

India's Questionable Ultra Mega Power Plans

Viability Issues Continue to Complicate New Coal-Fired Projects



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Jai Sharda, Editorials

Tim Buckley, Director of Energy Finance Studies, Australasia

Executive Summary

Indian energy policy has undergone a radical transformation over the past few years, a shift that has gained momentum since the Modi government took power in 2014.

Current initiatives include a huge renewable-generation expansion program that aims to increase renewable capacity to 175 gigawatts (GW) by 2022, of which 100GW would be solar. This ambitious program has shown much promise in the early stages, with India's total installed solar capacity almost doubling to 7GW in the year to March 2016 and with prices of solar electricity declining by more than 65% since 2010.

Other key aspects of India's electricity sector transformation include increasing domestic coal production to 1,500 Mtpa by 2022—a shift meant to eliminate thermal coal imports altogether—and initiatives aimed at containing demand growth through efficiency and grid-improvement programs and increasing the utilisation of existing power plants while shutting older, inefficient plants.

An important moment in the overall electricity sector transformation occurred in June 2016, when it was reported that the Indian Power Ministry had proposed scrapping plans for four coal-fired Ultra Mega Power Plants (UMPPs), in Chhattisgarh, Karnataka, Maharashtra and Odisha. This is the first such cancellations since a UMPP development policy was first proposed in 2005/06 and serves as a clear acknowledgement of multiple difficulties associated with the development of large-scale coal power plants.

The cancellation of these UMPPs also underlines a policy shift toward long-term energy security through the development of domestic coal-mining capacity and the cessation of thermal coal imports.

Nonetheless, and despite the recent major changes in India's energy policy, the government has gone ahead with the bidding process for two UMPPs, at Bhedabahal, Odisha and Cheyyur, Tamil Nadu. Private investors pulled out of both projects in 2014/15 owing in part to doubts about bidding restrictions imposed by the Design, Build, Finance, Operate and Transfer (DBFOT) model. Another major issue with the bidding guidelines: Limitations on how much developers can pass on increases in fuel costs, exposing investors to fuel-price and exchange-rate risk.

Almost by definition, UMPPs are delayed by approval and construction complications. One clear impact of these delays is on the cost of building these plants. One result of such delays: higher capital costs, which make such project even less viable and increase the risk of these projects becoming stranded assets.

Other hurdles to the viability of UMPPs in India: a doubling of coal taxes three times in the past four years and the overleveraged condition of the Indian electricity sector in generation, a situation combined with a high amount of stress in the Indian banking sector that makes it difficult for proposed UMPPs to raise debt financing.

While recently revised guidelines for the UMPPs address some roadblocks that private bidders faced in raising finance for the projects, important questions remain. Land-acquisition rules for the projects are ambiguous, a tangle of litigation promises further delays, and likely tariffs required on UMPP electricity would drive electricity prices up. Further, a significantly improved power supply scenario in Tamil Nadu has reduced the need for a project like Cheyyur UMPP. IEEFA's research suggests that electricity consumers would be better served by an improvement

in the finances of Tamil Nadu Generation and Distribution Company and a focus on eliminating Aggregate Technical and Commercial losses rather than building more power generating capacity. An additional core problem with UMPPs like Cheyyur: reliance on outdated supercritical technology.

Against the backdrop of research that shows the imprudence in expanding coal-fired electricity generation, India's impressive solar expansion has been accompanied by impressive price declines. The required tariff for solar power has dropped recently to Rs 4.4/kWh (~US\$ cents 6.5) from Rs 12.5/kWh (~US\$ cents 19.0) –a 65% decline. The cost of solar power has plunged in other parts of the world as well, with records being set in countries that include Dubai, Mexico and Peru.

IEEFA notes that the greatest advantage in solar power is its deflationary nature.

Because the operating costs of a solar power plant are very small (sunshine is free), overall costs remain flat across the life of a project. Fossil-fuel-based power plants, by contrast, are saddled with perennial fuel costs that can increase each year and that are prone to inflation.

Electricity from some existing coal-fired plants in India today is more expensive than solar power. As time goes by, more and more coal-fired plants in India will become costlier to operate than solar-powered sources.

Considering all these issues, IEEFA recommends that the Indian UMPP program be seriously reconsidered.

1.0 Shift in Indian Energy Policy - Cancellation of Four UMPPs

Indian energy policy has undergone a radical transformation over the past few years, a shift that has gained momentum since the Modi government took power in 2014.

An IEEFA [report](#) in August 2015 captured this movement, noting the emphasis on boosting overall system efficiency and documenting how India has undertaken a huge renewable power capacity addition program, targeting 175GW of renewable energy capacity by 2022, of which 100GW would be solar capacity. The renewables program has shown much promise in the early stages, with India's total installed solar capacity almost doubling to 7GW in the year to March 2016 and with prices of solar electricity declining by over 65% since 2010.

Other key aspects of India's electricity sector transformation include increasing domestic coal production to 1,500 Mtpa by 2022, containing demand growth through energy efficiency and grid efficiency programs and increasing the utilisation of existing power plants while shutting down old, inefficient plants.

India's electricity demand containment policy was evident in an Indian Power Ministry's April 2016 announcement¹ that scaled back the national thermal power capacity target from 289GW to 239GW by 2022, a decrease of 17%. In terms of utilisation, the average Plant Load Factor (PLF) of thermal power plants in India for 2015-16 was 54%,² while coal-fired power plants operated at a six-year-low PLF of around 58%, down from 75% in 2010-11.³

India has also made significant recent progress in boosting domestic coal production, with the state-owned Coal India Limited (CIL) increasing production to 539 million tonnes (Mt) in 2015/16 from 494Mt in 2014/15 and 463Mt in 2013/14,⁴ an annualised increase of 7.9%. This is a significant change in trend from 2011/12 to 2013/14, when CIL's production increased by only 3.0% annually.

As part of the Power Ministry's initiative to improve power plant efficiency, the state-owned NTPC, which is also the largest power player in India, is planning to build new plants based on more efficient technology at the site of existing plants rather than extending the life of old plants.⁵

In order to improve system efficiency, India's Central Electricity Authority (CEA), announced plans in May 2016 to close up to 37GW end of life coal plants that use out-dated subcritical technology – about 20% of India's installed coal-fired power generation capacity. The chairman of CEA, S.D. Dubey stated: "Our first concern is emissions ... We also want plants to be more efficient in use of resources."⁶

¹ http://www.business-standard.com/article/economy-policy/centre-scales-down-power-demand-forecast-116042500050_1.html

² IEEFA's calculated figures for overall capacity utilization in India are different from those published by the CEA. Refer Annexure III for details

³ http://cea.nic.in/reports/annual/thermalreview/thermal_review-2010.pdf

⁴ <https://www.coalindia.in/en-us/performance/physical.aspx>

⁵ http://www.business-standard.com/article/companies/ntpc-plans-new-plants-at-old-sites-116071401364_1.html

⁶ <http://www.livemint.com/Industry/QkD9eo3lrSVj1sxV3ubB9K/India-seeks-to-shut-12-of-power-capacity-in-antipollution.html>

As a result of these policy developments, the Power Minister stated publically in June 2016 that India could do without adding any new thermal capacity for the “next 5-6 years.”⁷ A separate media report quoted a Power Ministry official as saying that India would not need new thermal capacity for the next three years beyond what was already under construction.⁸

1.1 Cancellation of Four Proposed UMPPs

An important moment in India's electricity sector transformation occurred in June 2016, when it was reported that the Indian Power Ministry had proposed scrapping plans for four UMPPs – in Chhattisgarh, Karnataka, Maharashtra and Odisha – owing to “lack of interest from the host states.”⁹ This marked the first cancellation of UMPP proposals since UMPP policy was first proposed in 2005/06 and served as a clear acknowledgement of multiple difficulties associated with the development of large-scale coal power plants.

The reasons cited for the cancellation:

- a. Prolonged delays in land acquisition for the plants; and
- b. Electricity surpluses in the four Indian states that were to have hosted the UMPPs (two years ago these states had significant power deficits).

Two of the four cancelled UMPPs were to have been built at coastal locations utilising imported coal. Their cancellation underlines a policy shift toward long-term energy security through the development of domestic coal-mining capacity and the cessation of thermal coal imports.

Recent trends in the Indian electricity sector are reflected in S&P Global Platts' forecast that India's dependence on coal-fired power generation will drop from an estimated 69% share in 2020 to 60% by 2030 after peaking at 75% in 2015.¹⁰ IEEFA sees India's reliance on coal-fired power generation dropping faster—to 60% by 2025—because of a much faster than widely expected decline in the role of coal-based power in India's evolving energy mix.

