

UNCOMPETITIVE

Coal's cost disadvantage grows as renewable tariffs plummet

2/3 of Indian coal power generation is now more expensive than new renewable energy; India can save up to 54,000 crores (\$8.3 bn) in power purchase costs annually by replacing expensive coal power plants with cheaper renewables, while also reducing deadly air pollution.

Summary:

Analysis of coal power plant tariff data shows that replacing the most expensive coal power plants in India with electricity generated by solar photovoltaics (PV) and wind can save discoms and electricity consumers up to 54,000 crores (\$8.3 bn) annually. Focussing only on replacing older (>20 yrs), expensive plants can still yield 20,000 crore (\$3 bn) in reduced power purchase costs annually.*

These figures are based on a comparison of 2015-2016 tariff and generation data published by the Central Electricity Authority¹ against an assumed renewable energy tariff of Rs 3/kWh. New tariff bids for solar PV and wind have dropped well below Rs 3/kWh, with solar PV reaching a record low of 2.44² and wind reaching a record low of 2.64.³ It is now widely accepted that new coal power plants are no longer competitive with new renewables in India, as shown by Bloomberg New Energy Finance⁴ and others. This analysis now shows that significant cost-savings can accrue through a planned phase out of the most expensive coal power plants already in operation and their replacement with cheaper renewable energy.

** This is likely to be a conservative estimate as it is based on tariff data from FY2016 and does not incorporate the likelihood of future increases in the cost of coal power or expected declines in the cost of renewables. The analysis also assumes an average solar PV/wind tariff of Rs 3/kWh for new projects, higher than the record low bids accepted in 2017. The analysis also does not take into account the likely increase in tariffs as coal plants incur capital expenditure to comply with India's new air emission norms, or the likely increase in the price of coal supplied by Coal India Limited*

Key findings:

- **Nearly 2/3rds of India's coal power generation is no longer price competitive with electricity from new solar PV or wind projects.**
- **At least 65% of India's current coal power generation, representing 94GW of India's total coal capacity of 194GW, is being sold to distribution companies at rates higher than tariffs that can be expected from new renewable energy projects.**
- **Of these 94GW of uncompetitive coal plants, about 30GW is above 20 years old.**
- **The 30GW of older coal power plants operated at an average Plant Load Factor of just 53% in FY2016, contributing about 20% of total coal power generation.**
- **Replacing older, more expensive coal power plants with solar PV and/or wind energy can yield cost savings of approximately 52,000 crores (\$8 billion) per year, assuming an average tariff for new RE projects of Rs 3/kWh.**
- **Replacing expensive power plants over 20 years of age first would yield an annual reduction in power costs of at least 20,000 crore (\$3 billion).**

Explanation:

Tariff and generation data on a plant-basis contained in the Central Electricity Authority's monthly Executive Summary⁵ for 2015-2016 was compared to an assumed hybrid solar PV/wind tariff of Rs 3/kWh. This is significantly above 2017's record low bids of 2.44 and 2.64 respectively.

The total amount of power generated from power stations selling above Rs 3/kWh was calculated. For FY2016, this amounted to 456.3 billion kWh out of a total coal power generation (for which tariff data is available) of 694.2 billion kWh. The total differential in terms of generated power at an approved tariff above Rs.3 yielded the potential savings approximately Rs.54,000 crores (\$8 billion) to discoms and consumers if that quantum of power is replaced with renewable energy.

The total power generated from coal power plants older than 20 years which sold their power at above Rs.3/kWh was 140 billion kWh.

The age of different plants and units was collated from a variety of sources, including CEA databases, generating company websites and CoalSwarm.⁶

