Gagan Sidhu, CEEW-CEF Adviser
Kashish Shah, IEEFA Research Analyst
October 2020

The Case for Indexed Renewable Energy Tariffs

An Interim Solution To Buy Time for Indian Discoms To Make Durable, Long-Term Reforms

India has made significant strides in developing its renewable energy (RE) sector – primarily wind and solar – in recent years. From a relatively low base of 15.5 gigawatts (GW) in 2010, installed RE capacity grew at an impressive compound annual growth rate (CAGR) of 19% over the following decade to achieve 86.8GW at the end of March 2020.

India's targets for the next decade are more ambitious still. Its 2030 RE target of 450GW will require RE to grow at a CAGR of 16%, but this time from a materially higher base of 86.8GW. This will tilt the share of aggregate generating capacity – already an impressive 23% as of March 2020[1] – significantly further in RE's favour.

RE Shrugs Off COVID-19 Disruption

COVID-19 and the resultant fall in aggregate power demand has not dampened global investor interest in RE. In fact, announcements like General Electric's and Mitsui & Co's coal plant exits suggest appetite for the sector has only increased.

Take for example the June 2020 auction of 2GW of solar capacity by Solar Energy Corporation of India (SECI) which set a new record-low flat tariff of Rs2.36/kWh for solar-generated power in the midst of severe economic disruption. Capacity was eventually awarded in a tight range of Rs2.36-2.38/kWh (~US$31/MWh)[2] with zero indexation for inflation for 25 years. Winners of capacity were Enel (Italy), Amp Energy (Canada), Eden Renewables (France), IV Vogt (Germany), Ayana Renewables (backed by CDC Group of the UK) and ReNew Power (India).

Zero indexation has in fact been the norm in India for RE tariffs for many years. Foreign capital's unwavering enthusiasm for Indian RE is also not a recent phenomenon.

As pointed out in a recent CEEW-CEF analysis piece,[3] the recent economic disruption has brought to the surface an already simmering de-coupling of RE from other generation sources, which is now manifesting on multiple fronts.

---

[1] CEEW-CEF Market Handbook, Q1 FY2020/21.
[2] Exchange rate of US$1 = Rs74.81.
[3] CEEW-CEF. Renewable Energy As Catalyst for Capital Markets Atmanirbharta. August 2020.

Coal Versus RE

The winner of the long-term race between RE (with <Rs3/kWh tariffs) and coal-fired plants (with >Rs4/kWh) is well established. Unfortunately, the state-owned power distribution companies (discoms) have not been able to take full advantage of the low cost of RE owing to a combination of the decline in electricity demand and their legacy thermal power contracts with a two-part tariff structure.

For a thermal tariff of >Rs4/kWh, discoms pay ~Rs2/kWh of fixed capacity charge for the contracted capacity in the power purchase agreement (PPA) – even if no power is drawn from the plant. The remaining >Rs2/kWh is the variable charge (landed fuel cost + production costs) which is paid for every unit of power drawn from the plant. Also, the variable charge increases with inflation in landed fuel costs and currency (for import coal-reliant plants).

In the absence of sustained, strong electricity demand growth, discoms saddled with under-utilised two-part thermal capacity will only have an incentive to shift away from coal when RE tariffs achieve parity with the variable charge for coal. For that to happen, RE tariffs need to fall a further 15% beyond even the recently recorded lows of Rs2.36/kWh, to achieve levels of ~Rs2/kWh.

In the absence of sustained, strong electricity demand growth, discoms saddled with under-utilised two-part thermal capacity will only have an incentive to shift away from coal when RE tariffs achieve parity with the variable charge for coal.

The Curious Case of Indian Discoms

Against this backdrop, discoms face a growing number of structural and financial challenges compounded by COVID-19, as highlighted in IEEFA's recent report The Curious Case of India's Discoms.[4] Chief among them are high aggregate technical and commercial (AT&C) losses, expensive thermal PPAs and a cross-subsidy burden due to a varying tariff structure amongst the different categories of discom customers, combined with the provision of below-cost electricity to the rural population.

As a result, discoms' overdues to power producers jumped 52% from Rs76,701 crore (US$10.5bn) outstanding in June 2019 to Rs116,864 crore (US$15bn) as of July 2020.[5]

Ambitious RE Capacity Growth To Add Pressure on Discoms

[4] IEEFA. The Curious Case of India's Discoms. August 2020.
[5] PRAAPTI. July 2020.