⁷ <https://youtu.be/OI5DPshLfQ0>

⁸ <http://economictimes.indiatimes.com/industry/energy/power/india-wont-need-extra-power-plants-for-next-three-years-says-government-report/articleshow/52545715.cms>

⁹ <http://economictimes.indiatimes.com/industry/energy/power/government-plans-to-scrap-four-spvs-set-up-for-umpps-due-to-lack-of-interest-from-host-states/articleshow/52663606.cms>

¹⁰ <http://www.platts.com/videos/2016/june/snapshot-coal-energy-mix-060916?hootpostid=ab01bd6df9f5890f00378ed0e758814a>

2.0 Existing Coal Capacity Is Sufficient to Meet India's Needs Until 2022

In August 2015, IEEFA released a comprehensive [study](#) on the transformation of the Indian electricity sector. A key finding of the report was that the Coal Ministry's target of producing 1,500Mtpa by 2021/22 would leave India with significantly more coal on its hands than it needed. The study put the annual increase in electricity demand at 7.1%. However, in 2015/16, generation increased less than that, by 5.6% year-on-year.¹¹ As a result of the subdued increase in demand and a rapid increase in coal production (CIL increased coal production by 8.5% in 2015/16¹²), coal inventories at Indian power plants more than doubled in the year up to January 2016.¹³

The rising coal inventories and lower-than-expected consumption of coal means there are few takers for greater volumes of CIL production, prompting the Coal Ministry to direct state-owned power generation companies to cease importing and use CIL's coal instead.¹⁴ In the same statement announcing that direction, the Coal Ministry acknowledged that CIL's production target of 1 billion tonnes by 2020 may lead to massive oversupply, given that even at current production rates not all of the coal CIL is producing is being consumed.

IEEFA estimates that India's coal-fired power plants in 2015/16 operated at a Plant Load Factor (PLF) of only 58.0%, generating 97.6% of the official electricity generation target.¹⁵ IEEFA estimates that of the estimated 491TWh incremental gross electricity production requirement between 2014/15 and 2021/22, coal-fired power plants will need to provide only 151TWh.

Given these trends, IEEFA sees the average PLF of coal-fired power plants increasing to only ~65.2% by 2021/22, assuming no additional coal power plants are commissioned in the interim. However, as per data compiled by Global Coal Plant Tracker, India has 65.0GW of coal-fired power capacity under various stages of construction. On the other hand, Indian policymakers are looking to shut down 37.0GW of coal-fired generating capacity from old, inefficient subcritical technology.¹⁶ Taking into account these shutdowns, and assuming the commissioning of the under-construction power generation capacity, the average PLF of coal-based power plants in India would fall to 56.7% by 2021/22, given projected energy demand. There is no need, then, for new Greenfield coal-fired plants – in particular for the proposed UMPPs – for at least the next five years. Considering the breakneck speed at which progress is being made in renewable energy and grid efficiency across India and in storage technology globally, and considering that these coal-based plants require an investment commitment of 40 years or more, the government would be well advised to withhold adding excess capacity.

The Power Minister has acknowledged as much, as when he said at a June 2016 press conference that India has “sufficient capacity for the next 5-6 years.”¹⁷ A separate assessment

¹¹ <http://powermin.nic.in/content/overview>

¹² <http://www.livemint.com/Industry/X3fOGm3EMrp7X6vqbjO7OM/Coal-India-achieves-536-million-tonnes-output-in-fiscal-2016.html>

¹³ <http://www.platts.com/latest-news/coal/london/indian-power-plant-thermal-coal-stocks-rise-further-26353652>

¹⁴ <http://www.financialexpress.com/article/industry/companies/govt-asks-state-gencos-to-stop-imports-buy-coal-from-cil/287742/>

¹⁵ http://www.cea.nic.in/reports/monthly/executivesummary/2016/exe_summary-03.pdf

¹⁶ <http://www.livemint.com/Industry/QkD9eo3lrSVj1sxV3ubB9K/India-seeks-to-shut-12-of-power-capacity-in-antipollution.html>

¹⁷ <https://www.youtube.com/watch?v=Ol5DPshLfq0&feature=youtu.be>

by the Power Ministry points out that India does not need to add any greenfield thermal power plants for the next three years.¹⁸

Figure 2.1 – Existing capacity sufficient to meet India's power needs beyond 2022

Incremental Electricity required from Coal between FY2015-16 and FY2021-22 (TWh)	173
Average Thermal plant capacity in India 2015-16 (MW)	199,790
Indian Average Coal plant capacity in 2015-16 (MW)	174,900
Indian Average Gas plant capacity in 2015-16 (MW)	23,780
Indian Average Diesel plant capacity in 2015-16 (MW)	994
Thermal Units generated (TWh)	943
India Thermal Plant Load Factor (PLF) in 2015-16	53.9%
Gas Units generated (TWh)	52
India Gas PLF in 2015-16	24.8%
Oil Units generated (TWh)	3
India Oil PLF in 2015-16	29.0%
Coal Units Generated (TWh)	889
India Coal PLF in 2015-16 (%)	58.0%
Coal Units required in 2022 (TWh)	1,062
Existing Coal Capacity in April 2016 (GW)	186
Coal Plants PLF in 2021-22 assuming no capacity addition (%)	65.2%
Coal Plants PLF in 2021-22 assuming 37GW Shutdown and 65GW construction (%)	56.7%

Source: CEA, IEEFA Research Estimates

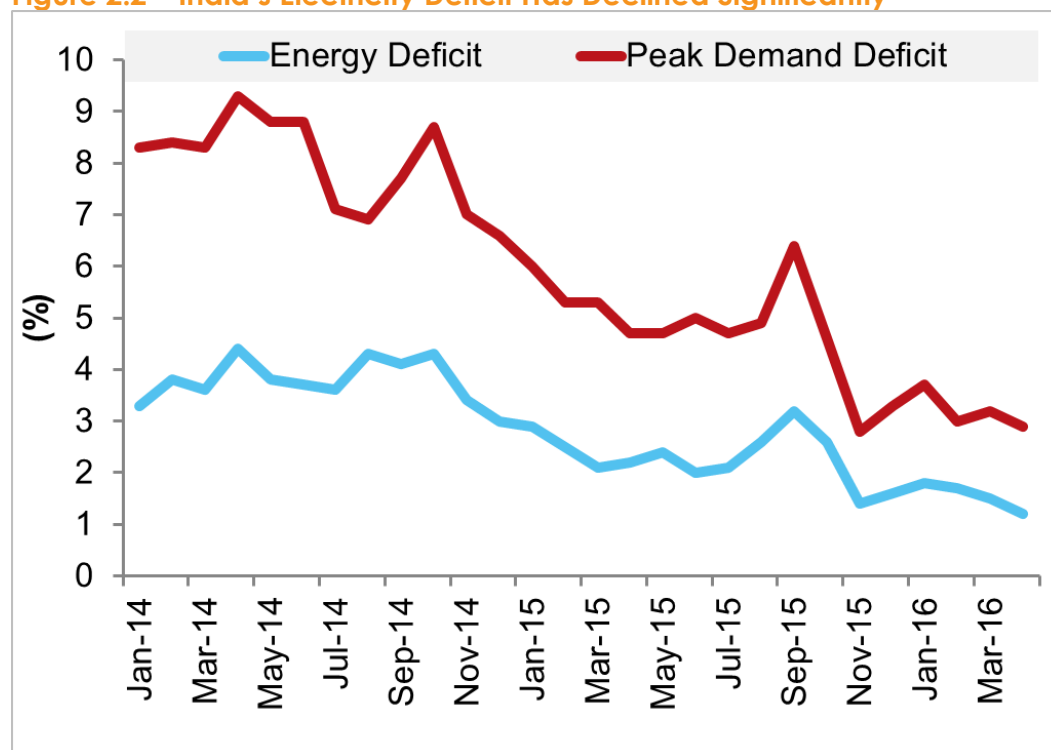
¹⁸ <http://economictimes.indiatimes.com/industry/energy/power/india-wont-need-extra-power-plants-for-next-three-years-says-government-report/articleshow/52545715.cms>

2.1 Surplus Power in India in 2016/17

There are other clear signs that India may have underutilised capacity.

India's overall energy power deficit has fallen in recent years, from 3.3% in January 2014 to 1.2% in April 2016. In 2015/16, India's peak energy deficit stood at 3.2%, while its overall energy deficit was 2.1%. CEA projects that India will have no energy deficit at all in 2016/17, with a peak surplus of 2.6% and an overall surplus of 1.1%,¹⁹ highlighting the current excess power generation capacity in India.

Figure 2.2 – India's Electricity Deficit Has Declined Significantly



Source: CEA

¹⁹ <http://www.cea.nic.in/reports/annual/lgbr/lgbr-2016.pdf>

3.0 Push for New UMPPs Despite Problems With Older Ones

3.1 India's UMPPs Model Has Seen Little Success

India's Ministry of Power launched its ambitious Ultra Mega Power Project (UMPP) program in 2005/06, aiming to develop 16 thermal power plants with a capacity of 4,000MW each and with an aim to deliver power at "competitive rates." However, the program has achieved little success. Only four UMPPs have been awarded to date, two of those four projects have been abandoned and the two operational ones are facing a host of problems, including cost overruns, unforeseen coal-supply troubles, litigation. Four additional proposed UMPPs were cancelled in June 2016.

Nonetheless, and despite recent major policy changes in India's energy policy, the government has gone ahead with the bidding process for two more UMPPs – in Bhedabahal, Odisha and Cheyyur, Tamil Nadu.

Private investors pulled out of both projects in 2014/15 owing in part to doubts about the Design, Build, Finance, Operate and Transfer (DBFOT) model.

Guidelines mandated that ownership of the plant be transferred to the government after the concession period, a stipulation that kept potential bidders from getting financing.^{20 21}

Another major issue with the bidding guidelines: Limitations on how much developers could pass on increases in fuel costs, from either higher international coal prices or exchange rate, to consumers, a restriction that exposed the plants' operator to fuel-price and exchange-rate risk.

Both issues were highlighted in IEEFA's May 2015 [paper](#) questioning the Cheyyur UMPP's financial feasibility.