Figure 1. Competitiveness of operational coal with new renewables

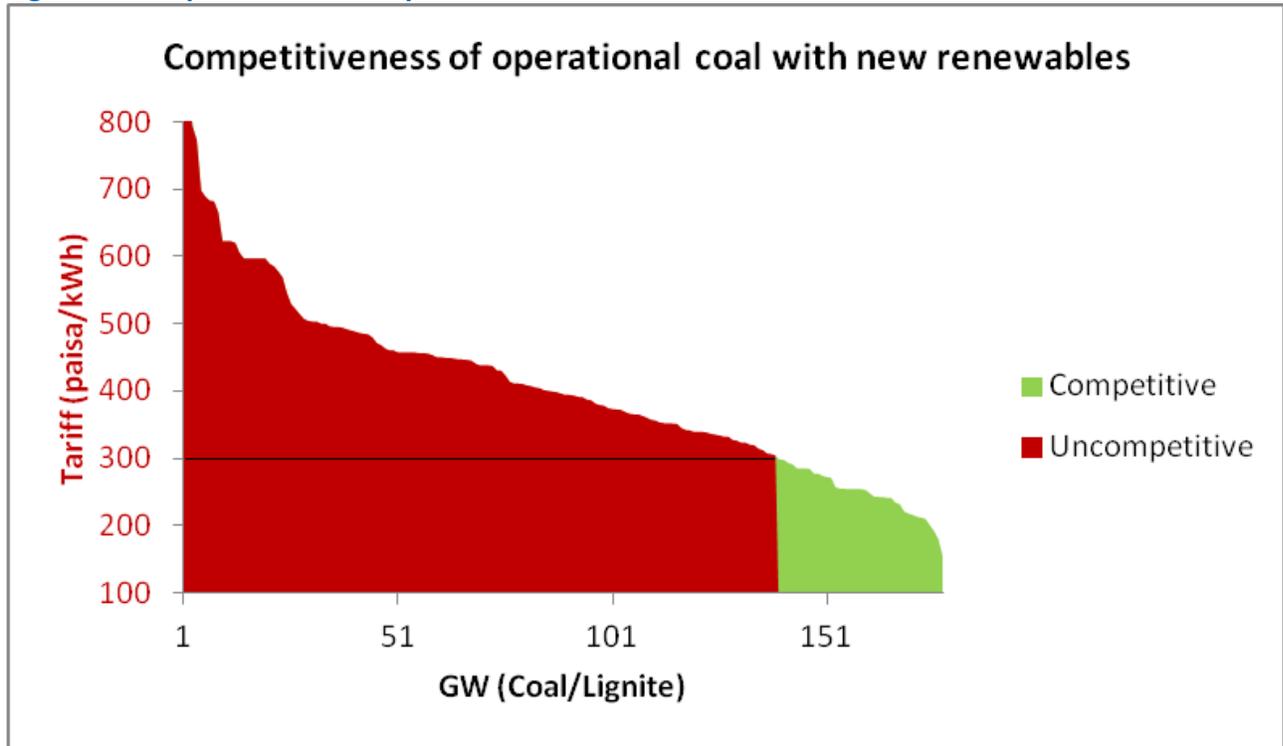
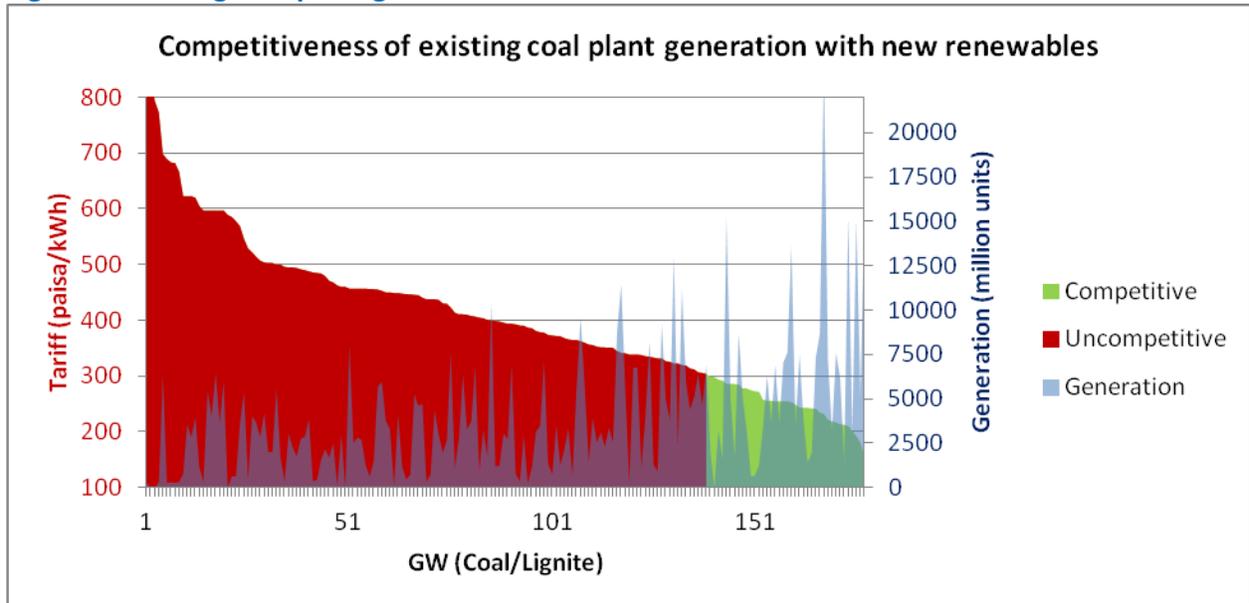