India's RE ambitions, as described at the outset, are second to none globally, and are set to enhance energy security by reducing reliance on fossil fuel imports, whilst also driving deflation and reducing pollution and emissions.

Unless managed carefully, however, such a large-scale capacity rollout will undermine the already beleaguered discoms. Growing RE from the current 86.8GW to 450GW by 2030 will require an annual addition of ~35GW of RE capacity over the next 10 years. The following table shows estimated incremental outflows for discoms assuming India's RE ambitions remain on track over the next five-year period.

Figure 1: Estimated Incremental Discoms Cash Outflow on Purchase of Solar Power 2021-2025

	FY2021/22	FY2022/23	FY2023/24	FY2024/25	FY2025/26
Solar tariffs (Rs/kWh)	2.36	2.30	2.24	2.19	2.13
Incremental solar capacity additions (GW)	35	35	35	35	35
Generation at full capacity (TWh)	307	307	307	307	307
First Year PLF (AC %)	25%	25%	25%	25%	25%
Incremental generation (TWh)	76.7	76.7	76.7	76.7	76.7
Cumulative incremental generation (TWh)	76.7	153.1	229.8	306.4	383.1
Discoms cash outflows (Rs crore)	**18,089**	**35,681**	**52,426**	**68,312**	**83,371**

Source: IEEFA and CEEW-CEF estimates

Note: (1) For the purpose of analysis, we assumed all incremental RE capacity is solar; apportioning capacity to wind, given its higher plant load factor (PLF), will increase discom burden even further (2) The AC PLF assumption is based on 40% DC overloading (3) It's possible AC PLFs will be significantly higher than the assumed 25% given the likelihood of concentration in high irradiation locations (Leh, Ladakh, Rajasthan, Gujarat) (4) We have assumed an exceptionally conservative annual solar tariff deflation of 2.5% (5) We have incorporated a solar annual degradation factor of 0.25%.

The burden imposed by huge incremental cash outflows is only one side of the story. Ensuring that the ambitious incremental RE capacity is not subjected to curtailment is equally important.

As highlighted in the figure below, the annual increase in power supply in India in FY2019/20 vs FY2018/19 was only 10TWh, and at no time over the last five years did the annual increase exceed 70TWh. Moreover, coal fired power plants have been operating unsustainably at below 60% utilisation rates consecutively over the last four years.[6] In this environment, ensuring that the market is able to absorb an incremental 76.7TWh of new RE-generated power year-over-year for a decade will pose its own set of challenges.

[6] CEA Generation Reports.

Figure 2: Incremental Annual Generation FY2015/16 – FY2019/20

	FY2015/16	FY2016/17	FY2017/18	FY2018/19	FY2019/20
Total annual generation (TWh)	1,174	1,242	1,308	1,376	1,386
Incremental annual generation (TWh)		69	66	68	10
Generation growth (%)		5.8%	5.3%	5.2%	0.7%

Source: CEA generation reports

What Is the Solution?

There is no silver bullet to resolve discoms' structural and financial woes. Tackling them head on will instead require a combination of measures.

IEEFA recommends the following broad recommendations to reduce financial and operational inefficiencies across the Indian discom sector:

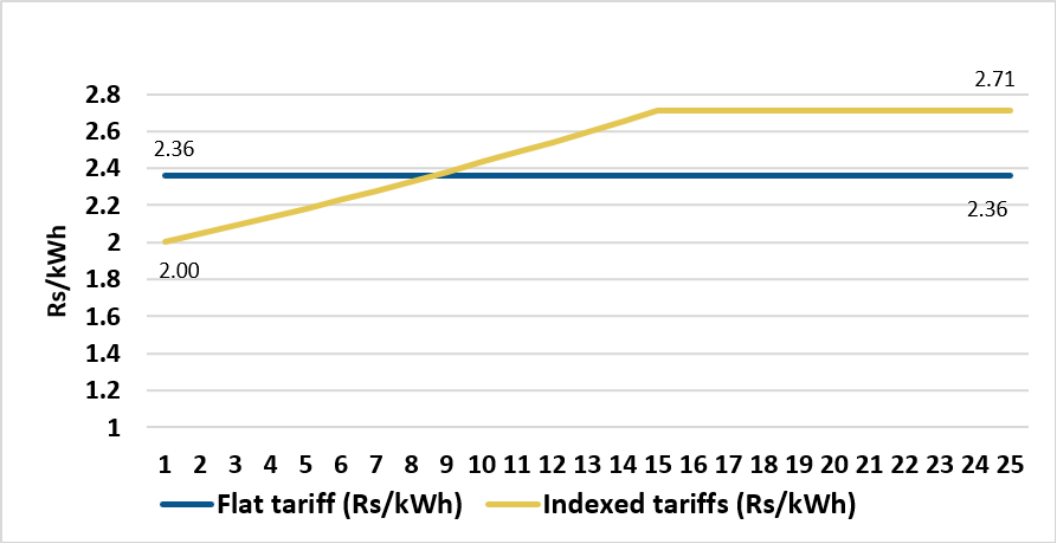
1. Resolve issues surrounding legacy contracts and close inefficient, end-of-life thermal plants.
2. Reduce cross-subsidies to 20% and implement Direct Benefit Transfers (DBT) for the targeted beneficiaries to have the subsidy amount upfront.
3. Reduce AT&C losses through digitalisation.
4. Increase competition by encouraging private sector participation in the power distribution sector.
5. Move to a nationally pooled market to get the best return from the huge investments in the national generation fleet, and allow a better managing of increasingly variable production and demand.

But such lasting solutions require time – a luxury that discoms can ill afford in the current COVID-19 crisis.

IEEFA and the CEEW Centre for Energy Finance (CEEW-CEF) recommend an interim solution that will immediately ease near-term financial pressure on discoms, buying them time to implement the kind of lasting solutions enumerated above.

As against the prevailing system of flat RE tariffs, IEEFA and CEEW-CEF propose that a partially indexed tariff structure should be profitably explored for future renewable capacity PPAs. Specifically, a lower first year tariff of Rs2/kWh, rising at a pre-determined index rate (below the inflation rate) for the first 15 years, and then remaining flat at the year 15 rate for the 10-year balance of PPA life.

Figure 3: Flat Versus Indexed Tariffs



Source: IEEFA and CEEW-CEF

Front ending RE tariffs at levels that are on a par with the prevailing variable charge for coal-fired power can also play a significant role in nudging discoms to hasten the switch from polluting coal to RE.

After all, if RE capacity is going to be rolled out in such ambitious quantities, it should be priced to reflect the current competitive environment. This will also unlock demand for an acceleration in new investment and jobs as India climbs out of the COVID-19 recession.

The Developer Perspective

Any indexed tariff structure will have to appeal to developers, who are by now fairly accustomed to operating in a fixed tariff environment in India. The broader financing ecosystem will also have to be flexible to accommodate project debt terms that are reflective of upward sloping revenue profiles that accompany indexation.

There have been some encouraging developments in this regard recently. In India's first-of-its-kind auction for 400MW of round-the-clock (RTC) renewable power supply,[7] ReNew Power won with a semi-firmed wholesale tariff of Rs2.90/kWh (US$39/kWh). The auction provided an annual escalation of 3% on the quoted tariff for the first 15 years of the 25-year PPA. As there is no indexation after year 15, the tariff for the last 11 years of the PPA is Rs4.39/kWh (US$59/MWh). Another solar project featuring indexation was Rewa, but the auction for its capacity took place over three years ago.

[7] Mercom India. ReNew Power Wins SECI's 400 MW Round-The-Clock Renewable Tender at ₹2.90/kWh. 8 May 2020.

Whatever the tariff profile, developers usually evaluate and compare project economics using a few standard criteria, including post-tax equity internal rate of return (IRR) at the special purpose vehicle (SPV) level of the project. At the very least, an indexed tariff structure should result in a post-tax equity IRR no worse than that yielded from a flat tariff structure.

In this respect, the table below depicts post tax equity IRR calculations for two solar PV projects, one with a flat tariff and the other with an indexed tariff. All other assumptions remain the same between the two, save the debt repayment profile which has been amended for the indexed tariff case to match its revenue generation.

Any indexed tariff structure will have to appeal to developers who are accustomed to operating in a fixed tariff environment in India.