3.2 Continuous Delays in Bidding for Proposed UMPPs

Delays have plagued the UMPPs at Bhedabahal, Odisha, and Cheyyur, Tamil Nadu, especially over the past two years.

Although the Bhedabahal plant was originally scheduled to be commissioned by 2013,²² bidding on the project (and on the Cheyyur plant) was not initiated until 2014. Then, because of doubts about the process, bidders backed out, and bidding was cancelled.

²⁰ <http://archive.financialexpress.com/news/adani-sterlite-gmr-jindal-power-pull-out-of-umpp-bidding-process/1298838>

²¹ <http://timesofindia.indiatimes.com/business/india-business/Pvt-cos-wont-bid-for-UMPPs-till-norms-change/articleshow/45644892.cms>

²² <http://www.kseboa.org/news/sundergarh-ultra-mega-power-project-in-orissa-by-2013-2212419.html>

At the time of bid cancellation, in January 2015, it was reported that the bidding guidelines would be revised “in a couple of months,”²³ but new guidelines were not offered until the end of 2015.²⁴ In January 2016, the Power Minister was quoted in a media report that bidding for two or three UMPPs would be conducted by March 2016 and for two more by June 2016.²⁵ In April 2016, it was reported that the standard bid document for domestic coal-based UMPPs would be submitted for Cabinet approval in early May 2016, while the standard bid document for imported coal-based UMPPs was still being finalised.²⁶

Guidelines indicated that the bidding process itself would take about 300 days from the finalisation of the Request for Qualification (RFQ).

In June 2016, the Power Minister said that bidding for the UMPPs would be conducted “at an appropriate time.”²⁷ He also stated that because of past experiences in which the bidding process did not lead to plant construction, the government wanted to ensure that pre-conditions for bidding were met. These conditions included environmental approvals, availability of water, and most important, the host state’s commitment, especially in providing land. Notably, the inability of the host states to procure land was one of the key reasons behind the scrapping of the four proposed UMPPs.

3.3 Capital Costs of UMPPs Have Increased

One clear impact of these delays is on the cost of building these plants. The investment required for building a 4,000MW UMPP has been revised upwards by 35% from Rs20,000cr (~US\$3bn) to Rs27,000cr (~US\$4bn). The reason cited for this increase was “a rise in prices of coal and land,”²⁸ although coal prices increases in fact would not affect capital costs. The more likely reasons for the required-investment increase probably comes from inflation in the cost of machinery required to comply with more stringent emission standards as well as from the expenses in procuring land for such plants.

These capital requirements may be understated, given that the Sasan UMPP, commissioned in 2015 by RPower, entailed an investment of Rs27,000cr (~ US\$4bn).²⁹ Similarly, the Request for Qualification (RFQ) document for the Cheyyur UMPP, made public in September 2013, specified a project cost of Rs24,200cr (~ US\$3.6bn).³⁰ Additionally, a plant recently approved by the Cabinet is estimated to cost US\$1.3bn/GW, whereas the power ministry’s guideline for cost of UMPPs is only US\$1.0bn/GW.

²³ http://www.business-standard.com/article/specials/horror-and-its-layers-114060601215_1.html

²⁴ http://www.business-standard.com/article/economy-policy/centre-drafts-imported-coal-based-umpp-guidelines-115122900919_1.html

²⁵ http://articles.economicstimes.indiatimes.com/2016-01-27/news/70120527_1_umpps-power-minister-piyush-goyal-ultra-mega-power-projects

²⁶ <http://economicstimes.indiatimes.com/industry/energy/power/cabinet-likely-to-approve-umpp-bid-paper-soon-says-piyush-goyal/articleshow/51979346.cms>

²⁷ <https://youtu.be/OI5DPshLfQ0>

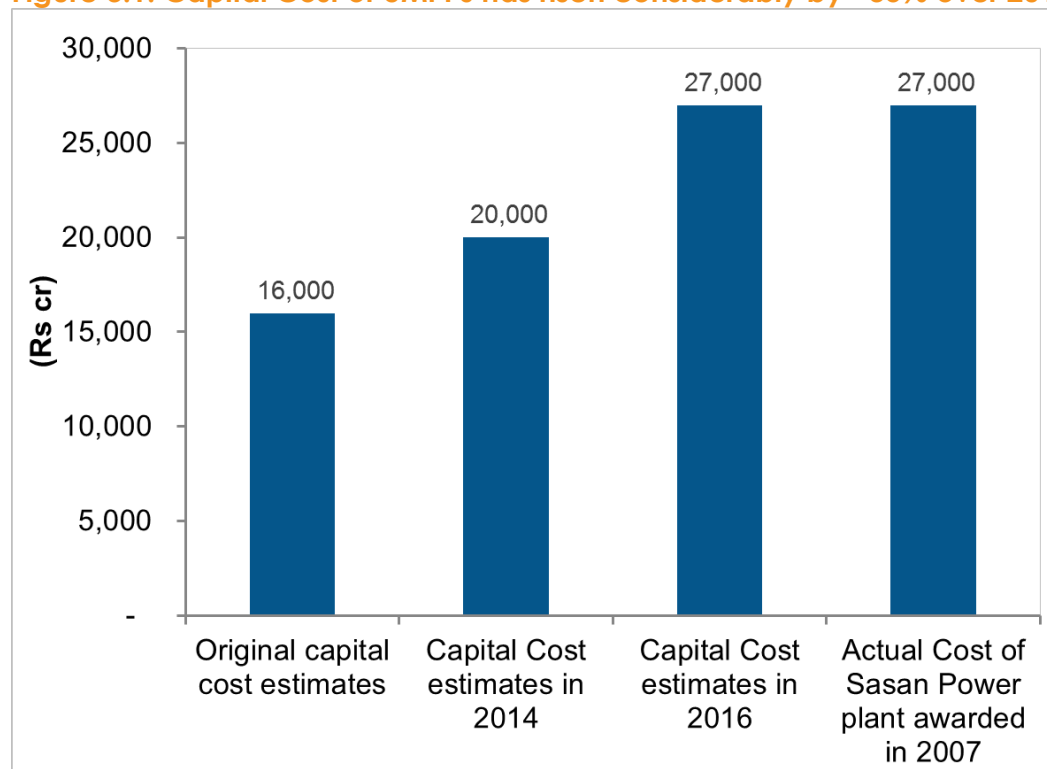
²⁸ http://articles.economicstimes.indiatimes.com/2016-01-27/news/70120527_1_umpps-power-minister-piyush-goyal-ultra-mega-power-projects

²⁹ http://www.business-standard.com/article/companies/rpower-cuts-its-losses-as-it-focuses-on-growth-115060801158_1.html

³⁰ http://www.pfcindia.com/writereaddata/WhatsNew/CTNPL_RFQ_UMPP_26-Sep-13.pdf

Cost estimates have increased with each delay making the proposed UMPP projects even less viable and increasing the risk of these projects becoming stranded assets. Even at the original lower cost estimates, the price of electricity produced from the imported coal-fired Cheyyur plant would have placed significant inflationary pressures on electricity rates.

Figure 3.1: Capital Cost of UMPPs has risen considerably by ~35% over 2013/14 to 2015/16



Source: Ministry of Power - Government of India, IEEFA Research

3.4 Increase in Coal Tax to Add Further to Costs, Investor Risk

After doubling the coal tax on domestically mined as well as imported coal in 2014/15 and then again in 2015/16, the government announced yet another doubling for 2016/17, increasing the tax to Rs400/t (US\$5.90/t) from Rs200/t (US\$2.90/t).

India's Finance Minister argued that the increase was justified as a way to internalise some of the cost externalities that result from the use of coal. This is a significant cost increase for coal-fired power plants, with the revised cess amounting, for example, to about 10% of the price of 6,000 Kcal/kg GCV imported coal.

IEEFA estimates that the increase will result in a Rs 0.15/kWh additional tariff requirement for imported coal. The coal cess burden will be passed on to the Discoms by the power producers, which would either recover it from consumers or bear it as a subsidized loss.

Such a tax is not unique to India; in fact, it is part of a global trend as part of policies aimed at mitigating climate change. In Australia, the Victorian government has announced a tripling of the brown coal royalty rate beginning in January 2017.³¹ Similarly, South Korea, which put a coal tax in place in 2014, increased that tax by 30% in July 2015 to US\$22/t.³²

Part of the backdrop to these increases is a June 2016 International Energy Agency (IEA) report, "Energy and Air Pollution," that concedes that electricity production is "the most important source of air pollution coming from human activity." The report concludes that large externalities in terms of air and particulate pollution will be reduced only with significantly higher investments in measures that avoid or reduce emissions. Such trends only make coal-fired power more expensive.

The fact that the government has doubled coal taxes three times in the past four years is an obvious indication of its commitment to policy change. There may be more to come, a possibility that poses a very clear threat to coal-fired power plants and one that increases investors' risk perception of coal-based power plants, leading them to demand more return on their investment to compensate for the higher risk.

The coal cess increases and the investor risk they pose is yet another hurdle to the construction of Indian UMPPs.