Figure 2: Existing coal plant generation across tariff levels



Conclusion:

Phasing out coal power plants providing electricity at uncompetitive prices and replacing that quantum of power with renewable generation could cumulatively save industry and residential power consumers billions each year.

There is substantial room to phase out older and/or more expensive coal-based power plants and replace that generation with cheaper, cleaner energy. A phased plan to replace generation from older and more expensive plants will reduce the average cost of electricity to discoms and consumers, will yield economic benefits in terms of cheaper electricity for industry and households, as well as help address India’s air pollution crisis.

Its important to note that this analysis ignores likely future trends in the price of power from coal and renewables. The competitive position of operational coal vs new renewables will likley worsen, not improve.

A key reason for this is that virtually all of India’s coal power plants are in violation of the new air pollution standards notified in December 2015 by the Ministry of Environment and Forests and being monitored by the National Green Tribunal.⁷ Operational coal power plants now face substantial retrofitting costs to ensure legal compliance. This will mean that operating costs will increase over the next few years and that cost will be passed on to distributors and consumers. At the same time, further cost reductions for solar PV and wind are expected, by 47-66% in the case of onshore wind and solar PV respectively.⁸

Further, Coal India is set to raise its coal prices, resulting in power tariff increases, having seen its costs rise and margins squeezed.⁹ Coal India supplies about 75-80% of the coal used in power generation in India.

Potential savings to the Indian economy from a phase out of older, more expensive coal will increase. A phased shutdown and replacement with renewable energy will be more economically viable than retrofitting for many plants. When viewed through this lens, a planned phase out of the older and more expensive coal plants becomes an economic and social necessity, rather than a luxury.

	Coal Power Plants selling electricity above Rs3/kWh	Coal Power plants selling electricity above Rs.3kWh & older than 20yrs
Installed capacity	94GW	30GW
% of total coal capacity	48%	15%
Generation (million kWh)	456351	140315
% of total coal power generation	65%	20%
Potential annual savings from replacement with RE	54,730 crores (\$8.3 billion)	20,486 crores (\$3 billion)

Prominent examples of older, expensive coal plants

NTPC Dadri: Units I and II of the Dadri coal power plant run by NTPC are over 20 years old and sell power at Rs.4.50 and Rs.5 per unit respectively.

Badarpur: The Badarpur power plant, currently temporarily shut due to the pollution crisis in Delhi, is also over 20 years old and sells power for over Rs 5 per unit.

Ropar: In Punjab, the 1260 MW Ropar thermal power plant sells power at over Rs 6/unit. All these power plants play a significant role in the air pollution crisis gripping north India.

A full list of coal power plants selling power above Rs 3/unit and their age is in Annexure I.

Implications:

For lenders, project investors and company shareholders: With a significant chunk of existing coal powered generation at a competitive disadvantage to new renewable energy, the financial problems facing existing coal generators will increase. In particular, any power plant (operating, under construction or planned) that is unable to guarantee a tariff of Rs3/kWh or below is likely to be wholly or partially stranded in the near future. The investments needed to ensure legal compliance with emission standards only strengthen the economic case against coal. As existing PPAs expire over the coming years, DISCOMS will start switching to cheaper energy generators – which based on current performance, means solar PV/wind.

For commercial and industrial power consumers: The C&I sector already pays higher tariffs to cross subsidise other sectors. As long as India's grid remains dominated by coal, power prices will continue to escalate, strengthening the incentive for the C&I sector to adopt rooftop/captive solar or wind, or negotiate direct solar power purchases under the open access regulations in the Electricity Act of 2003.

For discoms and state governments: Significant cost savings can accrue by phasing out Power Purchase Agreements with coal power plants that are selling electricity at >Rs.3/kWh and replacing electricity purchases from these plants with new renewable energy.

Since many of these plants are also older, less efficient, more polluting and have higher water requirements, there will be co-benefits in terms of a reduction in air pollution and water consumption.

