to inadequate capacity or unplanned outages but due primarily to fuel (coal) supply constraints.

- In the absence of proper evacuation/transmission/storage, it is likely that some RE generation would be curtailed. RE generation, available mostly during the day, would not have covered for generation constraints during evening peak hours. However, as the primary reason for the energy shortfall was unavailability of coal, RE generation would have allowed coal plant operators to conserve scarce supplies during the day-time and ramp up generation for the evening peak when availability of RE is lower.

- In the absence of a larger power market, substitution from RE generation would have mainly benefited DISCOMS that have signed RE PPAs, as these discoms and their allied state generators would have been able to ration their coal supplies. States with higher contracted RE capacity would be better able to ration coal generation. A larger wholesale power market would lead to more dispersed RE absorption and allow for better rationalisation of coal supplies.

Table 1: Actual solar PV and wind generation & recorded power shortage for April 2022					
Daily Gen (MU)	Solar Gen (MU)	Wind Gen (MU)	Solar CUF	Wind CUF	Recorded Shortage (MU)
01-Apr	263	119	20%	12%	10
02-Apr	261	111	20%	11%	14
03-Apr	263	91	20%	9%	17
04-Apr	266	84	21%	9%	20
05-Apr	260	84	20%	9%	43
06-Apr	264	99	20%	10%	75
07-Apr	266	105	21%	11%	81
08-Apr	260	142	20%	15%	61
09-Apr	255	136	20%	14%	63

10-Apr	247	129	19%	13%	63
11-Apr	253	141	20%	15%	59
12-Apr	259	167	20%	17%	106
13-Apr	253	134	20%	14%	115
14-Apr	246	127	19%	13%	75
15-Apr	253	171	20%	18%	43
16-Apr	256	181	20%	19%	41
17-Apr	259	209	20%	22%	31
18-Apr	266	179	21%	18%	55
19-Apr	261	158	20%	16%	88
20-Apr	252	135	19%	14%	105
21-Apr	248	139	19%	14%	70
22-Apr	261	109	20%	11%	93
23-Apr	251	99	19%	10%	96
24-Apr	264	140	20%	14%	56
25-Apr	264	153	20%	16%	82
26-Apr	274	129	21%	13%	120
27-Apr	275	116	21%	12%	199

28-Apr	274	169	21%	17%	192
29-Apr	281	189	22%	20%	214
30-Apr	274	268	21%	28%	128

Source: POSOCO, CRH calculations

Table 2 below shows the additional generation from solar and wind that would have accrued from the "deficit" of 35.6 GW and 15.95 GW solar and wind respectively, assuming the same CUF as installed capacity on respective days. If India was on track to achieve the 175 GW target, this would have been the additional generation.

Table 2: Additional generation if India was on track to meet 2022 target of 175 GW RE. <i>All Units in MU.</i>					
Daily Gen	Solar generation if target capacity met	Wind generation if target capacity met	Solar +Wind generation if target capacity met	Recorded Shortage	Generation Surplus from hypothetical solar+wind generation
01-Apr	174	47	221	10	211
02-Apr	172	44	216	14	202
03-Apr	174	36	210	17	192
04-Apr	176	33	209	20	189
05-Apr	172	33	205	43	162
06-Apr	174	39	213	75	138
07-Apr	176	42	217	81	136
08-Apr	172	56	228	61	167

09-Apr	168	54	222	63	159
10-Apr	163	51	214	63	151
11-Apr	167	56	223	59	164
12-Apr	171	66	237	106	131
13-Apr	167	53	220	115	105
14-Apr	162	50	213	75	138
15-Apr	167	68	235	43	191
16-Apr	169	72	241	41	200
17-Apr	171	83	254	31	222
18-Apr	176	71	246	55	191
19-Apr	172	62	235	88	147
20-Apr	166	53	220	105	114
21-Apr	164	55	219	70	149
22-Apr	172	43	215	93	122
23-Apr	166	39	205	96	109
24-Apr	174	55	230	56	174
25-Apr	174	60	235	82	153
26-Apr	181	51	232	120	112

27-Apr	182	46	227	199	29
28-Apr	181	67	248	192	56
29-Apr	186	75	260	214	46
30-Apr	181	106	287	128	159

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