3.5 Financing Issues: Bank NPAs

Indian domestic banks have been hurt in the recent past by problems associated with successive and rising Non Performing Advances (NPA)s. The Reserve Bank of India's (RBI) June 2016 Financial Stability Report (FSR) highlights how Indian Banks' Gross Non-Performing Advances (GNPAs) have risen sharply to 7.6% of gross advances in March 2016 from 4.6% in March 2015, with Stressed Assets increasing to 11.5% from 11.1%.³³ RBI expects the GNPAs to increase to 8.5% in March 2017 under the baseline scenario of its macro stress test. If the macro scenario deteriorates further, GNPAs may increase to a massive 9.3% by March 2017, undermining the very stability of the Indian financial system and retarding sustainable growth.

The power sector remains a root cause of these NPAs, with the RBI's sectorial credit stress test indicating that a shock to the power sector would have the most significant impact on banking-sector profitability. As per RBI estimates, the power sector constituted 11.0% of the total stressed advances of Indian banks, while constituting only 7.8% of the total advances.

The June 2016 FSR highlights that the annual credit growth of the Indian Banking system slowed to 8.8% in March 2016, as opposed to 9.4% in September 2015, indicating the cautious approach Indian banks have toward lending in the current macroeconomic scenario. RBI's November 2015 FSR stated that banks have become more cautious while lending to the stressed power sector – a view reinforced by Indian bankers.³⁴

³¹ <http://www.theage.com.au/victoria/victorias-own-mining-tax-to-triple-as-treasurer-gouges-brown-coal-for-revenue-20160422-gocymk.html>

³² <http://www.sightline.org/2015/06/26/south-korea-to-boost-its-coal-tax/>

³³ https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/6_CH264F22FA79FA64F798EEDB1EC37CF03A8.PDF

³⁴ http://articles.economicstimes.indiatimes.com/2015-07-14/news/64406206_1_power-sector-india-inc-state-power-utilities

RBI itself has enforced stricter norms for banks while they make provisions for NPAs. This issue is clearly reflected in the March 2016 Quarterly results of ICICI Bank, India's second largest Bank, which reported a profit decline of 76% year on year because of higher provisioning for NPAs.³⁵

The high amount of stress in the Indian banking sector will increase the difficulty for proposed UMPPs to raise debt financing.

3.6 Indian Power Producers Are Already Highly Leveraged

The Indian power sector is highly leveraged. The average debt-to-equity ratio of six of the top publicly listed power sector companies has risen from 1.5x in 2010/11 to 2.7x in 2015/16 – an increase of 80%.

Figure 3.2: Indian Power Sector companies are highly leveraged

S.No	Company	Leverage* (2010-11)	Leverage* (2015-16)
1	NTPC	0.7	1.2
2	Adani Power	3.8	6.7
3	JSW Energy	1.6	1.7
4	Jindal Steel and Power Ltd	0.9	2.3
5	Tata Power	1.7	2.8
6	Reliance Power	0.3	1.5
Average		1.5	2.7

Source: Company filings

Note: *Leverage is represented by the Debt-to-Equity ratio

This is a record high for this sector, indicating that companies will need to pare down debt rather than take on more. Coupled with the high NPAs in Indian banks, this significantly reduces the ability of power-sector players – the potential bidders for the proposed UMPPs – to raise the debt required to build UMPPs. IEEFA would note that given the different nature of PPAs and cash-flow guarantees from the central government, solar investment in India is being characterised by comparison as infrastructure lending, a separate and far less constrained sector of new bank lending. This difference is a key factor behind the rapid uptake of solar investment in India.

3.7 Indian Power Producers Have Underperformed Dramatically For Five Years

Over the past five years, the market value of the top Indian power companies has fallen significantly as well. Only one of the six biggest publicly listed power sector companies – JSW

³⁵ <http://www.livemint.com/Companies/BipmeIW44WVUjG47A2kvIO/ICICI-Bank-Q4-profit-plunges-76-to-Rs70189-crore-on-except.html>

Energy – has seen an increase in its stock price. The stocks of the remaining five companies have declined by 19% to 89%. In comparison, the general equity markets, measured by the BSE Sensex, have increased 47% in value over the same period. This sharp drop in these stocks also indicates the difficulty of these companies to raise equity and highlights the market assessment of a failed investment program by the sector overall.

Figure 3.3: Stock Prices fall of Indian Power Sector companies

S.No	Company	Change in Stock Price (2011-2016)
1	NTPC	-19%
2	Adani Power	-73%
3	JSW Energy	23%
4	Jindal Steel and Power Ltd	-89%
5	Tata Power	-41%
6	Reliance Power	-56%
Average		-43%
BSE Sensex		47%

Source: www.moneycontrol.com

4.0 New UMPP Guidelines

In an effort to revive the UMPP program, the government made new UMPP guidelines for the auction of Cheyyur plant public at the end of 2015. The guideline authors have tried to address questions raised by private players in the previous aborted bidding.

The key changes in the new guidelines:

- Adopting the Build-Own-Operate (BOO) model versus the Design-Build-Finance-Operate-Transfer (DBFOT) model;
- A revision of the land-acquisition policy by which “critical” land, i.e. land required for achieving the COD of the project, will be acquired by the project SPV before the bidding, while the “non-critical” land will have to be acquired by the winning bidder;
- Adoption of a mechanism that allows pass through increase in imported coal prices to the consumer under the CERC notification.

While the revised UMPP guidelines address some roadblocks that private bidders faced in raising finance for the projects, there remain important questions around the revised guidelines as well.

5.0 Issues With the Revised Guidelines

5.1 Land Acquisition Guidelines Are Ambiguous

The revised land acquisition guidelines state that the procurer will, in the name of an “Infrastructure Special Purpose Vehicle (SPV),” identify and acquire land that is “critical” to achieving the COD of the project. This land will then be leased to an Operating SPV. “Non-critical” land will be acquired by the winning bidder after the project is built.

A major issue with this scheme is that the procurer decides what land is “critical,” and the scheme lacks clarity on remedies in cases in which acquired land is less than required.

It is also ambiguous on what happens if “non-critical” land cannot be acquired at all. This ambiguity could create land-acquisition bottlenecks, even after significant construction has occurred. Moreover, land costs can rise significantly as a project proceeds, and there are limitations on how much costs can be passed through to the procurer, which means the project developer may end up having to absorb higher land costs. This flaw undermines the concept of the “plug and play” model of development, and is questionable on its face given that land acquisition issues have plagued many infrastructure projects in India — UMPPs included.

Social Impact Assessment and Environmental Impact Assessment requirements raise additional barriers to “non-critical” land acquisition.

Industry players have expressed serious reservations about the proposed guidelines on account of these issues.³⁶

5.2 The Fuel Price Pass-Through Clause Will Expose Consumers to International Coal Price and Currency Risks

The proposed guidelines include a mechanism that allows developers to pass coal price increases and foreign-exchange risk on to consumers.

This is an especially complex issue in the case of Cheyyur UMPP, since customers (primarily the people of Tamil Nadu) would end up bearing the risk of changes in international coal prices and currency markets over the long term. While international coal prices are now low, and expectations are for them to remain low for at least four or five years, there is no guarantee they will stay that way over the duration of the 25-40 year project. The people of Tamil Nadu would pay for any increase in the landed price of international coal.

While the guidelines include a provision by which the plant operator may be asked to get 30 percent of its coal from domestic sources when prices rise sharply, this provision can be used only once during the term of the PPA. Consequently, the potential hedging it provides is limited.

³⁶ <http://www.thehindubusinessline.com/economy/macro-economy/bids-for-mega-power-projects-industry-worried-over-land-acquisition-provisions/article7757965.ece>

6.0 Cheyyur UMPP – Still Plagued by Old Issues

In May 2015, IEEFA published a [report](#) questioning the feasibility of the proposed Cheyyur UMPP and recommending that it be shelved.

The main reasons:

1. High tariffs that would be two to five times that of a typical power plant, creating an upward pressure on wholesale electricity rates;
2. Dependence on imported coal, counter to the government's push to utilise more domestic coal;
3. An improved power supply/demand scenario in the state of Tamil Nadu; and
4. The fact that renewable power is now cheaper than the electricity Cheyyur UMPP would produce.

The report also highlighted land-acquisition delays as well as a court order related to irregularities in the environmental clearance process that bars the award of the bid before a judgement in the case.

Not much has changed over the past year. Although some progress has been made in land acquisition, almost all the issues raised by IEEFA persist.

6.1 National Green Tribunal Orders Prohibit Awarding of Tender

In October 2013, the National Green Tribunal (NGT) issued an injunction against finalising bids on the Cheyyur UMPP pending orders in a case related to environmental clearance granted to the captive port associated with the plant. While the bidding process can be carried out, no tender can be awarded, making the bidding process little more than a ritual.

6.2 Land Acquisition Far From Completion

Land acquisition has not even begun for railway siding, a coal conveyor corridor, ash pipeline and road access. Road access is especially critical, since the proposed location of the Cheyyur plant has little road connectivity, which would hamper delivery of plant-building equipment.

Even much of the land that has been acquired is tangled in litigation.³⁷ A stay order in the Madras High Court bars Coastal Tamil Nadu Power Limited (CTNPL) from taking possession of acquired land. CTNPL is the Special Purpose Vehicle required to obtain key clearances and that would be taken over by the winning bidder.

Notably, India's Power Minister has reiterated publically that policymakers are looking to initiate bidding for UMPPs in a true "plug-and-play" model. Such a model requires, however, that land

³⁷ See Figure 5.1

acquisition be done by the time a winning bidder is decided. Judging by the limited progress on land acquisition, the process looks set for additional delays, which will only drive up costs.