Figure 4: Comparison of Metrics – Flat vs Non-Indexed Tariff Model

	Flat Tariff	Indexed Tariff
PPA Tenure (Yrs)	25	25
Tariff (Rs/kWh)	2.36 Flat for 25 Yrs	2.00 Yr 1
Indexation (% pa)	na	2.20% ~ Yr 15
Post Indexation Tariff (Rs/kWh)	na	2.71 Yr 15 ~ Yr25
Capital Cost (Rs cr/MW DC)	2.80	2.80
DC Overloading	40%	40%
PLF (AC %)	25%	25%
Debt Tenure (Yrs)	15	18
Debt Repayment	Equated Yearly Installments (Principal + Interest)	Structured (To match Tariff Indexation)
Post-tax Equity IRR	15.6%	15.4%
DSCR (Avg)	**1.55**	**1.41**
DSCR (Min)	1.19	1.16

Source: IEEFA and CEEW-CEF estimates

As shown above, it is possible to achieve an indexed tariff structure that results in similar developer economics to flat tariffs.

However, there are two caveats worth highlighting here. First, lenders would need to be agreeable to the more structured and stretched project loan principal repayment profiles required to accommodate indexation. Second, sufficient comfort will need to be provided to developers that tail period tariffs will be suitably honoured, particularly in light of our expectation for solar deflation continuing in the coming decade.

Last year's contract cancellation and renegotiation issues in the state of Andhra Pradesh for renewable PPAs signed at higher tariffs (>Rs5/kWh) than currently available tariffs of <Rs3/kWh will certainly play on the minds of developers. One workaround here could be indexation for SECI/NTPC offtake tenders only, with specific and legally enforceable contractual protections for tail end period tariffs. Such protections may also need to be supplemented by other measures. For example, SECI/NTPC could consider extending and linking the benefit of indexed auctions only to discoms that are prepared to implement quantifiable operational improvements, as per reform paths outlined in UDAY or otherwise.

The Discom View

Discoms will no doubt benefit from materially lower RE tariffs achieved via indexation when compared with cash outflows resulting from incremental capacity that is auctioned under a flat tariff regime. But flat tariffs have been declining for several years, and that decline is expected to continue into the future.

So just how big is the indexation benefit likely to be? Assuming that flat solar tariffs decline at 2.5% year over year for the next five years, they will reach Rs2.13/kWh by 2025/26. The table below quantifies savings to discoms from indexation under this scenario.

Figure 5: Discoms Saving for the First Five Years With Indexed Tariffs

	FY2021/22	FY2022/23	FY2023/24	FY2024/25	FY2025/26
Incremental solar capacity additions (GW)	35	35	35	35	35
Solar tariffs (Rs/kWh)	2.36	2.30	2.24	2.19	2.13
Discoms annual cash outflows (Rs crore)	18,089	35,681	52,426	68,312	83,371
Indexed solar tariffs for incremental solar capacity with annual indexation rate of 2.20% up to 15 years					
First year tariffs for incremental capacity (Rs/kWh)	2.00	2.00	2.00	2.00	2.00
Post Indexation tariffs for Year-15 to Year-25 (Rs/kWh)	2.71	2.71	2.71	2.71	2.71
	FY2021/22	**FY2022/23**	**FY2023/24**	**FY2024/25**	**FY2025/26**
Discoms annual cash outflows (Rs crore)	15,330	30,958	46,890	63,132	79,689
Discom annual savings (Rs crore)	**2,759**	**4,723**	**5,536**	**5,180**	**3,681**
Total for 2021-2025 (Rs crore)			**21,880**		
Total for 2021-2025 (US$bn)			**3.0**		

Source: IEEFA and CEEW-CEF estimates

As Figure 5 shows, the pulling-forward of potential savings to discoms can be significant. Such savings can amount to Rs21,880 crore (US$3bn) over a five-year period even if solar tariffs continue to decline.

The effectiveness of indexed solar tariffs in displacing coal is likely to have a finite window, closing as flat solar tariffs inch towards Rs2.00 levels (post 2025/26 in Figure 5). At such levels, indexed tariffs may no longer present a superior near-term advantage over flat tariffs in displacing coal. However, if continued savings for discoms are still deemed necessary thereafter, then a new indexation structure would have to be worked out, with suitably lower (as compared to Rs2.00) first year tariffs.

It is worth highlighting in this context that ultra-low-cost solar, even if achieved over a finite indexation window, is still likely to contribute to the closures of end-of-life coal plants – those for which it is unviable to install emission control systems and inefficient plants that are not able to operate flexibly to provide better grid balancing.