Affordable electricity for all remains an elusive goal in most parts of India. This analysis adds to the body of research that shows renewable energy sources have a critical (and not just supplementary) role to play in meeting that goal.

Annex I – Rate of Sale of Power for the year 2015-2016

	Plant	Utility	MW	Net Generation (Million units)	Rate of Sale of Power (Paise/Kwh)
1.	Sikka 1-2 (retd 2017)	GSECL	240	290.18	885
2.	Rajghat Power House (shut Dec 2015)	IPGCL	135	32.3	847
3.	Panipat TPS I (Unit1-4)	HPGCL	447.8	2.69	793.1
4.	Calcutta Electric SCL	CESC	1125	6407	698
5.	GNDT Plant Bathinda	Punjab State Power Corp Ltd.	450	814.86	622.49
6.	G.G.S.S.T.PLANT ROOP NAGAR	Punjab State Power Corp Ltd.	1260	3600.7	622.49
7.	Gandhi Nagar TPS 1-4	GSECL	660	1164.22	605
8.	Ennore TPS (Retd 2017)	TN Gen & Dis Corp Ltd	340	347.36	596.88
9.	Mettur I	TN Gen & Dis Corp Ltd	840	5471.33	596.88
10.	North Chennai I (NCTPS I)	TN Gen & Dis Corp Ltd	630	4046.39	596.88
11.	Tuticorin (TTPS)	TN Gen & Dis Corp Ltd	1050	6501.37	596.88
12.	Dishergarh Power Station	India Power Corpn	12	35.35	589
13.	MTPS Stage I (Muzaffarpur)	Kanti Bijlee Utpadan Ltd	220	657.95	585.21
14.	Badarpur TPS	NTPC LTD.	705	2013	503
15.	Dadri Coal - II (NCTPP)	NTPC LTD.	980	5635	500
16.	Harduaganj	UPRVUNL	165	364.29	496
17.	Neyveli I	NLC Ltd	600	2776.89	491.63
18.	Nasik TPS	MSPGCL	630	3869.7	488
19.	Panki	UPRVUNL	210	454.12	485
20.	Koradi 5,6,7	MSPGCL	620	1598.18	484
21.	Dr. NTPS (Vijaywada)	APGENCO	1260	8079.09	457
22.	Rayalseema I	APGENCO	420	2549.01	457
23.	Parichha	UPRVUNL	220	642.31	456
24.	Bhusawal II & III	MSPGCL	420	1536.32	456
25.	Dadri Coal- I (NCTPP)	NTPC LTD.	840	3758	450
26.	Panipat TPS - II (Unit 5)	HPGCL	210	146.85	449.2
27.	Wanakbori 1-6	GSECL	1260	4181.62	449
28.	Ramagundem TPSB	TSPGENCO	62.5	353.6	438
29.	Ukai 1-5	GSECL	850	2808.51	411
30.	Trombay 5	Tata Power Co Ltd	500	3298	404
31.	Sanjay Gandhi TPS I&II	MPPGCL	840	3066	396
32.	Tanda TPS	NTPC LTD.	440	2757	394
33.	Kota TPS	RRVUNL	1240	6962.32	394
34.	Parli 3,4&5	MSPGCL	630	377.61	391
35.	Neyveli I Expn	NLC Ltd	420	3000.07	390.66
36.	Dahanu TPS	Reliance Infrac. Ltd	500	3480.74	379
37.	Neyveli II	NLC Ltd	1470	9546.47	362.81
38.	Kothagudem (KTPS O&M)	TSPGENCO	720	3953.84	356
39.	Satpura STPS Ph II & III	MPPGCL	830	3139	352
40.	Tenughat TPS	Tenughat Vidyut Nigam Ltd	420	2328.28	351.61
41.	UNCHAHAH TPS I	NTPC LTD.	420	2594	351

42.	Farakka STPS I&II	NTPC	1600	8750	345
43.	Obra A	UPRVUNL	288	307.26	339
44.	Kutch Lig 1-3	GSECL	215	1121.82	338
45.	Bandel TPS	West Bengal PDCL	450	948.79	332.06
46.	Kahalgaoon I	NTPC	840	5001	327
47.	Khaperkheda	MSPGCL	840	4420.46	314
48.	Kolaghat TPS	West Bengal PDCL	1260	5124.71	312.23

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