6.3 Estimated Plant Tariffs Remain High

In May 2015, the estimated levelized cost of electricity (LCoE) from the Cheyyur plant was Rs5.95/kWh. Since then, imported coal prices have dropped by about 2.1% and interest rates have declined by about 100 basis points. Meantime, coal taxes have doubled and, due to multiple delays, the cost of building the power plant has increased by about 12%.

The net result of changes in these factors is that the estimated LCoE for the plant has remained virtually unchanged, at Rs5.93/kWh. This cost assumes that there is no delay in the bidding process and that the plant is allocated to a winning bidder by the end of 2016. If there is a delay in the bidding process, the estimated LCoE will rise. The IEEFA estimate also assumes no increase in the coal cess through the life of the project, which is unlikely given that there have been three increases in the last four years.

The upward pressure on electricity rates that this plant will impose on the system will eventually lead to stress on household budgets, which in turn would create demand for public subsidies. In 2015/16, India's electricity consumption grew by 5.7%, down from 8.4% in 2014/15.³⁸ This slowdown suggests the inflationary pressures that this plant will impose on the electricity system are more uncalled for than ever.

6.4 Cheyyur Plant Faces Litigation on Several Fronts

Cheyyur UMPP remains tangled in litigation, including a case in which a court order bars CTNPL from awarding a bid until allegations are addressed around illegalities and fraud in the environmental clearance process.

Additional legal challenges continue to cast shadows over the bidding process.

³⁸ Indian Index of Industrial Production Data

Figure 6.1: Pending Litigation related to Cheyyur UMPP

Case/Court	Status	Interim Orders, if any
No. 151 of 2013 (SZ). Marimuthu v. Union of India. National Green Tribunal (South Zone), Chennai Challenges Environmental Clearance granted to captive port	Ongoing	Court restrained the Power Finance Corporation, 100 percent owner of the SPV Coastal Tamil Nadu Power Ltd, "from giving any final award to any third party in respect of any part of the project until further orders of the Tribunal."
No. 155 of 2013 (SZ) and RA No. 22 of 2014 in M.A. No. 222 of 2013. K. Saravanan v. Union of India. National Green Tribunal (South Zone), Chennai Challenges Environmental Clearance granted to power plant	Ongoing	None
No 155 of 2013 (SZ) - Conservation Action Trust and another. National Green Tribunal (South Zone), Chennai Challenging Environmental Clearance granted to power plant	Ongoing	None
No. 162 of 2013 (SZ) and MA 151 of 2014 (SZ). Ossie Fernandes, Chennai v. Union of India & Ors. National Green Tribunal (South Zone), Chennai Challenging Environmental Clearance to power plant	Ongoing	None
WP No. 3722 of 2015 – V. Durga Devi v. Union of India and Ors		Ordered status quo in respect of possession of land, in effect restraining the authorities from taking possession of acquired lands.

Source: National Green Tribunal, Madras High Court

6.5 A Significantly Improved Power Supply Scenario in Tamil Nadu Has Further Reduced Any Need for Cheyyur UMPP

Tamil Nadu – the state where Cheyyur UMPP is proposed to be located – has witnessed tremendous improvement in the power supply. From rampant power cuts a few years back, the state is able to meet all its demand from its existing capacity.³⁹ The peak power shortage in Tamil Nadu has declined from 506MW in May 2015 to only 11MW in May 2016 - a decline of 98%. For the year 2015-16, the peak power deficit for the year reduced to 0.3% of peak demand vs 1.2% of peak demand over 2014-15, while the overall power deficit in the same period has reduced from 3.1% to 0.7%.^{40 41} In terms of total power requirement, Tamil Nadu was able to meet its entire demand in May 2016. In comparison, there was a 2.7% deficit in May, 2015. Annexure I details the Tamil Nadu electricity sector.

Figure 6.2 - Tamil Nadu's Power Position has improved significantly

	2015-16	2014-15
Base Load		
Demand (mn units)	97,159	95,660
Supply (mn units)	96,469	92,652
Deficit (mn units)	690	3,008
Deficit (%)	0.70%	3.10%
Peak Load		
Demand (mn units)	14,217	13,663
Supply (mn units)	14,180	13,498
Deficit (mn units)	38	165
Deficit (%)	0.30%	1.20%

Source: CEA

In this much improved power scenario, where the existing capacity is sufficient to meet Tamil Nadu's overall electricity demand, there is little need for a baseload plant like the Cheyyur UMPP, especially considering the strong power capacity addition in Tamil Nadu expected in the near future. Over the next 3 years, nearly 9.9GW power capacity is expected to be commissioned in Tamil Nadu – 38.1% of the overall installed capacity in the state.

³⁹ <http://indianexpress.com/article/india/india-others/wind-new-power-projects-propel-jayalalithaas-tamil-nadu-shining-slogan/>

⁴⁰ http://cea.nic.in/reports/monthly/executivesummary/2015/exe_summary-03.pdf

⁴¹ http://cea.nic.in/reports/monthly/executivesummary/2016/exe_summary-03.pdf

Figure 6.3 – Significant power capacity addition planned in Tamil Nadu

S.No	Project Name	Fuel Type	Capacity (MW)	Cost (US\$mn)	Est. Commissioning Date
1	ILFS Cuddalore TPP U-2	Coal	600	796	2016-17
2	Tuticorin TPP (Ind. Barath) U-1	Coal	660	540	2017-18
3	Neyveli New TPP U-1	Lignite	500	443	2017-18
4	Neyveli New TPP U-2	Lignite	500	443	2018-19
5	Tuticorin TPP (SEPC Power) U-1	Coal	525	528	2018-19
6	Ennore SCETPP (Thiruvalluvar) U-1	Coal	660	744	2018-19
7	Ennore SEZ SCTPP TANGEDCO (Thiruvalluvar) U-1	Coal	660	736	2018-19
8	Ennore SEZ SCTPP TANGEDCO (Thiruvalluvar) U-2	Coal	660	736	2018-19
9	Adani Solar Plant	Solar	648	681	2016-17
10	Other Solar Projects	Solar	3,473	3,713	2016-19
11	Kudankalam U-2	Nuclear	1,000	1,300	2016-17
Total			9,886	10,660	

Source: CEA, IEEFA estimates

6.6 Cheyyur UMPP Fails to Address the Real Problems With the Tamil Nadu Electricity System

The real problem with the Tamil Nadu electricity system is not availability of power generating capacity but high indebtedness and grid transmission and distribution losses. The state's power distribution company, Tamil Nadu Generation and Distribution Company (TANGEDCO) had accumulated losses of Rs650bn (~US\$ 10bn) over the decade to March 2015. One of the key drivers of this indebtedness were losses incurred in transmission and distribution of electricity. The Aggregate Technical and Commercial (AT&C) losses in 2014-15 were an exceptionally high 24.4% (the global grid average is 6-8% and best practice is Germany at 4-5%). The high debt and the high losses incurred by TANGEDCO have prompted a recent downgrade to 'C+' in the annual integrated credit ratings of State Distribution Companies.⁴²

The Power Minister referred to the magnitude of the debt problem recently, highlighting how Tamil Nadu could save Rs224bn (US\$3.4bn) over three years by joining the Central Government's Ujwal Discom Assurance Yojana (UDAY) Scheme.⁴³

IEEFA's research suggests that the Tamil Nadu electricity consumers would be better served by an improvement in TANGEDCO's finances and if policymakers were to focus on eliminating AT&C losses rather than building more power generating capacity.

⁴² <http://www.thehindu.com/news/cities/chennai/tangedco-ranking-slips-to-c/article8805471.ece>

⁴³ <http://www.thehindu.com/news/national/tamil-nadu/centre-says-tn-can-save-rs-22400-crore-by-joining-uday-scheme/article8835761.ece>

6.7 Cheyyur UMPP Would Rely on Outdated Supercritical Technology

Indian energy policy is moving toward more efficient power generation and consumption in hopes of providing electricity for millions of people who do not have it and to do its part in the fight against climate change. The Indian Power Ministry's LED program,⁴⁴ the government's move to shut down end-of-life coal plants, and initiatives to improve grid transmission efficiency and inter-state connectivity all aim to achieve these goals.

The Cheyyur UMPP proposal and other UMPP proposals based on supercritical technology are clear aberration. By contrast, a compelling case can be made for future power plants to be developed using Ultra Supercritical (USC) technology in line with the other efficiency-improving developments in the Indian power sector.

Ultra-Supercritical technology, compared to Supercritical technology, would provide a net plant efficiency of up to 44%, reducing overall coal consumption. While the capital construction cost differential between the technologies varies from region to region, USC technology is on average about 12% more expensive than SC technology for the same capacity, as per IEA research. This difference highlights the true capital cost of the Cheyyur project. If the plant were to be built on the latest USC technology, in accordance with the Indian policy push for more efficient power solutions, the cost of its power would be higher, reflecting an honest internalisation of coal-fired costs.