The Central Electricity Authority's (CEA) optimal generation mix report predicts that in order to allow 450GW of renewable capacity by 2030 on the grid, coal-fired power plants will have to operate flexibly – closer to their minimum required loads, which could see their utilisation rates limited to 58%. Operating coal-fired power plants at minimum required loads incurs significant thermal losses. This will push coal-fired power plants' average power generation costs up even further.

Moreover, as per the Supreme Court (SC) of India's order, the coal-fired power plants that currently do not have emission control systems must retrofit them to be environmentally compliant or be retired by 2022.[8] Edelweiss Securities estimates that breaking-even on the capital costs of the implementation of emission control systems in coal-fired power plants would require a tariff hike of Rs0.63-0.93/kWh.[9] Such an expensive investment would not be viable for older coal-fired power plants nearing their end of life and would make them prime candidates for displacement by cheaper renewable energy sources.

Conclusion

Ensuring India's ambitious energy transition remains on track requires policy interventions on multiple fronts. Interventions that can accelerate the mobilisation of the required hundreds of billions of dollars of capital are vital. Tackling the long-standing issues facing discoms is no less important – in fact, discom reform has become a pre-requisite for sustained electricity system growth in India – and so in this report we propose an interim solution that will provide discoms with vital breathing room to implement more durable and lasting reforms.

Given the scale of India's RE targets, it is also inevitable that coal-fired capacity will bear the brunt of the increasing shift to RE. Lower RE tariffs achieved via indexation will put even further downward pressure on the utilisation rates of coal-fired plants. Discoms would be further incentivised to not just grow purchase of RE, but to switch to RE (from end-of-life coal plants).

This should not come as a surprise. A calibrated and accelerated phasing out of the most inefficient and uneconomical constituents of India's coal-fired fleet is already long overdue, leaving more efficient, flexible, newer coal plants with emission control equipment installed to optimise the balancing of India's electricity grid demand. This would reinforce India's position centre stage in the global push towards a more sustainable, lower emissions world economy, aligned with the recent leadership announcements of China[10] and the European Union.[11]

[8] Reuters. India's top court rejects power companies' bid to extend emissions deadline. 23 June 2020.
[9] Financial Express. Power sector needs Rs 9.4 lakh crore investment to curb emission. 9 April 2019.
[10] Centre for Research on Energy and Clean Air. China's 2060 climate pledge: long-awaited breakthrough or sugar-coating another decade of rising emissions?
[11] Financial Times. EU climate target is ambitious but feasible.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

About CEEW-CEF

The CEEW Centre for Energy Finance (CEEW-CEF) is an initiative of the Council on Energy, Environment and Water (CEEW), one of Asia's leading think tanks. It was launched in July 2019 in the presence of H.E. Mr Dharmendra Pradhan and H.E. Dr Fatih Birol at Energy Horizons.

CEEW-CEF acts as a non-partisan market observer and driver that monitors, develops, tests, and deploys financial solutions to advance the energy transition. It aims to help deepen markets, increase transparency, and attract capital in clean energy sectors in emerging economies. It achieves this by comprehensively tracking, interpreting, and responding to developments in the energy markets while also bridging gaps between governments, industry, and financiers. cef.ceew.in

About the Authors

Gagan Sidhu

As an Adviser, Gagan Sidhu supports the CEEW-CEF team with a particular focus on clean energy markets and the finance ecosystem. He was previously CFO of GMR Renewable Energy, and prior to that, he worked in the investment banking industry across multiple geographic locations (Tokyo, Singapore, London, Dubai & Delhi), where his various roles covered M&A, capital markets, straight & structured lending and cross-sell. Gagan holds a BA (Hons) degree in Economics from Delhi University's Shri Ram College of Commerce, and an MBA from Duke University.
gagan.sidhu@ceew.in

Kashish Shah

Kashish Shah, a Research Analyst at IEEFA, has a master's degree in economics from the University of Sydney and an engineering degree from NMIMS University in Mumbai. Kashish has worked in the Global Analytics Division of the Royal Bank of Scotland with a focus on regulatory policies. He has research experiences in India's public sector in his work for a member of the Indian Parliament and a University of Sydney-based research group. kshah@ieefa.org