⁴⁴ <http://pib.nic.in/newsite/mbErel.aspx?relid=114328>

Figure 6.4 – Capital Costs for Construction of New Coal Fired Power Plants (US\$m)

Project	Country	Technology	Technology Supplier	Completion	Capacity (GW)	Cost (US\$ bn)	Cost (US\$bn/GW)
Manjung Power Plant	Malaysia	USC	Alstom (France) and CMC (China)	2015	1.0	1.2	1.2
Tanjung Bin-4	Malaysia	SC	Alstom (France), Mudajaya and Shin Eversendai (Malaysia)	2016	1.0	1.1	1.1
Mae Moh Power Plant	Thailand	USC	Alstom (France) and Marubeni Corp (Japan)	2018	0.6	1.1	1.8
Batang Power Plant	Indonesia	USC	PT Adargo Energy (Indonesia), J-Power Electric Power Development Co Ltd and Itochu Corp (Japan)	2018	2.0	4.0	2.0
Jawa - 7	Indonesia	SC	China Shenhua Energy (China) and PT Pembangunan Jawa Bali (Indonesia)	2020	2.0	5.0	2.5
Kudgi STPP	India	USC	Doosan Heavy Industries (South Korea) and Toshiba (Japan)	2016-17	2.4	2.3	0.9
Khargone TPP	India	USC	BHEL and Alstom - Bharatforge (France, India)	2019	1.3	1.5	1.1
Bellary TPP	India	SC	Alstom (France) and Siemens (Germany)	2016	0.7	0.7	1.0
Yermarus TPP	India	SC	BHEL (India), Alstom (France) and Siemens (Germany)	2016	1.6	1.7	1.1
Gadarwara TPP	India	SC	BHEL (India)	2017-18	1.6	1.7	1.1
Luz de Atacama	Chile	USC	NA	2021	1.4	4.2	3.0
Matarbari	Bangladesh	USC	NA (Debt funding commitment by Japan International Cooperation Agency)	2023	1.2	4.6	3.9

Source: IEEFA Estimates

7.0 Renewable Energy – A Viable Alternative to High-Risk Coal Plants

While new coal-based power plants face major complications, the government push to increase the renewables share of the national energy portfolio has shown significant progress.

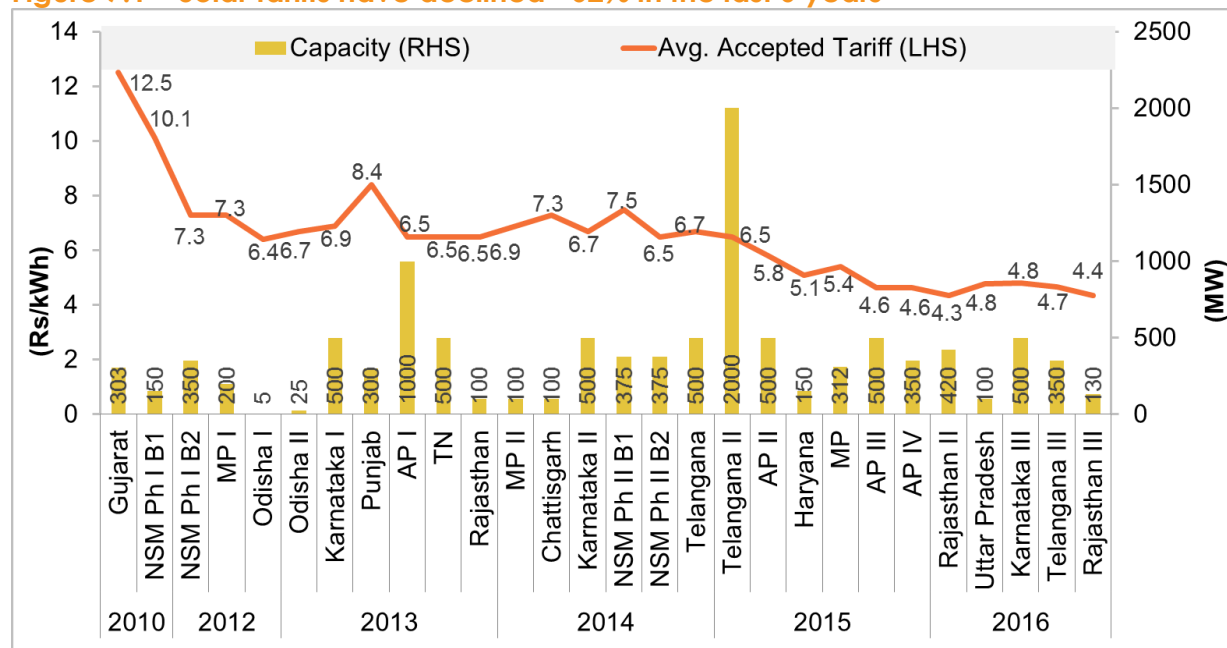
Gains have been made especially in solar capacity additions over the past two years and in the rapidly falling prices of solar power.

7.1 Solar Power Prices Have Fallen Significantly in India

India's impressive solar expansion has been accompanied by impressive price declines. The required tariff for solar power has dropped recently to Rs 4.4/kWh (~US\$ cents 6.5) from Rs 12.5/kWh (~US\$ cents 19.0)⁴⁵ – a 65% decline.

In Tamil Nadu, where Cheyyur UMPP has been proposed, the Tamil Nadu Electricity Regulatory Commission has imposed a comprehensive tariff order on solar power, with tariffs for solar photovoltaic (PV) projects fixed at Rs5.1/kWh (US7.6c/kWh),⁴⁶ about 14% less than the estimated tariff required for Cheyyur UMPP power.

Figure 7.1 – Solar tariffs have declined ~62% in the last 6 years



Source: IEEFA Research

⁴⁵ INR/US\$ Conversion rate used is current, to keep the INR prices comparable

⁴⁶ <http://tnerc.tn.nic.in/orders/Tariff%20Order%202009/2016/Solar%202016/Solar%20Order%20-%202020of%202016.pdf>

Solar Price Declines Are a Global Trend

Dubai set a world record for the lowest cost for solar power on May 1, 2016, when the Dubai Electricity and Water Authority (DEWA) received bids of US3.0c/kWh for the 800 MW Sheikh Maktoum Solar Park Phase III.⁴⁷ The bid was lower than the cost of any available fossil fuel options in Dubai and was about half of the US5.98c/kWh quoted by Riyadh-based Acwa power in December 2014.⁴⁸

The cost of solar power has plunged in other parts of the world as well, with records being set in countries that include Peru, which recorded solar power prices of US4.8c/kWh⁴⁹ and Mexico, where more than 1GW solar plants were auctioned at US4.0c/kWh. The U.S. regularly sees solar auctions at less than US3.0c/kWh, albeit those prices supported by a 30% tax credit.

Solar Power Is Deflationary

The greatest advantage in solar power is its deflationary nature.

Because the operating costs of a solar power plant are very small (sunshine is free), overall costs remain flat across the life of a project. Fossil-fuel-based power plants, on the other hand, are saddled with perennial fuel costs that can increase each year and that are prone to inflation. As a result of these fundamentals, electricity from some existing coal-fired plants in India today is more expensive than solar power.

As time goes by, more coal-fired plants in India will become costlier to operate than solar sources.

The Pace of Solar Capacity Addition in India Has Picked Up

India's solar power capacity had increased to nearly 7.1GW⁵⁰ in March 2016 from 4.3GW in September 2015 and 3.7GW in March 2015.⁵¹

India's solar expansion is likely to gain further momentum. IEEFA sees at least 8GW of new solar additions in 2016/17, and notes that this may prove to be a conservative outlook given that more than 20GW of tenders were completed in 2015/16⁵² and that IEEFA's estimate sits well below the 10-12GW targeted by the MNRE. IEEFA's projection would take the total installed solar capacity in India to over 15.0GW – an increase of 113% in just one year.

⁴⁷ <http://www.apricum-group.com/dubai-shatters-records-cost-solar-earths-largest-solar-power-plant/>

⁴⁸ <http://reneweconomy.com.au/2014/dubai-shatters-solar-price-records-lowest-ever-54972>

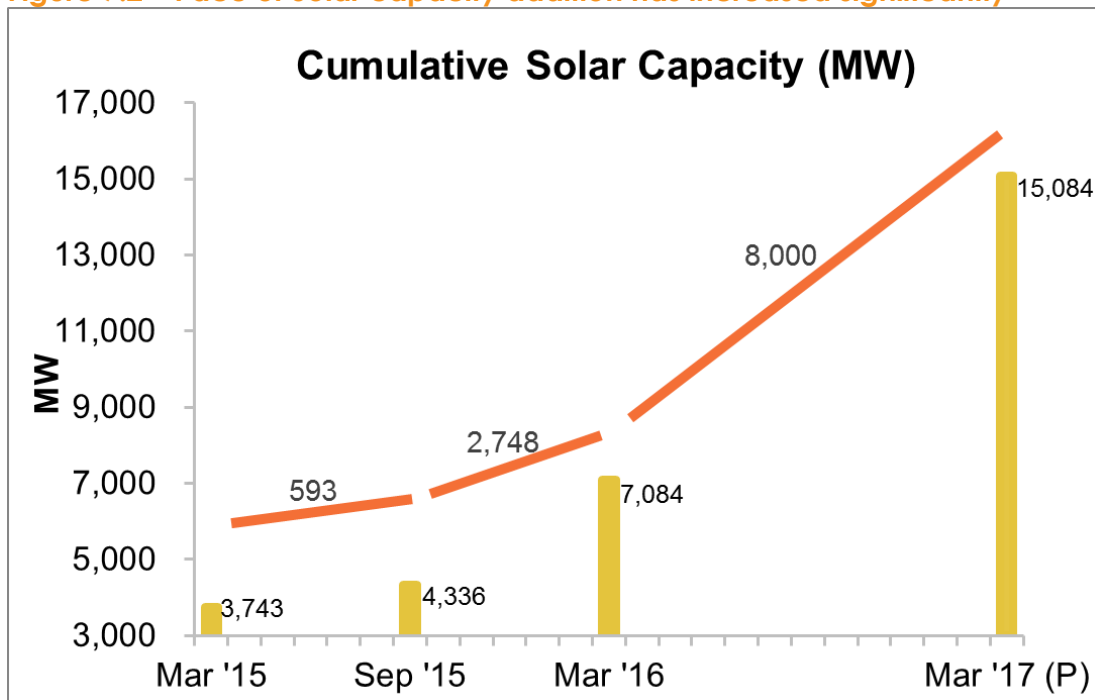
⁴⁹ http://www.pv-magazine.com/news/details/beitrag/peru-awards-185-mw-of-solar-pv-at-us48-mwh_100023273/#axzz4BMWj4rfq

⁵⁰ <http://mnre.gov.in/mission-and-vision-2/achievements/>

⁵¹ <http://www.thehindu.com/business/Industry/renewable-capacity-addition-jumps-49-in-h1/article7823967.ece>

⁵² <http://mnre.gov.in/file-manager/UserFiles/Ujwal-Bharat-English/index.html#/38>

Figure 7.2 – Pace of Solar capacity addition has increased significantly



Source: MNRE, IEEFA Research

Economic, financial, and practicality tailwinds support solar expansion while coal-based power—India's UMPPs included—is fighting headwinds. This contrast is rooted in the numerous advantages solar offers – quick commissioning times of typically 12 months, zero fuel-price risk and nearly zero impact on the environment and on surrounding living conditions.

An additional advantage solar has over coal: Solar plants need not be located next to water, which is required in vast quantities for large coal-fired plants.

Land is also an issue that favors solar. Land-procurement delays were key to the cancellation of four proposed UMPPs in June 2016. And while solar production requires space, it need not be all in one place. A 4GW coal-fired plant requires a singular, large tract of land; 4GW of solar energy can be produced by 40 100MW plants.

The rapidly increasing attractiveness of the solar market in India vis-à-vis solar power is evident in how so many of India's leading thermal power players have abandoned the sector to focus on solar. News that Adani Group, one of India's biggest coal-based electricity producers, is building a 10GW solar park⁵³ while putting its ambitious coal plans on hold⁵⁴ is an indicator of the paradigm shift occurring in the Indian power-generation industry.

Reliance ADAG, another big Indian power-sector players, has recently changed its business strategy, focusing now on renewables rather than thermal power.⁵⁵ Rattan India Power, another

⁵³ <http://www.dnaindia.com/money/report-adani-to-set-up-country-s-largest-solar-park-of-10000-mw-in-rajasthan-2095988>

⁵⁴ <http://www.thechronicle.com.au/news/adani-puts-mega-mine-funding-hold-until-2017/2920729/>

⁵⁵ <http://ieefa.org/indian-electricity-behemoth-reliance-power-has-turned-its-energy-now-to-renewables/>

Indian company engaged in coal-based power generation, has requested permits to build a solar power plant on a site it had once assigned for construction of a thermal power plant.⁵⁶

Case in Point: Rapid Solar Installation in Tamil Nadu

Solar power capacity has been added rapidly across the state of Tamil Nadu.

In June 2015, Adani group signed a contract with Tamil Nadu Generation and Distribution Corporation (TANGEDCO) to set up a 648 MW solar power plant to supply power for Rs. 7.01/kWh, with the condition that only projects commissioned before March 31, 2016, would receive this tariff.

The company started purchasing land in July 2015 to establish three units of 72 MW capacity each and two units of 216 MW capacity each. The company began construction in August 2015 and started generating power from the 72 MW units in early February 2016.⁵⁷ Over 300 MW had been commissioned by March 2016,⁵⁸ with a total agreement-to-installation time of eight months, as opposed to the more than four years that construction and commission of a plant like Cheyyur would require under the best-case scenario.

Other big solar players like Welspun Renewables (built 150Mw solar project, developing 330MW capacity)⁵⁹ and SunEdison (built 175MW power projects of 215MW total awarded)⁶⁰ have also quickly added significant solar power capacity in Tamil Nadu.^{61 62}

⁵⁶ <http://www.livemint.com/Companies/eQLRrrel4a1KL7vttAg9IM/Coal-plant-developer-RattanIndia-Power-switches-to-solar-for.html>

⁵⁷ <http://www.thehindu.com/todays-paper/tp-national/tp-tamilnadu/solar-power-adani-group-starts-transmitting-to-grid/article8316321.ece>

⁵⁸ <http://timesofindia.indiatimes.com/city/chennai/Solar-tariff-fixed-at-Rs-5-1-for-pending-projects/articleshow/51623378.cms>

⁵⁹ <http://www.welspunrenewables.com/buzz-TamilNadu.html>

⁶⁰ <http://www.thehindubusinessline.com/companies/sunedison-adanis-miss-march-31-project-commissioning-deadline-in-tn-sunedison-adanis-miss-march-31-project-commissioning-deadline-in-tn/article8548050.ece>

⁶¹ <http://www.dnaindia.com/money/report-tamil-nadu-cm-launches-projects-worth-rs-10000-crore-to-generate-24000-jobs-2171615>

⁶² <http://www.thehindubusinessline.com/companies/welspun-to-set-up-100-mw-solar-plant-in-tamil-nadu/article7000055.ece>

8.0 Conclusion

India should suspend its development of new UMPPs.

UMPPs are out of step with the times and out of step with the most prudent aspects of the Modi government's energy policies. They contradict initiatives to reduce dependence on coal-based power in general and imported coal in particular.

India has surplus electricity-generation capacity, a fact that underscores the lack of need for new UMPPs, which are expensive investments hobbled by complexities and repeated program failures.

Various delays have already increased the cost of building these plants, which would effectively increase inflationary pressures on power rates.

Recent revisions in UMPP bidding-process policies fall short of addressing key land-acquisition issues and do nothing to thwart the likelihood that consumers would bear the brunt of coal-price and exchange-rate risk.

Given the existing pipeline of thermal power projects and less-than-expected-growth in electricity demand, new UMPPs like those proposed at Bhedabahal, Odisha and Cheyyur, Tamil Nadu, will likely become stranded assets.

Remarkable progress in renewable energy development across India—especially in solar—and steep declines in the cost of solar generation present a superior alternative to UMPPs.

The Cheyyur UMPP project is a vivid case in point, hindered by litigation and land-acquisition issues. It is a glaring example of a UMPP project that should be put on hold.

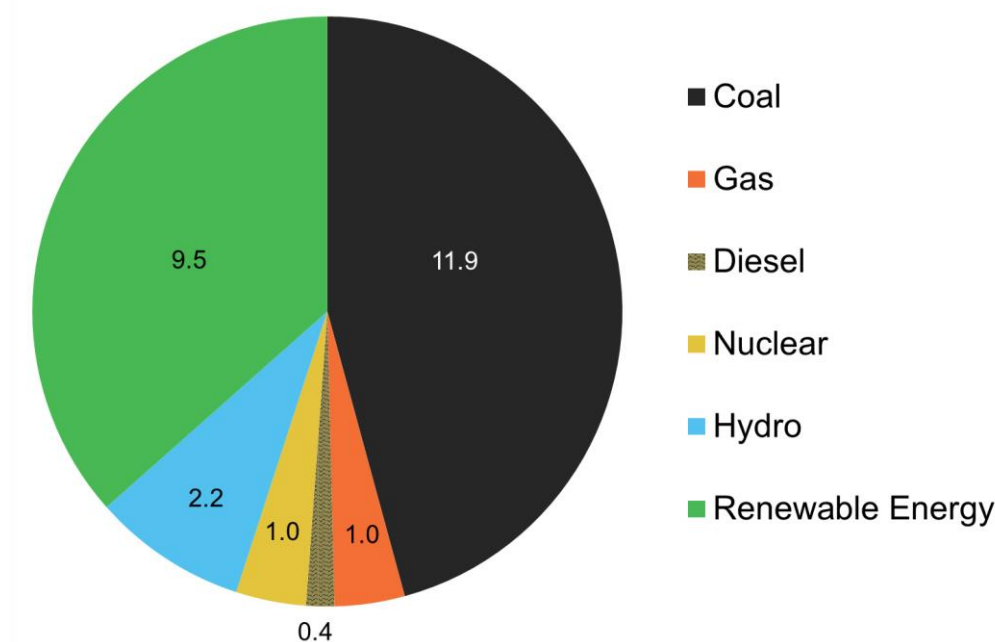
Annexure I: Tamil Nadu Electricity Sector

Tamil Nadu has the second biggest GDP in India and one the highest GDP growth rates at 9.2% per annum.⁶³ In per capita terms, Tamil Nadu is the third richest large state.⁶⁴ Tamil Nadu has a total installed power capacity of 26.0GW. With 9.5GW of installed wind and solar capacity, the state has the highest amount of renewable energy capacity in India. Tamil Nadu has over 7GW of wind power capacity. The renewable energy potential in the state is estimated at 680GW.⁶⁵ There are 13.3GW of thermal power capacity in Tamil Nadu.

Tamil Nadu has faced major power availability issues in the past. In 2014, parts of the state regularly saw 8-10 hours of electricity cuts.⁶⁶ A major reason for the power crisis was insufficient power generation capacity addition. Over 2005-2012, the Tamil Nadu Electricity Board (TNEB) added a mere 330MW of capacity, whereas demand over the same period rose by 3,800MW.

However, recognising this problem, Tamil Nadu added 19.0GW capacity over 2012-2016. In the process, the peak power deficit in the state has fallen from 14.9% in 2011-12 to just 0.3% in 2015-16, while the state met its overall power demand in May 2016.⁶⁷ Tamil Nadu has further plans to add nearly 9.9GW power over the next three years, of which 4.8GW capacity is thermal. The state has allocated a target of adding 8.9GW of solar capacity and 11.9GW of wind capacity by 2022 as part of India's overall target of adding 175GW of renewable energy capacity by 2022.

Figure A1.1 – Installed Power Generation Capacity (GW) in Tamil Nadu - May 2016



Source: CEA

⁶³ <http://statisticstimes.com/economy/gdp-growth-of-indian-states.php>

⁶⁴ <http://statisticstimes.com/economy/gdp-capita-of-indian-states.php>

⁶⁵ http://shaktifoundation.in/wp-content/uploads/2014/02/tamil%20nadu_re%20action%20plan_jan%202013.pdf

⁶⁶ <http://www.livemint.com/Politics/f0jg75XXKKNSBm31bw9uPI/In-Tamil-Nadu-electricity-supply-beats-corruption-developm.html>

⁶⁷ http://cea.nic.in/reports/monthly/executivesummary/2012/exe_summary-03.pdf

Annexure II: India's UMPP Program

India launched its ambitious Ultra Mega Power Project (UMPP) program in 2005/06, inviting bids for development of four UMPPs. The program envisaged a total of 16 UMPPs, of which four were auctioned and allocated to bidders in the first round. Of the four, three – UMPPs at Sasan, Tilaiya and Krishnapatnam – were allocated to Reliance Power (RPower), part of the Reliance ADAG conglomerate. The remaining UMPP, at Mundra, was allocated to Tata Power.⁶⁸

However, the UMPP program has met with very limited success. RPower has given up on Tilaiya UMPP⁶⁹ and is looking to exit the Krishnapatnam UMPP.⁷⁰ The Tilaiya example is a case study on the complexities of the UMPP program. RPower cited issues with land acquisition, captive coal blocks and infrastructure as the reasons to exit the Tilaiya UMPP, whereas the government of Jharkhand – the state where Tilaiya plant was to have been located – expressed surprise on RPower's decision.⁷¹ However, the fact that RPower had already petitioned for a tariff increase for the Tilaiya plant⁷² indicated that there were many more unspoken issues with the UMPP. RPower is citing the increase in Indonesian coal cost as the chief factor in seeking to exit the Krishnapatnam UMPP.⁷³

The other two UMPPs – one at Mundra operated by Tata Power and the other at Sasan operated by RPower – are now functional. However, their development was not smooth. The owners of both plants have petitioned for tariff increases for various reasons – ranging from increases in cost of construction and unforeseen depreciation in the rupee⁷⁴ to increases in the price of imported coal.⁷⁵

In both cases, regulators granted the increase in tariffs. RPower is reportedly seeking to offload the Sasan project onto the Indian government.⁷⁶

The fact that all projects faced multiple difficulties suggest that the fundamental problem was probably with the UMPP policy itself.

Figure A2.1 – Status of allocated UMPPs

UMPP	Developer	Status	Issues
Sasan	Reliance Power	Operating	Construction cost over-run Higher cost of imported coal Rupee depreciation RPower seeking to offload project
Mundra	Tata Power	Operating	Case related to tariff increase plea Litigation against IFC by locals Higher cost of imported coal
Krishnapatnam	Reliance Power	Stalled	Rise in Indonesian coal prices RPower seeking to exit project
Tilaiya	Reliance Power	Abandoned	Delays in land acquisition Issues with infrastructure development Tariff increase

⁶⁸ <http://www.pfc.gov.in/Content/UltraMegaPower.aspx>

⁶⁹ http://www.business-standard.com/article/companies/jharkhand-to-take-over-tilaiya-umpp-buy-all-shares-from-r-power-11601060007_1.html

⁷⁰ http://www.business-standard.com/article/pti-stories/rpower-seeks-to-exit-krishnapatnam-umpp-writes-to-ap-govt-116012600521_1.html

⁷¹ http://articles.economictimes.indiatimes.com/2015-04-29/news/61652840_1_gauba-tariff-land-acquisition

⁷² <http://www.thehindubusinessline.com/companies/reliance-power-seeks-higher-tariff-for-tilaiya-umpp/article5220813.ece>

⁷³ http://www.business-standard.com/article/pti-stories/rpower-seeks-to-exit-krishnapatnam-umpp-writes-to-ap-govt-116012600521_1.html

⁷⁴ <http://www.ksebo.org/news/cerc-admits-two-reliance-power-petitions-for-sasan-umpp-16042751.html>

⁷⁵ http://articles.economictimes.indiatimes.com/2013-04-15/news/38555850_1_indonesian-regulation-mw-mundra-ultra-mundra-umpp

⁷⁶ http://www.business-standard.com/article/companies/r-power-asks-pfc-to-buy-out-sasan-umpp-115082900032_1.html

Annexure III: Plant Load Factor in Indian Thermal Power Plants

India's Central Electricity Authority (CEA) publishes the average Plant Load Factor across all Thermal Power Plants in India for each month and Year-to-date (YTD) in its monthly Executive Summary report. In 2015/16, the average of the monthly numbers reported by CEA was 62.2%.

The same March 2016 Executive Summary reports that the total number of units of electricity produced by all thermal power plants in 2015/16 was 943.4 Billion kWh.⁷⁷ At the beginning of the year, the total installed thermal power plant capacity in India was 188.9GW⁷⁸ and at the end of the year, it was 210.7GW – an average of 199.8GW. This generation capacity translates to 1,750 Billion kWh at 100% utilisation. Given these numbers, IEEFA calculates that the overall PLF at which Indian thermal power plants operated was 53.9% in 2015/16.

Figure A3.1 – Indian Thermal Power Plants - Officially Calculated PLF for 2015/16

Month	Plant Load Factor (%)
April	62.1
May	64.3
June	59.4
July	58.4
August	57.6
September	63.6
October	66.9
November	60.3
December	61.8
January	63.2
February	65.0
March	63.9
Average	62.2

Source: CEA

Figure A3.2 – Indian Thermal Power Plants – IEEFA Estimated PLF in 2015/16

India's Thermal Power Capacity at the beginning of 2015-16 (GW)	188.9
India's Thermal Power Capacity at the end of 2015-16 (GW)	210.7
Average Thermal Power Capacity in India during 2015-16 (GW)	199.8
Number of hours per annum	8760
Number of units produced at 100% PLF (Billion kWh)	1750.1
Number of units actually produced in 2015-16 (Billion kWh)	943.4
Average estimated thermal plant PLF in 2015-16	53.9%

Source: CEA, IEEFA Estimates

Of the overall average thermal power capacity, about 24GW was gas-fired and 1GW was diesel-fired. The remaining 175GW was coal-fired. IEEFA estimates that the PLF of gas-fired and diesel-fired plants were 24.8% and 29.0%, producing 51.7 Billion kWh and 2.5 Billion kWh, respectively. Accordingly, coal-fired plants produced the remaining 889.2 Billion kWh through the year, meaning that capacity utilisation was 58.0%.

⁷⁷ http://cea.nic.in/reports/monthly/executivesummary/2016/exe_summary-03.pdf

⁷⁸ http://cea.nic.in/reports/monthly/executivesummary/2015/exe_summary-03.pdf

Figure A3.3 – Indian coal fired power plants – IEEFA estimated PLF in 2015/16

Electricity actually produced by thermal power plants (Billion kWh)	943.4
Average Gas fired power capacity during 2015-16 (GW)	23.8
Estimated PLF of Gas power plants	24.8%
Electricity produced by Gas fired power plants (Billion kWh)	51.7
Average Diesel fired power capacity during 2015-16 (GW)	1.0
Estimated PLF of Diesel power plants	29.0%
Electricity produced by Diesel fired power plants (Billion kWh)	2.5
Average Coal fired power capacity during 2015-16 (GW)	174.9
Electricity produced by Coal fired power plants (Billion kWh)	889.2
Number of units produced by Coal fired plants at 100% PLF (Billion kWh)	1532.1
Estimated PLF of Coal power plants	58.0%

Source: CEA, IEEFA Estimates

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The Institute for Energy Economics and Financial Analysis (IEEFA) conducts research and analyses on financial and economic issues related to energy and the environment. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy and to reduce dependence on coal and other non-renewable energy resources. More can be found at www.ieefa.org.

About the Authors

Jai Sharda

Jai Sharda is a Consultant with IEEFA in India and the managing partner at Equitorials, a financial research firm based in Bengaluru. Jai has 8 years of experience as an Equity Research analyst, both on the Buy side and the Sell side, having covered the mid-cap sector in the Indian markets.

Tim Buckley

Tim Buckley has 25 years of financial market experience covering the Australian, Asian and global equity markets from both a buy and sell side perspective. Tim was a top rated Equity Research Analyst and has covered most sectors of the Australian economy. Tim was a Managing Director, Head of Equity Research at Citigroup for many years, as well as co-Managing Director of Arkx Investment Management P/L, a global listed clean energy investment company that was jointly owned by management and Westpac Banking Group.

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